INTERNATIONAL CRITICAL TABLES
OF
NUMERICAL DATA
PHYSICS, CHEMISTRY AND TECHNOLOGY

VOLUME I

INTERNATIONAL CRITICAL TABLES
OF
NUMERICAL DATA,
PHYSICS, CHEMISTRY AND TECHNOLOGY

Prepared under the Auspices of the International
Research Council and the National
Academy of Sciences

BY THE

NATIONAL RESEARCH COUNCIL

OF THE

UNITED STATES OF AMERICA

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PREFACE BY THE BOARD OF TRUSTEES

The publication of International Critical Tables at a price that would make possible a world-wide distribution required that the undertaking be financed by those appreciating its importance and in a position to make the necessary investment. Some 244 firms and individuals and two of the larger Foundations have provided the sum of $170,000 required for the compilation.

Many individuals have given freely of their time and effort in helping to obtain the funds necessary for the compilation of this work. In addition to those who have been responsible for assigned territory, there are a large number of others in industrial organizations which have supported the enterprise, and grateful acknowledgment is made of their interest and help, quite as much as if it were possible to give here the complete list of names. Indeed, it is impossible for the trustees to know of all those who at different stages of the work have rendered valuable assistance.

Special acknowledgment is due to the Carnegie Corporation of New York and to the International Education Board, whose appropriations in the support of this work were a large factor in making its successful completion possible.

It is appropriate to give here special recognition to those who assumed and carried out definite responsibility in the solicitation of funds, as well as to those whose financial support enabled the project to be made a reality.

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The work of the trustees began with the appointment of Hugh K. Moore in 1920, with whom were later associated Julius Stieglitz, representing the American Chemical Society, and E. P. Hyde, representing the American Physical Society. After a substantial sum had been procured, the number was enlarged to include H. E. Howe and later George P. Adamson and Charles L. Reese. Mr. Hyde resigned to go abroad and was succeeded by Frank B. Jewett, who has lately been succeeded by Michael Pupin as representative of the American Physical Society. Upon relinquishing his active duties in the National Research Council, H. E. Howe was succeeded as Secretary of the Board of Trustees by W. M. Corse, but remained a member of the Board; and a little later Edward B. Craft was added to the Board.

The trustees have been obliged to place a maximum limit on the cost of this work, but they realize that other material which could not be included because of financial limitations should be made available and that International Critical Tables, if it is to render maximum service, should become an established institution, with supplements and revisions published from time to time, in order that these fundamental data may be made available as rapidly as the values are established through further research. An endowment therefore should be sought for International Critical Tables, and with the appearance of the completed set it is believed the enterprise will appeal to many of those able to make such an endowment a reality.

The trustees wish to express their gratitude to the many industrialists who have given of their time to become acquainted with this enterprise, for the courtesy which they have everywhere met, and for the widespread cooperation without which International Critical Tables could not have been brought into existence.

George P. Adamson
William M. Corse
Edward B. Craft
Harrison E. Howe
Hugh K. Moore
Michael I. Pupin
Charles L. Reese
Julius Stieglitz

PREFACE BY THE BOARD OF EDITORS

At the organization meeting of the International Union of Pure and Applied Chemistry, held in London in June 1919, the Union approved as one of its projects the compilation of International Critical Tables of Numerical Data of Physics, Chemistry, and Technology, and assigned to the United States of America the financial and editorial responsibility for the undertaking. The project was later given the patronage of the International Research Council at its Brussels meeting in 1923.

On behalf of the National Academy of Sciences, the National Research Council of the United States accepted the executive, editorial and financial responsibilities of the project, and with the cooperation of the American Chemical Society and the American Physical Society, created a Board of Trustees to take charge of the financial and business administration, and a Board of Editors to supervise and carry out the preparation of the text.

The first action of the Board of Editors, early in 1922, was to approve the appointment of Corresponding Editors in different parts of the world, particularly in all those countries in which conditions were such that they might be expected to take a really active part in the undertaking. In making these appointments, the Board first sought the advice of competent individuals in the several countries, and in accordance with the suggestions thus received, appointed ten Corresponding Editors and empowered them to arrange for Advisory Committees to assist in the work. In the case of certain countries, the Board was unsuccessful in its efforts to secure cooperation, usually either because of the receipt of no reply or an unfavorable reply, or through failure of the Corresponding Editor, after appointment, to perform his duties.

The general plan of preparation of the Tables was as follows: The subject matter was first divided into some 300 different sections. The Corresponding Editors were then asked to recommend for the several sections one or more persons who should either have some special knowledge of the subject matter of the section, or be otherwise qualified to pass critical judgment upon the available information on the subject. On the basis of the recommendations thus received, the Board of Editors selected the Cooperating Experts, to whom was intrusted the task of critically compiling, and displaying in suitable form, the available quantitative information upon the several topics. In making these selections, the Board consistently endeavored to secure the best man *available* in the light of all the information which it possessed. In certain special fields composed of closely related topics, the Board provided also for the appointment of Special Editors to supervise the work and to assist in the final arangement of the material.

In the course of its labors the Board of Editors has enjoyed the cooperation of numerous organizations and individuals whose advice, suggestions, and assistance, in many ways have greatly aided it in its complex and difficult task. It is especially indebted to the several Corresponding Editors and their Advisory Committees, who have generously contributed their time and thought to the success of the work; to the Special Editors; to the U. S. Bureau of Standards, the National Physical Laboratory of Great Britain and the Physical Society of France; to the International Commission in charge of Annual Tables; and to various organizations and individuals who made available unpublished data for the use of the Cooperating Experts.

PREFACE PAR LE COMITÉ DES RÉDACTEURS

Lors de l'Assemblée d'organisation de l'Union internationale de Chimie pure et appliquée, qui eut lieu à Londres en Juin 1919, l'Union approuva comme l'un de ses projets l'élaboration de Tables critiques de valeurs numériques de physique, chimie et technologie, et elle chargea les Etats-Unis d'Amérique de la responsabilité financière et d'édition de l'entreprise. Le projet fut, plus tard, placé sous le patronage du Conseil international de Recherches, à son assemblée de Bruxelles en 1923.

Chargé de ces attributions, le Conseil national de Recherches des Etats-Unis, agissant en collaboration avec la Société chimique américaine et la Société physique américaine, nomma un Conseil d'Administration et un Comité des Rédacteurs.

La première activité que manifesta le Comité des Rédacteurs, au début de 1922, fut d'approuver la nomination de Rédacteurs-correspondants dans les différentes parties du monde, particulièrement dans tous les pays dont les conditions autorisaient l'espoir d'une collaboration active dans cette entreprise. Pour procéder à ces nominations, le Comité sollicita d'abord l'avis de personnalités compétentes dans les divers pays, et c'est en tenant compte des suggestions ainsi obtenues qu'il nomma dix Rédacteurs-correspondants et leur donna les pouvoirs nécessaires pour organiser des Comités-consultatifs dans le but d'aider à l'accomplissement du travail. Dans le cas de certains pays, les efforts du Comité en vue de s'assurer leur coopération furent vains, soit qu'il n'y eût pas de réponse ou que celle-ci fut défavorable, soit encore que le Rédacteur-correspondant, après sa nomination, eût manqué à ses engagements.

Le plan général de préparation de ces Tables fut le suivant: l'ensemble des matières à traitér fut d'abord divisé en quelque 300 différentes sections. Les Rédacteurs-correspondants furent alors priés de recommander, pour les différentes sections, une ou plusieurs personnes qui eussent des connaissances spéciales du sujet traité dans la section ou qui fussent qualifiées pour formuler un jugement critique sur les informations à disposition concernant le sujet. Sur la base des recommandations ainsi reçues, le Comité des Rédacteurs choisit les Experts-coopérants qui furent chargés de la compilation critique et de la disposition sous une forme convenable des informations quantitatives disponibles sur les différents sujets. En faisant cette sélection, le Comité s'efforça de s'assurer la collaboration de la personne qui, d'après les renseignments recueillis, était la plus qualifiée et qui se trouvait alors disponible. Dans certains domaines spéciaux, composés de sujets étroitement apparentés, le Comité se chargea aussi de nommer des rédacteurs spéciaux pour diriger le travail et pour aider à l'arrangement final de la matière.

Au cours de ses travaux, le Comité des Rédacteurs a eu le plaisir d'enregistrer la coopération de nombreuses organisations et de particuliers dont les conseils, les suggestions et l'aide lui ont été, en maintes circonstances, d'un grand secours dans l'accomplissement de sa tâche complexe et difficile. Il est spécialement reconnaissant aux nombreux Rédacteurs-correspondants et à leurs Comités-consultatifs qui ont généreusement donné leur temps et leur pensée pour assurer le succès de l'oeuvre; aux Rédacteurs spéciaux, au U. S. Bureau of Standards, au National Physical Laboratory of Great Britain et à la Société de Physique de France; à la Commission internationale chargée des Tables annuelles; ainsi qu'aux

VORWORT DER REDAKTIONS-KOMMISSION

An der geschäftlichen Sitzung der Internationalen Union für reine und angewandte Chemie in London, Juni 1919 billigte die Union, als eine ihrer Aufgaben, die Abfassung Internationaler kritischer Tafeln, numerischer Daten der Physik, Chemie und Technologie und betraute die Vereinigten Staaten von Amerika sowohl mit dem finanziellen als auch mit dem redaktionellen Teil dieser Aufgabe. Der Plan erhielt später die Förderung durch International Research Council an der Tagung in Brüssel 1923.

Entsprechend dieser Betraung errichtete National Research Council der Vereinigten Staaten, zusammenwirkend mit American Chemical Society und American Physical Society vorgehend, eine geschäfts-führende Kommission und eine Redaktions-Kommission.

Die ersten Schritte, welche die Redaktions-Kommission zu Beginn des Jahres 1922 machte, war, sich korrespondierende Mitglieder in allen Teilen der Welt zu sichern, besonders in denjenigen in welchen die Bedingungen vorhanden waren, die eine lebhafte Beteiligung an dem Unternehmen erwarten liessen. Nach diesem nahm die Kommission zuerst den Rat massgebender Persönlichkeiten verschiedener Länder entgegen; in Übereinstimmung mit den so erhaltenen Vorschlägen, wurden zehn korrespondierende Mitglieder bestimmt, welche nun einen beratenden Ausschuss zu bilden hatten, um der Arbeit ihre Unterstützung zu zuwenden. In einigen Ländern gelang es der Kommission nicht Mitarbeiter zu erlangen, meistens deshalb weil keine, oder eine ablehnende Gegenäusserung erfolgte, oder, dass das korrespondierende Migglied, nach der entsprechenden Zusage nicht vorging.

Die Grundlinien für die Bearbeitung der Tafeln waren die folgenden. Das Material wurde zuerst in etwa dreihundert verschiedene Abschnitte zerlegt. Die korrespondierenden Mitglieder wurden dann gebeten, für einige dieser Abschnitte, einen oder mehrere Mitarbeiter zu empfehlen, die entweder besondere Kenntnisse über den Gegenstand des Abschnittes besitzen, oder imstande waren, kritisch, vorhandenes Material durchzugehen. Auf Grund der so erhaltenen Empfehlungen, wählte die Redaktionskommission die Mitarbeiter aus, die mit der Aufgabe betraut wurden, kritisch die numerischen Daten des betreffenden Gegenstandes durchzuarbeiten und in entsprechender Form darzustellen. Bei dieser Auswahl war die Kommission ganz besonders bestrebt, nach den vorhandenen Mitteilungen, den besten *zur Verfügung* stehenden Mitarbeiter zu erhalten. In gewissen nahe verwandten Gebieten war man darauf bedacht, besondere Redaktions-mitglieder zu erhalten, um die Arbeit hier zu überwachen und tätigen Anteil der Schlussredaktion des Materials zu nehmen.

Im Laufe ihrer Bestrebungen konnte sich die Redaktion-Kommission der Mitarbeit zahlreicher Vereinigungen und einzelner Personen erfreuen, deren Ratschläge, Winke and Beihilfe ihnen bei der verwickelten und schweren Aufgabe von grossem Nutzen waren. Die Redaktionskommission ist besondren Dank ihren verschiedenen korrespondierenden Mitgliedern und dem beratendem Ausschuss schuldig, die in grossmütiger Weise ihre Zeit und Arbeit dem Erfolg dieser Tafeln gewidmet haben, ferner auch den Mitgliedern, die die Arbeit an den besonderen Kapiteln überwachten. Der Dank gebührt U. S. Bureau of Standards, National Physical Laboratory of Great Britain und Société de Physique de France, der Internationalen Kommission betraut mit der Herausgabe der Tables annuelles und den verschiedenen Ver-

PREFAZIONE DELL' UFFICIO DI REDAZIONE

Nella conferenza tenuta a Londra nel giugno 1919 per organizzare la Unione Internazionale della Chimica Pura ed Applicata venne, tra gli altri, formulato il progetto di compilare delle Tabelle Critiche Internazionali contenenti dati numerici di fisica, chimica e tecnologia, e venne affidata agli Stati Uniti la responsabilità finanziaria ed editoriale dell'impresa. Al progetto fu in seguito accordato il patronato del Consiglio Internazionale di Ricerche nella riunione del 1923 a Bruxelles.

In seguito all'incarico ricevuto, il Consiglio Nazionale di Ricerche degli Stati Uniti, d'accordo con la American Chemical Society e con la American Physical Society, nominò un Consiglio di Amministrazione ed un Ufficio Editoriale.

Come suo primo atto, l'Ufficio, nel 1922, nominò Redattori Corrispondenti in tutto il mondo, scegliendoli di preferenza nei Paesi dove poteva ritenersi che essi avrebbero preso parte attiva al lavoro. Le nomine furono fatte dopo aver sentito il parere di persone competenti. A questo modo furono scelti dieci Redattori Corrispondenti e ad essi venne data facoltà di nominare ciascuno un Comitato consultivo col compito di assisterli nel lavoro. In alcuni Paesi l'Ufficio non riuscì ad assicurarsi collaborazione di sorta, o perchè addirittura non gli fu possibile ottenere una risposta, o perchè la risposta fu negativa, o perchè il Redattore Corrispondente scelto, dopo essere stato nominato, mancò agli obblighi assunti.

Il piano generale di preparazione delle tabelle è stato il seguente. Si è divisa la materia in circa 300 capitoli differenti, e i Redattori Corrispondenti sono stati invitati a suggerire per ogni singolo capitolo il nome di una o più persone le quali o avessero una speciale competenza nell'argomento o potessero ritenersi capaci di vagliare criticamente tutto quello che si conosce al riguardo. In base alle proposte ricevute, l'Ufficio di Redazione scelse gli Esperti, e a questi affidò l'incarico di raccogliere, vagliare ed esporre in forma opportuna i dati quantitativi che si sono potuti riunire sui diversi argomenti.

Nel fare la scelta degli Esperti l'Ufficio cercò sempre di assicurarsi la collaborazione degli uomini che, in base alle informazioni avute, dovevano ritenersi i migliori di cui si potesse disporre. In certi campi speciali, comprendenti argomenti strettamente connessi, l'Ufficio nominò anche dei Redattori Speciali col compito di sorvegliare il lavoro e collaborare alla disposizione definitiva del materiale.

Nell'espletare il suo compito, l'Ufficio di Redazione ha potuto giovarsi della collaborazione di numerouse organizzazioni e di numerose persone, le quali con consigli e suggerimenti vari sono state di grande aiuto nel portare a fine un lavoro che è stato certamente complesso e difficile. L'Ufficio è specialmente grato ai vari Redattori Corrispondenti e ai rispettivi Comitati Consultivi i quali hanno generosamente dato il loro tempo e la loro intelligenza al successo dell'opera, ai Redattori Speciali, al Bureau of Standards degli Stati Uniti, al National Physical Laboratory inglese e alla Société de Physique francese, alla Commissione Internazionale in carica per le Tabelle annuali e alle varie organizzazioni e persone che misero a disposizione degli Esperti dati inediti.

Infine i Membri dell'Ufficio desiderano manifestare l'alto apprezzamento che fanno dei contributi di tutti gli Esperti, il lavoro dei quali, compiuto in larga misura con entusiasmo e disinteressatamente, ha reso possibile queste tabella; ed in particolar modo

Finally, the members of the Board desire to record their appreciation of the work of all of the Cooperating Experts whose contributions, largely a labor of love, have made these tables possible; and in particular, of the work of the Editorial Staff, Messrs. Washburn, Dorsey, and West, to whom indeed the utility of this collection of tables should be largely accredited.

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Saul Dushman — C. E. Mendenhall
John Johnston — R. B. Moore.

organisations diverses et aux personnes qui ont procuré des données inédites à l'usage des Experts-coopérants.

Efin, les membres du Comité désirent exprimer leur appréciation pour le travail de tous les Experts-coopérants dont les contributions, pour une large part désintéressées, ont rendu possible l'élaboration de ces Tables, et en particulier pour le travail des Rédacteurs, MM. Washburn, Dorsey et West, auxquels nous sommes en grande partie redevables des services que rendra cette collection de Tables.

George K. Burgess — S. C. Lind
Saul Dushman — C. E. Mendenhall
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INTRODUCTION

International Critical Tables is the result of the cooperative labors of a large number of specialists, each of whom has been charged with the responsibility for the critical compilation of the quantitative information available on his topic. The word "critical" in this connection means that the Cooperating Expert was requested to give in each instance the "best" value which he could derive from all the information available, together, where possible, with an indication of its probable reliability.

Through a cooperative arrangement with International Annual Tables, the Board of Editors has been able to place in the hands of each Cooperating Expert the literature references belonging to his topic for the years 1910–1923 inclusive, as compiled by the staff of International Annual Tables. For the period preceding 1910, each Cooperating Expert was directed to collect the necessary literature references from the various published handbooks, special treatises, works of reference, and other sources known to him as a specialist in the field. No attempt has been made to systematically cover the literature since 1923, although a certain amount of information published since then has been utilized.

In preparing the various sections, the Cooperating Experts were instructed,—

1. To include in the bibliography only (*a*) the sources of the data upon which their reported values actually rest, and (*b*) the sources of available data of the same kind pertaining to those systems for which no numerical value is given. It is not intended to be a complete bibliography of the field.

2. To omit from the tables of numerical data all those systems for which the available data (*a*) were of slight scientific or practical interest, or (*b*) were so discordant as to be of little, if any, value.

3. To set forth the results of their work in the form of text, equations, tables, graphs, or charts, as seemed most appropriate under the circumstances, having regard to the necessity of space economy.

4. To give only selected samples illustrating types in the case of very large and heterogeneous fields, such as colloids, chemical kinetics, and certain classes of industrial materials.

5. To restrict the accompanying explanatory text to the amount necessary for the intelligent use of the data. (Under this restriction, the Expert is given no opportunity to present a general discussion of his subject or of the methods by which he obtained the values given.)

In preparing the textual material for publication the Editors have been compelled, in the interest of economy of space, to enforce the restrictions imposed by sections 3 and 5 of the preceding paragraph and have freely rearranged and rewritten the text, whenever it was evident that a compression or an improvement in logical order could be so secured. With few exceptions, which are duly

INTRODUCTION

Les Tables critiques internationales sont le résultat du travail coopératif d'un grand nombre de spécialistes, chacun de ceux-ci ayant été chargé de la responsabilité de la compilation critique des informations disponibles sur son sujet. Le mot "critique" dans ce cas signifie que l'expert coopérant fut invité à donner dans chaque circonstance la "meilleure" valeur qu'il pouvait recueillir de toutes les informations disponibles, en ajoutant si possible une indication au sujet de la confiance probable qu'on pouvait avoir en elle.

Par le fait d'un arrangement coopératif avec les Tables annuelles internationales, le Comité des Rèdacteurs a été en mesure de mettre à la disposition de chaque expert coopérant les références bibliographiques appartenant à son sujet de l'année 1910 à l'année 1923 inclusivement, celles-ci ayant été compilées par le Bureau des Tables annuelles internationales. Pour la période précédant 1910, chaque expert coopérant fut chargé de recuillir les références bibliographiques nécessaires en usant des manuels variés publiés, des traités spéciaux, des ouvrages de références, et d'autres sources connues de lui en sa qualité de spécialiste du sujet traité. En ce qui concerne la littérature depuis 1923, aucune tentative n'a été faite pour la couvrir d'une façon systématique; un certain nombre d'informations postérieures à 1923 ont cependant été utilisées.

Pour la préparation des différentes sections, il fut recommandé aux experts coopérants:

1. D'inclure dans la bibliographie seulement (*a*) les sources de valeurs sur lesquelles reposent actuellement leurs valeurs reportées, et (*b*) les sources des données de même nature appartenant aux systèmes pour lesquels aucune valeur numérique n'est donnée. Le but poursuivi n'est pas de constituer une bibliographie complète du sujet.

2. De ne pas introduire dans les tables de valeurs numériques tous les systèmes pour lesquels les valeurs disponibles (*a*) sont de peu d'intérêt scientifique ou pratique, ou (*b*) sont par trop discordantes pour être d'une valeur quelconque, si toutefois elles en présentent une.

3. De disposer les résultats de leur travail sous la forme d'un texte, d'équations, de tables, de graphiques ou de cartes, en employant le moyen qui leur parut le mieux approprié suivant les circonstances, en ayant en vue la nécessité d'économiser de la place.

4. De ne donner que des exemples choisis, illustrant les types, dans le cas d'un champ très vaste et hétérogène, tel que: les colloides, la cinétique chimique et certaines classes de matières industrielles.

5. De restreindre le texte explicatif accompagnant les données au strict nécessarie pour la compréhension de celles-ci. (Vu cette restriction, l'expert n'a donc pas l'occasion de présenter une discussion générale de son sujet et des méthodes par lesquelles il a obtenu les valeurs données).

einigungen und Freunden, die noch nicht veröffentlichten Daten den Mitarbeiteren zur Verfügung stellten.

Schliesslich möchte die Redaktions-Kommission ihre Anerkennung den Mitarbeiteren ausdrücken, deren Arbeitsfreudigkeit diese Tafeln möglich machten, im besondrem aber auch der Mühewaltung des Redaktionsstabes der Herrn Washburn, Dorsey und West, denen man vorwiegend den Erfolg und die Nützlichkeit dieses Tabellenwerkes schulden muss.

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ricordano l'opera dei dirigenti dell'Ufficio di Redazione, Sigg. Washburn, Dorsey, e West ai quali sopratutto si deve essere grati per l'utilità che si avrà dalla presente raccolta di tabelle.

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EINLEITUNG

Die Internationalen kristischen Tafeln stellen die Ergebnisse des Zusammenwirkens einer grossen Zahl von Mitarbeiteren mit besonderen Erfahrungen dar, die mit der Aufgabe betraut wurden, die erreichbaren Daten des entsprechenden Gebietes kritisch darzustellen. In dieser Verbindung bedeutet das Wort kritisch soviel, dass der Mitarbeiter gebeten wurde, in jedem einzelnem Fall die "besten" Werte zu geben, die er auf Grund aller zur Verfügung stehenden Literaturstellen, ableiten konnte, zugleich ferner, wenn möglich, alle Angaben mit dem Grade ihrer Zuverlässlichkeit zu vermerken.

Durch ein Übereinkommen mit der Redaktion der Tables annuelles konnte die Redaktionskommission jedem einzelnem Mitarbeiter, über seinen Gegenstand die Literatur der Jahre 1910 bis einschliesslich 1923 soweit übergeben, als sie durch die Redaktion der Tables annuelles ausgearbeitet worden ist. Für die Zeit vor 1910 wurde ein jeder Mitarbeiter gebeten, die notwendigen Literaturstellen und Daten aus den verschieden vorhandenen Handbüchern Spezial-und Nachschlagewerken und anderen, ihm als besonderem Kenner auf diesem Gebiete erreichbaren Quellen, zu sammeln. Es ist nicht versucht worden, die Literatur seit 1923 noch systematisch darzustellen, obwohl ein gewisser Teil davon noch Berücksichtigung finden konnte.

Bei der Bearbeitung der verschiedenen Abschnitte erhielt der Mitarbeiter folgende Anweisungen:

1. Als Literatur sind (*a*) nur diejenigen Stellen anzugeben, auf Grund deren die angegebenen Werte besonders folgerten, (*b*) die Quellen, über denselben Gegenstand, die aber keine numerischen Daten enthalten, die Verwendung gefunden haben.

2. Es sind in den Zahlenangaben der Tafeln alle diejenigen Systeme wegzulassen, deren vorliegende Daten, (*a*) von geringem wissenschaftlichen und praktischen Werte sind, order (*b*) die Daten sind so wiedersprechend, dass sie, wenn überhaupt, von geringem Werte sind.

3. Die Ergebnisse ihrer Arbeit sind in einer solchen Form darzustellen, dass durch den Text, die Gleichungen, Tabellen und Tafeln mit Rücksichtnahme auf Raumersparnis, der Zweck am besten erfüllt wird.

4. In sehr grossen, heterogenen Gebieten wie in denen der Kolloide, der chemischen Kinetik und in gewissen Fällen von technischer Bedeutung, sind nur ausgewählte Beispiele zu geben, die das Gebeit charakterisieren sollen.

5. Der erläuternde Text ist soweit zu beschränken, dass eine sachgemässe Verwertung der Tafeln noch möglich ist. (Bei dieser Einschränkung hat der Experte nicht die Gelegenheit allgemein seine Aufgabe, noch die Methode, darzustellen, nach welchen er seine Angaben erhalten hat.)

INTRODUZIONE

Le Tabelle Critiche internazionali sono il frutto della collaborazione di un gran numero di specialisti a ciascuno dei quali è stato affidato il compito di vagliare i dati disponibili sopra un determinato soggetto. La denominazione di tabelle "critiche" indica che l'esperto è stato incaricato di dare in ogni caso il valore "migliore," deducibile da tutte le notizie che si hanno a disposizione. Tutte le volte che è stato possibile l'esperto è stato incaricato anche di dare indicazioni sul grado di attendibilità dei valori numerici.

In seguito ad accordi intervenuti con le Tabelle annuali internazionali, l'ufficio di Redazione ha potuto fornire a ciascun esperto le indicazioni bibliografiche riferentisi agli anni dal 1910 al 1923 incluso, quali vengono compilate dalla direzione delle Tabelle internazionali. Per gli anni precedenti al 1910, gli esperti vennero consigliati a raccogliere la letteratura dai vari manuali, trattati speciali, lavori bibliografici e da altre fonti ad essi note data la qualità di ognuno di specialista in un determinato campo. Dei dati pubblicati dopo il 1923 si è tenuto conto solo in parte.

E' stato raccomandato agli esperti che, nel preparare le varie parti:

1. Includessero nella Bibliografia soltanto: (*a*) le fonti delle indicazioni sulle quali sono basati i valori riportati, e (*b*) le fonti delle indicazioni riguardanti i sistemi per i quali non viene dato nessun valore. Non si è riportare inteso una bibliografia completa del soggetto.

2. Omettessero nelle tabelle delle grandezze numeriche tutti quei sistemi per i quali i dati disponibili; (*a*) fossero di poco interesse scientifico o pratico, oppure (*b*) fossero così in disaccordo da essere di poco o di nessum valore.

3. Esponessero, a seconda dei casi, i risultati del loro lavoro in forma di testo, di equazioni, di tabelle, di grafici, o di tavole tenendo presente la necessità di economia di spazio.

4. Riportassero soltanto esempi tipici nei campi molto vasti ed eterogenei come colloidi, cinetica chimica ed alcune classi di prodotti industriali.

5. Limitassero il testo esplicativo a quel tanto sufficiente per un uso intelligente delle tabelle (data questa limitazione, all' esperto non è stato consentito di redigere una esposizione generale del suo soggetto o dei metodi con i quali egli ha ottenuto i valori che riporta).

Nel preparare il testo per la pubblicazione i Redattori sono stati obbligati, per economia di spazio, ad applicare le restrizioni imposte nei capoversi 3 e 5 del precedente paragrafo, ed hanno liberamente cambiato disposizione e forma al testo, ogni qualvolta era evidente che potesse derivarne un miglioramento. Salvo poche eccezioni, tutte indicate la forma definitiva del testo è stata sottoposta alla approvazione dell'Esperto.

noted, the final form of the rewritten text was submitted to the Expert and was accepted by him.

In preparing the numerical data for publication the Editors have made no change except in their arrangement and in their mode of presentation. In making such changes the Editors have been guided by the necessity of saving space. The numerical data are in all cases those submitted by the Expert, excepting that (*a*) a few additional values, all duly indicated, have been inserted, and (*b*) when an Expert has submitted a number of values for the same nominal quantity, these have been grouped so as to make a single entry with an indication of the range covered by the values submitted, whenever such grouping seemed justifiable. In these cases, the final manner of grouping was in every case where possible submitted to and accepted by the Expert. The exceptional cases are noted as they occur.

Owing to the method of publication, *i.e.*, one volume at a time, a strictly logical arrangement of subject matter is not always followed. Among such a large number of Cooperating Experts a few instances of greatly delayed reports, arising from illness, accident, or other unforeseen causes, are to be expected; and certain sections or parts of sections, therefore, may not appear in their logical places but will be found in a later volume. The whole set of volumes is very completely indexed, however, and the user who consults the index should have no difficulty in locating any information given.

Chemical compounds are arranged in the tables by formula according to a definite system, called the "Standard Arrangement." This system is based upon a set of key numbers for the chemical elements and is fully explained in Volume One.

In order to find a given substance in the longer tables it is therefore necessary to know its chemical formula, at least approximately. If only the name is known, the formula, for most organic compounds or minerals, may be found with the aid of the name indices in Volume One, p. 174 and 280.

Pour la préparation du texte destiné à la publication, les rédacteurs se sont vu obligés, afin d'économiser encore de la place, d'accentuer encore les restrictions imposées dans les sections 3 et 5 du paragraphe précédent et ils ont pris la liberté de ré-arranger et de ré-écrire le texte partout où il était évident qu'une compression ou une amélioration dans l'ordre logique pouvait ainsi être réalisée. A part de rares exceptions, qui sont du reste dûment notées, la forme définitive du texte ré-écrit fut soumise à l'expert et acceptée par lui.

En disposant les données numériques pour la publication, les rédacteurs n'ont fait aucune modification, excepté en ce qui concerne l'arrangement et le mode de présentation. En faisant ces changements, les rédacteurs ont été guidés par la nécessité d'épargner de la place.

Les données numériques sont dans tous les cas celles fournies par les experts, à l'exception (*a*) d'un petit nombre de valeurs, toutes dûment indiquées, qui ont été insérées, et (*b*) lorsqu'un expert à soumis un certain nombre de valeurs pour la même quantité nominale, ces valeurs ont été groupées de façon à constituer une entrée unique, avec une indication du range occupé par les valeurs fournies, toutes les fois qu'un tel groupement paraissait indiqué. Dans ces cas, la forme définitive du groupement fut, partout où cela était possible, soumise a l'expert et acceptée par lui. Les cas exceptionnels sont notés lorsqu'ils se présentent.

Etant donné le mode de publication par un volume à la fois, un arrangement strictement logique de la matière traitée n'est pas toujours possible. En effet, avec un tel nombre d'experts coopérants, il faut s'attendre à ce qu'il y ait quelques circonstances imprévues, telles que maladies, accidents ou autres causes, occasionnat un grand retard dans la remise des rapports; c'est pourquoi certaines sections ou parties de sections ne peuvent paraître à leur place logique mais se trouveront dans un volume suivant. Cependant, la série complète des volumes étant indexée d'une façon très détaillée, le lecteur qui consulte la table des matières n'aura aucune difficulté pour repérer toute information donnée.

Les composés chimiques sont disposés dans les tables suivant leurs formules et cela d'après un système défini appelé "arrangement type." Ce système est basé sur une suite de "nombres clés" pour les éléments chimiques, et il est expliqué d'une façon complète dans le volume I.

Afin de trouver une substance donnée dans les longues tables, il est nécessaire de connaître sa formule chimique au moins approximativement. Si le nom seul est connu, la formule peut être trouvée pour la plupart des composés organiques ou des minéraux au moyen des noms indices qui se trouvent dans le volume I, p. 174 et 280.

Bei der Zusammenstellung des Textes für die Veröffentlichung waren die Herausgeber gezwungen, im Interesse der Raumersparnis die unter 3 und 5 oben angegebenen Richtlinein besonders zu betonen. Sobald erkannt wurde, dass eine Zusammenziehung und eine Verbesserung in der logische Anordnung möglich sei, wurde der Text frei zusammengestellt und frisch geschrieben. Mit wenigen Ausnahmen, welche besonders bezeichnet sind, wurde die entgültige Form des neu geschriebenen Textes dem Experten vorgelegt und von ihm angenommen.

Bei der Vorbereitung des Zahlenmaterials für die Veröffentlichung änderten die Herausgeber nichts, ausgenommen war nur dessen Anordnung und die Form der Darstellung, wobei man sich von der Notwendigkeit, Raum zu sparen, leiten liess. Die Zahlenwerte sind in allen Fällen dieselben, welche vom Experten vorlagen, ausgenommen, (*a*) dass einige ergänzende, besonders bezeichnete Werte hinzugefügt wurden und (*b*), wenn der Experte für dieselbe quantitative Grösse mehrere Werte angegeben hat. Diese wurden dann, sobald ein solches Vorgehen gerechtfertigt war, zusammengestellt, so, dass nur eine Zahl, mit den Grenzen hingeschrieben werden konnte, welche durch die Werte gegeben sind. In so einem Falle wurde die Endform der Anordnung jedesmal dem Experten, wo möglich vorgelegt und von ihm angenommen. Die Ausnahmsfälle sind dorten wo sie vorgekommen bezeichnet.

Entsprechend der Publikationsmethode, der Herausgabe eines Bandes zu einer bestimmten möglichen Zeit, konnte eine genaue logische Anordnung eines bestimmten Kapitels nicht immer erreicht werden. Unter einer so grossen Zahl von Mitarbeiteren sind Fälle zu erwarten, wo sich einige Artikel stark verzögern werden, sei es durch Krankheit oder andere unvorhergesehene Ursachen. Deshalb werden gewisse Abschnitte oder deren Teile nicht an ihren richtigen Plätzen erscheinen, sonderen sie können in einem späteren Band gefunden werden. Die ganze Bänderfolge ist mit einem sehr vollständigem Verzeichnis versehen und der Leser, welcher das Verzeichnis benützt, wird keine Schwierigkeit haben, Vorhandenes aufzufinden.

Die chemischen Verbindungen sind in den Tafeln nach einem Formelsystem angeordnet, das als "Normalanordnung" (Standard Arrangement) bezeichnet wird. Dieses System, das im ersten Bande vollständig erklärt wird, beruht darauf, dass für die chemischen Elemente Schlüsselnummern gewählt werden.

Um im den längeren Tafeln eine gegebene Substanz aufzufinden, ist es notwendig, deren chemische Formel wenigstens annähernd zu kennen. Ist nur der Name bekannt, so kann die Formel der meisten organischen Verbindungen und der Minerale, mit Hilfe des englischen Namenverzeichnisses im Bande 1 Seite 174 und 280 gefunden werden.

Nell'allestire i dati numerici per la pubblicazione i Redattori hanno fatto cambiamenti solo nel modo di disporli e di presentarli. Nel fare questi cambiamenti i Redattori sono stati guidati dalla necessità di risparmiare spazio. I dati numerici sono in tutti i casi quelli forniti dall'Esperto; solo qualche volta sono stati aggiunti alcuni pochi valori, tutti bene indicati, e qualche altra, avendo l'Esperto riportato parecchi valori per una stessa grandezza, questi—allorchè è sembrato giustificato il farlo—sono stati raggruppati indicando un solo numero ed i limiti entro i quali oscillano i valori considerati. In questi casi, la disposizione finale fu sempre, quando possibile, sottoposta all'approvazione dell' Esperto. Tutte le volte che è stato fatto diversamente, lo si è indicato.

Siccome le tabelle vengono pubblicate un volume alla volta, non sempre la disposizione della materia è fatta in modo strettamente logico.

Dato il numero grande di Esperti, è da aspettarsi che qualche rapporto sarà presentato con grande ritardo a causa di malattie o di incidenti imprevedibili. Certe parti periciò potranno comparire non nel posto che logicamente ad esse spetterebbe, ma in volumi posteriori. Tutti i volumi sono però muniti di indici accurati e il lettore, consultandoli, non avrà difficoltà a rintracciare una notizia qualunque.

I composti chimici sono disposti nelle tabelle in base alle formule seguendo un sistema chiamato "disposizione Standard." Questo sistema è fondato sopra una serie di numeri chiave assegnati agli elementi chimici ed è esaurientemente spiegato nel primo volume.

Per poter quindi trovare una data sostanza nelle tabelle più lunghe, è necessario conoscerne la formula chimica, almeno approssimativamente. Se si conosce solo il nome, la formula si può trovare (per la massima parte dei composti organici o minerali) con l'aiuto degli indici per nome centenuti nel 1° volume p. 174 e 280.

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INTERNATIONAL CRITICAL TABLES

NATIONAL AND LOCAL SYSTEMS OF WEIGHTS AND MEASURES

Charles-Édouard Guillaume and Charles Volet

Plan.—Section A: International Metric System; list of countries in which its use was compulsory on January 1, 1925; list of those in which its use was either legally optional or partially compulsory on same date.

Section B: Other modern systems; the more important units at present in use or in use before adoption of metric system.

Section C: Weights and measures of antiquity.

Style and Abbreviations.—Only the singular number of the names of the units are used; ten meters will appear as 10 meter. Units of area and of volume will be written in the form centimeter^2 ($=cm^2$) and centimeter^3 ($=cm^3$), respectively.

ca.	Value given is only approximate.
ch.	Units have changed from time to time.
cm^2	Square centimeter = centimètre carré = Quadratzentimeter = centimetro quadrato.
current	Units, other than metric, which are now in use; some of the units included in this class are practically obsolete. (*See* Local.)
local	Units of local or native origin or derivation which are in use, but which are embraced neither by the metric system nor by that of the central government. Applies mainly to colonial possessions. (*See* Current.)
m^3	Cubic meter = mètre cube = Kubikmeter = metro cubico.
m.c.	International metric system compulsory since . . .
m.o.	International metric system legally optional since . .
older	Units used before adoption of international metric system.
older =	The older units were those of . . .
provincial	Units vary from one province or city to another.
since . . . = . . .	Since . . . the units have been the same as those of . . .
v.	*Vide* = see.
var.	Units are variable, not rigidly defined.

A. INTERNATIONAL METRIC SYSTEM

The decimal metric system, established in France by the Loi du 7 Avril, 1795, and represented by standards deposited in the Archives de France, became international on May 20, 1875, by the action of the Convention Internationale du Mètre. The new standards, of platinum-iridium, constructed at that time and serving as the basis of the international system, were copied from those of the Archives.

On January 1, 1925, the metric system was compulsory in:

Algeria	Greece	Peru
Allemagne	Guam	Poland
Argentina	Guatemala	Porto Rico
Austria	Haiti	Portugal and colonies
Autriche	Holland	Rumania
Belgium	Honduras	Russia
Bolivia	Hungary	Salvador
Brazil	Iceland	Schweden
Bulgaria	Italy & colonies	Schweiz
Chile	Japan	Serbie-Croatie-Slovénie
Colombia	Kolumbien	Seychelles Islands
Congo, Belgian	Kongo, Belgisch	Siam
Costa Rica	Kuba	Spain
Cuba	Luxemburg	Suède
Czechoslovakia	Malta	Suisse
Denmark	Mauritius	Svézia
Deutschland	Mexico	Svizzera
Ecuador	Netherlands & colonies	Sweden
Equateur	Nicaragua	Switzerland
Espagne	Norway	Tchécoslovaquie
Filippine	Olanda	Tunis
Finland	Österreich	Ungarn
France	Panama	Ungheria
Germany	Pay-Bas & colonies	Uruguay
Gioppóne	Philippine Islands	Venezuela
		Yugoslavia

On the same date, it was legally optional or partially compulsory in:

Canada	Great Britian	Irish Free State
China	India, British	Paraguay
Egypt		Turkey
Ethiopia	Ireland, Northern	United States of America

The fundamental units are: Meter (m), which is the distance at 0°C between the axes of two lines ruled on the prototype deposited at the Bureau international des Poids et Mesures, Sèvres, France; Kilogram (kg), which is the mass of the prototype deposited at the same Bureau; and Liter (l), which is the volume of one kilogram of pure water at the temperature of its maximum density, under the pressure of one normal atmosphere.[1]

The primary units of the system are the *meter* (m), *micron* (μ) = 10^{-6} meter, *gram* (g) = 10^{-3} kilogram, *liter* (l), *are* (a) = area of a square with a side 10 meter long, and *stere* (s) = volume of a cube with an edge one meter long. The units of area [of volume], characterized by the adjective square [cubic], are *not* derived from a primary unit, but are each defined as the area [volume] of a square [cube] with side [edge] equal to the stated unit of length. The names of other secondary units are formed by attaching to the name of a primary unit certain prefixes of unvarying significance.

[1] Normal atmosphere, *v.* p. 18.

Secondary units.

Length m = meter		
μ	micron*	= 10^{-6} m
mm	millimeter	= 10^{-3} m
cm	centimeter	= 10^{-2} m
dm	decimeter	= 10^{-1} m
dkm	dekameter	= 10 m
hm	hectometer	= 10^2 m
km	kilometer	= 10^3 m
Mm	myriameter	= 10^4 m
	megameter	= 10^6 m

* mμ millimicron = 10^{-9} m   μμ micromicron = 10^{-12} m

Mass g = gram		
μg*	microgram	= 10^{-6} g
mg	milligram	= 10^{-3} g
cg	centigram	= 10^{-2} g
dg	decigram	= 10^{-1} g
dkg	dekagram	= 10 g
hg	hectogram	= 10^2 g
kg	kilogram	= 10^3 g
q	metric quintal = 10^2 kg	= 10^5 g
t	metric ton = 10^3 kg	= 10^6 g
c	metric carat	= 200 mg

* Symbol γ also used.

Capacity l = liter = 1.000 027 dm³		
μl*	microliter	= 10^{-6} l
ml	milliliter	= 10^{-3} l
cl	centiliter	= 10^{-2} l
dl	deciliter	= 10^{-1} l
dkl	dekaliter	= 10 l
hl	hectoliter	= 10^2 l

* Symbol λ also used.

Area m² = square meter		
mm²	square millimeter	= 10^{-6} m²
cm²	square centimeter	= 10^{-4} m²
dm²	square decimeter	= 10^{-2} m²
a	are	= 10^2 m²
ha	hectare	= 10^2 a
km²	square kilometer	= 10^6 m²

Volume m³ = cubic meter		
mm³	cubic millimeter	= 10^{-9} m³
cm³	cubic centimeter	= 10^{-6} m³
dm³	cubic decimeter	= 10^{-3} m³
km³	cubic kilometer	= 10^9 m³
ds	decistere = 0.1 s	= 10^{-1} m³
s	stere	= 1 m³
dks	dekastere = 10 s	= 10 m³

B. MODERN SYSTEMS

Abyssinia.—var.: current, *ca.*:

Length

1 pic = 0.686 m
1 farsang = 5.07 km
1 berri = ⅓ farsang

Mass

1 rottolo = 311 g

Unit	Rottolo
1 drachm	= $\frac{1}{120}$
1 derime	= $\frac{1}{120}$
1 wakea	= $\frac{1}{12}$
1 mocha	= $\frac{1}{10}$

Capacity, dry

1 madega = 0.44 l
1 ardeb = 10 or 24 madega

Capacity, liquid

1 kuba = 1.016 l

Ägypten *v.* Egypt.

Äthiopien *v.* Ethiopia.

Algeria.—Since 1843 = France. Older:

Length

1 pic (dzera à torky) = 0.640 m
1 pic (dzera à rabry) = 0.480 m

Unit	Pic
1 termin	= ⅛
1 rebia	= ¼
1 nus	= ½

Mass

1 ukkia = 34.13 g
1 metical = *ca.* 4.7 g

Unit	Ukkia
1 rottolo à thary	= 16
1 rottolo à khadhary	= 18
1 rottolo à kebyr	= 24
1 cantar	= 100 rottolo

Capacity, dry

1 caffiso = 317.47 l
1 saah = 58 l
1 tarri = $\frac{1}{16}$ caffiso

Capacity, liquid

1 khoull = 16⅔ l or 16 l

Allemagne *v.* Germany.

Anam.—var.: ch., current:*

Length

1 thuoc moc = 0.425 m
1 thuoc de ruong = 0.470 m
1 thuoc vai = 0.644 m

Unit	Thuoc
1 ly	= 0.001
1 phan	= 0.01
1 tat	= 0.1
1 tam	= 5
1 ngu	= 5
1 truong	= 10
1 sao	= 15
1 chai vai	= 30
1 that	= 30
1 mao	= 150
1 gon	= 300

Mass

1 dong = 3.775 g
1 picul = 60 kg

Unit	Dong
1 hao	= 0.001
1 li	= 0.01
1 fan	= 0.1
1 luong	= 10
1 neu	= 100
1 can	= 160
1 yen	= 1600
1 binh	= 8000
1 ta	= 16 000
1 quan	= 18 000

Area

1 ngu² = 4.5156 m²

Unit	Ngu²
1 thuoc	= 6
1 sao	= 90
1 mau	= 900
1 quo	= 1800

Capacity

1 hao or shita = 28.26 l
1 tao = 2 hao

* By an ordinance of 1872, units were defined in terms of metric.

Angola.—m.c. 1910.

Arabia.—Provincial, current:

Length

1 covid = 0.482 m
1 guz = 0.635 m
1 cassaba = 3.84 m
1 farsakh = 4.83 km

Unit	Farsakh
1 baryd	= 4
1 marhala	= 8

Mass

1 maund = 1350 g
1 ratl = *ca.* 460 g

Unit	Maund
1 coffilas	= $\frac{1}{400}$
1 vakias	= $\frac{1}{40}$
1 tukeas	= $\frac{1}{40}$
1 farzil	= 10
1 farecella	= 10
1 bahar	= 150
1 bokard	= 150

Capacity, dry

1 téman = 85 l

Unit	Téman
1 mecmeda	= $\frac{1}{40}$
1 kella	= $\frac{1}{40}$
1 mec dema	= $\frac{1}{80}$

Capacity, liquid

1 nusfiah = 0.79 l or = 0.95 l

Unit	Nusfiah
1 vakia	= $\frac{1}{16}$
1 cuddy	= 4
1 zudda	= 8

Argentine Republic.—m.c. 1887; m.o. 1863. Older,* provincial:

Length

1 vara = 0.8666 m

Unit	Vara
1 linéa	= $\frac{1}{432}$
1 pulgada	= $\frac{1}{36}$
1 pié	= ⅓
1 braza	= 2
1 cuadra	= 150
1 legua	= 6000

Mass

1 libra† = 459.4 g

Unit	Libra
1 grano	= $\frac{1}{9216}$
1 adarme	= $\frac{1}{256}$
1 onza	= $\frac{1}{16}$

* National system derived from old Spanish. Units given are those of province of Buenos Aires.

† 1 libra de farmacia = ¾ libra = 344.5 g.

Unit	Libra
1 arroba	= 25
1 quintal	= 100
1 tonelada	= 2000

Area

1 vara² = 0.75 m²

Capacity, dry

1 fanega = 137.1977 l

Unit	Fanega
1 cuartilla	= $\frac{1}{4}$
1 tonelada	= 7.5
1 lastre	= 15

Capacity, liquid

1 frasco = 2.375 l

Unit	Frasco
1 octava	= $\frac{1}{16}$
1 cuarta	= $\frac{1}{4}$
1 baril	= 32
1 cuarter	= 48
1 pipa	= 192

Austria.—m.c. 1876; m.o. 1873. Older:

Length

1 Fuss* = 0.316 08 m
1 Ell = 0.7792 m

Unit	Fuss
1 Punkt	= $\frac{1}{1728}$
1 Linie	= $\frac{1}{144}$
1 Zoll	= $\frac{1}{12}$
1 Klafter	= 6
1 Meile	= 24 000

Mass, (1) ordinary

1 Pfund = 560.01 g

Unit	Pfund
1 Pfennig, 1 Denat	= $\frac{1}{512}$
1 Quentchen	= $\frac{1}{128}$
1 Loth	= $\frac{1}{32}$
1 Unze	= $\frac{1}{16}$
1 Vierding	= $\frac{1}{4}$
1 Mark	= $\frac{1}{2}$
1 Stein	= 20
1 Zentner	= 100
1 Saum	= 275
1 Karch	= 400

Mass, (2) for drugs

1 Pfund apoth. = $\frac{3}{4}$ Pfund
= 420.01 g

Unit	Pfund apoth.
1 Gran	= $\frac{1}{5760}$
1 Scrupel	= $\frac{1}{288}$
1 Drachme	= $\frac{1}{96}$
1 Unze	= $\frac{1}{12}$

Area

1 Joch = 1600 Klafter²
= 57.557 a
1 Metze = $\frac{1}{3}$ Joch

* Vienna.

Capacity, dry

1 Metze = 61.489 l

Unit	Metze
1 Probmetze	= $\frac{1}{1024}$
1 Becher	= $\frac{1}{128}$
1 Futtermassel	= $\frac{1}{32}$
1 Muthmassel	= $\frac{1}{16}$
1 Achtel	= $\frac{1}{8}$
1 Viertel	= $\frac{1}{4}$
1 Muth	= 30

Capacity, liquid

1 Mass = 1.4151 l

Unit	Mass
1 Pfiff	= $\frac{1}{8}$
1 Seidel	= $\frac{1}{4}$
1 Halbe	= $\frac{1}{2}$
1 Viertel	= 10
1 Eimer	= 40
1 Fass	= 400
1 Dreiling	= 1200
1 Fuder	= 1280

Balearic Islands.—*v.* Spain. Local:

Length

1 canna = 1.564 m
1 palmos = $\frac{1}{8}$ canna

Mass

1 rottolo = 408 g

Unit	Rottolo
1 libra major	= 3
1 corta	= 9
1 quartano	= 9
1 arroba	= 26
1 misura	= 36
1 cantaro barbaresco	= 100
1 cantaro	= 104
1 cargo	= 312

Capacity, dry

1 quartera = 71.97 l

Unit	Quartera
1 barcella	= $\frac{1}{6}$
1 almude	= $\frac{1}{36}$

Capacity, liquid

1 quartin = 27.14 l

Unit	Quartin
1 quarte	= $\frac{2}{13}$
1 quarta	= $\frac{1}{26}$

Bavaria *v.* Germany.

Belgian Congo.—m.c. 1911.

Belgium.—m.c. 1820; at first with the names: aune = m, litron = l, livre = kg, once = hg, lood = dg, wigtje = g, Older:

Length

1 perche = 6.497 m
1 pied = $\frac{1}{20}$ perche

Mass

1 livre = 489.5 g

Unit	Livre
1 loth	= $\frac{1}{32}$
1 once	= $\frac{1}{16}$
1 marc	= $\frac{1}{2}$
1 stein	= 8
1 quintal	= 100
1 chariot	= 165
1 balle	= 200
1 schiffpfund	= 300
1 charge	= 400

Area

1 arpent = 400 perche²
= 130.6 a

Birmanie *v.* British India, Rangoon.

Bolivia.—m.c. 1893; m.o. 1871. Older = Spain.

Brazil.—m.c. 1862. Older:*

Length

1 pé = 0.33 m

Unit	Pé
1 palmo	= $\frac{2}{3}$
1 vara	= $3\frac{1}{3}$
1 passo geometrico	= 5
1 braca	= $6\frac{2}{3}$
1 legoa	= 20 000

Mass

1 libra = 459.05 g

Unit	Libra
1 onza	= $\frac{1}{16}$
1 marco	= $\frac{1}{2}$
1 arroba†	= 32
1 quintal	= 128
1 tonelada	= 1728

Area

1 tarefa = 30 to 40 a
1 alqueire = 242 or 484 a

Capacity

1 almude = 31.944 l
1 alqueire = 40 to 320 l

Unit	Almude
1 canada	= $\frac{1}{12}$
1 pipa	= 15
1 tonel	= 30

Britain, British *v.* Great Britain.

British India.—m.o. 1920. Current: British and local. Local,‡ provincial:

BOMBAY.

Length

1 guz = 0.6858 m

Unit	Guz
1 tassoos	= $\frac{1}{24}$

* Those of Portugal, with notable local differences.
† 1 arroba metrica = 15 kg.
‡ Local or national measures are now defined by their equivalents in British units.

Unit	Guz
1 hath, 1 covid, 1 cubit	= $\frac{2}{3}$

Mass

1 seer = 317.5147 g

Unit	Seer
1 tank	= $\frac{1}{72}$
1 pice, 1 parah	= $\frac{1}{30}$ or $\frac{1}{15}$
1 maund	= 40
1 candy	= 800

Area

Unit	Are
1 ground	= 2.03
1 biggah	= 24.68
1 kani	= 30.75
1 cawnie	= 54
1 chahar	= 2962

Capacity

1 parah = 110.1 l

Unit	Parah
1 tipree	= $\frac{1}{128}$
1 seer	= $\frac{1}{64}$
1 adoulie	= $\frac{1}{16}$
1 candy	= 8
1 garce	= 80

CALCUTTA.

Length

1 guz* = 0.9144 m

Unit	Guz
1 jaob, 1 jow	= $\frac{1}{144}$
1 unglee	= $\frac{1}{48}$
1 moot	= $\frac{1}{12}$
1 span	= $\frac{1}{4}$
1 covid, 1 haut	= $\frac{1}{2}$
1 danda	= 2
1 niranga	= 10
1 coss	= 2000

Mass

1 seer = 933.04 g

Unit	Seer
1 ruttee	= $\frac{1}{7680}$
1 masha	= $\frac{1}{960}$
1 tolah, 1 sicca	= $\frac{1}{80}$
1 chittack	= $\frac{1}{16}$
1 pouah	= $\frac{1}{4}$
1 raik	= $\frac{5}{4}$
1 pally, 1 dhurra	= 5
1 maund (bazar)	= 40

Area

1 guz² = 0.836126 m²

Unit	Guz²
1 chattack	= 5
1 cottah	= 80
1 biggah	= 1600
1 tenab	= 2500

* Old guz = 0.915 m.

British India.—*Cont'd.*

Capacity

1 pally = 5.0 to 5.5 l

Unit	Pally
1 chattack	= $\frac{1}{80}$
1 khoonke	= $\frac{1}{64}$
1 kunk	= $\frac{1}{16}$
1 raik	= $\frac{1}{4}$
1 soally	= 20
1 khahoon	= 320

CEYLON.

Length

1 covid = 0.464 m

Mass

1 candy / 1 bahar = 226.8 kg

Capacity

1 ammonam = 203.4 l

Unit	Ammonam
1 parrah	= $\frac{1}{8}$
1 seer	= $\frac{1}{288}$

MADRAS.

Length

1 covid = 0.472 m

Mass

1 seer = 283.495 g

1 cafh = 1.230 447 mg

Unit	Cafh
1 fanam	= 80
1 pagoda	= 2880

Unit	Seer
1 pagoda	= $\frac{1}{80}$
1 pollam / 1 varahan	= $\frac{1}{8}$
1 powe	= $\frac{1}{4}$
1 vis	= 5
1 maund	= 40
1 candy	= 800

Area

1 cawnie = 53.41 a

1 maoney = $\frac{1}{24}$ cawnie

Capacity

1 puddy = 1.533 l

Unit	Puddy
1 olluck	= $\frac{1}{8}$
1 measure	= 1
1 marcal	= 8
1 parah	= 40
1 garce	= 3200

RANGOON.

Length

1 sandong = 0.5588 m

Unit	Sandong
1 palgat	= $\frac{1}{22}$
1 taim / 1 cubit	= $\frac{9}{11}$
1 lan	= 4
1 bamboo / 1 dha	= 7
1 oke thapal	= 140
1 dain	= 7000

Mass

1 tical = 16.32 g

Unit	Tical
1 ruay	= $\frac{1}{64}$
1 pai	= $\frac{1}{16}$
1 moo	= $\frac{1}{8}$
1 mat	= $\frac{1}{4}$
1 cattie	= $33\frac{1}{3}$
1 viss	= 100
1 candy	= 15 000

Capacity

1 byee = 0.505 l

Unit	Byee
1 lamany	= $\frac{1}{8}$
1 zalay	= $\frac{1}{4}$
1 zayoot	= 2
1 seit	= 4
1 kwai	= 8

STRAITS SETTLEMENTS.

Mass

1 kati = 604.79 g

Unit	Kati
1 tahil	= $\frac{1}{16}$
1 pikul	= 100
1 bhara	= 300
1 koyan	= 4000

Capacity

1 gantang* = 4.545 96 l

Unit	Gantang
1 para	= 10
1 koyan	= 800

Bulgaria.—m.c. 1892.

Burma *v.* British India.

Cambodia *v.* Indo-China.

Canada.—m.o. 1871. Current = British,† French names are:

Length

1 pouce	= 1 inch
1 chainon	= 1 link
1 pied	= 1 foot
1 verge	= 1 yard
1 perche	= 1 rod, pole
1 chaine	= 1 chain‡

Mass

1 livre	= 1 pound av.
1 cent / 1 quintal	= 1 hundred weight
1 tonneau	= 1 short ton

Area

1 arpent = 34.196 a

Capacity

1 pinte	= 1 quart
1 chopine	= 1 pint
1 boisseau	= 8 gallons
1 minot	= 39.025 l

* Gantang = British gallon.

† Old French measures have been used, but only minot and arpent are now in use.

‡ Gunther's.

Ceylon *v.* British India.

Chile.—m.c. 1848. Older were from Spanish; legal values:

Length

1 bara = 0.836 m

Unit	Bara
1 linea	= $\frac{1}{432}$
1 pulgada	= $\frac{1}{36}$
1 pié	= $\frac{1}{3}$
1 cuadra	= 150
1 legua	= 5400

Mass

1 libra = 460.093 g

Unit	Libra
1 granos	= $\frac{1}{9216}$
1 adarme	= $\frac{1}{256}$
1 castellano	= $\frac{1}{100}$
1 onza	= $\frac{1}{16}$
1 arroba	= 25
1 quintale	= 100

Area

1 bara^2 = 0.698 896 m^2

Capacity, dry

1 almude = 8.083 l

1 fanega = 12 almude

Capacity, liquid

1 cuartillo = 1.111 l

1 arroba = 32 cuartillo

China.—m.o. 1903 with the following names:

Length

kilometer	= sin li
hectometer	= sin yin
dekameter	= sin tchang
meter	= sin tchi
decimeter	= sin tshwen
centimeter	= sin fen
millimeter	= sin li

Area

hectare	= sin khing
are	= sin meou
centare	= sin li

Capacity

kiloliter	= sin ping
hectoliter	= sin chi
dekaliter	= sin teou
liter	= sin cheng
deciliter	= sin ho
centiliter	= sin cho
milliliter	= sin tshwo

Great diversity in national system; since 1908, defined by metric equivalents. (The orthography here employed is arbitrary; there is diversity in provincial pronunciation.)

Length

1 tchi = 0.32 m

Unit	Tchi
1 hoé	= 10^{-6}
1 su	= 10^{-5}
1 hao	= 10^{-4}
1 lî	= 10^{-3}
1 fen	= 10^{-2}
1 tsouen	= 10^{-1}
1 pou	= 5
1 tchang	= 10
1 yin / 1 yan	= 100
1 fen	= 120
1 kyo	= 300
1 li	= 1800
1 poû	= 18 000
1 thsan	= 144 000
1 tou	= 450 000

Mass

1 liang = 37.301 g

Unit	Liang
1 hao	= 0.0001
1 lii	= 0.001
1 fen	= 0.01
1 tsien	= 0.1
1 kin / 1 tchin	= 16
1 kwan	= 480
1 tan	= 1600
1 shih	= 1920

Area

1 meou = 6000 tchi^2 = 614.4 m^2

Unit	Meou
1 hao	= $\frac{1}{1000}$
1 pou^2 / 1 kung	= $\frac{1}{240}$
1 lyi	= $\frac{1}{100}$
1 fen	= $\frac{1}{10}$
1 kish	= $\frac{1}{4}$
1 king	= 10
1 ching	= 100

Volume

1 tchi^3 = 32.768 dm^3

1 ma / 1 fang = 100 tchi^3

Capacity

1 cheng = 1.035 44 l

Unit	Cheng
1 quei	= 0.0001
1 ço	= 0.001
1 chao	= 0.01
1 yo	= 0.5
1 khô	= 0.1
1 to	= 10
1 hou	= 50
1 chei / 1 sei	= 100
1 ping	= 500

Capacity, liquid

Liquids are measured by weight.

Chypre, Cipro *v.* Cyprus.

Cochin-China *v.* Indo-China.

Columbia.—m.c. 1854, but following, derived from metric system, are current:

Length

1 vara	= 0.8 m
Unit	Vara
1 pulgada	= $\frac{1}{32}$
1 cuarta	= $\frac{1}{4}$
1 cuadra	= 100
1 legua	= 6250

Mass

1 libra	= 500 g
Unit	Libra
1 onza	= $\frac{1}{16}$
1 arroba	= 25
1 quintal	= 100
1 saco	= 125
1 carga	= 250
1 tonelada	= 2000

Area

1 vara²	= 0.64 m²
1 fanegada	= 10 000 vara²

Cirénaïque *v.* Tripoli.

Congo, Belgian.—m.c. 1911.

Costa Rica, Guatemala, Honduras, Nicaragua, Salvador.—m.c. 1912 by a joint convention; in partial use at earlier dates. Older (modified Spanish, English, and local):

Length

1 vara	= 0.8393 m (Costa Rica)
	= 0.8359 m (Guatemala)
	= 0.8128 m (Honduras)
Unit	Vara
1 cuarta	= $\frac{1}{4}$
1 tercia	= $\frac{1}{3}$
1 mecate	= 24

Mass

1 caja	= 16 kg
1 fanega	= 92 kg
1 carga	= 161 kg

Area

1 manzana	= 10 000 vara²
	= 6960.5 m² (Costa Rica)
	= 6987.4 m² (Guatemala)
	= 6987.4 m² (Nicaragua)
1 caballeria	= 64 manzana

Capacity

1 botella	= 0.63 to 0.67 l
1 cajuela	= 16.6 l

Cuartillo is very variable.

Cuba.—m.c. 1858, but others (old Spanish, American, and local) are current:

Mass

1 tonelada	= 1015.65 kg
1 tercio	= 72.22 kg

Area

1 caballeria Cubana	= 1342.02 a
1 cordele	= $\frac{1}{324}$ caballeria

Capacity

1 bocoy	= 136.27 l
1 barrile	= $\frac{1}{6}$ bocoy

Cyprus.—British system. Accepted equivalents:

Length

1 pic	= 2 foot
	= 0.6096 m

Mass

1 oke	= 2.8 pound av
	= 1270.06 g
1 moosa*	= 50 700 g
Unit	Oke
1 drachme	= $\frac{1}{400}$
1 rottolo	= 0.44
1 stone	= 5
1 kantar	= 44
1 kantar (Aleppo)	= 180
1 ton	= 800

Area

1 donum	= 1600 yard²
	= 13.378 a
1 scala	= 1 donum

Capacity

1 oke	= 1.278 55 l
1 cass	= 4.73 l
1 kile†	= 36.368 l
1 medimno	= 75.05 l
1 kartos	= 4 oke
1 kouza	= 8 oke
1 gomari	= 128 oke

Cyrenaïca *v.* Tripoli.

Czechoslovakia.—m.c. 1876.‡ Local:

Length

1 latro	= 1.917 m
Bohemia.	
1 stopa§	= 0.296 m
1 sah	= 1.778 m
1 mile	= 7.003 km
Prague.	
1 loket	= 0.593 m
Moravia.	
1 stopa§	= 0.284 m
1 loket	= 0.594 m
Silesia.	
1 loket	= 0.579 m
1 mile	= 6.483 km

Area

Bohemia.	
1 merice	= 19.99 a
1 korec, 1 strych, 1 mira	= 28.78 a
Unit	Korec
1 jitro	= 2
1 lan	= 60

* Moosa = hundredweight.

† Kile = bushel.

‡ Old Vienna (*v.* Austria) and some local measures were still in use when the state was established.

§ Stopa = strevic.

Capacity

1 merice*	= 70.6 l
1 korec, 1 strych	= 93.592 l

Denmark.—m.c. 1912; m.o. 1910. Older:

Length

1 fod	= 0.313 857 m
Unit	Fod
1 linie	= $\frac{1}{144}$
1 tomme	= $\frac{1}{12}$
1 aln	= 2
1 faon, favn	= 6
1 ruthe	= 10
1 miil	= 24 000

Mass

1 pund	= 500 g
Unit	Pund
1 es	= $\frac{1}{9152}$
1 ort	= $\frac{1}{512}$
1 quintin	= $\frac{1}{128}$
1 loth	= $\frac{1}{32}$
1 unze	= $\frac{1}{16}$
1 mark	= $\frac{1}{2}$
1 bismerpund	= 12
1 lispund	= 16
1 wog, 1 waag	= 36
1 quintal, 1 centner	= 100
1 skippund	= 320
1 skyplast	= 5200
1 quint	= 0.1
1 ort	= 0.01
1 kvint	= 0.001

Area

1 tondelande	= 55.162 a
1 tonde	= 283.69 a
Unit	Tonde
1 penge	= $\frac{1}{348}$
1 album	= $\frac{1}{96}$
1 fjerdingar	= $\frac{1}{32}$
1 skiepper	= $\frac{1}{8}$
1 pflug	= 32

Capacity, dry

1 korntonde	= 139.12 l
Unit	Korntonde
1 pott	= $\frac{1}{144}$
1 achtel	= $\frac{1}{64}$
1 viertel	= $\frac{1}{32}$
1 skieppe, 1 ottingkar	= $\frac{1}{8}$
1 fjerdingkar	= $\frac{1}{4}$
1 last	= 22

Capacity, liquid

1 pott	= 0.9661 l
Unit	Pott
1 paegel	= $\frac{1}{4}$
1 kande	= 2
1 stubchen	= 4
1 viertel	= 8
1 fod³	= 32
1 anker*	= 40
1 ohm*	= 160
1 oxhoft*	= 240
1 pipe*	= 480
1 fuder*	= 960

* Moravian.

Deutschland *v.* Germany.

Dutch East Indies.—Same as Netherlands. Old Dutch and local measures are also used. Latter very variable; recently they have been legally defined by their metric equivalents. Current:

Length

1 depa	= 1.70 m
Unit	Depa
1 hasta	= $\frac{1}{4}$
1 kilan	= $\frac{1}{8}$

Mass. (1) *Ordinary*

1 pikol, 1 pecul	= 61.761 3025 kg
Unit	Pikol
1 thail	= $\frac{1}{1600}$
1 catti, 1 kabi	= $\frac{1}{100}$
1 kulack	= 0.0725
1 amat	= 2
1 small bahar	= 3
1 large bahar	= 4.5
1 timbang	= 5
1 kojang (Batavia)	= 1667.555 kg
1 kojang (Semarang)	= 1729.316 kg
1 kojang (Soerabaya)	= 1852.839 kg

Mass. (2) *For precious metals*

1 thail	= 54.090 g
Unit	Thail
1 wang	= $\frac{1}{48}$
1 tali	= $\frac{1}{16}$
1 soekoe	= $\frac{1}{8}$
1 reaal	= $\frac{1}{2}$

Mass. (3) *For opium*

1 thail	= 38.601 g
Unit	Thail
1 tji	= 0.1
1 tjembang Mata, 1 hoen	= 0.001

Area

1 bahoe, 1 bouw	= 70.965 a
1 lieue² †	= 55.0632 km

Volume

1 kojang	= 1.976 362 m³
1 toembak	= 6.684 m³

Capacity, dry

1 kojang	= 2011.2679 l
1 pikol	= $\frac{1}{30}$ kojang

* Variable.

† Geographic.

Dutch East Indies.—*Cont'd.*

Capacity, liquid

(Legal equivalents)

Unit	Liter
1 takar*	= 25.770
1 kit*	= 15.159
1 koelak*	= 3.709
1 kan†	= 1.5751
1 mutsje†	= 0.1516
1 pintje*	= 0.0758

Ecuador.—m.c. 1865, but the British and, more generally the old Spanish, measures are currently used.

Egypt.—m.o. 1873; m.c. in government use, 1891. Current:‡

Length

1 diraa baladi	= 0.58 m
1 kassabah	= 3.55 m

Unit	Diraa
1 kirat	= $\frac{1}{24}$
1 abdat	= $\frac{1}{6}$
1 kadam	= $\frac{1}{2}$
1 pic	= 1
1 gasab	= 4
1 mil hachmi	= 1000
1 farsakh	= 3000

Mass

1 oke = 1248 g

Unit	Oke
1 kirat	= $\frac{1}{6400}$
1 dirhem	= $\frac{1}{400}$
1 miskal	= $\frac{3}{800}$
1 okieh	= 0.03
1 rotoli	= 0.36
1 kantar	= 36
1 helm	= 200

Area

1 feddan = 42.008 a

Unit	Feddan
1 sahme	= $\frac{1}{576}$
1 kirat kamel	= $\frac{1}{24}$
1 feddan masri	= 1

Capacity

1 keddah = 2.0625 l

Unit	Keddah
1 kirat	= $\frac{1}{32}$
1 khanoubah	= $\frac{1}{16}$
1 toumnah	= $\frac{1}{8}$
1 robhah	= $\frac{1}{4}$
1 nisf keddah	= $\frac{1}{2}$
1 malouah	= 2
1 rob } 1 roubouh }	= 4
1 keila	= 8
1 ardeb	= 96
1 daribah	= 768

* For oil.

† For various products.

‡ In national system, units and their interrelations were very variable, but since 1891, have been defined by their metric equivalents.

England *v.* Great Britain.

Equateur *v.* Ecuador.

Eritrea.—m.o. Local, provincial:

Length

1 cubi	= 0.32 m
1 emmet } 1 derah }	= 0.46 m

Mass

1 rotolo	= 448 g
1 okia	= $\frac{1}{16}$ rotolo
1 gisla	= 163 kg

Capacity

1 messé = 1.50 l

Unit	Messé
1 cabaho	= 4
1 tanica	= 12
1 ghebeta	= 16
1 entelam	= 128

Espagne *v.* Spain.

Esthonia.—Russian and local. Current:

Length

1 archine (Russian)	= 0.7112 m
1 elle (Livonian)	= 0.6096 m

Unit	Archine
1 elle (Kuunar)	= 0.75
1 faden	= 3

Mass

1 pfund = 430 g

Unit	Pfund
1 quent	= $\frac{1}{128}$
1 loth	= $\frac{1}{32}$
1 liespfund	= 20
1 centner	= 120
1 tonne	= 240
1 schiffspfund	= 400

Area

Reval

1 lofstelle	= 18.55 a
1 tonnland	= 54.627 a

Livonian

1 lofstelle	= 37.1 a
1 tonnland	= 51.94 a

Capacity

1 hulmit = 11.48 l

Unit	Hulmit
1 lof (Reval)	= 3
1 lof (Livonian)	= 6
1 tonne (Livonian)	= 12

Etablissements des Détroits *v.* British India.

Etats-Unis *v.* United States.

Ethiopia.—var. Current:

Length

(Approximate only)

Unit	cm
1 tat	= 2.5
1 gat	= 8
1 sinzer	= 16
1 kend	= 49

Mass

1 kasm	= 3.90 g
1 neter	= 336 g
1 farasula*	= 13.478 kg
1 farasula†	= 16.85 kg
1 farasula‡	= 17.972 kg

Unit	Kasm
1 mutagalla	= 2
1 alada	= 4
1 wogiet	= 8

Capacity

1 menelik = 1 l (approximate)

Filippine *v.* Philippine.

Finland.—m.c. 1892; m.o. 1887. Older (Russian and local):

Area

1 tunnland = 46.54 a

Capacity

1 tunna	= 163.49 l
1 kannor	= $\frac{1}{63}$ tunna
1 ottingar	= 15.71 l
1 sextingkar	= $\frac{1}{2}$ ottingar

France.—m.c. 1794. Other legal units:

Length

1 mille marin = 1852 m

Volume

1 tonneau de jauge	= 2.83 m³
1 tonneau de mer	= 1.44 m³

Old measures derived from the system of Charlemagne are:

Length

1 toise§	= 1.949 0365 m‖
1 toise§	= 1.949 090 m¶

Unit	Toise
1 ligne	= $\frac{1}{864}$
1 pouce	= $\frac{1}{72}$
1 pied	= $\frac{1}{6}$
1 aune	= 0.6064
1 lieue	= 2280.3
1 mille marin	= 950.13
1 lieue marine	= 2850.4

Mass

1 livre** = 489.505 85 g

Unit	Livre
1 grain	= $\frac{1}{9216}$
1 scruple	= $\frac{1}{384}$
1 gros } 1 drachme }	= $\frac{1}{128}$
1 once	= $\frac{1}{16}$
1 marc ††	= $\frac{1}{2}$

* For ivory.

† For coffee.

‡ For rubber.

§ Toise de Perou at 16.25°C.

‖ Equivalent made legal in 1799.

¶ By measurement, in 1887, by J. R. Benoit.

** One livre de Charlemagne = 367.128 g.

†† 1 Marc de la Rochelle = 244.75 g
1 Marc de Limoges = 240.93 g
1 Marc de Tours = 237.87 g
1 Marc de Troyes et Paris = 260.05 g

Unit	Livre
1 quintal	= 100
1 millier	= 1000

Unit	Livre (Ch)
1 sol	= $\frac{1}{20}$
1 denier	= $\frac{1}{240}$
1 obole	= $\frac{1}{480}$
1 grain	= $\frac{1}{5760}$

Area

1 pied² = 0.10552 m²

Unit	Pied²
1 toise²	= 36
1 perche de Paris	= 324
1 perche des Eaux et Forêts	= 484
1 arpent de Paris	= 32 400
1 arpent des Eaux et Forêts	= 48 400

Capacity, dry

1 boisseau = 1.862 78 l*

Unit	Boisseau
1 litron	= $\frac{1}{16}$
1 quart	= $\frac{1}{4}$
1 minot	= 3
1 mine	= 6
1 setier	= 12
1 muid	= 144

Capacity, liquid

1 muid	= 274.239 l†
1 muid	= 268.241 l‡
1 pinte	= 0.931 389 l§

Unit	Pinte
1 roquille	= $\frac{1}{32}$
1 posson	= $\frac{1}{8}$
1 demi-setier	= $\frac{1}{4}$
1 chopine	= $\frac{1}{2}$
1 pot	= 2
1 velte	= 8
1 quarteau	= 72
1 feuillette	= 144
1 muid	= 288

Fráncia, Isola di *v.* Mauritius.

Frankreich *v.* France.

Germany.—m.c. 1872. Since the beginning of the nineteenth century, the other units and their interrelations have been fairly definite, but before that there was great diversity. *Length:* fundamental unit was Fuss (foot), its value, depending upon the state, varied from 0.280 to 0.320 m. The one most extensively used was the Rheinlandischer Fuss (Rhenish foot) = 0.313 857 m. *Mass:* fundamental unit was Pfund

* From 1 muid = 268.241 l by relation 144 boisseau = 1 muid (see Capacity, Liquid).

† Legal value.

‡ Derived from concrete standards.

§ From 1 muid = 268.241 l by relation 288 pinte = 1 muid.

(pound), its value generally varied little from 467 g; during transition period preceding 1872 the accepted equivalents were Pfund = 30 Loth = 300 Zeut = 3000 Korn; Centner = 100 Pfund. Older:

BAVARIA.

Length

1 Fuss	= 0.291 86 m
1 Elle	= 0.833 01 m
Unit	Fuss
1 Linie	= $\frac{1}{144}$
1 Zoll	= $\frac{1}{12}$
1 Ruthe	= 10
1 Chauseemeile	= 25 406

Mass

1 Pfund	= 560 g
Unit	Pfund
1 Gran	= $\frac{1}{7680}$
1 Pfennig	= $\frac{1}{512}$
1 Quint	= $\frac{1}{128}$
1 Loth	= $\frac{1}{32}$
1 Unze	= $\frac{1}{16}$
1 Zentner	= 100

Area

1 Morgen, 1 Tagwerk, 1 Juchert	= 34.072 a
	= 400 Ruthe^2

Capacity, dry

1 Metzen	= 37.0596 l
Unit	Metzen
1 Dreissiger	= $\frac{1}{32}$
1 Mässel	= $\frac{1}{8}$
1 Scheffel	= 6

Capacity, liquid

1 Masskanne	= 1.069 03 l
Unit	Masskanne
1 Zoll^3	= $\frac{1}{43}$
1 Eimer	= 60 or 64
1 Fass	= 1600

PRUSSIA.

Length

1 Fuss	= 0.313 857 m
Unit	Fuss
1 Linie	= $\frac{1}{144}$
1 Zoll	= $\frac{1}{12}$
1 Ruthe	= 12
1 Meile	= 24 000
1 Elle	= 25.5 Zoll

Mass

1 Pfund	= 467.711 g
Unit	Pfund
1 Quentchen	= $\frac{1}{96}$
1 Loth	= $\frac{1}{32}$
1 Stein	= 22
1 Centner	= 110
1 Schiffspfund	= 330

Area

1 Morgen	= 25.532 24 a
1 Morgen	= 180 Ruthe^2

Capacity, dry

1 Metze	= 3.435 89 l
Unit	Metze
1 Quart	= $\frac{1}{3}$
1 Zoll^3	= $\frac{1}{192}$
1 Scheffel	= 16

Capacity, liquid

1 Quart	= 64 Zoll^3
1 Quart	= 1.145 03 l
Unit	Quart
1 Anker	= 30
1 Eimer	= 60
1 Ohm	= 120
1 Oxhoft	= 180
1 Fuder	= 720

WÜRTTEMBERG.

Length

1 Fuss	= 0.286 49 m
Unit	Fuss
1 Linie	= 0.01
1 Zoll	= 0.1
1 Elle	= 2.144
1 Ruthe	= 10
1 Meile	= 26 000

Mass

1 Pfund	= 467.728 g
1 Apotheker-Pfund	= 357.647 g
Unit	Pfund
1 Quentlein	= $\frac{1}{96}$
1 Loth	= $\frac{1}{32}$
1 Mark	= $\frac{1}{2}$
1 Zentner	= 104

Area

1 Ruthe^2	= 8.207 66 m^2
1 Morgen	= 384 Ruthe^2
1 Juchart, 1 Tagwerk	= 576 Ruthe^2

Capacity, dry

1 Simri	= 942.125 Zoll^3
	= 22.1533 l
Unit	Simri
1 Viertelein	= $\frac{1}{128}$
1 Erklein	= $\frac{1}{32}$
1 Vierling	= $\frac{1}{4}$
1 Scheffel	= 8

Capacity, liquid

1 Maass	= 78.125 Zoll^3
	= 1.837 05 l
Unit	Maass
1 Schoppe	= $\frac{1}{4}$
1 Imi	= 10
1 Eimer	= 160
1 Fuder	= 960

Gioppóne *v.* Japan.

Great Britain, Irish Free State, and Northern Ireland.—m.o. 1864. Since 1898, the national measures are convertible to metric by the legally sanctioned factors given below. National fundamental units defined thus: *Length:* The yard is distance at 62°F between axes of two lines traced on gold plugs set in a bronze bar preserved at the Standards Department of the Board of Trade. *Mass:* The pound avoirdupois is the mass of a certain platinum standard, similarly preserved. *Capacity:* The gallon is the volume of 10 pounds avoirdupois of pure water, as weighed in air against brass weights, the water and air being at the temperature of 62°F and the barometer at 30 inches. In official comparisons, the density of brass is taken as 8.143 g/cm^3. Some of the units in the following tables are not in current use.

Length

1 yard* (yd.)	= 0.914 3992 m
1 foot (ft.)	= $\frac{1}{3}$ yd.
	= 30.479 97 cm
1 inch (in.)	= $\frac{1}{36}$ yd.
	= 2.539 998 cm
Unit	Inch
1 mil	= 0.001
1 point	= $\frac{1}{72}$
1 line	= $\frac{1}{12}$
1 barleycorn	= $\frac{1}{3}$
1 nail	= 2.25
1 palm	= 3
1 hand	= 4
1 span, 1 quarter	= 9
1 foot	= 12
1 cubit	= 18
1 pace	= 30
1 yard	= 36
1 ell	= 45
Unit	Foot
1 fathom	= 6
1 pole, 1 rod (rd.), 1 perch	= 16.5
1 rope	= 20
1 chain†	= 66
1 skein	= 360
1 furlong	= 660
1 cable length	= 720
1 mile (statute)	= 5280
1 mile (nautical), 1 knot	= 6080
1 league	= 15 840

Mass

1 pound avoirdupois (lb. av.)	= 453.592 45 g
	= 7 000 grain
1 grain (gr.)	= 64.798 182 mg

(Three systems: avoirdupois, troy, apothecary.)

* This is the present legal equivalent of the imperial yard; recent comparisons by the National Physical Laboratory show that the yard as defined by the Weights and Measures Act of 1878 = 0.914 3987 m.

† Gunther's chain, divided into 100 link.

Avoirdupois (av.)

(General use)

Unit	Pound
1 dram (dm.)	= $\frac{1}{256}$
1 ounce (oz.)	= $\frac{1}{16}$
1 clove or customary stone	= 8
1 stone (legal)	= 14
1 quarter	= 28
1 cental	= 100
1 hundred-weight (cwt.)	= 112
1 wey, 1 load	= 252*
1 ton	= 2240

Troy (t.)

(For precious metals)

Unit	Grain
1 pennyweight (dwt.)	= 24
1 ounce (oz.)	= 480
1 pound (lb.)	= 5760

Apothecary (ap.)

(For dispensing drugs)

Unit	Grain
1 scruple (s.)	= 20
1 drachm (dr.)	= 60
1 ounce (oz.)	= 480
1 pound (lb.)	= 5760

Area

1 inch^2 (sq. in.)	= 6.451 5898 cm^2
1 foot^2 (sq. ft.)	= 929.0289 cm^2
1 yard^2 (sq. yd.)	= 0.836 1259 m^2
1 acre (A.)	= 4046.849 m^2
Unit	Foot^2
1 inch^2	= $\frac{1}{144}$
1 yard^2	= $\frac{1}{9}$
Unit	Yard^2
1 pole^2 (sq. po.), 1 rod^2, 1 perch^2	= 30.25
1 chain^2† (ch.)	= 484
1 rood	= 1210
1 acre (A.)	= 4840
Unit	= Acre
1 mile^2 (sq. mi.)	= 640

Volume

1 yard^3 (cu. yd.)	= 0.764 552 85 m^3
1 foot^3 (cu. ft.)	= 28 316.77 cm^3
1 inch^3 (cu. in.)	= 16.387 0253 cm^3
Unit	Foot^3
1 inch^3	= $\frac{1}{1728}$
1 yard^3	= 27

* Variable.

† Gunther's chain.

Great Britain.—*Cont'd.*

Unit	Foot³
1 register ton	= 100
1 rod	= 1000

Capacity, dry

1 gallon (gal.) = 4.545 9631 l
1 bushel (bu.) = 8 gallon = 35.367 7048 l

Unit	Gallon
1 quartern	= $\frac{1}{2}$
1 peck	= 2
1 bucket	= 4
1 bushel	= 8
1 firkin	= 9
1 kilderkin	= 18
1 barrel	= 36
1 hogshead	= 63
1 puncheon	= 84
1 butt	= 126

Unit	Bushel
1 strike	= 2
1 sack, 1 bag	= 3
1 coomb	= 4
1 quarter	= 8
1 seam	= 8
1 chaldron	= 32*
1 wey, 1 load	= 40*
1 last	= 80*

Capacity, Liquid

1 gallon (gal.) = 4.545 9631 l

Unit	Gallon
1 gill, 1 quartern, 1 noggin	= $\frac{1}{32}$
1 pint	= $\frac{1}{8}$
1 quart	= $\frac{1}{4}$
1 pottle	= $\frac{1}{2}$

Greece.—m.c. 1922; m.o. 1836. Older:

Length

1 piki varies 0.640 to 0.670 m
1 pic = 1 piki
1 small piki of Constantinople = 0.648 m
1 large piki of Constantinople = 0.669 m
1 piki (masonry) = 0.750 m

Mass

1 dramme = 3.2 g
1 livre (Venetian) = 450 g
1 mna = 1.5 kg
1 mine (royal) = 1.5 kg
1 oka† = 1.280 kg
1 oka = 1.250 to 1.333 kg
1 stater = 56.32 kg
1 talanton = 150 kg

Area

1 stemma = 10 a

* Variable.
† 0.85331 royal mine.

Capacity

1 oka = 1.333 to 1.340 l
1 baril = 74.236 l

Grossbritannien *v.* Great Britain.

Guam.—Metric is compulsory.

Guatemala *v.* Costa Rica.

Guinea.—m.c. 1910. Older = Portugal, England, and local:

Length

1 pik = 0.578 m
1 jacktan = 3.658 m

Mass

1 benda = 64.2 g
1 kantar = 977 kg
1 gammell = $\frac{1}{5}$ kantar

Unit	Benda
1 akey	= $\frac{1}{48}$
1 mediatabla	= $\frac{1}{32}$
1 aguirage	= $\frac{1}{16}$
1 quinto	= $\frac{3}{32}$
1 piso, 1 uzan	= $\frac{1}{8}$
1 seron	= $\frac{3}{16}$
1 benda (offa)	= $\frac{1}{2}$

Haiti.—m.c. 1921. Older = British, old French, and Spanish; legal equivalents during transition period:

Length

1 toise = 1.9488 m
1 aune = 1.188 m

Area

1 carreau = 1292.3 m

Volume

1 baril = 0.1 m³
1 corde = 3.84 m³
1 toise = 8 m³

Holland *v.* Netherlands.

Honduras *v.* Costa Rica.

Hungary.—m.c. 1876. Older = old Vienna:

Length

1 mertföld, 1 meile = 8.3536 km
1 marok, 1 faust = 0.105 36 m

Area

1 hold = 43.16 a
1 joch = 43.16 a
1 meile² = 6978 ha

Volume

1 eimer = 54.30 l
1 halbe, 1 itcze = $\frac{1}{64}$ eimer
1 metzen, 1 ako = 62.53 l

Iceland.—m.c. 1907. Older (analogous to Danish) were defined by their metric equivalents.

Length

1 fet = 0.313 85 m
1 sjomila = 1855 m

Unit	Fet
1 lina	= $\frac{1}{144}$
1 þumlungur	= $\frac{1}{12}$
1 alin	= 2
1 faðmur	= 6
1 mila a landi	= 24 000

Mass

1 pund = 0.5 kg

Unit	Pund
1 mark	= 2
1 fisk	= 8
1 fierding	= 40
1 liespund	= 64
1 tunna smjörs	= 224
1 skippund, 1 batt	= 320

Area

1 ferfaðmur = 3.546 m²
1 fermila = 56.7383 km²

Unit	Ferfaðmur
1 ferþumlungur	= $\frac{1}{5184}$
1 ferfet	= $\frac{1}{36}$
1 feralin	= $\frac{1}{9}$
1 tundagslatta	= 900
1 engjateigur	= 1600

Capacity

1 pottar = $\frac{1}{32}$ fet³ = 0.9661 l

Unit	Pottar
1 kornskeppa	= 18
1 anker	= 39
1 almenn turma	= 120
1 öltunna	= 136
1 korntunna	= 144

India *v.* British India; *v.* Indo-China.

Indies, East *v.* British India; *v.* Dutch East Indies.

Indo-China, British *v.* British India.

Indo-China, French:

Cochin China.—m.c. 1911, with the names:

Length

1 môt thuoc = 1 m

Mass

1 môt cân tây = 1 kg
1 môt dông cân tây = 1 g
1 picul = 60 kg

Capacity

1 vuông môt bat tây = 1 l
1 vuông môt gia = 40 l

Cambodia.—m.c. 1914, with the names:

Length

1 muoi mètre = 1 m

Mass

1 pram rôi = 1 kg
1 muoi gramme = 1 g
1 hocsep = 60 kg

Capacity

1 muoi litre = 1 l
1 sêsep litre = 40 l

Irish Free State *v.* Great Britain.

Islande *v.* Iceland.

Italian colonies.—Metric compulsory.

Italy.—m.c. 1861; adopted in Milan as early as 1803, with the following names:

Length

metro = m
palmo = dm
dito = cm
atomo = mm

Mass

libbra nuova = kg
oncia = hg
grosso = dkg
denar = g
grano = dg

Capacity

soma = hl
mina = dkl
pinta = l
coppo = dl

Older, provincial:

Length

1 piede liprando = 0.513 77 m

Unit	Piede lip.
1 punto	= $\frac{1}{144}$
1 oncia	= $\frac{1}{12}$
1 canna	= 4
1 trabucco	= 6
1 miglio	= $4333\frac{1}{3}$

Mass

1 libbra = 307 to 398 g

Unit	Libbra
1 grano	= $\frac{1}{6912}$
1 denaro	= $\frac{1}{288}$
1 ottavo	= $\frac{1}{96}$
1 oncia	= $\frac{1}{12}$
1 rubbo	= 25
1 cantaro	= 150

Area

1 quadrao, 1 giornata = 38 a
1 tavola = $\frac{1}{100}$ giornata

Capacity, dry

1 mine = varies 12 to 120 l

Capacity, liquid

1 barile da vino = 45.6 l
1 barile da olio = 33.4 l

Japan.—m.o. 1893. Before 1891, great diversity; since 1891, fundamental units defined by metric equivalents.

Length

1 shaku*	= $\frac{10}{33}$ m
	= 0.303 0303 m
Unit	Shaku
1 shi	= 10^{-5}
1 mô	= 10^{-4}
1 rin	= 10^{-3}
1 bu	= 10^{-2}
1 sun	= 10^{-1}
1 yabiki	= 2.5
1 hiro	= 5
1 ken	= 6
1 jô	= 10
1 chô	= 360
1 ri†	= 12 960

Mass

1 kwan	= $\frac{15}{4}$ kg
	= 3.75 kg
Unit	Kwan
1 shi	= 10^{-7}
1 mô	= 10^{-6}
1 rin	= 10^{-5}
1 fun	= 10^{-4}
1 candareen	= 10^{-4}
1 mommé	= 10^{-3}
1 niyo	= 0.004
1 hyaku-mé	= 0.10
1 kin	= 0.16
1 ninsoku-ichi-nin	= 7
1 kiyak-kin	= 16
1 karus hiri-ichi-da	= 18
1 komma-ichi-da	= 40

Area

(Land Measure)

1 bu	= $\frac{100}{30.25}$ m^2
	= 3.305 785 12 m^2
Unit	Bu
1 gô	= 0.1
1 tsubo	= 1
1 sé	= 30
1 tan	= 300
1 chô	= 3000
1 ri^2	= 46 656

Capacity

1 shô	= $\frac{2401}{1331}$ l
	= 1.803 9068 l
	= 64827 bu^3
Unit	Shô
1 shaku	= 10^{-2}
1 gô	= 10^{-1}
1 to	= 10
1 koku	= 100

Kanada *v.* Canada.

Kolumbien *v.* Columbia.

Kongo *v.* Congo.

* The old shaku (kujirajaku) = 1.25 shaku is legal for fabrics.

† One ri marin (kai-ri) = nautical ri.

Kuba *v.* Cuba.

Latvia.—m.o. Russian and local measures since 1845. Old measures were those of Holland.

Length

1 elle	= 0.537 m
1 quartier	= $\frac{1}{4}$ elle
1 meile	= 7 verste (Russian)
	= 7.468 km

Mass

1 pfund = 419 g

For secondary units, *see* Esthonia.

Area

1 kapp	= 1.4864 a
Unit	Kapp
1 pourvete } 1 loofstelle }	= 25
1 tonnstelle	= 35

Volume

1 faden = 4.077 s

Capacity

1 stoof	= 1.2752 l
Unit	Stoof
1 kanne	= 2
1 kulmet	= 9
1 anker	= 30
1 poure } 1 loof }	= 54
1 tonne	= 108

Lettonie *v.* Latvia.

Luxemburg.—m.c. 1820. Previously used a local unit: 1 malter = 191 l.

Malacca.—

Length

1 asta	= 0.457 m
1 depa	= 4 asta
1 jumba	= 8 asta

Mass

1 catty	= 0.61 kg
Unit	Catty
1 miam	= $\frac{1}{320}$
1 buncal	= $\frac{1}{20}$
1 tampang	= 1
1 bedur	= 2
1 kip	= 15
1 pecul	= 100
1 bahar	= 300

Area

1 $jumba^2$	= 13.38 m^2
1 orlong	= 400 $jumba^2$
	= 53.52 a

Capacity

1 chupa	= *ca.* 1 l
1 gantang	= 4 chupa

Malaysia *v.* British India; *v.* Dutch East Indies.

Malta.—m.c. 1914. Older, British and local (old Sicilian):

Length

1 foot	= 0.2836 m
1 canna	= 2.088 m
1 palmo	= $\frac{1}{8}$ canna

Mass

1 rottolo	= 1.75 lb. av.
	= 0.793 79 kg
Unit	Rottolo
1 parto	= $\frac{1}{480}$
1 ounce	= $\frac{1}{30}$
1 cantaro	= 100

Capacity

1 caffiso	= 20.457 l
1 baril	= 43.162 l
1 salma	= 290.944 l

Marokko *v.* Morocco.

Mauritius and Seychelles Islands.—m.c. Older = old French, British, and the following:

Capacity

1 cash	= 227.11 l
1 velt	= $\frac{1}{30}$ cash

Mexico.—m.c. 1896; m.o. 1857. Older (from Spanish, Castillian), legally defined, during transition period, in terms of metric equivalents:

Length

1 vara	= 0.838 m
Unit	Vara
1 linea	= $\frac{1}{432}$
1 pulgada	= $\frac{1}{36}$
1 pie	= $\frac{1}{3}$
1 legua	= 5000

Mass

1 libra	= 460.246 34 g
Unit	Libra
1 tomin	= $\frac{1}{768}$
1 adarme	= $\frac{1}{256}$
1 ochava	= $\frac{1}{128}$
1 onza	= $\frac{1}{16}$
1 arroba	= 25
1 quintal	= 100
1 tercio	= 160

Area

1 fanega	= 356.628 a
Unit	Fanega
1 caballeria	= 12
1 labor	= 18
1 sitio	= 492.28

Capacity, dry

1 cuartillo	= 1.8918 l
Unit	Cuartillo
1 almud	= 4
1 fanega	= 48
1 carga	= 96

Capacity, liquid

1 cuartillo	= 0.456 264 l
1 cuartillo for oil	= 0.506 162 l
1 jarra	= 18 cuartillos

Morocco.—m.o.; local, var.:

Length

1 cubit } 1 canna }	= 0.533 m
1 pic	= 0.61 m
1 tonni	= $\frac{1}{8}$ pic

Mass

1 rotal } 1 artal }	= 507.5 g
1 gerbe	= 3 kg
1 kula	= 22 rotal
1 kantar	= 100 rotal

Capacity

1 sahh } 1 fanega }	= 56 l
1 mudd } 1 almude }	= 14 l

Mozambique *v.* Portuguese East Africa.

Netherlands.—m.c. 1820, with the names:

Length

streep	= mm
duim	= cm
palm	= dm
elle	= m
roede	= dkm
mijle	= km

Mass

korrel	= dg
wigtje	= g
lood	= dkg
once	= hg
pond	= kg

Capacity, dry

maatje	= dl
kop	= l
schepel	= dkl
mudde	= hl
zak	= hl
last	= 30 hl

Capacity, liquid

vingerhoed	= cl
maatje	= dl
kan	= l
dekaliter	= dkl
vat	= hl

Old national system is more or less current in some of the old colonies:

Length

(Amsterdam)

1 roeden	= 3.679 77 m
1 elle	= 0.687 813 m
1 voeten	= 0.283 0594 m
1 duime	= 25.733 mm
1 lyne	= 2.144 mm

Mass

1 pond	= 492.16772 g
1 pond*	= 494.090 32 g

* Amsterdam.

Netherlands.—*Cont'd.*

1 pond (Apothecary) = $\frac{3}{4}$ pond = 369.126 g

Unit	Pond
1 mark	= $\frac{1}{2}$
1 unze	= $\frac{1}{16}$
1 drachme	= $\frac{1}{128}$
1 engel	= $\frac{1}{320}$
1 vierling	= $\frac{1}{1280}$
1 grein	= $\frac{1}{7680}$

Area

1 morgen = 81.244 346 a

Capacity, dry

1 schepel = 27.26 l

Unit	Schepel
1 kop	= $\frac{1}{32}$
1 vierd	= $\frac{1}{4}$
1 zak	= 3
1 mud	= 4
1 last	= 108

Capacity, liquid

1 mingelen = 1.200 to 1.237 l

Unit	Mingelen
1 vat	= 768
1 oxhooft	= 192
1 aam	= 128
1 anker	= 32
1 steekan	= 16
1 stoop	= 2
1 pint	= $\frac{1}{2}$
1 mutsje	= $\frac{1}{8}$

Nicaragua *v.* Costa Rica.

Niederlande *v.* Netherlands.

Northern Ireland *v.* Great Britain.

Norway.—m.c. 1882; m.o. 1879. Older differed very little from Danish; legal equivalents:

Length

1 fod = 0.3137 m

Mass

1 skaalpund = 0.4981 kg

Area

1 mal = 10 a

Capacity, dry

1 korntonde = 138.97 l

Capacity, liquid

1 pot = 0.9651 l

Oceania.—British measures.

Olanda *v.* Netherlands.

Österreich *v.* Austria.

Paési Bássi *v.* Netherlands.

Panama.—Metric compulsory.

Paraguay.—Metric almost exclusively used. m.o. 1899. Older = Spain; legal equivalents:

Length

1 vara (old) = 0.838 56 m

1 cuerda, 1 cordel = $83\frac{1}{3}$ vara = 69.88 m

1 vara = 0.866 m

Unit	Vara
1 piede	= $\frac{1}{3}$
1 pouce	= $\frac{1}{36}$
1 ligne	= $\frac{1}{432}$
1 cuadra	= 100
1 lieue	= 5000

Mass

1 libra (old) = 460.08 g

1 libra = 459 g

Unit	Libra
1 once	= $\frac{1}{16}$
1 arrobe	= 25
1 quintal	= 100
1 tonne	= 2000

Area

1 liño (old) = 48.832 a

1 liño = 100 vara²

1 liño = 75 m²

Capacity, dry

1 fanega = 288 l

1 almude = $\frac{1}{12}$ fanega

Capacity, liquid

1 frasco = 3.029 l

Unit	Frasco
1 cuarta	= $\frac{1}{4}$
1 baril	= 32
1 pipe	= 192

Pays-Bas *v.* Netherlands.

Persia.—Metric is in process of adoption. By 1924 the following assimilation had occurred: 1 zar = 1 m, 1 dram = 1 g, 1 ralte = 1 l. National measures, provincial, var.; even today, in retail commerce, cereal grains are used as weights:

Length

1 guerze (common) = 0.63 to 0.97 m = 1 monkelzer

1 zar = 1.04 m

Unit	Zar
1 gireh	= $\frac{1}{16}$
1 ouroub	= $\frac{1}{8}$
1 charac	= $\frac{1}{4}$
1 gez, 1 guerze	= 1
1 farsakh, 1 parasang	= 6000

Mass

1 miskal = 4.60 g

Unit	Miskal
1 una	= $\frac{1}{384}$
1 gandum, 1 grain	= $\frac{1}{96}$
1 abbas	= $\frac{1}{25}$
1 nakhod, 1 carat	= $\frac{1}{24}$
1 dung	= $\frac{1}{6}$
1 dartung	= 0.22
1 dirhem	= 2
1 sir	= 16
1 pinar	= 20
1 danar	= 40
1 abbassi	= 80
1 rottel	= 100
1 tcheirek	= 160
1 saddirham	= 320
1 batman (Tauris)	= 640
1 batman (Shirez)	= 1280
1 batman	= 600 to 1000
1 karvar	= 100 batman

Area

1 jerib = 1082 m² to 1153 m² = 1000 to 1066 zar²

Capacity

1 chenica = 1.32 l

Unit	Chenica
1 sextario	= 0.25
1 capichas	= 2
1 sabbitha	= 5.5
1 colluthun	= 6.25
1 legana	= 30
1 artaba	= 50

Peru.—m.c. 1869. Older (from Spanish, Castillian):

Length

1 vara = 0.835 98 m

Mass

1 libra = 460.09 g

Unit	Libra
1 arroba	= 25
1 quintal	= 100
1 fanega	= 140

Area

1 topo = 27.06 a

1 fanegada = 64.596 a

Philippine Islands.—m.c. 1860. Older = Spain. Local:

Mass

1 catty = about 600 g

Unit	Catty
1 punto	= $\frac{1}{3}$
1 chinanta	= 10
1 lachsa	= 48
1 caban	= 97
1 pecul	= 100

Area

1 balita = 27.95 a

Unit	Balita
1 loan	= 0.1
1 quignon	= 10

Capacity

1 kaban = 99.90 l

1 chupa = 3.75 cm³

1 ganta = $\frac{1}{25}$ kaban

1 apatan = $\frac{1}{4}$ chupa

Poland.—Metric in process of adoption; in some provinces it has been in use since 1872. Russian system legalized in 1849, without displacing national measurements. Since 1819 these have been defined by their metric equivalents. National:

Length

1 stopa = 0.288 m

Unit	Stopa
1 linja	= $\frac{1}{144}$
1 cal	= $\frac{1}{12}$
1 lokiec	= 2
1 sazen	= 6
1 pret	= 15

Old measures

1 pied (Warsaw) = 0.2978 m

1 pied (Cracow) = 0.3564 m

1 aune = 0.620 m

Mass

1 funt = 405.504 g

Unit	Funt
1 gran	= $\frac{1}{9216}$
1 skrupul	= $\frac{1}{384}$
1 drachma	= $\frac{1}{128}$
1 lut	= $\frac{1}{32}$
1 uncja	= $\frac{1}{16}$
1 kamian	= 25
1 centnar	= 100

Old measures

1 funt = 404 g

1 centner = 16 funt

1 stein = 3.2 funt

Area

1 pret² = 18.6624 m²

1 morga = 300 pret²

1 wloka = 9000 pret²

Capacity

1 kwarta = 1 l

Unit	Kwarta
1 kwarterka	= $\frac{1}{4}$
1 garniec	= 4
1 cwierc	= 32
1 korzec	= 128

Porto Rico.—m.c. 1860. Older = Spain:

Area

1 cuerdo = 2250 vara² = 15.72 a

Portugal.—m.c. 1872; m.o. 1852. Older:*

Length

1 pe = 0.3285 m

1 estadio = 258 m

1 milha = 8 estadio

1 legoa = 24 estadio

* In some of the older colonies the old Portuguese system, more or less modified, is still in use.

Unit	Pe
1 linha	= $\frac{1}{144}$
1 pollegada	= $\frac{1}{12}$
1 palmo	= $\frac{2}{3}$
1 covada	= 2
1 vara	= $\frac{10}{3}$

Mass

1 libra*	= 459 g
Unit	Libra
1 grao	= $\frac{1}{9216}$
1 escrupulo	= $\frac{1}{384}$
1 outava	= $\frac{1}{128}$
1 onca	= $\frac{1}{16}$
1 marco 1 meio	= $\frac{1}{2}$
1 arratel	= 1
1 arroba	= 32
1 quintal	= 128

Area

1 vara²	= 1.2 m²
Unit	Vara²
1 ferrado	= 605
1 geira	= 4840

Capacity, dry

1 fanga	= 54 l
Unit	Fanga
1 outava	= $\frac{1}{32}$
1 quarto	= $\frac{1}{16}$
1 meio	= $\frac{1}{8}$
1 alqueira	= $\frac{1}{4}$
1 moio	= 15

Capacity, liquid

1 almude	= 16.5 l
Unit	Almude
1 quartillo	= $\frac{1}{48}$
1 meio	= $\frac{1}{24}$
1 canada	= $\frac{1}{12}$
1 alqueira	= $\frac{1}{6}$
1 bota 1 pipa	= 26
1 tonelada	= 52

Portuguese Colonies.—Metric compulsory.

Portuguese East Africa (Mozambique).—m.c. 1910. Older, mainly of Portugal; one bahar is considered equivalent to 109 kg.

Prussia *v.* Germany.

Rumania.—m.c. 1884; m.o. 1866. In old Bessarabia, Russian measures replaced by metric in 1922. Older:

Length

1 halibiu	= 0.701 m
1 endere	= 0.662 m
1 stringene	= 1.96 m

Mass

1 cantar	= *ca.* 56 kg
1 oke	= $\frac{1}{44}$ cantar

*For drugs 1 libra = $\frac{3}{4}$ libra = 344.25 g.

Capacity

1 dimerla	= 24.6 l
Unit	Dimerla
1 oke	= $\frac{1}{16}$
1 mirze	= 8
1 kilo	= 16

Capacity, liquid

1 viacka	= 14.15 l
1 oke	= 0.1 viacka

Russia.—m.o. 1900. Definitions of fundamental national units: *Length:* Archine is distance at 17°C between the axes of two lines drawn on the platinum-iridium prototype marked "H 1894." *Mass:* Fount is mass of the platinum-iridium prototype marked "H 1894." *Capacity, liquid:* Vedro is volume of 30 founts of pure water at 16⅔°C. *Capacity, dry:* Garnetz is $\frac{4}{15}$ vedro.

Length

1 archine	= 0.711 200 m
1 totchka	= 0.254 0000 mm
Unit	Totchka
1 ligne	= 10
1 paletz	= 50
1 sotka	= 84
1 duïme	= 100
1 verchoc	= 175
1 foute	= 1200
1 archine	= 2800
Unit	Archine
1 sagène	= 3
1 verste	= 1500

Mass (1) Ordinary

1 fount	= 409.51241 g
1 doli	= 44.434 9403 mg
Unit	Doli
1 sol 1 zolotnik	= 96
1 lote	= 288
1 once	= 576
1 lana	= 768
1 fount	= 9216
Unit	Fount
1 poud	= 40
1 berkovets	= 400
1 tonne marine	= 2400

Mass (2) For drugs

Unit	Doli
1 grain	= 1.4
1 scrupule	= 28
1 drachme	= 84
1 once	= 672
1 livre	= 8064

Area

1 archine²	= 0.505 8054 m²
1 ligne²	= 6.451 600 mm²
Unit	Ligne²
1 duïme²	= 100
1 verchoc²	= 306.25
1 foute²	= 14 400
1 archine²	= 78 400
Unit	Archine²
1 sagène²	= 9
1 déciatine	= 21 600
1 verste²	= 2 250 000

Volume

1 archine³	= 0.359 7288 m³
1 ligne³	= 16.387 06 mm³
Unit	Ligne³
1 duïme³	= 1000
1 verchoc³	= 5359.375
1 foute³	= 1 728 000
1 archine³	= 21 952 000
Unit	Archine³
1 sagène³	= 27
1 tonne marine	= 7.871 72
1 last marin	= 15.743 44

Capacity, dry

1 garnetz	= 3.279 842 l
1 tchast	= 0.109 328 07 l
Unit	Tchast
1 polougarnetz	= 15
1 garnetz	= 30
1 lof	= 592
Unit	Garnetz
1 tchetverik	= 8
1 polouosmina	= 16
1 osmina	= 32
1 tchetvert	= 64

Capacity, liquid

1 vedro	= 12.299 41 l
1 tcharka	= 0.122 9941 l
Unit	Tcharka
1 chkalik	= 0.5
1 bottle (vodka)	= 5
1 bottle (wine)	= 6.25
1 krouchka	= 10
1 shtoff	= 12.5
1 vedro	= 100
Unit	Vedro
1 stekar	= 1.5
1 anker	= 3
1 pipe	= 36
1 fass 1 botchka	= 40

Salvador *v.* Costa Rica.

Schottland *v.* Great Britain.

Schweden *v.* Sweden.

Schweiz *v.* Switzerland.

Scotland, Scozia *v.* Great Britain.

Serbie-Croatie-Slovénie *v.* Yugoslavia.

Seychelles Islands *v.* Mauritius.

Siam.—m.c. 1923; m.o. 1889. Older now defined by metric equivalents; those of transition period:

Length

1 wah	= 2 m
Unit	Wah
1 anukabiet	= $\frac{1}{768}$
1 kabiet	= $\frac{1}{384}$
1 niou	= $\frac{1}{96}$
1 keup	= $\frac{1}{8}$
1 sawk 1 sock	= $\frac{1}{4}$
1 ken	= $\frac{1}{2}$
1 sen	= 20
1 roeneng	= 2000
1 yote	= 8000

Mass

1 tchang*	= 1200 g
Unit	Tchang
1 klom	= $\frac{1}{10240}$
1 klam	= $\frac{1}{5120}$
1 pai	= $\frac{1}{2560}$
1 sompay 1 grani	= $\frac{1}{1280}$
1 fuang	= $\frac{1}{640}$
1 salung	= $\frac{1}{320}$
1 baht	= $\frac{1}{80}$
1 tamlung	= $\frac{1}{20}$
1 doon	= 20
1 hap	= 50
1 bara	= 400

Area

1 wah²	= 4 m²
1 ngan	= 100 wah²
1 rai	= 400 wah²

Capacity

1 tanan†	= 1 l
Unit	Tanan
1 niou	= $\frac{1}{100}$
1 chai meu	= $\frac{1}{32}$
1 kam meu	= $\frac{1}{8}$
1 laang 1 chang awn	= $\frac{1}{2}$
1 kanahn	= 1
1 sat	= 20
1 tang	= 40
1 tamlaum	= 400
1 seste	= 800
1 ban	= 1600
1 kwien 1 koyan	= 2000 or 3200
1 cohi	= 32 000

Siria *v.* Syria.

Somaliland.—m.o.; local, vary with material and province:

Length

1 top	= 3.92 m
1 cubito	= $\frac{1}{7}$ top

Mass

1 rottolo	= 448 g

* Previously, 1 tchang = 600 to 1300 g.

† Previously, 1 tanan = 0.9 to 1.2 liter.

Somaliland.—*Cont'd.*

Unit	Rottolo
1 okia	= $\frac{1}{16}$
1 frasla	= 36
1 gisla	= 360

Area

1 darat = 80 a

Capacity, dry

1 chela = 1.359 l

Unit	Chela
1 tabla	= 15
1 gisla	= 120

Capacity, liquid

1 caba = 0.453 l

Soudan *v.* Sudan.

South Africa *v.* Union of South Africa

Spain.—m.c. 1860. Older,* var., provincial; Castillian:

Length

1 vara = 0.835 905 m

(Other vara comprised between 0.768 m and 0.912 m)

Unit	Vara
1 punto	= $\frac{1}{6912}$
1 linea	= $\frac{1}{576}$
1 diedo	= $\frac{1}{48}$
1 pulgada	= $\frac{1}{36}$
1 sesma	= $\frac{1}{6}$
1 palma	= $\frac{1}{4}$
1 pie	= $\frac{1}{3}$
1 codos	= $\frac{1}{2}$
1 passo	= $1\frac{2}{3}$
1 estado	= 2
1 estadal	= 4
1 milla†	= $1666\frac{2}{3}$
1 legua	= 5000 or 8000

Mass

1 libra = 460.093 g

(Other libra comprised between 350 g and 575 g)

Unit	Libra
1 grano	= $\frac{1}{9216}$
1 arienzo	= $\frac{1}{2304}$
1 tomin	= $\frac{1}{768}$
1 dinero	= $\frac{1}{384}$
1 adarme, 1 dracma	= $\frac{1}{256}$
1 ochava, 1 caracter	= $\frac{1}{128}$
1 escrupulo	= $\frac{3}{64}$
1 onza	= $\frac{1}{16}$
1 marco	= $\frac{1}{2}$
1 arroba	= 25
1 barril	= 50
1 quintal	= 100
1 quintalmacho	= 150
1 tonelada	= 2000

* Old national system, more or less modified, is still in use in the old Spanish colonies.

† Milla = 5000 pie.

Area

1 vara² = 0.698 7372 m²

Unit	Vara²
1 cuartilla	= 25
1 calemin	= 768
1 aranzada	= 6400
1 fanega, 1 fanegada	= 9216
1 yugada	= 460 800

Capacity, dry

1 fanega = 55.501 l

Unit	Fanega
1 ochavillo	= $\frac{1}{768}$
1 racion	= $\frac{1}{192}$
1 cuartillo	= $\frac{1}{48}$
1 medio	= $\frac{1}{24}$
1 calemin	= $\frac{1}{12}$
1 almude	= $\frac{1}{12}$
1 cuartilla	= $\frac{1}{4}$
1 cahiz	= 12

Capacity, liquid

(Arroba was defined as volume of 34 libra of river water. The arroba for oil was volume of 25 libra of oil)

1 arroba (wine) = 16.133 l

1 arroba (oil) = 12.563 l

Unit	Arroba
1 copas	= $\frac{1}{128}$
1 quarterone, 1 panilla*	= $\frac{1}{100}$
1 libra, 1 cuartillo	= $\frac{1}{32}$
1 azumbre	= $\frac{1}{8}$
1 cuartilla*	= $\frac{1}{4}$
1 cantara	= 1
1 moio	= 16
1 pipa	= 27
1 bota	= 30

Stati Uniti *v.* United States.

Straits Settlements *v.* British India.

Sud-Africaine, Union *v.* Union of South Africa.

Sudan.—Egyptian in use.

Suède *v.* Sweden.

Suisse *v.* Switzerland.

Svézia *v.* Sweden.

Svizzera *v.* Switzerland.

Sweden.—m.c. 1889; m.o. 1879. Older:

Length

1 fot = 0.296 90 m

Unit	Fot†
1 linie	= $\frac{1}{144}$
1 tum	= $\frac{1}{12}$
1 alm	= 2
1 famm	= 6
1 stang	= 16
1 ref	= 100 or 160
1 mil	= 18 000

* Oils.

† The fot is also divided into decimals.

Mass

1 skälpund = 425.076 g

Unit	Skälpund
1 as	= $\frac{1}{8848}$
1 quintin	= $\frac{1}{128}$
1 lod	= $\frac{1}{32}$
1 untz	= $\frac{1}{16}$
1 lispund	= 20
1 sten	= 32
1 centner	= 100 or 120
1 waag	= 165
1 skeppund	= 400
1 nyläst	= 12 000

Area

1 fot² = 0.088 149 61 m²

1 kappland = 1.542 618 17 a = 1750 fot²

1 ref² = 8.814 961 a

1 tunland = 49.363 781 6 a = 56 000 fot²

Capacity, dry

1 kanna = 2.617 l

Unit	Kanna
1 ort	= $\frac{1}{32}$
1 junkfra	= $\frac{1}{32}$
1 quarter	= $\frac{1}{8}$
1 stop	= $\frac{1}{2}$
1 kappar	= $\frac{7}{4}$
1 fjerdingar	= 7
1 spanna	= 28
1 tunna	= 56
1 koltunna	= 63
1 kolläst	= 756

Capacity, liquid

1 kanna = 0.1 fot³ = 2.617 162 l

Unit	Kanna
1 jungfrur, 1 jungfer	= $\frac{1}{32}$
1 quarter	= $\frac{1}{8}$
1 stop	= $\frac{1}{2}$
1 ankar	= 15
1 eimer	= 30
1 am, 1 ohm	= 60
1 oxhufud, 1 oxhoft	= 90
1 pipe	= 180
1 fuder	= 360

Switzerland.—m.c. 1877; m.o. 1868. Older, var.; during transition were fixed as follows:

Length

1 pied, 1 fuss = 30 cm

Unit	Pied
1 ligne, 1 linie	= $\frac{1}{144}$
1 pouce, 1 zoll	= $\frac{1}{12}$
1 aune, 1 elle	= 2
1 toise, 1 ruthe	= 6
1 perche	= 16
1 lieue	= 16 000

Mass (1) Ordinary

1 livre = 500 g

Unit	Livre
1 loth	= $\frac{1}{32}$
1 once	= $\frac{1}{16}$

Mass (2) For medicine

1 livre = 375 g

Unit	Livre
1 grain	= $\frac{1}{5760}$
1 scruple	= $\frac{1}{288}$
1 drachme	= $\frac{1}{96}$
1 once	= $\frac{1}{12}$

Syria.—m.o.; current:

Length

1 pic = 0.582 m

Mass

1 rottolo = 1785 g

Unit	Rottolo
1 drachme, 1 pesi	= $\frac{1}{600}$
1 metecali	= $\frac{1}{400}$
1 mitcal	= $\frac{1}{400}$
1 once	= $\frac{1}{60}$
1 zurbo	= 27.5
1 cola	= 35
1 cantar	= 100

Capacity

1 rotl = 3.2 l

Unit	Rotl
1 makuk	= 250
1 garava	= 450

Tchéco-Slovaquie *v.* Czechoslovakia.

Tonkin.—Same as Anam (*q.v.*)

Tripoli and Cyrenaïca.—m.o., current defined by metric equivalents:

Length

1 pik = 0.68 m = 1 handaze

1 palmo = $\frac{1}{3}$ pik

1 draa = 0.46 m

Mass

1 rottolo = 512.8 g

1 oka = 2.5 rottolo = 1282 g

1 metical = 4.76 g

Unit	Rottolo
1 kharouba	= $\frac{1}{2560}$
1 dram	= $\frac{1}{160}$
1 termino	= $\frac{1}{128}$
1 uckin	= $\frac{1}{16}$
1 mattaro	= 42
1 cantar	= 100

Area

1 pik² = 0.4624 m²

Unit	Pik[2]
1 denum	= 1600
1 jabia	= 1800

Capacity, dry

1 orba	= 7.6 l

Unit	Orba
1 nufsorbah	= $\frac{1}{2}$
1 temen	= 4
1 ueba	= 16

(Measured by weight)

1 oka	= 1282 g
1 marta	= 11 to 14 oka
1 kele	= 2 marta

Capacity, liquid

1 barile	= 64.8 l
1 bozze	= $\frac{1}{24}$ barile

(Measured by weight)

1 oka	= 1282 g

Unit	Oka
1 gorraf	= 9.75
1 giarra	= 58.5

Tschechoslovak *v.* Czechoslovakia.

Tunis.—m.c. 1895. Current:

Length

1 pic arabe	= 48.8 cm
1 pic turc	= 63.7 cm
1 pic endazé	= 67.3 cm

The pic used depends upon the object measured.

Mass

1 uckir	= 31.495 g

Unit	Uckir
1 rottolo attari	= 16
1 rottolo sucki	= 18
1 rottolo khaddari	= 20
1 cantaro	= 100

Capacity

1 cafisso	= 496 l
1 millerole (Marseilles)	= *ca.* 64 l

Unit	Cafisso
1 saah	= $\frac{1}{129}$
1 whiba	= $\frac{1}{16}$

Turkestan.

Length

1 hasch	= 0.7112 m

Unit	Hasch
1 archine*	} = 1
1 altschin	}

Mass

1 batman	= 125 kg to 128 kg

Unit	Batman
1 sir	= $\frac{1}{8}$
1 tscharik	= $\frac{1}{64}$
1 mimtscha	= $\frac{1}{256}$

Turkey.—m.o.; current, var.:

* Russian.

Length

1 archine	= 64 to 76 cm
1 archine (for architecture)	= 75.77 cm
1 nul	= 1 km

Unit	Archine
1 nocktat	= $\frac{1}{3456}$
1 hatt	= $\frac{1}{288}$
1 parmack	= $\frac{1}{24}$
1 ouromb	= $\frac{1}{8}$
1 pic	= 1

Mass

1 oka	= 1283 g

Unit	Oka
1 karat	= $\frac{1}{6400}$
1 denke	= $\frac{1}{1600}$
1 dirhem	} = $\frac{1}{400}$
1 drachme	}
1 miskal	= $\frac{3}{800}$
1 cequi	} = $\frac{1}{4}$
1 yusdrum	}
1 rottel	= 0.44
1 batman	= 6
1 kantar	= 44
1 tcheki	= 176 to 195

Area

1 deunum	= 1600 archine[2]
	= 913 m[2]
1 djeril	= 100 a

Capacity

1 kile	= 32 to 43 l
1 zira[3]	= 0.435 m[3]

Unit	Kile
1 chinik	= $\frac{1}{4}$
1 fortin	= 4

Ungarn, Ungheria *v.* Hungary.

Union of South Africa.—Metric, British, and old Dutch:

Length

1 elle	= 0.685 m

Mass

1 bundle	= 3175 g

Area

1 morgen	= 85.5 a

Capacity

1 gantang	= 9.2 l
1 balli	= 5 gantang
1 muid	= 109.1 l
1 legger	= 516 l

Unit	Legger
1 kanne	= $\frac{1}{388}$
1 ahm	= $\frac{1}{4}$

United States of America.—m.o. 1866; m.c. for certain governmental purposes. Fundamental units of national system are defined in terms of metric units. For less common and obsolescent units, see Great Britain.

Length

1 yard (yd.)	= $\frac{3600}{3937}$ m
	= 0.914 401 83 m
1 foot (ft.)	= $\frac{1}{3}$ yd.
	= 30.480 061 cm
1 inch (in.)	= $\frac{1}{36}$ yd.
	= 2.540 005 08 cm

Unit	Inch
1 mil	= 0.001
1 hand	= 4
1 span	= 9
1 foot	= 12
1 yard	= 36

Unit	Foot
1 fathom	= 6
1 rod } 1 pole } 1 perch }	= 16.5
1 chain* (Gunther's)	= 66
1 chain* (engineer's)	= 100
1 bolt	= 120
1 furlong	= 660
1 cable length	= 720
1 mile (statute)	= 5280
1 mile (nautical)†	= 6080.20
1 league (statute)	= 3 st. mile
1 league (nautical)	= 3 n. mile

Mass

1 pound avoirdupois (lb. av.)	= 453.592 4277 g
	= 7000 grain (gr.)
1 grain	= 64.798 918 24 mg

(Three systems: avoirdupois, troy, apothecary.)

Avoirdupois (av.)

(General use)

Unit	Pound
1 dram (dr.)	= $\frac{1}{256}$
1 ounce (oz.)	= $\frac{1}{16}$
1 hundred-weight (cwt.) (long)	= 112
1 ton (short) (sh. tn.)	= 2000
1 ton (long) (l. tn.)	= 2240

Troy (t.)

(For precious metals)

Unit	Grain
1 pennyweight (dwt.)	= 24
1 ounce (oz.)	= 480
1 pound (lb.)	= 5760

Apothecary (ap.)

(For dispensing drugs)

Unit	Grain
1 scruple (s. or ℈)	= 20
1 dram (dr. or ʒ)	= 60
1 ounce (oz. or ℥)	= 480
1 pound (lb.)	= 5760

* 1 link = 0.01 chain.

† 1 nautical mile = 1853.249 m

Area

1 inch[2] (sq. in.)	= 6.451 6258 cm[2]
1 foot[2] (sq. ft.)	= 929.0341 cm[2]
1 yard[2] (sq. yd.)	= 0.836 130 71 m[2]
1 acre (A.)	= 4046.873 m[2]

Unit	Foot[2]
1 inch[2]	= $\frac{1}{144}$
1 yard[2]	= 9

Unit	Yard[2]
1 rod[2] (sq. rd.) } 1 perch }	= 30.25
1 chain[2]*	= 484
1 rood	= 1210
1 acre (A.)	= 4840

Unit	Acre
1 mile[2] (sq. mi.)	= 640
1 township†	= 23 040

Volume

1 yard[3] (cu. yd.)	= 0.764 559 45 m[3]
1 foot[3] (cu. ft.)	= 28 317.0 cm[3]
1 inch[3] (cu. in.)	= 16.387 162 cm[3]

Unit	Foot[3]
1 inch[3]	= $\frac{1}{1728}$
1 board foot (bd. ft.)	= $\frac{1}{12}$
1 yard[3]	= 27
1 shipping ton	= 40
1 register ton	= 100
1 cord (cd.)	= 128

Capacity, dry

1 bushel (bu.)	= 2150.42 inch[3]
	= 35.238 329 l

Unit	Bushel
1 pint (pt.)	= $\frac{1}{64}$
1 quart (qt.)	= $\frac{1}{32}$
1 peck (pk.)	= $\frac{1}{4}$
1 barrel‡ (bbl.)	= 3.281
1 chaldron§	= 36
1 firkin	= 9 gallon

Capacity, liquid

1 gallon (gal.)	= 231 inch[3]
	= 3.785 332 l
1 minim (min. or ♏)	= $\frac{1}{61440}$ gal.
	= 0.061 6102 ml

Unit	Minim
1 fluid dram (fl. dr.)	= 60
1 fluid ounce (fl. oz.)	= 480
1 gill (gi.)	= 1920

* Gunther's chain.

† 36 mile[2].

‡ For dry commodities, except cranberries, barrel = 7056 inch[3]; cranberry barrel = 5826 inch[3]; lime barrel contains 180 lb. av. or 280 lb. av.; by custom, flour barrel = 196 lb. av.

§ Variable.

United States.—*Cont'd.*

Unit	Gallon
1 gill (gi.)	= $\frac{1}{32}$
1 pint (pt.)	= $\frac{1}{8}$
1 quart (qt.)	= $\frac{1}{4}$
1 barrel*	= 31.5
1 hogshead	= 63

Uruguay.—m.c. 1894; m.o. 1866. Older = Spain (Castillian), more or less modified.

Venezuela.—m.c. 1914; m.o. 1857. Older = Spain (Castillian), more or less modified, and the following of Granada:

Length

1 vara	= 0.8 m
1 meile	= 6280 vara

Mass

1 libra	= 1 kg
1 bag	= 62.5 kg

Vereinigte Staaten *v.* United States.

Württemberg *v.* Germany

Yugoslavia.—m.c. 1883. Older:

Length

1 linija	= 21.95 mm
1 palaz	= 36.34 mm
1 archine	= 660 mm to 712 mm
1 khvat	= 1.896 m
1 stopa	= $\frac{1}{6}$ kvat

Mass

1 oka = 1280 g

Unit	Oka
1 dramm	= $\frac{1}{400}$
1 satlijk	= $\frac{1}{4}$
1 litra	= $\frac{1}{4}$
1 akov	= 40
1 tovar	= 100

Area

1 stopa² = 998.56 cm²

Unit	m²
1 dunum	= 700
1 motyka	= 800
1 raliza	= 2500
1 dan oranja	= 3597
1 lanaz	= 5760 = 1600 khvat²

Capacity

(Liquids are measured by weight.)

C. SYSTEMS OF ANTIQUITY

Our knowledge of the measures of antiquity is derived from the texts and monuments which have persisted to modern times, and some actual standards which have come down to us. The latter enable us to establish quite exact equivalence between the measures which they represent and ours. But most frequently such equivalence is only very roughly known, or is actually unknown. In this section are given only the more important or the best studied of these systems. The values given must not be taken too literally. Indeed, especially in antiquity, systems do not succeed one another; they evolve. Several may coexist among a single people; it is generally impossible to fix the dates at which these systems were used. The ancients had no capacity measures, such as ours; they weighed liquids and grains in terms of standards forming a second system of weights.

Arabian System.

Length

1 foot = 0.320 m

Unit	Foot
1 assbaa (finger)	= $\frac{1}{16}$
1 cabda (palm)	= $\frac{1}{4}$
1 cubit (new)	= $1\frac{1}{2}$
1 cubit†	= 2
1 orgye (pace)	= 6
1 qasab	= 12
1 seir	= 600
1 ghalva	= 720
1 mille	= 6000
1 parasang	= 18 000
1 barid 1 veredus	= 72 000
1 marhala	= 144 000

* Wine barrel.
† Hachemic.

Mass

(So-called system of the Prophet)

1 rotl = 340 g

Unit	Rotl
1 dirhem	= $\frac{1}{120}$
1 nevat	= $\frac{1}{24}$
1 nasch	= $\frac{1}{6}$
1 oukia	= $\frac{1}{3}$
1 man 1 mine	= 2
1 ocque	= 4
1 qanthar	= 100
1 kikkar	= 125

Area

1 feddan = 14 400 cubit²†
= 59 a

Unit	Feddan
1 achir 1 qasaba	= $\frac{1}{400}$
1 qamha	= $\frac{1}{96}$
1 habbah	= $\frac{1}{72}$
1 cafiz	= $\frac{1}{40}$
1 qirat	= $\frac{1}{24}$
1 daneq	= $\frac{1}{6}$
1 djarib	= $\frac{1}{4}$

Capacity

(Measured by weight)

1 cafiz = 32.64 kg

Unit	Cafiz
1 mudd	= $\frac{1}{48}$
1 kiladja 1 caphite 1 kist	= $\frac{1}{24}$
1 sâa	= $\frac{1}{12}$
1 makuk	= $\frac{1}{8}$
1 ferk	= $\frac{1}{4}$
1 woëbe 1 khoull	= $\frac{1}{2}$
1 modius	= $1\frac{1}{4}$
1 artabe 1 amphora	= 2
1 gariba 1 den	= 8

Assyro-Chaldean-Persian System.

Length

1 foot = 0.320 m

Unit	Foot
1 finger	= $\frac{1}{16}$
1 palm	= $\frac{1}{4}$
1 zereth	= 1
1 cubit	= 2
1 pace	= 6
1 qasab 1 cane	= 12
1 chebel	= 80
1 stadion 1 ghalva	= 720
1 mille	= 5400
1 parasang	= 20 000
1 schoëme	= 21 600
1 stathmos 1 mansion	= 80 000

Mass

1 talent = 32.6 kg
(Talent divided into 50, 60 or 100 mina)
1 drachma = 0.01 mina

Area

1 gar = 14.7 m²
= 144 foot²

Unit	Gar
1 dizaine	= 10
1 gan	= 100
1 gur	= 1000

Capacity

(Measured by weight)

1 amphora = 32.6 kg

Unit	Amphora
1 cados	= $\frac{1}{32}$
1 makuk	= $\frac{1}{8}$
1 woëbe 1 modius	= $\frac{1}{2}$
1 small artaba	= $1\frac{1}{2}$
1 large artaba	= 2
1 large amphora	= 3
1 gariba	= 8

Egypt: System of the Pharaohs.

Length

1 pied = 0.349 m

Unit	Pied
1 doigt, finger 1 theb	= $\frac{1}{16}$
1 palme 1 choryos	= $\frac{1}{4}$
1 dichas	= $\frac{1}{2}$
1 spithame	= $\frac{3}{4}$
1 pied royal 1 zereth	= 1
1 pigon	= $1\frac{1}{4}$
1 coudée royale 1 derah	= $1\frac{1}{2}$
1 coudée longue	= 2
1 pas	= $2\frac{1}{3}$
1 xilon	= $4\frac{1}{2}$
1 orgye	= 6
1 canne	= $11\frac{2}{3}$
1 senus	= 150
1 stade	= 500 or 600
1 mille	= 5000
1 atour vulgaire	= 15 000
1 schoëme	= 18 000
1 parasange	= 20 000
1 atour royal	= 30 000

Mass

1 mine = 850 g

Unit	Mine
1 gerah	= $\frac{1}{1200}$
1 sicle	= $\frac{1}{60}$
1 kikkar 1 talent	= 50

Area

1 pekeis = 27.405 m²

Unit	Pekeis
1 coudée²	= $\frac{1}{100}$
1 sû	= 6.25
1 dizaine	= 10
1 rema	= 50
1 aurure 1 aroure	= 100
1 setta	= 1000

Capacity

(Measured by weight)

1 khar = 34 kg

Unit	Khar
1 outen	= $\frac{1}{160}$
1 man 1 mine	= $\frac{1}{40}$
1 hecte	= $\frac{1}{10}$
1 apt	= $\frac{1}{4}$
1 keramion	= 1
1 metretes d'Héron	= $1\frac{1}{4}$
1 artabe des septante	= $1\frac{1}{2}$
1 artabe 1 letech	= $4\frac{7}{32}$

Greek System.

Length

1 pous* = 0.308 56 m

Unit	Pous
1 daktylos (finger)	= $\frac{1}{16}$
1 condylos	= $\frac{1}{8}$
1 palestra (palm)	= $\frac{1}{4}$
1 dichas	= $\frac{1}{2}$
1 spithame (span)	= $\frac{3}{4}$
1 cubit†	= $1\frac{1}{2}$
1 Grecian cubit	= 2
1 bema (pace)	= $2\frac{1}{2}$
1 orgyia	= 6
1 amma (corde)	= 60
1 plethron	= 100
1 stadion	= 600
1 mille	= 4500
1 kiloorgyia	= 6000

Mass

1 mina = 425 g

Unit	Mina
1 chalque	= $\frac{1}{4800}$
1 obol	= $\frac{1}{600}$
1 diobol	= $\frac{1}{300}$
1 drachma	= 0.01
1 tetradrachma	= 0.04
1 talent	= 60

Area

1 pous² = 0.095 209 m²

Unit	Pous²
1 dekapode²	= 100
1 plethron²	= 10 000

Capacity

(Measured by weight)

1 chenica = 816 g

Unit	Chenica
1 cyanthos	= $\frac{1}{24}$
1 oxybaphon	= $\frac{1}{16}$
1 cotyle	= $\frac{1}{4}$
1 sexte	= $\frac{1}{2}$
1 maris	= 2
1 choüs	= 3
1 hemiektos	= 4
1 hektos 1 modius	= 8
1 metretes	= 36
1 medimnos	= 48

* The Olympic foot of Egyptian origin.

† Lapidary.

Hebrew System.

Length

1 sacred cubit = 0.640 m

1 cubit* = 0.555 m

Unit	Cubit*
1 finger	= $\frac{1}{24}$
1 palm	= $\frac{1}{6}$
1 zereth	= $\frac{1}{2}$

Mass (Sacred system)

1 mina = 850 g

Unit	Mina
1 obol 1 gerah	= $\frac{1}{1200}$
1 rabah	= $\frac{1}{240}$
1 bekah	= $\frac{1}{120}$
1 shekel	= $\frac{1}{60}$
1 talent†	= 50

Mass (Talmudist or Rabbinical system)

1 mina = 354.2 g

Unit	Mina
1 pondiuscule	= $\frac{1}{1200}$
1 mehah 1 gerah 1 obol	= $\frac{1}{600}$
1 zuzah 1 drachma	= $\frac{1}{100}$
1 shekel 1 tetradrachma	= $\frac{1}{25}$
1 talent	= 60

Capacity, dry

(Measured by weight)

1 ephah (old) = 29.376 kg; (new) = 21.420 kg

Unit	Ephah
1 log	= $\frac{1}{72}$
1 cab	= $\frac{1}{18}$
1 gomor	= 0.1
1 sath 1 modius	= 0.3
1 cor	= 10

Capacity, liquid

(Measured by weight)

1 bath (old) = 29.376 kg

1 bath (new) = 21.420 kg

Unit	Bath
1 log	= $\frac{1}{72}$
1 hin	= $\frac{1}{6}$
1 cor	= 10

* Talmudist.

† Of Moses.

Hindu System.

Length

1 hasta = 0.457 m

Unit	Hasta
1 angula (finger)	= $\frac{1}{24}$
1 vitasti (span)	= $\frac{1}{2}$
1 cubit	= 1
1 dhanush 1 orgyla	= 4
1 crosa	= 8000
1 gavyuti	= 16 000
1 yodjana	= 32 000

Mass

1 retti, 1 ratica = 0.147 g

1 pala = 47 g

Unit	Retti
1 yava	= 0.1
1 masha	= 2, 5, 6, or 8
1 tank-sala	= 24
1 kona	= 48
1 tola	= 80
1 karsha	= 96
1 dharana	= 32 (silver) 3200 (gold)
1 pala	= 320

Unit	Pala
1 tuba	= 100
1 hara	= 200
1 bara	= 2000
1 achita	= 20 000

Capacity

(Measured by weight)

1 drona = 13.2 kg

Unit	Drona
1 pala 1 musti	= $\frac{1}{256}$
1 cudava	= $\frac{1}{32}$
1 prastha	= $\frac{1}{16}$
1 adhaka	= $\frac{1}{4}$
1 cumbha (small)	= 2
1 shari	= 16
1 cumbha	= 20
1 baha	= 200

Persian System *v.* Assyrio-Chaldean-Persian.

Roman System.

Length

1 pes (common or Drusian) (foot) = 0.3196 m

1 legal pes (1st) = 0.2962 m

1 legal pes (2nd) = 0.2967 m

Unit	Pes
1 digitus (finger)	= $\frac{1}{16}$
1 uncia (inch)	= $\frac{1}{12}$
1 cubitus (cubit)	= $1\frac{1}{2}$
1 passus (pace)	= 5
1 decempeda (perch)	= 10
1 actus (chain)	= 120
1 millarium (mile)	= 5000

Mass

1 podium = 326 g

Unit	Podium
1 scrupulus	= $\frac{1}{288}$
1 denier*	= $\frac{1}{96}$
1 denier†	= $\frac{1}{90}$
1 denarius	= $\frac{1}{84}$
1 solidus 1 sextula	= $\frac{1}{72}$
1 miliaresium	= $\frac{1}{60}$
1 sicilium	= $\frac{1}{48}$
1 duella	= $\frac{1}{36}$
1 semuncia	= $\frac{1}{24}$
1 ounce	= $\frac{1}{12}$
1 mina	= $1\frac{2}{3}$
1 centum-podium	= 100

Area

1 common pes² = 0.102 14 m²

1 legal pes² (1st) = 0.087 73 m²

1 legal pes² (2nd) = 0.088 03 m²

Unit	Pes²
1 decempeda²	= 100
1 actus (small)	= 400
1 clima	= 3600
1 versum	= 10 000
1 actus	= 14 400
1 jugerum	= 28 800
1 heredium	= 57 600
1 centuria	= 5 760 000
1 saltus	= 23 040 000

Capacity, dry

1 sextarius = 544 g

Unit	Sextarius
1 modius	= 16
1 quadrantal	= 48
1 pes³‡ (of water)	= 48

Capacity, liquid

(Measured by weight)

1 sextarius, 1 sextus = 544 g

Unit	Sextarius
1 cyathus	= $\frac{1}{12}$
1 acetabulum	= $\frac{1}{8}$
1 quartus	= $\frac{1}{4}$
1 hemina	= $\frac{1}{2}$
1 congius	= 6
1 urna	= 24
1 amphora	= 48
1 culeus 1 dolium	= 960

* Silver.

† Neronian.

‡ Legal pes (2).

SYMBOLS, BASIC CONSTANTS, CONVERSION DATA, DIMENSIONS, DEFINITIONS

BASES OF DATA CONTAINED IN I. C. T.

When many experts are cooperating in the assembling of data, it is essential that the same values for the fundamental constants and for the necessary conversion factors shall be employed by all. Consequently, at the very beginning of the work, the Editors compiled a set of accepted, or I. C. T., values for such constants and factors; and the Experts were instructed to base all their data upon these values. In the few cases in which it was not feasible to follow these instructions, the data were to be accompanied by a statement of the actual basis upon which they rest.

In compiling this list, and in choosing the accepted values of such of the quantities as were independently chosen, the Editors secured and utilized the advice of the United States Bureau of Standards, the National Physical Laboratory of Great Britain, and the Société Française de Physique. Acknowledgments are also due to Dr. F. E. Fowle, of the Smithsonian Institution, for his valued assistance in preparing the initial table of fundamental constants, and to Professors T. W. Richards and G. P. Baxter for their recommendations concerning the table of atomic weights.

The list so prepared comprised (1) a table of atomic weights (p. 43), (2) a set of nine basic constants (p. 17) (the estimated uncertainties were added at a later date), (3) twenty-one derived constants (computed directly from the nine basic constants), five conventional constants, and two experimental constants (p. 18) and (4) certain conversion factors selected from Tables 1 to 79 (p. 20–32). Although the accepted values were close approximations to the best values at that time available, it was not claimed that they were such best values.

SYMBOLS AND ABBREVIATIONS

Except as the contrary is definitely stated, the following symbols and abbreviations will always be used in the sense here indicated. Other symbols will be defined in the sections in which they are used. For those quantities which are included in the list of symbols approved by the International Association of Chemical Societies (*4*, **119**: 502; 21), the symbols so approved have, in general, been used; in some cases, this has necessitated the use of the same symbol to represent two distinct quantities; the context will serve to indicate which interpretation is correct. For explanations of the several technical terms, consult Selected Technical Terms, p. 34.

Å	Ångstrom unit
A.	Acre
A_n	Normal atmosphere
A_{45}	Atmosphere, 45° latitude
A	Atomic weight. Maximum work of a thermodynamic system
a	Are
(a)	Based on Int. ohm and Int. ampere as defined by silver voltameter. (*See* Int. elec. units, p. 27)
abs.	Absolute
ap.	Apothecaries
Av.	Average
av.	Avoirdupois
a	Van der Waal's pressure constant. Capillary constant.
BTU	British Thermal Unit
bbl.	Barrel
bd.	Board
bu.	Bushel
b	Van der Waal's volume constant
C	Centigrade
CTU	Centigrade thermal unit
C	Concentration. Molecular heat
C_1, C_2	Radiation constants of black body. (*See* definition of black body.)
C_i	Intensity coefficient. (*See* definition of black body.)
C_p, C_v	Molecular heat at constant pressure, at constant volume
c	Velocity of light in vacuo
c	Carat. Centi-
ca	Candle
ca.	*circa* = about, approximately
cal	Calorie (gram)
cd.	Cord
cf.	*Confer* = compare
cgs	Centimeter-gram-second system of units
cgse	Cgs electrostatic system
cgsm	Cgs electromagnetic system
ch.	Chain
cm	Centimeter
cm^2	Square centimeter
cm^3	Cubic centimeter
c.p.	Candle power
cu.	Cubic
cu. ft.	Cubic foot
cwt.	Hundredweight
c	Specific heat = heat capacity of the substance
c_p, c_v	Specific heat at constant pressure, at constant volume
D	Density
d	Derivative. Deci-
da	Day
deg	Thermometric degree, absolute C unless contrary is indicated
dk	Deka-
dm^3	Cubic decimeter
dr.	Dram
dwt.	Pennyweight
d	Density. Diameter
d_c	Critical density
$d^{t_2}_{t_1}$	Specific gravity at temperature t_{12}, with reference to water at temperature t_1
E	Electromotive force
E_0	Mean translational energy of molecule of ideal gas at 0°C
e	Electronic charge
e	Base of natural system of logarithms = 2.71828+
e.g.	*Exempli gratia* = for example
em	Cgsm unit of quantity of electricity
emf	Electromotive force
equiv	Electrochemical equivalent
es	Cgse unit of quantity of electricity
etc.	*Et cetera* = and so forth
et seq.	*Et sequentes* = and the following
e_0	Ratio of E_0 to T_0
F	Faraday
F	Fahrenheit
fath.	Fathom
fir.	Firkin
fl.	Fluid
fps	Foot-pound-second system of units
fpse	Fps electrostatic system
fpsm	Fps electromagnetic system
ft.	Foot
$ft.^2$	Square foot
$ft.^3$	Cubic foot
fur.	Furlong
G	Gravitation constant
g	Gram
gal.	Gallon
gi.	Gill
gr.	Grain
g	Acceleration due to gravity
g_s	Standard gravity
HP	Horse-power
H	Atomic weight of hydrogen
h	Planck's constant of action
h	Hecto-
ha	Hectare
hhd.	Hogshead
h.p.	Horse-power
hr	Hour
h	Height
Int.	International
I. C. T.	International Critical Tables
I	Electric current
ibid.	*Ibidem* = in the same place
i.e.	*Id est* = that is
in.	Inch
$in.^3$	Cubic inch
J	Radiance
J_λ	Intensity of monochromatic radiance of wave-length λ
J_m	Value of J_λ for $\lambda = \lambda_m$
K	Karat. Kelvin, or absolute C, scale of temperature
K	Constant of chemical equilibrium
k	Kilo-
kg	Kilogram
km	Kilometer
km^2	Square kilometer
k	Velocity coefficient of chemical reaction
k_0	Boltzmann's gas constant
L	Latent heat per mole
l	Liter
l.	Long
lat.	Latitude
lb.	Pound
li.	Link
liq.	Liquid
long.	Longitude
l	Length. Latent heat per gram
M	Molecular weight
M [α]	Molecular rotatory power
M [ω]	Molecular magnetic rotatory power
m_0	Mass of electron at low velocity
m	Meter. Milli-
m^2	Square meter
max.	Maximum
mg	Milligram
mi.	Mile
min	Minute

min.	Minim, Minimum
ml	Milliliter
mmf	Magnetomotive force
$m\mu$	Millimicron. Millimicro-
m	Mass
m_H	Mass of a hydrogen atom
N	Numeric
N_0	Avogadro's number
N_∞	Rydberg's universal series constant
n	Refractive index
n_a, n_k	Transport number for anion, kation
n_0	Loschmidt's number
O	Atomic weight of oxygen
oz.	Ounce
P	Pressure
pk.	Peck
pt.	Pint
p	Pressure
p_c, p_r	Critical pressure, reduced pressure
Q	Quantity
q	Quintal
qt.	Quart
q.v.	*Quod vide* = which see
R	Réaumur
R	Gas constant per mole of ideal gas. Electrical resistance.
rd.	Rod
r	Radius
r_G	Specific refractivity (Gladstone and Dale)
r_L	Specific refraction (Lorentz and Lorenz)
r_1	Radius of first Bohr ring, hydrogen
S.E.	Siemens unit
S	Entropy
s	Stere
s.	Scruple
sec	Second (mean solar unless contrary is stated)
sh.	Short
sq.	Square
sq. ft.	Square foot
T_0	Ice point, absolute C
T	Temperature on absolute C scale
T_c	Critical temperature, absolute C
t	Metric ton
t.	Troy
tn.	Ton
t	Time. Temperature C (above ice point)
t_c	Critical temperature C (above ice point)
U. S.	United States of America
V	Volume
V_0	Volume per gram-mole of ideal gas at 0°C and A_n
v.	*Vide* = see
(v)	Based on Int. ohm and Int. volt as defined by standard cell. (*See* Int. elec. units, p. 27.)
v	Volume
v_c, v_r	Critical volume, reduced volume
W	Electrical resistance
wt.	Weight
w	Wien's displacement constant
yd.	Yard
yr	Year
Z	Atomic number
α	Degree of dissociation. Angle of optical rotation
$[\alpha]$	Specific rotatory power
β	Specific heat constant
γ	Surface tension. Ratio of c_p/c_v. Gamma (magnetic unit)
Δ	Diffusion coefficient
ϵ	Dielectric constant. Electrode potential
ϵ_h, ϵ_c	Electrode potential above that of normal hydrogen, of normal calomel, electrode
η	Viscosity
θ	Angle (plane). Temperature C above ice point
κ	Susceptibility (magnetic). Electrical (volume) conductivity
Λ	Equivalent conductivity (electrical)
λ	Wave-length. λ5890 = spectral line of wave-length = 5890Å
λ_m	Wave-length of maximum monochromatic radiance of black-body at stated temperature
μ	Permeability (magnetic). Micron, Micro-, Molecular conductivity (electrical)
$\mu\mu$	Micromicron. Micromicro-
ν	Frequency
ν_∞	Rydberg's fundamental frequency
π	Ratio of circumference of a circle to its diameter
σ	Stefan's constant (radiation)
φ	Fluidity. Angle
ψ	Luminous flux
Ω	Ohm
$[\Omega]$	Relative molecular magnetic rotatory power with reference to water
ω	Solid angle
$[\omega]$	Specific magnetic rotatory power
♏	Minim
℥	Apothecaries' ounce
ʒ	Apothecaries' dram
℈	Apothecaries' scruple
°	Degree (arc or temperature)
′	Minute of arc (sexagesimal)
″	Second of arc (sexagesimal)
%	Percent = per hundred
‰	Per thousand = 0.1 %
[ ]	Dimensional expressions are inclosed in [ ]. In text, [ ] is used to inclose a second reading. (*E.g.*, Length [diameter] of the bar is 10 cm [1 cm] = length of bar is 10 cm, diameter of bar is 1 cm)
$<$	$A < B$ [$A > B$] denotes that A is less than [greater than] B
$\nless$	Negative of $<$; $A \nless B$ denotes that A is not less than B
$\leq$	Combination of $<$ and $=$; $A \leq B$ denotes that A is equal to or less than, B
$\neq$	Is not equal to
$\equiv$	Identically equal to; used in defining symbols, etc.
$\cong$	Approximately (or essentially) equal to
∞	Infinity

FUNDAMENTAL CONSTANTS

By an *accepted*, *conventional*, or *defined* value, is meant one which is to be regarded as exactly correct for purposes of computation.[1] Thus, errors from computational approximations are avoided and do not enter into consideration in any future revision of the computed result for a discovered difference between the true and the accepted value. When the computation involves several accepted values, it is especially important that each shall be regarded as exactly correct, for only then can the result be independently revised (without complete recalculation) for changes in the values of each. For this reason the logarithms of the several accepted values are given to the full precision of Vega's seven-place table. The degree of uncertainty in the value accepted is indicated by the number of significant figures retained in the value itself, not by the logarithm.

[1] In every computation it is tacitly assumed that the values employed are exact. If but three digits are employed, it is assumed that all others are zero; if a computing machine is used, the assumption is carried out to the extreme limit of the machine; if logarithms are used, it is carried to the limit within which the logarithms are interpolated. To adopt an accepted or a conventional value, and to give as its logarithm an abbreviated value, is to introduce an ambiguity of a magnitude determined by the degree of abbreviation of the logarithm. But the sole object in adopting accepted or conventional values is to avoid ambiguity.

ACCEPTED BASIC CONSTANTS Units: cgs, °C, liter, A_n, absolute electric

	Quantity	Value	Uncertainty	Log_{10} (value)
c	Velocity of light	2.9986 × 10^{10} cm sec^{-1}	0.0003	10.476 9185
G	Gravitation constant	6.66 × 10^{-8} cm^3 g^{-1} sec^{-2}	0.01	$\overline{8}$.823 4742
e	Electronic charge	4.774 × 10^{-10} es	0.005	$\overline{10}$.678 8824
e	Electronic charge	*1.592 × 10^{-20} em	....	$\overline{20}$.201 9639
e/m_0	Electronic ratio	5.305 × 10^{17} es g^{-1}	0.010	17.724 6854
e/m_0	Electronic ratio	*1.769 × 10^7 emg^{-1}	....	7.247 7669
F	Faraday	9.6500 × 10^4 coulombs	0.0010	4.984 5273
F	Faraday	*2.893 65 × 10^{14} es	....	14.461 4458
v_0	Volume 1 mole at 0°C, A_n	†22.4115 × 10^3 cm^3 $mole^{-1}$	0.002	4.350 4709
h	Planck's constant	6.554 × 10^{-27} erg sec	0.001	$\overline{27}$.816 5064
T_0	Ice point, absolute	273.1 deg C	+0.15 to −0.05	2.436 3217
O	Atomic weight of oxygen	16.000 (by definition)	(definition)	1.204 1200

* This value is derived from the preceding one, which is the value actually accepted.
† Derived from volume at 0°C, A_{45} = 22.412 liters/g-mole on assumption $\log_{10}$ (A_n/A_{45}) = 0.000 0214, liter = 1000.027 cm^3.

ACCEPTED CONSTANTS:—CONVENTIONAL AND NON-BASIC Units: cgs, °C, liter, A_n absolute electric, international angstrom

	Quantity	Value	Log_{10} (value)
	A. Derived Constants		
R	Gas constant	8.315×10^{7} erg deg^{-1} mole^{-1}	7.919 8658
R	Gas constant	0.082 06 liter atm deg^{-1} mole^{-1}	$\bar{2}$.914 1375
R	Gas constant	1.9869 cal$_{15}$ deg^{-1} mole^{-1}	0.298 1703
N_0	Avogadro's number	6.061×10^{23} mole^{-1}	23.782 5634
n_0	Loschmidt's number	2.705×10^{19} cm^{-3} (at 0°C, A_n)	19.432 0925
k_0	Molecular gas constant	1.372×10^{-16} erg deg^{-1}	$\overline{16}$.137 3024
E_0	Translational energy of molecules, 0°C	5.620×10^{-14} erg	$\overline{14}$.749 7154
e_0	Ratio of E_0 to T_0	2.058×10^{-16} erg deg^{-1}	$\overline{16}$.313 3937
m_H	Mass of hydrogen atom	1.663×10^{-24} g	$\overline{24}$.220 7679
m_0	Electronic mass	8.999×10^{-28} g	$\overline{28}$.954 1970
r_1	Radius 1st Bohr ring of hydrogen	0.5305×10^{-8} cm	$\bar{9}$.724 6912
h/e	Photo-electric constant	1.373×10^{-17} erg sec es^{-1}	$\overline{17}$.137 6240
h/e	Photo-electric constant	*4.117×10^{-15} volt sec	$\overline{15}$.614 5425
hc/e	Photo-electric constant	4.117×10^{-7} erg cm es^{-1}	$\bar{7}$.614 5425
hc/e	Photo-electric constant	1.2344×10^{4} volt Å	4.091 4610
β	Specific heat constant	4.778×10^{-11} sec deg	$\overline{11}$.679 2040
σ	Stefan's constant	5.709×10^{-5} erg cm^{-2} sec^{-1} deg^{-4}	$\bar{5}$.756 5416
C_1	Radiation constant, first	3.703×10^{-5} erg cm^{2} sec^{-1}	$\bar{5}$.568 5233
C_2	Radiation constant, second	1.433 cm deg	0.156 1225
w	Wien's displacement constant	0.2885 cm deg	$\bar{1}$.460 1933
C_j	Intensity coefficient	1.301×10^{-4} erg cm^{-3} sec^{-1} deg^{-4}	$\bar{4}$.114 2762
ν_∞	Rydberg frequency	3.2775×10^{15} sec^{-1}	15.515 5372
N_∞	Rydberg wave number	1.0930×10^{5} cm^{-1}	5.038 6187
	B. Conventional Constants		
A_n	Normal atmosphere	$1.0132\ 50 \times 10^{6}$ dyne cm^{-2}	6.005 7166
A_{45}	Atmosphere, latitude 45°	$1.0132\ 00 \times 10^{6}$ dyne cm^{-2}	6.005 6952
Å	Wave-length of red Cd line is	6438.4696 Å	4.808 7827
g_s	Standard gravity	980.665 cm sec^{-2}	2.991 5207
	Aberration constant	20.47″	1.311 1178
	C. Experimental Constants		
	Grating space in calcite	3.028 Å	0.481 1559
H	Atomic weight of hydrogen	1.0077	0.003 3313
	‡Liter	1000.027 cm^{3}	3.000 0117
	‡Gram calorie (20°C)	4.181 joule	0.621 2802
	‡Gram calorie (15°C)	4.185 joule	0.621 6955
	‡Gram calorie (mean)	4.186 joule	0.621 7992
	‡British Thermal Unit (39°F)	1060.4 joule	3.025 4697
	‡British Thermal Unit (mean)	1054.8 joule	3.023 1701
	‡British Thermal Unit (60°F)	1054.6 joule	3.023 0878
	‡International ohm	1.000 52 ohm	0.000 2259
	‡International ampere (v)§	0.999 90 ampere	0.999 9566
	‡International ampere (a)§	0.999 93 ampere	0.999 9696

* This value is derived from the preceding one, which is the value actually accepted.

‡ In the original list, this quantity was included solely in the list of conversion factors; its value, however, is an independently selected, *accepted* constant, and, consequently, is treated as exact in all computations.

§ (v) = Based on Int. ohm and Weston normal cell = 1.018300 Int. volts at 20°C; (a) = based on deposit of 1.11800 mg of silver per Int. ampere second.

CONVERSION FACTORS AND DIMENSIONAL FORMULAE

N. Ernest Dorsey

In the following tables are given the factors by which values expressed in other units must be multiplied in order to obtain their equivalents in units of the centimeter-gram-second (cgs) system. To convert in the reverse direction, divide by the factor given. The dimensional formula in the cgs, or any similarly constructed, system is given in the title of each table.

Conversion Factors.—With few exceptions,[1] the values given are based exclusively upon legal definitions, conventional constants, and the I. C. T. accepted values (p. 16). Consequently, they are computable to as extreme a precision as may be desired. They have been computed by means of Vega's seven-place logarithms, and it is hoped that their logarithms as given are correct to a unit in the last digit. Obviously, those factors which involve the accepted value of an experimentally determined constant will be in error by an amount determined by the error in the accepted value; but quantities converted by means of the logarithms given will retain their same relative precision, however great this may be, within the limit set by the seven-place table, and may at any time be as exactly corrected for a revision of the accepted value. This would not be true if an abbreviated logarithm were used, unless the exact value of the abbreviated logarithm itself were given. The latter would be equivalent merely to the adoption of another accepted value for the experimental constant involved;

[1] The exceptions are (1) astronomical unit of distance, (2) parsec, (3) sidereal second, (4) certain units of luminous intensity, (5) international electrical units prior to 1911, and (6) the data for hydrometers.

and the new value so fixed would, in general, be expressible only by an indefinite number of digits. The former procedure is to be preferred.

Frequently, the same factor applies to more than one type of physical quantity; if the units of the several types have distinctive names, separate tables are given, otherwise, not. In general, the tables are arranged in the order of increasing complexity of the dimensional formulae. Some quantities for which conversion factors are seldom required, and a few dimensionless quantities have been grouped together in Table 78. The dimensional formulae of the more important electric and magnetic units, and the numerical relations connecting these units in the three systems most frequently used, are assembled in Table 77. To find the conversion factor for a given quantity, consult the index below.

Dimensions.—Two types of dimensional equations need to be considered, *viz.:* (1) Those in which the dimensions are expressed in terms of the quantities directly involved in the phenomenon under consideration, and (2) those in which the dimensions are expressed in terms of certain fundamental units.

As an illustration of the first we may consider the force of repulsion between two point charges (e, e') of electricity situated at a distance, r, apart in a medium of dielectric constant ϵ. If this force is denoted by f, then $f = ee'/\epsilon r^2$, and we may write $[e^2] = [f\epsilon l^2]$, $[\epsilon] = [e^2 f^{-1} l^{-2}]$, etc., where [ ] denotes that we are concerned with dimensions only; $[l]$ denotes the dimension of length, $[f]$ that of force, etc. These dimensional equations are true whatever be the system of units employed. As they involve quantities, such as force, which can be expressed in terms of other units that are usually considered more fundamental, such dimensional equations will be referred to as "unreduced," in order to distinguish them from those of the second class in which the dimensions are expressed solely in terms of a small number of fundamental units.

It is evident that the dimensions of a quantity in terms of fundamental units can be assigned only in relation to a specific system of units and to a specific method of derivation. For example, (1) if the unit of volume is defined as the volume occupied by a unit mass of water when at its greatest density under a pressure of one atmosphere, then the volume so defined will be independent of the units of length and time, and will vary directly as the unit of mass: we will have $[v] = [m]$. (2) If the unit of volume is defined as the volume occupied by a mass of water (when at its greatest density, etc.) which is equal to the mass of a specified block of platinum, then the volume so defined will not change as we change our units of length, of mass, and of time: that is $[v] = [v]$. In this case $[v]$ is an independent unit and must be so regarded in all dimensional equations. (3) If the unit of volume is defined as the volume of a cube of which the edge is equal to the unit of length then $[v] = [l^3]$. A unit may be defined in any desired unambiguous manner and, in general, the dimensions of the unit will vary from definition to definition.

Dimensional equations of the second type stand in marked contrast to those of the former, in being far less general and in implying the acceptance of a very exactly defined system of units. This, however, is the type of equation which is commonly in mind when dimensional equations are mentioned, and is probably the one which is the more generally useful; the unreduced dimensional expressions (the first type), however, are often simpler, convey more detailed information, and in many cases are to be preferred. For these reasons, unreduced dimensional expressions are to be found in explanations of technical terms (p. 34); they are followed by others, the final one in each case being the fully reduced dimensions on the centimeter, gram, second, degree centigrade absolute, electrostatic system. Wherever necessary, this system of units will be denoted by the symbol *cgse* in order to distinguish it from the corresponding electromagnetic system, which will be denoted by *cgsm.* In the conversion tables, dimensional formulae only of the cgse and of the cgsm systems are given. In the cgse system, the fundamental units and their symbols are those of length $[l]$ the centimeter, of mass $[m]$ the gram, of time $[t]$ the mean solar second, of temperature $[T]$ the absolute centigrade degree, and of dielectric constant $[\epsilon]$, that of a vacuum. The fundamental units in the cgsm system differ from those in the cgse system only by the replacement of dielectric constant by magnetic permeability $[\mu]$, the unit being the permeability of a vacuum.

It should be realized that dimensional expressions give no positive information regarding the ultimate nature of the quantity to which they refer; *e.g.*, energy and torque have the same dimensions, but differ vastly in their nature.

Symbols.—(U. S.) before a logarithm denotes that it is based upon the U. S. yard; for explanation of other symbols, see Symbols and Abbreviations, p. 16.

INDEX TO TABLES OF CONVERSION FACTORS

INDEX TO TABLES OF CONVERSION FACTORS.—*Continued*

CONVERSION FACTORS

1. Length [l] (*see also* p. 1)

Unit		Value	Log$_{10}$ (value)
1 angström unit	=	1.0000 × 10^{-8} cm	$\bar{8}$.000 0000
1 micron	=	1.0000 × 10^{-4} cm	$\bar{4}$.000 0000
1 mil	=	2.5400 × 10^{-3} cm	$\bar{3}$.404 8346
1 inch	=	2.5400 cm	(U. S.) 0.404 8346
1 foot	=	30.480 cm	(U. S.) 1.484 0158
1 yard (U. S.)	=	91.44018 cm	1.961 1371
1 yard (British)	=	91.43992 cm	1.961 1350
1 mile, statute	=	1.6093 km	(U. S.) 0.206 6497
1 light year	=	9.4627 × 10^{12} km	12.976 0131
1 astronomical unit	=	1.495 × 10^{8} km	8.174 6712
1 parsec	=	3.084 × 10^{13} km	13.489 09

2. Length^{-1}; Absorptivity; Coefficient of Absorption* [l^{-1}]

Unit		Value	Log$_{10}$ (value)
1 angström^{-1}	=	1.0000 × 10^{8} cm^{-1}	8.000 0000
1 micron^{-1}	=	1.0000 × 10^{4} cm^{-1}	4.000 0000
1 mil^{-1}	=	393.70 cm^{-1}	2.595 1654
1 inch^{-1}	=	0.39370 cm^{-1}	(U. S.) $\bar{1}$.595 1654
1 foot^{-1}	=	3.2808 × 10^{-2} cm^{-1}	(U. S.) $\bar{2}$.515 9842
1 mile^{-1}	=	0.62137 km^{-1}	$\bar{1}$.793 3503

* Coefficient of transmission (τ) is so defined that $-\log_e \tau$ = coefficient of absorption.

3. Mass [m]; Weight (*see also* p. 1)

Unit		Value	Log$_{10}$ (value)
1 grain	=	64.799 mg	1.811 5677
1 carat (metric)	=	200.000 mg	2.301 0300
1 ounce (avoirdupois)	=	28.350 g	1.452 5458
1 ounce (apothecary) or (troy)	=	31.103 g	1.492 8090
1 pound (avoirdupois)	=	453.59243 g	2.656 6658
1 pound (apothecary) or (troy)	=	373.2417 g	2.571 9902
1 ton, short (2000 pounds)	=	907.185 kg	2.957 6958
1 ton, long (2240 pounds)	=	1016.047 kg	3.006 9138
1 slug (g_s)	=	14.594 kg	1.164 1707
1 gram mole	=	M. W.† g	
1 molecule/M. W.†	=	1.6498 × 10^{-24} g	$\overline{24}$.217 4366
1 assay ton	=	29.1667 g	1.464 8868

† M. W. denotes the molecular weight of the substance.

4. Mass^{-1} [m^{-1}]

Unit		Value	Log$_{10}$ (value)
1 grain^{-1}	=	1.5432 × 10^{-2} mg^{-1}	$\bar{2}$.188 4323
1 ounce^{-1} (avoirdupois)	=	3.5274 × 10^{-2} g^{-1}	$\bar{2}$.547 4542
1 ounce^{-1} (troy)	=	3.2151 × 10^{-2} g^{-1}	$\bar{2}$.507 1910
1 pound^{-1} (avoirdupois)	=	2.2046 × 10^{-3} g^{-1}	$\bar{3}$.343 3342
1 ton^{-1} (2000 pounds)	=	11.0231 × 10^{-4} kg^{-1}	$\bar{3}$.042 3042
1 ton^{-1} (2240 pounds)	=	9.8421 × 10^{-4} kg^{-1}	$\bar{4}$.993 0862
1 (gram mole)$^{-1}$	=	†(M. W.)$^{-1}$ g^{-1}	

† M. W. denotes the molecular weight of the substance.

5. Time [t]

Unit		Value	Log$_{10}$ (value)
1 second, mean solar	=	1.00273791 sidereal sec	0.001 1874
1 second, sidereal	=	0.997270 sec (mean solar)	$\bar{1}$.998 8126
1 hour (tropical, mean solar)	=	3.6000 × 10^{3} sec (mean solar)	3.556 3025
1 day (tropical, mean solar)	=	8.6400 × 10^{4} sec (mean solar)	4.936 5137
1 day (sidereal)	=	8.6164 × 10^{4} sec (mean solar)	4.935 3263
1 year (tropical, mean solar)	=	31.5569 × 10^{6} sec (mean solar)	7.499 0946
1 year (tropical, mean solar)	=	365.2422 day (mean solar)	2.562 5809

CONVERSION FACTORS.—*Continued*

6. Time^{-1}; Frequency; "Velocity" of a Process $[t^{-1}]$

1 second^{-1} (sidereal)	=	1.002738 sec^{-1} (mean solar)	0.001 1874
1 minute^{-1} (mean solar)	=	1.66667 × 10^{-2} sec^{-1} (mean solar)	$\bar{2}$.221 8487
1 hour^{-1} (mean solar)	=	2.77778 × 10^{-4} sec^{-1} (mean solar)	$\bar{4}$.443 6975
1 day^{-1} (mean solar)	=	1.15741 × 10^{-5} sec^{-1} (mean solar)	$\bar{5}$.063 4863
1 year^{-1} (mean solar)	=	3.16888 × 10^{-8} sec^{-1} (mean solar)	$\bar{8}$.500 9054
1 year^{-1} (mean solar)	=	2.73791 × 10^{-3} day^{-1} (mean solar)	$\bar{3}$.437 4191
1 electron-volt, quantum^{-1}	=	2.4292 × 10^{14} sec^{-1} (mean solar)	14.385 4575
1 joule per mole, N_0^{-1} quantum^{-1}	=	2.5173 × 10^{9} sec^{-1} (mean solar)	9.400 9301
1 velocity of light, (angström unit)$^{-1}$	=	2.9986 × 10^{18} sec^{-1} (mean solar)	18.476 9185
1 velocity of light, millimicron^{-1}	=	2.9986 × 10^{17} sec^{-1} (mean solar)	17.476 9185
1 velocity of light, micron^{-1}	=	2.9986 × 10^{14} sec^{-1} (mean solar)	14.476 9185
1 velocity of light, millimeter^{-1}	=	2.9986 × 10^{11} sec^{-1} (mean solar)	11.476 9185
1 velocity of light, meter^{-1}	=	2.9986 × 10^{8} sec^{-1} (mean solar)	8.476 9185

7. Angle $[\theta]$

1 radian	=	57.29578 degree	1.758 1226
1 circumference	=	6.28319 radian	0.798 1799
1 quadrant	=	1.57080 radian	0.196 1199
1 degree	=	1.74533 × 10^{-2} radian	$\bar{2}$.241 8774
1 minute	=	2.90888 × 10^{-4} radian	$\bar{4}$.463 7261
1 second	=	4.84814 × 10^{-6} radian	$\bar{6}$.685 5749

8. Angle^{-1} $[\theta^{-1}]$

1 circumference^{-1}	=	0.159155 radian^{-1}	$\bar{1}$.201 8201
1 degree^{-1}	=	57.29578 radian^{-1}	1.758 1226
1 minute^{-1}	=	3.43775 × 10^{3} radian^{-1}	3.536 2739
1 second^{-1}	=	2.06265 × 10^{5} radian^{-1}	5.314 4251

9. Solid Angle $[\omega]$

Entire space	=	12.5664 steradian	1.099 2099
1 hemisphere	=	6.2832 steradian	0.798 1799
1 square degree	=	3.0462 × 10^{-4} steradian	$\bar{4}$.483 7548

10. Solid Angle^{-1} $[\omega^{-1}]$

Entire space^{-1}	=	7.9577 × 10^{-2} steradian^{-1}	$\bar{2}$.900 7901
1 hemisphere^{-1}	=	1.5916 × 10^{-1} steradian^{-1}	$\bar{1}$.201 8201
1 square degree^{-1}	=	3.2828 × 10^{3} steradian^{-1}	3.516 2452

11. Temperature $[T]$ (*See also* Thermometry, p. 52)

Fahrenheit	$x°$ F	$= (\frac{5}{9})(x - 32)$°C
Réaumur	$x°$ R	$= (\frac{5}{4})x$°C
Absolute (Centigrade)	$x°$ K	$= (x - T_0)$°C
Absolute (Fahrenheit)	$x°$ Rankine	$= (\frac{5}{9})(x - 491.58)$°C

12. Degree^{-1} (Thermometric); Expansivity; Curie's Constant (magnetic) $[T^{-1}]$

1 per degree F	=	1.8000 per degree C	0.255 2725
1 per degree R	=	0.8000 per degree C	$\bar{1}$.903 0900
1 per degree K	=	1.000 per degree C	0.000 0000

13. Luminous Flux $[\psi]$

By definition, the total luminous flux emitted by a point source of one spherical candle power is 4π *lumen.*

14. Dielectric Constant; Electrical Inductivity $[\epsilon]$; $[\mu^{-1}l^{-2}t^{2}]$

Specific inductive capacity is of zero dimensions. It is numerically equal to the dielectric constant expressed in cgse or in fpse units.

1 cgsm unit	=	8.9916 × 10^{20} cgse unit	20.953 8370
1 fpse unit	=	1.0000 cgse unit	0.000 0000
1 fpsm unit	=	1.0764 × 10^{-3} cgsm unit	$\bar{3}$.031 9684
1 fpsm unit	=	9.6784 × 10^{17} cgse unit	17.985 8054

15. Magnetic Permeability; Susceptibility $[\epsilon^{-1}l^{-2}t^{2}]$; $[\mu]$

1 cgse unit	=	8.9916 × 10^{20} cgsm unit	20.953 8370
1 fpsm unit	=	1.0000 cgsm unit	0.000 0000
1 fpse unit	=	1.0764 × 10^{-3} cgse unit	$\bar{3}$.031 9684
1 fpse unit	=	9.6784 × 10^{17} cgsm unit	17.985 8054

CONVERSION FACTORS.—*Continued*

16. Area $[l^2]$

1 circular millimeter	=	7.8540×10^{-3} cm²	$\bar{3}.895\ 0899$
1 circular mil	=	5.0671×10^{-6} cm²	(U. S.) $\bar{6}.704\ 7591$
1 square inch	=	6.4516 cm²	(U. S.) 0.809 6692
1 square foot	=	9.2903×10^{2} cm²	(U. S.) 2.968 0316
1 square yard	=	8.3613×10^{3} cm²	(U. S.) 3.922 2742
1 square mile	=	2.5900 km²	(U. S.) 0.413 2995
1 are	=	1.0000×10^{2} m²	2.000 0000
1 hectare	=	1.0000×10^{4} m²	4.000 0000
1 acre	=	4.0469×10^{3} m²	3.607 1196

17. Area^{-1} $[l^{-2}]$

1 (circular millimeter)$^{-1}$	=	127.324 cm^{-2}	2.104 9101
1 millimeter^{-2}	=	100.0000 cm^{-2}	2.000 0000
1 meter^{-2}	=	0.0001 cm^{-2}	$\bar{4}.000\ 0000$
1 (circular mil)$^{-1}$	=	1.9735×10^{5} cm^{-2}	(U. S.) 5.295 2409
1 inch^{-2}	=	0.15500 cm^{-2}	(U. S.) $\bar{1}.190\ 3308$
1 foot^{-2}	=	1.0764×10^{-3} cm^{-2}	(U. S.) $\bar{3}.031\ 9684$
1 yard^{-2}	=	1.19599×10^{-4} cm^{-2}	(U. S.) $\bar{4}.077\ 7258$
1 mile^{-2}	=	0.38610 km^{-2}	(U. S.) $\bar{1}.586\ 7005$

18. Volume $[l^3]$ or $[v]$

1 liter	=	1000.027 cm³	3.000 0117
1 cubic inch	=	16.387 cm³	(U. S.) 1.214 5038
1 cubic foot	=	2.8317×10^{4} cm³	(U. S.) 4.452 0474
1 cubic yard	=	7.6456×10^{5} cm³	(U. S.) 5.883 4112
1 gallon (U. S.)	=	3.7854×10^{3} cm³	3.578 1157
1 gallon (British)	=	4.5461×10^{3} cm³	3.657 6376
1 bushel (U. S.)	=	3.5239×10^{4} cm³	4.547 0271
1 bushel (British)	=	3.6369×10^{4} cm³	4.560 7276
1 quart, dry (U. S.)	=	1101.23 cm³	3.041 8771
1 quart, liquid (U. S.)	=	946.358 cm³	2.976 0557
1 quart (British)	=	1136.521 cm³	3.055 5776
1 fluid ounce (U. S.)	=	29.5737 cm³	1.470 9057
1 fluid ounce (British)	=	28.4130 cm³	1.453 5176

19. Volume^{-1} $[l^{-3}]$ or $[v^{-1}]$

1 liter^{-1}	=	9.9997×10^{-4} cm^{-3}	$\bar{4}.999\ 9883$
1 inch^{-3}	=	6.1023×10^{-2} cm^{-3}	(U. S.) $\bar{2}.785\ 4962$
1 foot^{-3}	=	3.5314×10^{-5} cm^{-3}	(U. S.) $\bar{5}.547\ 9526$
1 yard^{-3}	=	1.3079 m^{-3}	(U. S.) 0.116 5888
1 gallon^{-1} (U. S.)	=	2.6417×10^{-4} cm^{-3}	$\bar{4}.421\ 8843$
1 gallon^{-1} (British)	=	2.1997×10^{-4} cm^{-3}	$\bar{4}.342\ 3624$
1 quart^{-1}, dry (U. S.)	=	9.0808×10^{-4} cm^{-3}	$\bar{4}.958\ 1229$
1 quart^{-1}, liquid (U. S.)	=	1.0567×10^{-3} cm^{-3}	$\bar{3}.023\ 9443$
1 quart^{-1} (British)	=	8.7988×10^{-4} cm^{-3}	$\bar{4}.944\ 4224$
1 (fluid ounce)$^{-1}$ (U. S.)	=	3.3814×10^{-2} cm^{-3}	$\bar{2}.529\ 0943$
1 (fluid ounce)$^{-1}$ (British)	=	3.5195×10^{-2} cm^{-3}	$\bar{2}.546\ 4824$

20. Length Degree^{-1} $[lT^{-1}]$

1 inch per °F	=	4.5720 cm per °C	0.660 1071
1 foot per °F	=	54.864 cm per °C	1.739 2883
1 meter per °C	=	100.00 cm per °C	2.000 0000

21. Mass^{-1} Degree^{-1} $[m^{-1}T^{-1}]$

1 per gram °F	=	1.8000 per gram °C	0.255 2725
1 per pound °F	=	3.9683×10^{-3} per gram °C	$\bar{3}.598\ 6067$
1 per pound °C	=	2.2046×10^{-3} per gram °C	$\bar{3}.343\ 3342$

22. Area^{-1} Time^{-1} $[l^{-2}t^{-1}]$

1 foot^{-2} second^{-1}	=	3.8750 cm^{-2} hr^{-1}	(U. S.) 0.588 2709
1 foot^{-2} second^{-1}	=	1.0764×10^{-3} cm^{-2} sec^{-1}	(U. S.) $\bar{3}.031\ 9684$
1 mile^{-2} second^{-1}	=	1.2184×10^{-3} cm^{-2} yr^{-1}	(U. S.) $\bar{3}.085\ 7951$
1 meter^{-2} second^{-1}	=	3.600×10^{-1} cm^{-2} hr^{-1}	$\bar{1}.556\ 3025$

CONVERSION FACTORS.—*Continued*

23. Velocity $[lt^{-1}]$

1 foot per second	=	30.4801 cm sec⁻¹	(U. S.) 1.484 0158
1 foot per minute	=	0.5080 cm sec^{-1}	(U. S.) $\bar{1}$.705 8645
1 mile per hour	=	44.7041 cm sec^{-1}	(U. S.) 1.650 3472
1 mile per minute	=	2.6822×10^3 cm sec^{-1}	(U. S.) 3.428 4984
1 meter per minute	=	1.6667 cm sec^{-1}	0.221 8487
1 kilometer per hour	=	27.7778 cm sec^{-1}	1.443 6975
Velocity of light	=	2.9986×10^{10} cm sec^{-1}	10.476 9185

24. Acceleration $[lt^{-2}]$

1 foot per second²	=	30.480 cm sec^{-2}	(U. S.) 1.484 0158
1 mile per hour second	=	44.704 cm sec^{-2}	(U. S.) 1.650 3472
1 mile per hour minute	=	0.74507 cm sec^{-2}	(U. S.) $\bar{1}$.872 1959
1 meter per second²	=	100.000 cm sec^{-2}	2.000 0000
1 kilometer per hour second	=	27.778 cm sec^{-2}	1.443 6975
Gravity, standard	=	980.665 cm sec^{-2}	2.991 5207
Gravity, standard	=	32.174 ft. sec^{-2}	(U. S.) 1.507 5049

25. Angular Velocity $[\theta t^{-1}]$

1 revolution per day	=	7.2722×10^{-5} radian sec^{-1}	$\bar{5}$.861 6662
1 revolution per minute	=	1.0472×10^{-1} radian sec^{-1}	$\bar{1}$.020 0286
1 revolution per second	=	6.2832 radian sec^{-1}	0.798 1799
1 degree per second	=	1.7453×10^{-2} radian sec^{-1}	$\bar{2}$.241 8774

26. Angular Acceleration $[\theta t^{-2}]$

1 revolution per second²	=	6.2832 radian sec^{-2}	0.798 1799
1 revolution per minute²	=	1.7453×10^{-3} radian sec^{-2}	$\bar{3}$.241 8773
1 revolution per minute second	=	0.10420 radian sec^{-2}	$\bar{1}$.020 0286

27. Twist; Rotatory Power $[\theta l^{-1}]$

1 degree per inch	=	6.8714×10^{-3} radian cm^{-1}	(U. S.) $\bar{3}$.837 0428
1 degree per foot	=	5.7261×10^{-4} radian cm^{-1}	(U. S.) $\bar{4}$.757 8616
1 degree per centimeter	=	1.7453×10^{-2} radian cm^{-1}	$\bar{2}$.241 8774
1 minute per centimeter	=	2.9089×10^{-4} radian cm^{-1}	$\bar{4}$.463 7261

28. Density; Volume Concentration; Solubility (Non-gases) $[ml^{-3}]$ or $[mv^{-1}]$ (*See also* Hydrometer Tables, p. 31)

1 gram per milliliter*	=	0.999973 g cm^{-3}	$\bar{1}$.999 9883
1 pound per inch³	=	27.680 g cm^{-3}	(U. S.) 1.442 1621
1 pound per foot³	=	0.016018 g cm^{-3}	(U. S.) $\bar{2}$.204 6183
1 pound per gallon (U. S.)	=	0.119826 g cm^{-3}	$\bar{1}$.078 5502
1 pound per gallon (British)	=	0.099776 g cm^{-3}	$\bar{2}$.999 0282
1 slug per foot³ (g_s)	=	0.5154 g cm^{-3}	(U. S.) $\bar{1}$.712 1233
Mercury† at 0°C	=	15.5951 g cm^{-3}	1.192 9882

* Numerically equal to specific gravity $t°/4°$. † Internationally accepted conventional value to be used in expressing pressures in terms of columns of mercury.

29. Mass Concentration $[m_1m_2^{-1}]$

(This quantity involves two distinct units of mass; when the two units are the same, the concentration is called the "titer," or is denoted as a per cent.)

1 gram per ton (2000 pound)	=	1.1023 mg per kilogram	0.042 3042
1 gram per ton (2240 pound)	=	0.9842 mg per kilogram	$\bar{1}$.993 0862
1 milligram per assay ton	=	*34.286 mg per kilogram	1.535 1132
1 ounce (av.) per ton (2000 lb.)	=	31.2500 mg per kilogram	1.494 8500
1 ounce (av.) per ton (2240 lb.)	=	27.9018 mg per kilogram	1.445 6320
1 pound (av.) per ton (2000 lb.)	=	500.000 mg per kilogram	2.698 9700
1 pound (av.) per ton (2240 lb.)	=	446.429 mg per kilogram	2.649 7520
1 gram per ton (metric)	=	1.0000 mg per kilogram	0.000 0000
1 karat†	=	41.667 mg per gram	1.619 7888

* Equals one troy ounce per 2000 lb. av. † 1 of gold to 24 of mixture.

30. Force $[mlt^{-2}]$

1 gram weight (g_s)	=	980.665 dyne	2.991 5207
1 poundal	=	1.3825×10^4 dyne	(U. S.) 4.140 6816
1 pound weight (g_s)	=	4.4482×10^5 dyne	5.648 1864
1 ton weight (2000 lb.) (g_s)	=	8.8964×10^8 dyne	8.949 2164
1 ton weight (2240 lb.) (g_s)	=	9.9640×10^8 dyne	8.998 4344

CONVERSION FACTORS.—*Continued*

31. Force^{-1} $[m^{-1}l^{-1}t^2]$

1 (gram weight)$^{-1}$ (g_s)	=	1.0917 × 10^{-3} dyne^{-1}	$\bar{3}$.008 4793
1 poundal^{-1}	=	7.2330 × 10^{-5} dyne^{-1}	$\bar{5}$.859 3184
1 (pound weight)$^{-1}$ (g_s)	=	2.2481 × 10^{-6} dyne^{-1}	$\bar{6}$.351 8136

32. Torque; Moment of a Force $[ml^2t^{-2}]$

1 pound-foot (g_s)	=	1.3558 × 10^7 dyne cm	(U. S.) 7.132 2022
1 pound-inch (g_s)	=	1.1298 × 10^6 dyne cm	(U. S.) 6.053 0210
1 kilogram-meter (g_s)	=	9.8066 × 10^7 dyne cm	7.991 5207
1 poundal-foot	=	4.2140 × 10^5 dyne cm	(U. S.) 5.624 6974

33. Stress; Pressure; Tension; Young's Modulus; Modulus of Rigidity; Modulus of Compression; Bulk Modulus; Coefficient of Skin Friction $[ml^{-1}t^{-2}]$

1 barye	=	1.0000 dyne cm^{-2}	0.000 0000
1 bar	=	*1.0000 × 10^6 dyne cm^{-2}	6.000 0000
1 gram weight per cm^2 (g_s)	=	980.665 dyne cm^{-2}	2.991 5207
1 kilogram weight per m^2 (g_s)	=	98.0665 dyne cm^{-2}	1.991 5207
1 kilogram weight per mm^2 (g_s)	=	9.8066 × 10^7 dyne cm^{-2}	7.991 5207
1 pound weight per in.^{2} (g_s)	=	6.8947 × 10^4 dyne cm^{-2}	(U. S.) 4.838 5173
1 pound weight per ft.^{2} (g_s)	=	4.7880 × 10^2 dyne cm^{-2}	(U. S.)2.680 1548
1 ton (2000 lb.) weight per in.^{2} (g_s)	=	1.3789 × 10^8 dyne cm^{-2}	(U. S.) 8.139 5473
1 ton (2240 lb.) weight per in.^{2} (g_s)	=	1.5444 × 10^8 dyne cm^{-2}	(U. S.) 8.188 7653
1 ton (2000 lb.) weight per ft.^{2} (g_s)	=	9.5760 × 10^5 dyne cm^{-2}	(U. S.) 5.981 1848
1 ton (2240 lb.) weight per ft.^{2} (g_s)	=	10.7251 × 10^5 dyne cm^{-2}	(U. S.) 6.030 4028
1 centimeter of water at 4°C (g_s)	=	9.80638 × 10^2 dyne cm^{-2}	2.991 5090
1 inch of water at 4°C (g_s)	=	2.49082 × 10^3 dyne cm^{-2}	(U. S.) 3.396 3436
1 centimeter of mercury at 0°C (g_s)	=	1.33322 × 10^4 dyne cm^{-2}	4.124 9031
1 inch of mercury at 0°C (g_s)	=	3.38639 × 10^4 dyne cm^{-2}	(U. S.) 4.529 7377
1 normal atmosphere (g_s)	=	1.01325 × 10^6 dyne cm^{-2}	6.005 7166

* This value accords with the only internationally accepted use of this term; but "bar" has also been used to denote a pressure of one dyne per cm^2.

34. Stress^{-1}; Compressibility $[m^{-1}lt^2]$

1 centimeter^2 per gram weight (g_s)	=	1.0197 × 10^{-3} cm^2 dyne^{-1}	$\bar{3}$.008 4793
1 centimeter^2 per kilogram weight (g_s)	=	1.0197 × 10^{-6} cm^2 dyne^{-1}	$\bar{6}$.008 4793
1 millimeter^2 per kilogram weight (g_s)	=	1.0197 × 10^{-8} cm^2 dyne^{-1}	$\bar{8}$.008 4793
1 inch^2 per pound weight (g_s)	=	1.4504 × 10^{-5} cm^2 dyne^{-1}	(U. S.) $\bar{5}$.161 4827
1 inch^2 per ton weight (2000 lb.) (g_s)	=	7.2519 × 10^{-9} cm^2 dyne^{-1}	(U. S.) $\bar{9}$.860 4527
1 inch^2 per ton weight (2240 lb.) (g_s)	=	6.4749 × 10^{-9} cm^2 dyne^{-1}	(U. S.) $\bar{9}$.811 2347
1 foot^2 per pound weight (g_s)	=	2.0886 × 10^{-3} cm^2 dyne^{-1}	(U. S.) $\bar{3}$.319 8452
1 (centimeter of water at 4°C)$^{-1}$ (g_s)	=	1.0197 × 10^{-3} cm^2 dyne^{-1}	$\bar{3}$.008 4910
1 (inch of water at 4°C)$^{-1}$ (g_s)	=	4.0147 × 10^{-4} cm^2 dyne^{-1}	(U. S.) $\bar{4}$.603 6564
1 (centimeter of mercury at 0°C)$^{-1}$ (g_s)	=	7.5006 × 10^{-5} cm^2 dyne^{-1}	$\bar{5}$.875 0969
1 (inch of mercury at 0°C)$^{-1}$ (g_s)	=	2.9530 × 10^{-5} cm^2 dyne^{-1}	(U. S.) $\bar{5}$.470 2623
1 (normal atmosphere)$^{-1}$ (g_s)	=	9.8692 × 10^{-7} cm^2 dyne^{-1}	$\bar{7}$.994 2834

35. Work; Energy; Heat $[ml^2t^{-2}]$

1 centimeter-dyne	=	1.0000 erg	0.000 0000
1 joule (absolute)	=	1.0000 × 10^7 erg	7.000 0000
1 joule (International) (v)	=	1.00032 joule (abs.)	0.000 1390
1 meter-kilogram (g_s)	=	9.80665 joule (abs.)	0.991 5207
1 foot-pound (g_s)	=	1.35582 joule (abs.)	(U. S.) 0.132 2022
1 liter-atmosphere (normal) (g_s)	=	101.328 joule (abs.)	2.005 7283
1 liter-atmosphere (45° lat.)	=	*101.323 joule (abs.)	2.005 7067
1 cubic centimeter-atmosphere (normal) (g_s)	=	0.101325 joule (abs.)	$\bar{1}$.005 7166
1 horse-power hour (HP hr.) (g_s)	=	2.6845 × 10^6 joule (abs.)	(U. S.) 6.428 8674
1 horse-power hour (electrical, U. S., British)	=	2.6856 × 10^6 joule (abs.)	6.429 0413
1 cheval-vapeur heure (g_s)	=	2.6478 × 10^6 joule (abs.)	6.422 8845
1 kilowatt-hour (abs.)	=	3.6000 × 10^6 joule (abs.)	6.556 3025
1 International volt (v) faraday	=	9.6541 × 10^4 joule (abs.)	4.984 7097
1 International volt (v) electronic charge	=	1.5927 × 10^{-19} joule (abs.)	$\overline{19}$.202 1463
1 gram calorie (20°C)	=	4.181 joule (abs.)	0.621 2802
1 gram calorie (15°C)	=	4.185 joule (abs.)	0.621 6955
1 gram calorie (mean)	=	4.186 joule (abs.)	0.621 7992
1 British Thermal Unit (39°F)	=	1060.4 joule (abs.)	3.025 4697
1 British Thermal Unit (mean)	=	1054.8 joule (abs.)	3.023 1701
1 British Thermal Unit (60°F)	=	1054.6 joule (abs.)	3.023 0878
1 Centigrade Thermal Unit (15°C)	=	1.8983 × 10^3 joule (abs.)	3.278 3613

* g_{45} = 980.616 cm sec^{-2}

CONVERSION FACTORS.—*Continued*

36. Power $[ml^2t^{-3}]$

1 watt (absolute)	=	1.0000 × 10^7 erg sec^{-1}	7.000 0000
1 watt (International) (v)	=	1.00032 watt (abs.)	0.000 1390
1 meter-kilogram per second (g_s)	=	9.80665 watt (abs.)	0.991 5207
1 foot-pound per second (g_s)	=	1.35582 watt (abs.)	(U. S.) $\overline{1}$.132 2022
1 horsepower, electrical (U. S., British)	=	*746.00 watt (abs.)	2.872 7388
1 horsepower, electrical (Continental Europe)	=	*736.00 watt (abs.)	2.866 0778
1 horsepower (HP) (g_s)	=	†745.70 watt (abs.)	2.872 5649
1 cheval-vapeur (g_s)	=	735.499 watt (abs.)	2.866 5820

* Defined in terms of the watt, commonly used in rating electrical machinery. † Defined as 550 ft. lb. per sec.

37. Action $[ml^2t^{-1}]$

1 Planck's quantum	=	6.554 × 10^{-27} erg sec	$\overline{27}$.816 5064
1 volt electronic-charge second	=	2.4292 × 10^{14} quanta	14.385 4575
1 volt faraday second	=	1.4724 × 10^{38} quanta	38.168 0209
1 joule second	=	1.5258 × 10^{33} quanta	33.183 4936
1 calorie (15°C) second	=	6.3854 × 10^{33} quanta	33.805 1891
1 joule second/N_0*	=	2.5173 × 10^9 quanta	9.400 9302
1 calorie (15°C) second/N_0*	=	1.0535 × 10^{10} quanta	10.022 6257

* N_0 denotes Avogadro's number, the number of molecules per gram mole.

38. Fluidity $[m^{-1}lt]$ (*See also* 39)

1 rhe	=	1.0000 poise^{-1}	0.000 0000

39. Viscosity $[ml^{-1}t^{-1}]$

1 poise	=	1.000 gram cm^{-1} sec^{-1}	0.000 0000
1 gram weight sec cm^{-2} (g_s)	=	980.665 poise	2.991 5207
1 pound weight sec inch^{-2} (g_s)	=	6.895 × 10^4 poise	(U. S.) 4.838 5173
1 pound weight sec foot^{-2} (g_s)	=	4.788 × 10^2 poise	(U. S.) 2.680 1548

40. Kinematic Viscosity $[l^2t^{-1}]$

1 poise centimeter^3 gram^{-1}	=	1.000 cm^2 sec^{-1}	0.000 0000
1 poise inch^3 gram^{-1}	=	16.387 cm^2 sec^{-1}	1.214 5038
1 inch^2 second^{-1}	=	6.451 cm^2 sec^{-1}	(U. S.) 0.809 6692
1 poise foot^3 pound^{-1}	=	62.43 cm^2 sec^{-1}	(U. S.) 1.795 3817

41. Diffusivity; Diffusion, Coefficient of $[l^2t^{-1}]$

All quantities of the thing diffusing are to be expressed in terms of the same units. Heat diffusivity is numerically equal to heat conductivity divided by the product of the density times the heat capacity (per unit of mass); all must be expressed in the same system of units.

1 liter centimeter^{-1} day^{-1}	=	1.1574 × 10^{-2} cm^2 sec^{-1}	$\overline{2}$.063 4980
1 centimeter^2 day^{-1}	=	1.1574 × 10^{-5} cm^2 sec^{-1}	$\overline{5}$.063 4863
1 inch^2 sec^{-1}	=	6.4516 cm^2 sec^{-1}	(U. S.) 0.809 6692

42. Surface Tension $[mt^{-2}]$ (*See also* Capillary Constant, Table 43)

1 milligram weight per mm (g_s)	=	9.80665 dyne cm^{-1}	0.991 5207
1 milligram weight per inch (g_s)	=	0.38609 dyne cm^{-1}	(U. S.) $\overline{1}$.586 6861
1 erg per centimeter^2	=	1.00000 dyne cm^{-1}	0.000 0000
1 erg per millimeter^2	=	100.00000 dyne cm^{-1}	2.000 0000

43. (Capillary Constant)^2 $[l^2]$

The term "Capillary Constant" is used in two different senses; *viz.*, either to denote $a_1 = \sqrt{\gamma/\rho g}$, or to denote $a_2 = \sqrt{2\gamma/\rho g}$. English authors generally follow the former practice, and German authors the latter; neither use the subscript. γ denotes the surface tension, g the acceleration of gravity, and ρ the positive difference in the densities of the adjacent fluids.

1 inch^2	=	6.451 cm^2	0.809 6692
1 millimeter^2 (a_1^2) (g_s)	=	*9.807 dyne cm^{-1} per (g cm^{-3})	0.991 5207
1 millimeter^2 (a_2^2) (g_s)	=	*4.903 dyne cm^{-1} per (g cm^{-3})	0.690 4907
1 inch^2 (a_1^2) (g_s)	=	*6.327 × 10^3 dyne cm^{-1} per (g cm^{-3})	(U. S.) 3.801 1899
1 inch^2 (a_2^2) (g_s)	=	*3.163 × 10^3 dyne cm^{-1} per (g cm^{-3})	(U. S.) 3.500 1599

* To convert a^2, when referred to g_s, to surface tension in dynes per cm, multiply a^2 by the factor given in this table and by the difference in the densities (gram per cm^3) of the adjacent fluids; if a^2 is referred to g, multiply the resulting product by g/g_s.

44. Thermal Conductivity $[T^{-1}mlt^{-3}]$

The dimensions practically employed in expressing this property are (Heat Area^{-1} Time^{-1} per Degree Length^{-1}). Other conversion factors may be obtained by combining those of Tables 35 (Heat), 22 (Area^{-1} Time^{-1}) and 20 (Length Degree^{-1}).

1 calorie (15°) cm^{-2} sec^{-1} (°C, cm^{-1})$^{-1}$	=	4.185 joules (abs.) cm^{-2} sec^{-1} (°C, cm^{-1})$^{-1}$	0.621 6955
1 calorie (20°) cm^{-2} sec^{-1} (°C, cm^{-1})$^{-1}$	=	4.181 joules (abs.) cm^{-2} sec^{-1} (°C, cm^{-1})$^{-1}$	0.621 2802

CONVERSION FACTORS.—*Continued*

44. Thermal Conductivity $[T^{-1}mlt^{-3}]$.—*Continued*

1 British Thermal Unit (39°F) ft.$^{-2}$ sec^{-1} (°F, in.$^{-1}$)$^{-1}$	=	5.218 joules (abs.) cm^{-2} sec^{-1} (°C, cm^{-1})$^{-1}$	0.717 5452
1 British Thermal Unit (mean) ft.$^{-2}$ sec^{-1} (°F, in.$^{-1}$)$^{-1}$	=	5.191 joules (abs.) cm^{-2} sec^{-1} (°C, cm^{-1})$^{-1}$	0.715 2456
1 British Thermal Unit (60°F) ft.$^{-2}$ sec^{-1} (°F, in.$^{-1}$)$^{-1}$	=	5.190 joules (abs.) cm^{-2} sec^{-1} (°C, cm^{-1})$^{-1}$	0.715 1633

45. Intensity of Radiation $[mt^{-3}]$ or $[ml^{-1}t^{-2}]$

The dimensions depend upon the point of view; when the receptor is considered, they are [Energy, Area^{-1}, Time^{-1}]; when the radiation itself is considered they are [Energy, Volume^{-1}]. Conversion from one to the other involves the velocity of propagation; if this is the velocity of light in vacuo, the factors are as given below; if the velocity is v cm sec^{-1}, the factors given must be multiplied by $v/(2.9986 \times 10^{10})$. For other units, combine these factors with those of Tables 19 (Volume^{-1}), 22 (Area^{-1} Time^{-1}), and 35 (Energy).

1 erg cm^{-3}	=	2.9986×10^{10} erg cm^{-2} sec^{-1}	10.476 9185
1 foot-pound ft.$^{-3}$ (g_s)	=	1.4357×10^{13} erg cm^{-2} sec^{-1}	(U. S.) 13.157 0733

46. Luminous Intensity of a Source in a Given Direction $[\psi\omega^{-1}]$

By definition of the lumen, a source of one spherical candle power emits $4\pi(= 12.566)$ lumens. (*See also* Photometric Standards, in another section (consult index).)

1 candle, International	=	1.0000 Int. lumen per steradian		0.000 0000
1 pentane candle	=	1.0 Int. candle	Approximate	
1 Hefner unit	=	0.9_0 Int. candle	Approximate	
1 Carcel unit	=	9.6 Int. candle	Approximate	
1 bougie decimale	=	1.0 Int. candle	Approximate	
1 English sperm candle	=	1.0 Int. candle	Approximate	

47. Illumination of a Surface $[\psi l^{-2}]$

1 lux	=	1.000 lumen meter^{-2}	0.000 0000
1 meter-candle	=	1.000 lumen meter^{-2}	0.000 0000
1 phot	=	1.000×10^4 lumen meter^{-2}	4.000 0000
1 foot-candle	=	10.764 lumen meter^{-2}	(U. S.) 1.031 9684
1 lumen foot^{-2}	=	10.764 lumen meter^{-2}	(U. S.) 1.031 9684

48. Surface Brightness $[\psi l^{-2}\omega^{-1}]$

1 lumen centimeter^{-2} steradian^{-1}	=	1.0000 lambert	0.000 0000
1 lumen foot^{-2} steradian^{-1}	=	1.0764 millilambert	(U. S.) 0.031 9684
1 candle centimeter^{-2}	=	3.1416×10^3 millilambert	3.497 1499
1 candle inch^{-2}	=	4.8695×10^2 millilambert	(U. S.) 2.687 4807

49. Electrical Quantity; Charge; Total Electric Displacement; Flux of Induction $[\epsilon^{\frac{1}{2}}m^{\frac{1}{2}}l^{\frac{3}{2}}t^{-1}]$; $[\mu^{-\frac{1}{2}}m^{\frac{1}{2}}l^{\frac{1}{2}}]$

1 absolute coulomb	=	1.00010 Int. coulomb (v)	0.000 0434
1 absolute coulomb	=	1.00007 Int. coulomb (a)	0.000 0304
1 International coulomb (v)	=	0.99990 abs. coulomb	$\bar{1}$.999 9566
1 International coulomb (a)	=	0.99993 abs. coulomb	$\bar{1}$.999 9696
1 cgsm unit	=	10.0000 abs. coulomb	1.000 0000
1 cgsm unit	=	*2.9986×10^{10} cgse unit	10.476 9185
1 cgse unit	=	3.3349×10^{-10} abs. coulomb	$\overline{10}$.523 0815
1 fpsm unit	=	1.1758×10^2 cgsm unit	2.070 3408
1 fpse unit	=	3.5839×10^3 cgse unit	3.554 3566
1 fpse unit	=	1.1952×10^{-6} abs. coulomb	$\bar{6}$.077 4381
1 ampere-hour (abs.)	=	3.6000×10^3 abs. coulomb	3.556 3025
1 electronic charge	=	1.5921×10^{-19} abs. coulomb	$\overline{19}$.201 9639
1 electronic charge	=	4.774×10^{-10} cgse unit	$\overline{10}$.678 8824
1 faraday	=	9.6500×10^4 abs. coulomb	4.984 5273
1 faraday	=	9.6510×10^4 Int. coulomb (v)	4.984 5707
1 faraday	=	9.6507×10^4 Int. coulomb (a)	4.984 5577
1 faraday	=	2.89365×10^{14} cgse unit	14.461 4458

* Value of **c**; experimental value = 2.9979×10^{10} (Rosa and Dorsey, *Bull. U. S. Bur. Standards*, **3**: 433; 07).

50. Electrical Quantity^{-1}; Charge^{-1}; Total Electric Displacement^{-1}; Flux of Induction^{-1} $[\epsilon^{-\frac{1}{2}}m^{-\frac{1}{2}}l^{-\frac{3}{2}}t]$; $[\mu^{\frac{1}{2}}m^{-\frac{1}{2}}l^{-\frac{1}{2}}]$

1 absolute coulomb^{-1}	=	0.99990 Int. coulomb^{-1} (v)	$\bar{1}$.999 9566
1 absolute coulomb^{-1}	=	0.99993 Int. coulomb^{-1} (a)	$\bar{1}$.999 9696
1 cgsm unit^{-1}	=	0.1000 abs. coulomb^{-1}	$\bar{1}$.000 0000
1 cgse unit^{-1}	=	2.9986×10^9 abs. coulomb^{-1}	9.476 9185
1 ampere-hour^{-1}	=	2.7778×10^{-4} abs. coulomb^{-1}	$\bar{4}$.443 6975
1 faraday^{-1}	=	1.0363×10^{-5} abs. coulomb^{-1}	$\bar{5}$.015 4727
1 electronic charge^{-1}	=	6.281×10^{18} abs. coulomb^{-1}	18.798 0361

CONVERSION FACTORS.—*Continued*

51. Electrical Current $[\epsilon^{\frac{1}{2}}m^{\frac{1}{2}}l^{\frac{3}{2}}t^{-2}]$; $[\mu^{-\frac{1}{2}}m^{\frac{1}{2}}l^{\frac{1}{2}}t^{-1}]$

1 absolute ampere	=	1.00010	Int. ampere (v)	0.000 0434
1 absolute ampere	=	1.00007	Int. ampere (a)	0.000 0304
1 International ampere (v)	=	0.99990	abs. ampere	$\bar{1}$.999 9566
1 International ampere (a)	=	0.99993	abs. ampere	$\bar{1}$.999 9696
1 cgsm unit	=	10.0000	abs. ampere	1.000 0000
1 cgse unit	=	3.3349×10^{-10}	abs. ampere	$\overline{10}$.523 0815
1 faraday second^{-1}	=	9.6500×10^{4}	abs. ampere	4.984 5273
1 International ampere (U. S. before 1911)	=	0.99916	Int. ampere (v)	$\bar{1}$.999 6353
1 International ampere (England before 1906)	=	0.99870	Int. ampere (v)	$\bar{1}$.999 4358
1 International ampere (England 1906–8)	=	0.99894	Int. ampere (v)	$\bar{1}$.999 5399
1 International ampere (England 1909–10)	=	0.99990	Int. ampere (v)	$\bar{1}$.999 9566
1 International ampere (France before 1911)	=	0.9998	Int. ampere (v)	$\bar{1}$.999 9131
1 International ampere (Germany before 1911)	=	0.99968	Int. ampere (v)	$\bar{1}$.999 8610

52. Electrical Potential $[\epsilon^{-\frac{1}{2}}m^{\frac{1}{2}}l^{\frac{1}{2}}t^{-1}]$; $[\mu^{\frac{1}{2}}m^{\frac{1}{2}}l^{\frac{3}{2}}t^{-2}]$

1 absolute volt	=	0.99958	Int. volt (v)	$\bar{1}$.999 8176
1 absolute volt	=	0.99955	Int. volt (a)	$\bar{1}$.999 8046
1 International volt (v)	=	1.00042	abs. volt	0.000 1824
1 International volt (a)	=	1.00045	abs. volt	0.000 1954
1 cgsm unit	=	1.0000×10^{-8}	abs. volt	$\bar{8}$.000 0000
1 cgse unit	=	299.86	abs. volt	2.476 9185
1 International volt (U. S. before 1911)	=	0.99916	Int. volt (v)	$\bar{1}$.999 6353
1 International volt (England before 1906)	=	0.99870	Int. volt (v)	$\bar{1}$.999 4358
1 International volt (England 1906–8)	=	0.99894	Int. volt (v)	$\bar{1}$.999 5399
1 International volt (England 1909–10)	=	0.99990	Int. volt (v)	$\bar{1}$.999 9566
1 International volt (Germany and France, before 1911)	=	0.99968	Int. volt (v)	$\bar{1}$.999 8610

53. Electrical Field Strength; Potential Gradient; Dielectric Strength $[\epsilon^{-\frac{1}{2}}m^{\frac{1}{2}}l^{-\frac{1}{2}}t^{-1}]$; $[\mu^{\frac{1}{2}}m^{\frac{1}{2}}l^{\frac{1}{2}}t^{-2}]$

1 cgsm centimeter^{-1}	=	1.0000×10^{-8}	abs. volt cm^{-1}	$\bar{8}$.000 0000
1 cgsm inch^{-1}	=	3.9370×10^{-9}	abs. volt cm^{-1}	(U. S.) $\bar{9}$.595 1654
1 cgse centimeter^{-1}	=	2.9986×10^{2}	abs. volt cm^{-1}	2.476 9185
1 cgse inch^{-1}	=	1.1805×10^{2}	abs. volt cm^{-1}	(U. S.) 2.072 0839
1 volt inch^{-1}	=	3.9370×10^{-1}	volt cm^{-1}	(U. S.) $\bar{1}$.595 1654

54. Electrical Resistance; Surface Resistivity $[\epsilon^{-1}l^{-1}t]$; $[\mu l t^{-1}]$

1 absolute ohm	=	0.99948	Int. ohm	$\bar{1}$.999 7741
1 International ohm	=	1.00052	abs. ohm	0.000 2259
1 cgsm unit	=	1.0000×10^{-9}	abs. ohm	$\bar{9}$.000 0000
1 cgse unit	=	8.9916×10^{11}	abs. ohm	11.953 8370
1 International ohm (France before 1911)	=	0.9999	Int. ohm	$\bar{1}$.999 9566
1 Board of Trade unit (England 1903)	=	0.99984	Int. ohm	$\bar{1}$.999 9306
1 B. A. unit	=	0.98660	Int. ohm	$\bar{1}$.994 1420
1 "Legal ohm" of 1884 (England)	=	0.99718	Int. ohm	$\bar{1}$.998 7727
1 Siemens unit	=	0.94073	Int. ohm	$\bar{1}$.973 4667

55. Electrical Inductance $[\epsilon^{-1}l^{-1}t^{2}]$; $[\mu l]$

1 absolute henry	=	0.99948	Int. henry	$\bar{1}$.999 7741
1 International henry	=	1.00052	abs. henry	0.000 2259
1 cgsm unit*	=	1.0000×10^{-9}	abs. henry	$\bar{9}$.000 0000
1 cgse unit	=	8.9916×10^{11}	abs. henry	11.953 8370

* Occasionally called a centimeter.

56. Electrical Capacity $[\epsilon l]$; $[\mu^{-1}l^{-1}t^{2}]$

1 absolute farad	=	1.00052	Int. farad	0.000 2259
1 International farad	=	0.99948	abs. farad	$\bar{1}$.999 7741
1 cgsm unit	=	1.0000×10^{9}	abs. farad	9.000 0000
1 cgse unit*	=	1.1121×10^{-12}	abs. farad	$\overline{12}$.046 1630
1 cgsm unit	=	8.9916×10^{20}	cgse unit	20.953 8370
1 absolute farad	=	8.9916×10^{11}	cgse unit	11.953 8370

* Frequently called a centimeter.

57. Electrical Volume Resistivity $[\epsilon^{-1}t]$; $[\mu l^{2}t^{-1}]$

1 absolute ohm-centimeter	=	0.99948	Int. ohm-cm	$\bar{1}$.999 7741
1 International ohm-centimeter	=	1.00052	abs. ohm-cm	0.000 2259
1 cgsm unit	=	9.9948×10^{-10}	Int. ohm-cm	$\overline{10}$.999 7741
1 cgse unit	=	8.9869×10^{11}	Int. ohm-cm	11.953 6111

CONVERSION FACTORS.—*Continued*

57. Electrical Volume Resistivity [$\epsilon^{-1}t$]; [$\mu l^2 t^{-1}$].—*Continued*

1 microhm-centimeter	=	1.0000 × 10^{-6} ohm-cm		$\bar{6}$.000 0000
1 microhm-inch	=	2.5400 microhm-cm	(U. S.)	0.404 8346
1 ohm-inch	=	2.5400 × 10^{6} microhm-cm	(U. S.)	6.404 8346
1 ohm (meter, millimeter^2)	=	100.0000 microhm-cm		2.000 0000
1 ohm (meter, millimeter)	=	78.540 microhm-cm		1.895 0899
1 ohm (mil, foot)	=	1.6624 × 10^{-1} microhm-cm	(U. S.)	$\bar{1}$.220 7433
International Annealed Copper Standard (20°C)	=	1.7241 microhm-cm		0.236 5720

58. Volume Conductivity [ϵt^{-1}]; [$\mu^{-1} l^{-2} t$]

1 absolute *ohm^{-1}-centimeter^{-1}	=	1.00052 Int.* ohm^{-1} cm^{-1}		0.000 2259
1 International ohm^{-1}-centimeter^{-1}	=	0.99948 abs. ohm^{-1} cm^{-1}		$\bar{1}$.999 7741
1 cgsm unit	=	1.00052 × 10^{9} Int. ohm^{-1} cm^{-1}		9.000 2259
1 cgse unit	=	1.11273 × 10^{-12} Int. ohm^{-1} cm^{-1}		$\overline{12}$.046 3889
1 microhm^{-1}-centimeter^{-1}	=	1.0000 × 10^{6} ohm^{-1} cm^{-1}		6.000 0000
1 microhm^{-1}-inch^{-1}	=	3.9370 × 10^{-1} microhm^{-1} cm^{-1}	(U. S.)	$\bar{1}$.595 1654
1 ohm^{-1}-inch^{-1}	=	3.9370 × 10^{-7} microhm^{-1} cm^{-1}	(U. S.)	$\bar{7}$.595 1654
1 ohm^{-1} (meter, millimeter^2)$^{-1}$	=	1.000 × 10^{-2} microhm^{-1} cm^{-1}		$\bar{2}$.000 0000
1 ohm^{-1} (meter, millimeter)$^{-1}$	=	1.2732 × 10^{-2} microhm^{-1} cm^{-1}		$\bar{2}$.104 9101
1 ohm^{-1} (mil, foot)$^{-1}$	=	6.0153 microhm^{-1} cm^{-1}	(U. S.)	0.779 2567
International Annealed Copper Standard (20°C)	=	0.5800 microhm^{-1} cm^{-1}		$\bar{1}$.763 4280
100% conductivity (20°C)	=	0.5800 microhm^{-1} cm^{-1}		$\bar{1}$.763 4280

* "Mho" is occasionally used instead of ohm^{-1}.

59. Electrical Mass Resistivity [$\epsilon^{-1} m l^{-3} t$]; [$\mu m l^{-1} t^{-1}$]

1 absolute ohm (meter, gram)	=	0.99948 Int. ohm (meter, gram)		$\bar{1}$.999 7741
1 International ohm (meter, gram)	=	1.00052 abs. ohm (meter, gram)		0.000 2259
1 cgsm unit	=	9.9948 × 10^{-6} Int. ohm (meter, gram)		$\bar{6}$.999 7741
1 cgse unit	=	8.9869 × 10^{15} Int. ohm (meter, gram)		15.953 6111
1 ohm (mile, pound)	=	1.7513 × 10^{-4} ohm (meter, gram)	(U. S.)	$\bar{4}$.243 3663
1 ohm (centimeter, gram)	=	1.0000 × 10^{4} ohm (meter, gram)		4.000 0000
1 ohm (centimeter, gram)	=	D* ohm-cm		
†International Annealed Copper Standard at 20°C	=	0.15328 ohm (meter, gram)		$\bar{1}$.185 4738

* D represents the density in grams per centimeter^3. † Density = 8.89 grams per centimeter^3. *See* Table 61.

60. Electrical Mass Conductivity [$\epsilon m^{-1} l^3 t^{-1}$]; [$\mu^{-1} m^{-1} l t$]

1 absolute ohm^{-1} (meter, gram)	=	1.00052 Int. ohm^{-1} (meter, gram)	0.000 2259
1 International ohm^{-1} (meter, gram)	=	0.99948 abs. ohm^{-1} (meter, gram)	$\bar{1}$.999 7741
1 cgsm unit^{-1}	=	1.00052 × 10^{5} Int. ohm^{-1} (meter, gram)	5.000 2259
1 cgse unit^{-1}	=	1.1127 × 10^{-16} Int. ohm^{-1} (meter, gram)	$\overline{16}$.046 3889
1 ohm^{-1} (mile, pound)	=	5.7100 × 10^{-3} ohm^{-1} (meter, gram)	$\bar{3}$.756 6337
1 ohm^{-1} (centimeter, gram)	=	1.0000 × 10^{-4} ohm^{-1} (meter, gram)	$\bar{4}$.000 0000
1 ohm^{-1} (centimeter, gram)	=	*D^{-1} (ohm-centimeter)$^{-1}$	

* D^{-1} = reciprocal of the density in grams per centimeter^3.

61. Constants of Annealed Copper as Accepted at Various Times

Data taken from U. S. Bur. Standards Circular No. 31

Temperature °C	England (Eng. Stds. Com. 1904)	Germany (Old "Normal Kupfer" density = 8.91)	Germany (Old "Normal Kupfer" assuming density 8.89)	Lindeck, Matthiessen, assuming density 8.89	A. I. E. E. before 1907 (Matthiessen value)	A. I. E. E. 1907 to 1910	Bureau Standards and A. I. E. E. 1911	Inter. Annealed Copper Standard 1913
				Resistivity in ohms (meter, grams)				
0	0.14136_2	0.13959_0	0.13927_7	0.14157_1	**0.14172_9**	**0.14172_8**	0.14106_8	0.14133_2
15	0.15043_7	**0.14850_2**	**0.14816_4**	**0.14997_4**	0.15014_1	0.15065_8	0.15003_4	0.15029_0
15.6	**0.1508**							
20	0.15346_3	0.15147_0	0.15113_0	0.15285_1	0.15302_2	0.15363_4	**0.15302_2**	**0.15328**
25	0.15648_8	0.15444_0	0.15409_8	0.15576_5	0.15593_8	0.15661_0	0.15601_0	0.15626_2
				Temperature coefficient of resistance (mass constant)				
0	**0.00428**	0.00425_5	0.00425_5	$\frac{1}{R_t} = \frac{1}{R_o}(1 - 3.8701t \times 10^{-3} + 9.009t^2 \times 10^{-6})$		**0.0042**	0.00427_7	0.00426_5
15	0.00402_2	**0.004**	**0.004**			0.00395_1	0.00401_9	0.00400_9
20	0.00394_3	0.00392_2	0.00392_2			0.00387_5	**0.00394**	**0.00393**
25	0.00386_6	0.00384_6	0.00384_6			0.00380_1	0.00386_4	0.00385_4
				Density				
	8.89 15.6°	8.91	(8.89)	(8.89)	8.89	8.89	8.89 20°	8.89 20°

CONVERSION FACTORS.—*Continued*

62. Ionic Mobility $[\epsilon^{\frac{1}{2}}m^{-\frac{1}{2}}l^{\frac{3}{2}}]$; $[\mu^{-\frac{1}{2}}m^{-\frac{1}{2}}l^{\frac{1}{2}}t]$

1 centimeter^2 second^{-1} per cgse unit of potential	=	3.3349 × 10^{-3} cm^2 sec^{-1} volt^{-1} (abs.)	$\bar{3}$.523 0815
1 inch^2 second^{-1} per cgse unit of potential	=	2.1515 × 10^{-2} cm^2 sec^{-1} volt^{-1} (abs.)	(U. S.) $\bar{2}$.332 7507
1 inch^2 second^{-1} volt^{-1} (absolute)	=	6.4516 cm^2 sec^{-1} volt^{-1} (abs.)	(U. S.) 0.809 6692

63. Thermoelectric Power $[\epsilon^{-\frac{1}{2}}m^{\frac{1}{2}}l^{\frac{1}{2}}t^{-1}T^{-1}]$; $[\mu^{\frac{1}{2}}m^{\frac{1}{2}}l^{\frac{3}{2}}t^{-2}T^{-1}]$

1 cgsm unit of potential per °C	=	1.0000 × 10^{-2} microvolt per °C (abs.)	$\bar{2}$.000 0000
1 cgsm unit of potential per °F	=	1.8000 × 10^{-2} microvolt per °C (abs.)	$\bar{2}$.255 2725
1 cgse unit of potential per °C	=	2.9986 × 10^{8} microvolt per °C (abs.)	8.476 9185
1 cgse unit of potential per °F	=	5.3975 × 10^{8} microvolt per °C (abs.)	8.732 1910
1 microvolt per °F	=	1.8000 microvolt per °C	0.255 2725

64. Peltier Coefficient $[\epsilon^{-\frac{1}{2}}m^{\frac{1}{2}}l^{\frac{1}{2}}t^{-1}]$; $[\mu^{\frac{1}{2}}m^{\frac{1}{2}}l^{\frac{3}{2}}t^{-2}]$

1 joule per ampere-hour (absolute)	=	2.7778 × 10^{-3} joule em^{-1}	$\bar{3}$.443 6975
1 joule per ampere-hour (absolute)	=	9.2636 × 10^{-14} joule es^{-1}	$\overline{14}$.966 7790
1 joule per coulomb	=	10.000 joule em^{-1}	1.000 0000
1 joule per faraday	=	1.0363 × 10^{-4} joule em^{-1}	$\bar{4}$.015 4727
1 joule per electron	=	6.2811 × 10^{19} joule em^{-1}	19.798 0361
1 calorie (15°C) per ampere-hour	=	1.1625 × 10^{-2} joule em^{-1}	$\bar{2}$.065 3930
1 calorie (15°C) per coulomb	=	41.850 joule em^{-1}	1.621 6955
1 millivolt	=	1.0000 × 10^{-2} joule em^{-1}	$\bar{2}$.000 0000

65. Thomson Effect, Coefficient of; Specific Heat of Electricity $[\epsilon^{-\frac{1}{2}}m^{\frac{1}{2}}l^{\frac{1}{2}}t^{-1}T^{-1}]$; $[\mu^{\frac{1}{2}}m^{\frac{1}{2}}l^{\frac{3}{2}}t^{-2}T^{-1}]$

1 joule coulomb^{-1} per °F	=	1.8000 joule coulomb^{-1} per °C	0.255 2725
1 joule es^{-1} per °F	=	5.3975 × 10^{9} joule coulomb^{-1} per °C	9.732 1910
1 joule em^{-1} per °F	=	0.1800 joule coulomb^{-1} per °C	$\bar{1}$.255 2725
1 joule es^{-1} per °C	=	2.9986 × 10^{9} joule coulomb^{-1} per °C	9.476 9185
1 joule faraday^{-1} per °C	=	1.0363 × 10^{-5} joule coulomb^{-1} per °C	$\bar{5}$.015 4727
1 joule electron^{-1} per °C	=	6.2811 × 10^{18} joule coulomb^{-1} per °C	18.798 0361
1 volt per °C	=	1.0000 joule coulomb^{-1} per °C	0.000 0000

66. Piezoelectric Constant $[\epsilon^{\frac{1}{2}}m^{-\frac{1}{2}}l^{\frac{1}{2}}t]$; $[\mu^{-\frac{1}{2}}m^{-\frac{1}{2}}l^{-\frac{1}{2}}t^2]$

1 em per kilogram weight (g_s)	=	3.0577 × 10^{4} es per dyne	4.485 3978
1 em per pound weight (g_s)	=	6.7411 × 10^{4} es per dyne	4.828 7321
1 es per kilogram weight (g_s)	=	1.0197 × 10^{-6} es per dyne	$\bar{6}$.008 4793
1 es per pound weight (g_s)	=	2.2481 × 10^{-6} es per dyne	$\bar{6}$.351 8136
1 coulomb per kilogram weight (g_s)	=	3.0577 × 10^{3} es per dyne	3.485 3978
1 faraday per kilogram weight (g_s)	=	2.9507 × 10^{8} es per dyne	8.469 9251
1 electron per kilogram weight (g_s)	=	4.868 × 10^{-16} es per dyne	$\overline{16}$.687 3617

67. Magnetic Field Intensity; Magnetic Potential Gradient; Magnetizing Force $[\epsilon^{\frac{1}{2}}m^{\frac{1}{2}}l^{\frac{1}{2}}t^{-2}]$; $[\mu^{-\frac{1}{2}}m^{\frac{1}{2}}l^{-\frac{1}{2}}t^{-1}]$

1 gauss, absolute	=	1.00010 Int. gauss (v)	0.000 0434
1 gauss, absolute	=	1.00007 Int. gauss (a)	0.000 0304
1 International gauss (v)	=	0.99990 abs. gauss	$\bar{1}$.999 9566
1 International gauss (a)	=	0.99993 abs. gauss	$\bar{1}$.999 9696
1 cgsm unit	=	1.0000 abs. gauss	0.000 0000
1 cgse unit	=	3.3349 × 10^{-11} abs. gauss	$\overline{11}$.523 0815
1 gilbert per centimeter	=	1.0000 gauss	0.000 0000
1 ampere-turn per centimeter	=	1.2566 gauss	0.099 2099
1 ampere-turn per inch	=	0.49474 gauss	(U. S.) $\bar{1}$.694 3753
1 gamma, γ	=	1.0000 × 10^{-5} gauss	$\bar{5}$.000 0000

68. (Magnetic Field Intensity)$^{-1}$; Coefficient of Leduc Effect $[\epsilon^{-\frac{1}{2}}m^{-\frac{1}{2}}l^{-\frac{1}{2}}t^2]$; $[\mu^{\frac{1}{2}}m^{-\frac{1}{2}}l^{\frac{1}{2}}t]$

1 gauss^{-1} (absolute)	=	0.99990 Int. gauss^{-1} (v)	$\bar{1}$.999 9566
1 International gauss^{-1} (v)	=	1.00010 gauss^{-1} (abs.)	0.000 0434
1 cgsm unit^{-1}	=	1.0000 gauss^{-1} (abs.)	0.000 0000
1 cgse unit^{-1}	=	2.9986 × 10^{10} gauss^{-1} (abs.)	10.476 9185
1 centimeter per gilbert	=	1.0000 gauss^{-1}	0.000 0000
1 centimeter per ampere-turn	=	7.9577 × 10^{-1} gauss^{-1}	$\bar{1}$.900 7901
1 inch per ampere-turn	=	2.0213 gauss^{-1}	0.305 6246

CONVERSION FACTORS.—*Continued*

69. Magnetomotive Force; Magnetic Potential $[\epsilon^{\frac{1}{2}}m^{\frac{1}{2}}l^{\frac{3}{2}}t^{-2}]$; $[\mu^{-\frac{1}{2}}m^{\frac{1}{2}}l^{\frac{1}{2}}t^{-1}]$

1 gilbert, absolute	=	1.00010	Int. gilbert (v)	0.000 0434
1 gilbert, absolute	=	1.00007	Int. gilbert (a)	0.000 0304
1 International gilbert (v)	=	0.99990	abs. gilbert	$\bar{1}$.999 9566
1 International gilbert (a)	=	0.99993	abs. gilbert	$\bar{1}$.999 9696
1 cgsm unit	=	1.00000	abs. gilbert	0.000 0000
1 cgse unit	=	3.3349 $\times 10^{-11}$	abs. gilbert	$\overline{11}$.523 0815
1 ampere-turn	=	1.2566	gilbert	0.099 2099

70. Magnetic Induction; Intensity of Magnetization $[\epsilon^{-\frac{1}{2}}m^{\frac{1}{2}}l^{-\frac{3}{2}}]$; $[\mu^{\frac{1}{2}}m^{\frac{1}{2}}l^{-\frac{1}{2}}t^{-1}]$

Units of Magnetization are not named

1 maxwell per centimeter^2, absolute	=	0.99958	Int. maxwell per cm^2 (v)	$\bar{1}$.999 8176
1 maxwell per centimeter^2, absolute	=	0.99955	Int. maxwell per cm^2 (a)	$\bar{1}$.999 8046
1 International maxwell per centimeter^2 (v)	=	1.00042	abs. maxwell per cm^2	0.000 1824
1 International maxwell per centimeter^2 (a)	=	1.00045	abs. maxwell per cm^2	0.000 1954
1 maxwell per inch^2	=	0.15500	maxwell per cm^2	(U. S.) $\bar{1}$.190 3308
1 cgsm unit	=	1.00000	abs. maxwell per cm^2	0.000 0000
1 cgse unit	=	2.9986 $\times 10^{10}$	abs. maxwell per cm^2	10.476 9185
1 line per centimeter^2	=	1.00000	maxwell per cm^2	0.000 0000
1 line per inch^2	=	0.15500	maxwell per cm^2	(U. S.) $\bar{1}$.190 3308

71. Flux of Magnetic Induction; Magnetic Flux; Pole Strength; Quantity of Magnetism $[\epsilon^{-\frac{1}{2}}m^{\frac{1}{2}}l^{\frac{1}{2}}]$; $[\mu^{\frac{1}{2}}m^{\frac{1}{2}}l^{\frac{3}{2}}t^{-1}]$

Units of Pole Strength and Quantity of Magnetism are not named

1 maxwell, absolute	=	0.99958	Int. maxwell (v)	$\bar{1}$.999 8176
1 maxwell, absolute	=	0.99955	Int. maxwell (a)	$\bar{1}$.999 8046
1 International maxwell (v)	=	1.00042	abs. maxwell	0.000 1824
1 International maxwell (a)	=	1.00045	abs. maxwell	0.000 1954
1 cgsm unit	=	1.0000	abs. maxwell	0.000 0000
1 cgse unit	=	2.9986 $\times 10^{10}$	abs. maxwell	10.476 9185
1 line	=	1.0000	abs. maxwell	0.000 0000
1 volt-second	=	1.0000 $\times 10^{8}$	maxwell	8.000 0000

72. Magnetic Reluctance $[\epsilon l t^{-2}]$; $[\mu^{-1}l^{-1}]$

1 oersted, absolute	=	1.00052	Int. oersted	0.000 2259
1 International oersted	=	0.99948	abs. oersted	$\bar{1}$.999 7741
1 cgsm unit	=	1.0000	abs. oersted	0.000 0000
1 cgse unit	=	1.1122 $\times 10^{-21}$	abs. oersted	$\overline{21}$.046 1630

73. Hall Effect, Coefficient of $[\epsilon^{-\frac{3}{2}}m^{-\frac{1}{2}}l^{-\frac{1}{2}}t^{3}]$; $[\mu^{\frac{3}{2}}m^{-\frac{1}{2}}l^{\frac{5}{2}}]$

1 volt centimeter per ampere gauss (absolute)	=	1.0000 $\times 10^{9}$	cgsm unit	9.000 0000
1 volt inch per ampere gauss (absolute)	=	2.5400 $\times 10^{9}$	cgsm unit	(U. S.) 9.404 8346
1 cgse unit	=	2.6962 $\times 10^{31}$	cgsm unit	31.430 7555

74. Ettinghausen Effect, Coefficient of $[\epsilon^{-1}m^{-1}l^{-1}t^{4}T]$; $[\mu m^{-1}lt^{2}T]$

1°C centimeter per ampere gauss (absolute)	=	10.000	°C cm per cgsm unit	1.000 0000
1°F inch per ampere gauss (absolute)	=	45.720	°C cm per cgsm unit	1.660 1071
1°C centimeter per cgse unit	=	8.9916 $\times 10^{20}$	°C cm per cgsm unit	20.953 8370

75. Nernst Effect, Coefficient of $[\epsilon^{-1}tT^{-1}]$; $[\mu l^{2}t^{-1}T^{-1}]$

1 volt per gauss °C (absolute)	=	1.0000 $\times 10^{8}$	cgsm unit per °C	8.000 0000
1 volt per gauss °F (absolute)	=	1.8000 $\times 10^{8}$	cgsm unit per °C	8.255 2725
1 cgse unit per °C	=	8.9916 $\times 10^{20}$	cgsm unit per °C	20.953 8370

76. Verdet's Constant $[\epsilon^{-\frac{1}{2}}m^{-\frac{1}{2}}l^{-\frac{3}{2}}t^{2}\theta]$; $[\mu^{\frac{1}{2}}m^{-\frac{1}{2}}l^{-\frac{1}{2}}t\theta]$

1 minute per gilbert	=	1.0000	minute per cgsm unit	0.000 0000
1 minute per ampere-turn	=	1.2566	minute per cgsm unit	0.099 2099
1 radian per gilbert	=	3.4377 $\times 10^{3}$	minute per cgsm unit	3.536 2739

77. Fundamental Electric and Magnetic Units

Name of quantity	1 *Cgsm unit equals		Dimensions		
	Cgse units	Practical units (abs.)	Cgse system	Cgsm system	‡Practical system
Electric:					
Capacity	c^2	10^9 farad	ϵl	$\mu^{-1}l^{-1}t^{2}$	$IE^{-1}t$
Charge, quantity	c	10 coulomb	$\epsilon^{\frac{1}{2}}m^{\frac{1}{2}}l^{\frac{3}{2}}t^{-1}$	$\mu^{-\frac{1}{2}}m^{\frac{1}{2}}l^{\frac{1}{2}}$	It

CONVERSION FACTORS.—*Continued*

77. Fundamental Electric and Magnetic Units.—(*Continued*)

Conductivity (mass)	c^2	10^9 ohm^{-1} (cm, g)	$\epsilon m^{-1}l^3t^{-1}$	$\mu^{-1}m^{-1}lt$	$R^{-1}m^{-1}l^2$
Conductivity (surface)	c^2	10^9 ohm^{-1}	ϵlt^{-1}	$\mu^{-1}l^{-1}t$	R^{-1}
Conductivity (volume)	c^2	10^9 ohm^{-1} cm^{-1}	ϵt^{-1}	$\mu^{-1}l^{-2}t$	$R^{-1}l^{-1}$
Current	c	10 ampere	$\epsilon^{\frac{1}{2}}m^{\frac{1}{2}}l^{\frac{3}{2}}t^{-2}$	$\mu^{-\frac{1}{2}}m^{\frac{1}{2}}l^{\frac{1}{2}}t^{-1}$	I
Dielectric constant	c^2	†10^9 ohm^{-1} per (cm sec^{-1})	ϵ	$\mu^{-1}l^{-2}t^2$	†$IE^{-1}l^{-1}t$
Displacement (local)	c	10 coulomb per cm^2	$\epsilon^{\frac{1}{2}}m^{\frac{1}{2}}l^{-\frac{1}{2}}t^{-1}$	$\mu^{-\frac{1}{2}}m^{\frac{1}{2}}l^{-\frac{3}{2}}$	$Il^{-2}t$
Displacement (integral)	c	10 coulomb	$\epsilon^{\frac{1}{2}}m^{\frac{1}{2}}l^{\frac{3}{2}}t^{-1}$	$\mu^{-\frac{1}{2}}m^{\frac{1}{2}}l^{\frac{1}{2}}$	It
Electromotive force	c^{-1}	10^{-8} volt	$\epsilon^{-\frac{1}{2}}m^{\frac{1}{2}}l^{\frac{1}{2}}t^{-1}$	$\mu^{\frac{1}{2}}m^{\frac{1}{2}}l^{\frac{3}{2}}t^{-2}$	E
Field strength	c^{-1}	10^{-8} volt cm^{-1}	$\epsilon^{-\frac{1}{2}}m^{\frac{1}{2}}l^{-\frac{1}{2}}t^{-1}$	$\mu^{\frac{1}{2}}m^{\frac{1}{2}}l^{\frac{1}{2}}t^{-2}$	El^{-1}
Inductance	c^{-2}	10^{-9} henry	$\epsilon^{-1}l^{-1}t^2$	μl	Rt
Inductivity	c^2	† 10^9 ohm^{-1} per (cm sec^{-1})	ϵ	$\mu^{-1}l^{-2}t^2$	†$IE^{-1}l^{-1}t$
Ionic mobility	c	10^8 cm sec^{-1} per (volt cm^{-1})	$\epsilon^{\frac{1}{2}}m^{-\frac{1}{2}}l^{\frac{3}{2}}$	$\mu^{-\frac{1}{2}}m^{-\frac{1}{2}}l^{\frac{1}{2}}t$	$E^{-1}l^2t^{-1}$
Polarization capacity	c^2	10^9 farad cm^{-2}	ϵl^{-1}	$\mu^{-1}l^{-3}t^2$	$IE^{-1}l^{-2}t$
Potential	c^{-1}	10^{-8} volt	$\epsilon^{-\frac{1}{2}}m^{\frac{1}{2}}l^{\frac{1}{2}}t^{-1}$	$\mu^{\frac{1}{2}}m^{\frac{1}{2}}l^{\frac{3}{2}}t^{-2}$	E
Resistance	c^{-2}	10^{-9} ohm	$\epsilon^{-1}l^{-1}t$	μlt^{-1}	R
Resistivity (mass)	c^{-2}	10^{-9} ohm (cm, g)	$\epsilon^{-1}ml^{-3}t$	$\mu ml^{-1}t^{-1}$	Rml^{-2}
Resistivity (surface)	c^{-2}	10^{-9} ohm	$\epsilon^{-1}l^{-1}t$	μlt^{-1}	R
Resistivity (volume)	c^{-2}	10^{-9} ohm-cm	$\epsilon^{-1}t$	μl^2t^{-1}	Rl
Specific heat of electricity (Thomson)	c^{-1}	10^{-8} volt deg^{-1}	$\epsilon^{-\frac{1}{2}}m^{\frac{1}{2}}l^{\frac{1}{2}}t^{-1}T^{-1}$	$\mu^{\frac{1}{2}}m^{\frac{1}{2}}l^{\frac{3}{2}}t^{-2}T^{-1}$	ET^{-1}
Specific inductive capacity	1	1	zero	zero	zero
Magnetic:					
Field intensity	c	1 gauss	$\epsilon^{\frac{1}{2}}m^{\frac{1}{2}}l^{\frac{1}{2}}t^{-2}$	$\mu^{-\frac{1}{2}}m^{\frac{1}{2}}l^{-\frac{1}{2}}t^{-1}$	Il^{-1}
Flux of induction (integral)	c^{-1}	1 maxwell	$\epsilon^{-\frac{1}{2}}m^{\frac{1}{2}}l^{\frac{1}{2}}$	$\mu^{\frac{1}{2}}m^{\frac{1}{2}}l^{\frac{3}{2}}t^{-1}$	Et
Induction (local)	c^{-1}	1 maxwell cm^{-2}	$\epsilon^{-\frac{1}{2}}m^{\frac{1}{2}}l^{-\frac{3}{2}}$	$\mu^{\frac{1}{2}}m^{\frac{1}{2}}l^{-\frac{1}{2}}t^{-1}$	$El^{-2}t$
Intensity of magnetization (volume)	c^{-1}	1	$\epsilon^{-\frac{1}{2}}m^{\frac{1}{2}}l^{-\frac{3}{2}}$	$\mu^{\frac{1}{2}}m^{\frac{1}{2}}l^{-\frac{1}{2}}t^{-1}$	$El^{-2}t$
Magnetic flux (integral)	c^{-1}	1 maxwell	$\epsilon^{-\frac{1}{2}}m^{\frac{1}{2}}l^{\frac{1}{2}}$	$\mu^{\frac{1}{2}}m^{\frac{1}{2}}l^{\frac{3}{2}}t^{-1}$	Et
Magnetizing force	c	1 gauss	$\epsilon^{\frac{1}{2}}m^{\frac{1}{2}}l^{\frac{1}{2}}t^{-2}$	$\mu^{-\frac{1}{2}}m^{\frac{1}{2}}l^{-\frac{1}{2}}t^{-1}$	Il^{-1}
Magnetomotive force	c	1 gilbert	$\epsilon^{\frac{1}{2}}m^{\frac{1}{2}}l^{\frac{3}{2}}t^{-2}$	$\mu^{-\frac{1}{2}}m^{\frac{1}{2}}l^{\frac{1}{2}}t^{-1}$	I
Permeability	c^{-2}	1 maxwell cm^{-2} per gauss	$\epsilon^{-1}l^{-2}t^2$	μ	$I^{-1}El^{-1}t$
Pole strength	c^{-1}	1	$\epsilon^{-\frac{1}{2}}m^{\frac{1}{2}}l^{\frac{1}{2}}$	$\mu^{\frac{1}{2}}m^{\frac{1}{2}}l^{\frac{3}{2}}t^{-1}$	Et
Potential	c	1 gilbert	$\epsilon^{\frac{1}{2}}m^{\frac{1}{2}}l^{\frac{3}{2}}t^{-2}$	$\mu^{-\frac{1}{2}}m^{\frac{1}{2}}l^{\frac{1}{2}}t^{-1}$	I
Quantity	c^{-1}	1	$\epsilon^{-\frac{1}{2}}m^{\frac{1}{2}}l^{\frac{1}{2}}$	$\mu^{\frac{1}{2}}m^{\frac{1}{2}}l^{\frac{3}{2}}t^{-1}$	Et
Reluctance	c^2	1 oersted	ϵlt^{-2}	$\mu^{-1}l^{-1}$	$IE^{-1}t^{-1}$
Susceptibility	c^{-2}	$\frac{1}{4}\pi$ maxwell cm^{-2} per gauss	$\epsilon^{-1}l^{-2}t^2$	μ	$I^{-1}El^{-1}t$

* For the purposes of International Critical Tables, c has been taken as 2.9986 × 10^{10} cm per sec, $\log_{10}$ c = 10.476 9185, $\log_{10}$ c^{-1} = $\overline{11}$.523 0815. This is the accepted value for the velocity of light in vacuo. The best directly determined value of the ratio of the two electrical units of quantity gives c = 2.9979 × 10^{10} cm per sec. (Rosa and Dorsey, *Bull. U. S. Bur. Standards*, **3**: 433; 07.)

† In practice this unit is not used; the quantity given in essentially every instance is the dimensionless "specific inductive capacity," which is numerically equal to the dielectric constant expressed in cgse units.

‡ In this column are given the dimensions in terms of the practical electrical units, as these generally enter into the actual determinations of the several quantities. As three basic electrical units are employed, alternative expressions are possible. T = thermometric degree, E = potential, I = current, R = resistance.

78. Indicated Conversion Factors

a = area, C = electrical capacity, T = thermometric degree, d = density, E = electrical potential, e = electric charge, F = electrical field intensity, h = heat, m = mass, Q = quantity of magnetism, R = electrical resistance, t = time, v = volume, ϵ = dielectric constant, η = viscosity, θ = plane angle.

Name of quantity	Dimensions	Tables
Electricity		
Electric displacement	ϵF	14, 53
Polarization capacity	Ca^{-1}	56, 17
Pyroelectric constant	$ea^{-1}T^{-1}$	49, 17, 12
Specific inductive capacity	zero	
Surface density of charge	ea^{-1}	49, 17
Thermoelectric power	ET^{-1}	52, 12
Volume density of charge	ev^{-1}	49, 19
Heat, capacity	$hm^{-1}T^{-1}$	35, 21
Latent	hm^{-1}	35, 4
Reaction	hm^{-1}	35, 4
Superficial latent	ha^{-1}	35, 17
Transformation	hm^{-1}	35, 4

Name of quantity	Dimensions	Tables
Radiation, index of absorption	zero	
Intensity of	$ha^{-1}t^{-1}$	35, 22
Kerr's constant (magneto-optic)	$\theta Q^{-1}a$	7, 71, 16
Reflectivity	zero	
Refraction, index of	zero	
Solubility, gases in liquids	zero	
Viscosity, kinematic	ηd^{-1}	39, 28

79. Hydrometer Scales

Unless the hydrometer is used in the liquid and at the temperature for which it is graduated, corrections must be applied for the changed capillary depression and for the expansion (or contraction) of the instrument. (The following table does not include all scales which have been used.)

T = temperature at which the instrument is to be used; r = reading of instrument; the specific gravity is with reference to water at temperature T unless another temperature is indicated in the last column.

79. Hydrometer Scales.—*Continued*

Hydrometer	T	Specific gravity		Remarks
		Dense	Light	
A. P. I. = American Petroleum Institute.	60°F = 15.56°C		$\frac{141.5}{131.5 + r}$	Petroleum
Balling	17.5°C	$\frac{200}{200 - r}$	$\frac{200}{200 + r}$	
Bates	60°F = 15.56°C	$\frac{1000 + 2.78r}{1000}$		
Baumé	10°R = 12.5°C	$\frac{145.88}{145.88 - r}$	$\frac{145.88}{135.88 + r}$	
Baumé	15°C	$\frac{146.3}{146.3 - r}$	$\frac{146.3}{136.3 + r}$	
Baumé	17.5°C	$\frac{146.78}{146.78 - r}$	$\frac{146.78}{136.78 + r}$	
Baumé	15°C	$\frac{144.3}{144.3 - r}$		"Rational"
Baumé	15°C	$\frac{144.3}{144.3 - r}$		"Rational" (water at 4°C)
Baumé-Lunge	12.5°C	$\frac{144.32}{144.32 - r}$	$\frac{144.32}{144.32 + r}$	"Rational"
Baumé	15°C	$\frac{144.32}{144.32 - r}$	$\frac{144.32}{144.32 + r}$	French (water at 4°C)
Baumé	60°F = 15.56°C	$\frac{145}{145 - r}$	$\frac{140}{130 + r}$	American
Beck	12.5°C	$\frac{170}{170 - r}$	$\frac{170}{170 + r}$	
Brix	12.5°R = 15.625°C	$\frac{400}{400 - r}$	$\frac{400}{400 + r}$	
Cartier	12.5°C	$\frac{136.8}{126.1 - r}$	$\frac{136.8}{126.1 + r}$	
Fischer	12.5°R = 15.625°C	$\frac{400}{400 - r}$	$\frac{400}{400 + r}$	
Fleischer		$\frac{1000 + 10r}{1000}$		
Gay-Lussac		$\frac{100}{100 - r}$	$\frac{100}{100 + r}$	
Gerlach, or "new"	17.5°C	$\frac{146.78}{146.78 - r}$		
Holland, or "old"	12.5°C	$\frac{144}{144 - r}$		
Stoppani	12.5°R = 15.625°C	$\frac{166}{166 - r}$		
Twaddell	60°F = 15.56°C	$\frac{1000 + 5r}{1000}$		British (water at 4°C)

TECHNICAL EFFLUX VISCOMETERS: INTERPRETATION AND INTERCONVERSION OF READINGS

Winslow H. Herschel

Since changes are made from time to time in the standardization or method of operation of these instruments, and many old instruments are still in use, it is believed that in general the determination of kinematic viscosity from the readings of the instruments, and direct interconversions between instruments, when used at the same temperature, may be made by the use of Fig. 1, with as great precision (about 5%) as the data will warrant. It is assumed that the instruments are used in the normal manner. For the Saybolt instruments, a higher precision is occasionally justified, and may be obtained by the use of Table 2.

If the instruments are used at different temperatures, appropriate temperature corrections must be applied. For lubricating oils, the viscosity at one temperature may be estimated from that at another by the approximate empirical rule, applicable between 100° and 212°F (37.8° and 100°C), that the logarithmic viscosity-temperature graphs are straight and meet at a point, temperatures being expressed in degrees Fahrenheit. (For other temperatures see ([1, 7, 8])). The location of the point of intersection for several classes of oils is given in Table 1.

Table 1.—Coordinates of Points of Intersection of Logarithmic Graphs([5])

η_0 = viscosity in poises; t_0 = temperature in °F

Class of oils	$\log_{10} \eta_0$	η_0	$\log_{10} t_0$	t_0
Paraffin base	$\bar{3}.58$	0.0038	2.77	589
Naphthene base	$\bar{3}.88$	.0076	2.57	371
Mixed base	$\bar{3}.43$	.0027	2.78	605
Fatty oils	$\bar{3}.75$	.0056	2.82	661

In estimating the viscometer reading at a given temperature for a certain type of instrument, from an observed reading at another temperature with another type of instrument, the following steps may be taken.

1. Determine the kinematic viscosity corresponding to the observed reading by means of Fig. 1.
2. Multiply by the density (g/cm³) so as to obtain the absolute viscosity (η) in poises; find the logarithm of the absolute viscosity and the logarithm of the temperature (t) of test (°F).
3. Plot the observed η, t and the η_o, t_o of the point of intersection, as given in Table 1, on logarithmic paper. Or plot the corresponding logarithms on equispaced coordinate paper. In either case, these two points locate a straight graph upon which the viscosity at the desired temperature will be found.
4. Divide the absolute viscosity at the desired temperature by the density at that temperature to get the kinematic viscosity. From this, determine, by means of Fig. 1, the corresponding time of flow on the desired viscometer.

It will be noted that the density under (2) and (4) must be the density at the temperature under consideration, and not the density at 60°F (15.6°C), which is generally the standard for such density determinations.

If an instrument is used in an irregular manner, appropriate corrections must be applied ([2, 3, 6, 9]).

Table 2.—Saybolt Universal and Saybolt Furol Viscometers
Units: Time (t), sec; kinematic viscosity = (η/d), poise/(g per cm³).

Saybolt Universal		Saybolt Furol	
t	η/d	t	η/d
32	0.0115	25	0.486
40	0.0417	26	0.512
50	0.0740	27	0.537
60	0.103	28	0.562
70	0.130	29	0.586
80	0.156	30	0.610
90	0.181	35	0.730
100	0.206	40	0.846
125	0.266	45	0.960
150	0.324	50	1.072
175	0.381	60	1.292
200	0.437	70	1.507
225	0.492	80	1.724
250	0.548	90	1.939
275	0.603	100	2.155
300	0.658		

For higher viscosities the kinematic viscosity is equal to $0.00220t$ for the Saybolt Universal, or to $0.0216t$ for the Saybolt Furol.

LITERATURE

(For a key to the periodicals see end of volume)

(1) Fortsch and Wilson, *45*, **16**: 789; 24. (2) Ganz, *252*, **6**: 218; 99. (3) Herschel, *32*, No. **100**; 17. (4) Herschel, *244*, **10**: 31; 22. (5) Herschel, *45*, **14**: 715; 22. (6) Holde, Examination of hydrocarbon oils, 1917. (7) Lane and Dean, *45*, **16**: 905; 24. (8) MacCoull, *253*, **7**: No. 6; 21. (9) Ubbelohde, Tabellen zum Englerschen Viskosimeter, 1907.

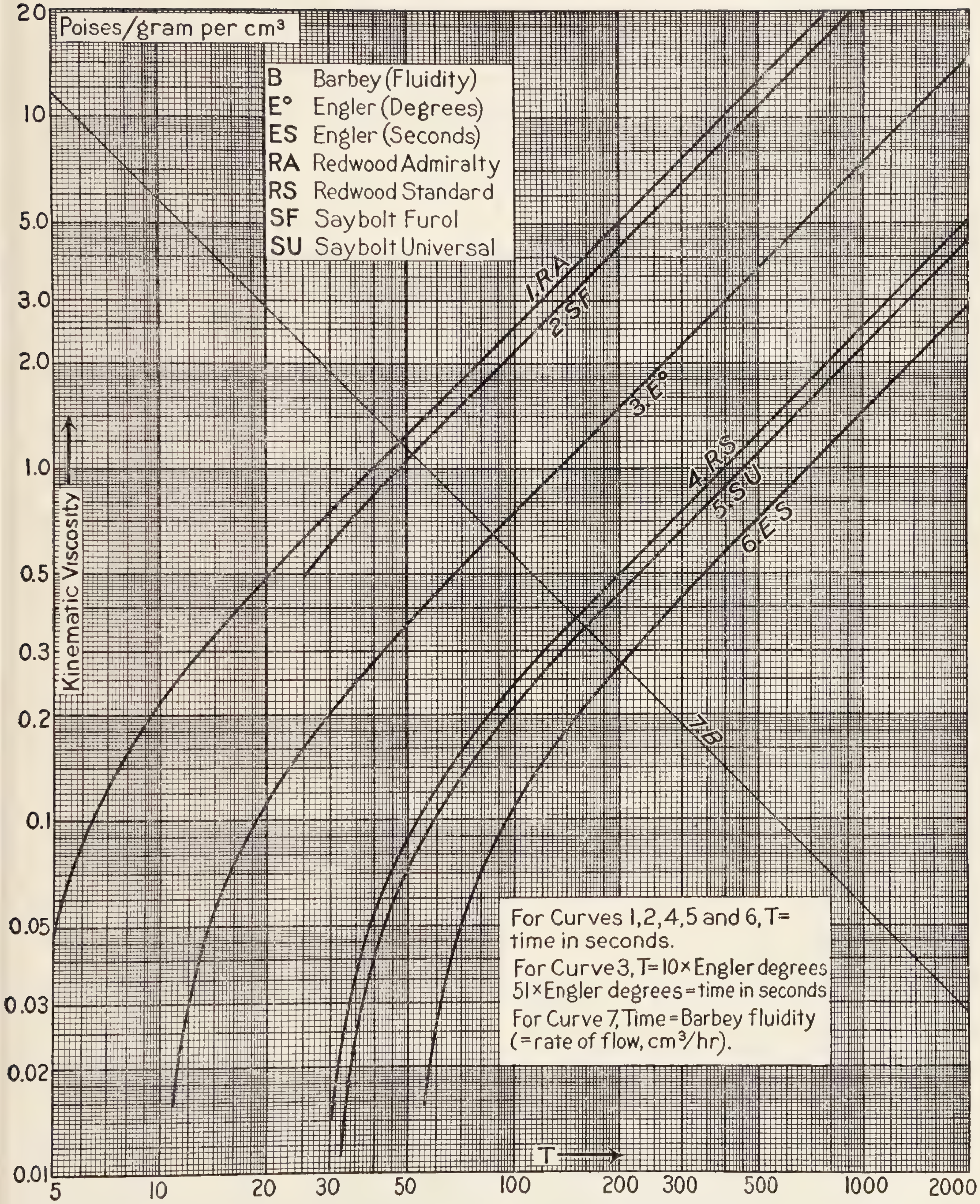

Fig. 1.—Conversion diagram for viscosimeters at a common temperature (4).

SELECTED TECHNICAL TERMS

N. Ernest Dorsey

In this section are given the definitions of numerous units, and very brief explanations of such technical terms as occur in many sections of the I. C. T. or are for other reasons more suitably considered here than elsewhere. Other terms will be explained where they occur in the body of the work. Symbolical explanations will be given wherever they appear to be satisfactory. In many cases, dimensional formulae (see p. 18) are given; these are enclosed in [ ]. Symbols are enclosed in ( ). The sequence will be: Name, symbol or symbols, dimensional formula, definition or explanation; but the symbol or formula, or both may be omitted. For the explanation of the symbols employed in the formulae and explanations, see p. 16.

Aberration, Constant of.—[θ]. tan $(V\text{-}v)/\mathbf{c}$. V, v = maximum and minimum velocity of earth in its orbit, **c** = velocity of light in vacuo.

Absolute.—(abs.). 1. An adjective, descriptive of a system of units which is based upon the smallest possible number of independent units. In this connection, every specification of a definite substance or of a vacuum is to be regarded as the introduction of an independent unit. 2. **Absolute zero.** The temperature at which the pressure of a fixed mass of an ideal gas, maintained at a constant volume, becomes zero. 3. **Absolute temperature.** The temperature reckoned from the absolute zero.

Absorption.—When the absorption of radiation by a substance is such that $J = J_o e^{-kl}$, J, J_o = intensity, l = length of path, k is the **coefficient of absorption.** k/d = coefficient of **mass absorption.** Writing $k = (4\pi k'n)/\lambda$, n = index of refraction, λ = wave length in vacuo, k' = **index of absorption.** (Some call $k'n$ the index.)

Absorptivity.—Ratio of radiant energy absorbed to that absorbed, under same conditions, by a black body.

Action, Planck's constant of.—*See* Planck.

Ampere.—Unit of electric current. **Abs. ampere** = 0.1 cgs unit. **Int. ampere** is that unvarying electric current which, when passed through a solution of silver nitrate in water, in accordance with certain specifications, deposits silver at the rate of 0.00111800 gram per second.

Ampere-turn.—Unit of mmf. Difference in magnetic potential between the faces of a coil of one turn carrying one ampere.

Ångstrom unit.—(Å). [l]. 10^{-10} meters. **International Ångstrom** defined as such a length that wave-length of red cadmium line in air at 15°C, A_n, is exactly 6438.4696 Int. Å; it = 10^{-10} m within experimental error.

Anomalistic.—Anom. year [month] = time between successive passages of earth [moon] through perihelion [perigee].

Aphelion.—Point of planet's orbit farthest from sun.

Apogee.—Point of moon's orbit farthest from earth.

Aries, First point of.—Designation of position of vernal equinox (*see* Celestial sphere); not at present in constellation Aries.

Assay ton.—[m]. 29⅙ grams; as many mg as there are troy ounces in short ton.

Astronomical unit of length.—Mean distance (*q.v.*) earth to sun; 149.50×10^6 km.

Astronomical unit of mass.—Mass of sun.

Astronomical unit of time.—Mean solar day.

Atmosphere.—[force area^{-1}], [m/lt^2]. 1. **Normal atmosphere** (A_n) defined as pressure exerted by vertical column of liquid 76 cm long, density 13.5951 grams per cm^3, acceleration of gravity being 980.665 cm sec^{-2}. 2. **Atmosphere at 45°** (A_{45}) differs from A_n only in use of acceleration of gravity at sea level and lat. 45° instead of 980.655 cm sec^{-2}. 3. **British atmosphere** is based on 30 inches instead of 76 cm.

Avogadro's number.—(N_0). [m^{-1}]. Number of molecules in a mole.

Bar.—[force/area], [m/lt^2]. Internationally accepted unit of pressure; = 10^6 dyne/cm^2. Has also been used to denote one dyne/cm^2 (*cf.* Barye).

Barye.—[force/area], [m/lt^2]. The cgs unit of pressure, one dyne/cm^2. (In accordance with recommendation of special committee of International Congress of Physicists, Paris, 1900, and with the usage of the International Bureau of Weights and Measures.) (*cf.* Bar).

B. A. unit.—A unit of electrical resistance based on certain coils prepared in 1863–1864 by British Association for Advancement of Science.

Black Body.—One which absorbs all radiant energy incident upon it. Its radiance of wave-length λ is $J_\lambda\, d\lambda$; the **intensity,** $J_\lambda = C_1\lambda^{-5}[e^{C_2/\lambda T} - 1]^{-1}$, T = absolute temperature, C_1, C_2 are **radiation constants. Total radiance** (J) is $\int J_\lambda\, d\lambda$ taken over all wave-lengths. $J = \sigma T^4$, σ = **Stefan,** or **Stefan-Boltzmann** constant of total radiation. For each T there is a wave-length (λ_m) for which $J_\lambda(=J_m)$ is a maximum; $J_m = C_j T^5$, C_j = **intensity coefficient;** $\lambda_m = w/T$, w = **Wien's displacement constant.**

Board of Trade unit.—1. A unit of **electrical resistance** based upon certain coils preserved by British Board of Trade. 2. (B.T.u.). Unit of **work.** Generally used in England as equivalent of one kilowatt-hour. (To be distinguished from British thermal unit (BTU).)

Boltzmann's molecular gas constant.—(k_o). [ml^2/t^2T]. Gas constant (*q.v.*) per molecule.

Bougie decimale.—[$\psi\omega^{-1}$]. An old unit of luminous intensity, 0.05 Violle unit.

Brightness.—[$\psi/l^2\omega$]. Luminous intensity per unit of apparent area of the luminous surface; if emission follows Lambert's law, brightness is independent of direction of line of sight, otherwise it is not; in latter case, line of sight is assumed to be normal to the surface unless the contrary is stated.

British Thermal Unit.—(BTU). [energy], [ml^2/t^2]. Heat per pound, per °F of rise, required to produce small rise in temperature of water under pressure A_n; varies with temperature, which must be stated. **"Mean" BTU** = 1⁄180 of heat required to raise one lb. of water from 32°F to 212°F, pressure A_n. (To be distinguished from Board of Trade unit (B.T.u.).)

Bulk modulus.—[stress], [m/lt^2]. Hydrostatic pressure divided by resulting decrease in volume per unit volume. Also called **volume elasticity, cubical elasticity, resistance to compression, modulus of compression** (*cf.* compressibility).

Calorie.—[Heat], [ml^2/t^2]. 1. Heat per unit of mass, per °C of rise, required to produce small rise in temperature of water under pressure A_n; varies with temperature, which must be stated. If unit of mass is gram, it is called small calorie, gram calorie, or calorie; symbol is cal. If unit of mass is kilogram, it is called large calorie, kilogram calorie, or Calorie; symbol, Cal. (2) **Mean calorie** = 1⁄100 of heat required to raise unit mass of water from 0°C to 100°C, pressure A_n.

Candle.—(ca). [$\psi\omega^{-1}$]. Basic photometric unit of luminous-intensity. A value determined by international agreement, and maintained at certain national laboratories by means of incandescent electric lamps is known as the "International candle."

Candle per square centimeter.—[$\psi/l^2\omega$]. Brightness of surface which, in direction considered, has a luminous intensity of one candle per cm^2 of apparent area; π lamberts. Similarly: Candle per sq. in., etc.

Candlepower.—(c.p.). Luminous intensity in terms of candles.

Capacity, heat.—1. Of a substance, is heat per unit of mass, per degree of rise, required to produce a very small rise in temperature, also called **specific heat,** and **thermal capacity.** 2. Of a body, is heat, per degree of rise, required to heat the body.

Capacity, electrical.—Of body A with reference to body B is $Q/(V_A - V_B)$, all other bodies in the field being insulated and uncharged; Q = charge on A; V_A, V_B = potential of A, B.

Capacity, polarization.—Of one electrode with reference to another is its electrical capacity per unit of area.

Capillary constant.—(a). [l]. 1. **British usage:** $a_1^2 = \gamma/(d_1 - d_2)g$; γ = surface tension, g = acceleration of gravity, $(d_1 - d_2)$ = positive difference in the densities of the fluids separated by the surface. 2. **German usage:** $a_2^2 = 2\gamma/(d_1 - d_2)g$. (The subscripts to the a are usually omitted.)

Carat fine.—*See* Karat.

Carcel unit.—A superseded unit of luminous intensity; approximately = 9.6 Int. candles.

Celestial sphere.—Sphere, concentric with earth, serving to locate angular positions of celestial bodies; its intersection with plane of earth's orbit [equator] is called **ecliptic [celestial equator]**; intersections of ecliptic and equator are called **equinoxes**; motion of equinoxes with reference to stars is called **precession of equinoxes,** it is resultant of an oscillatory and a nearly uniform motion, a fictitious equinox possessing only the latter motion is called **mean equinox.** The mean equinox through which sun passes in spring of northern terrestrial hemisphere is called mean vernal equinox, and is point from which **celestial longitude** (along the ecliptic) and **mean right ascension** (R. A.) (along the equator) are measured—positive to the east. Intersections of the sphere and the axis of rotation of earth are called **celestial poles**; that of the sphere and its diameter perpendicular to plane of ecliptic called **poles of the ecliptic.** Declinations are measured from equator along great circles passing through the poles—positive towards north; **celestial latitudes,** from ecliptic along great circles passing through poles of ecliptic—positive towards north. The pole of the sphere has a motion compounded of a nearly uniform progressive motion and a rotation about a point having the former motion; that point is called **mean pole,** its motion is the **precession of the pole,** the rotation of the true pole about the mean pole is called the nutation of the pole; mean (angular) distance between mean pole and true pole is called **constant of nutation.**

Centi-.—Prefix denoting $1/100$.

Centigrade.—(C). Thermometric system in which freezing point of water is called 0° and its boiling point is called 100°; pressure = A_n.

Centigrade thermal unit.—(CTU). [energy], [ml^2/t^2]. Differs from British Thermal Unit only in the substitution of Centigrade for Fahrenheit scale.

Centimeter.—(cm). 1. The cgs unit of **length,** 0.01 meter. 2. Often used to denote cgse unit of **electrical capacity.** 3. Occasionally used to denote cgsm unit of **electrical inductance.**

Centimeter-dyne.—[work], [ml^2/t^2]. One erg.

Centimeter of water [of mercury, etc.] at t°.—[force/area], [m/lt^2]. Denotes pressure exerted by a vertical column of water [of mercury, etc.] one cm long, temperature t°, at a place where acceleration of gravity is g_s (=980.665 cm/sec²).

Cheval-vapeur.—[work/time], [ml^2/t^3]. 1. Primary definition, 75 meter-kilograms per second. Also called **force de cheval, continental horsepower, Pferdekraft.** 2. For electrical purposes, generally regarded as exactly 736 watts; may be called **continental electrical horsepower.**

Circular inch.—(cir. in.). [l^2]. Area of a circle one inch in diameter. Similarly for **circular mil** (cir. mil), **circular millimeter** (cir. mm), etc.

Compressibility.—[lt^2/m]. Reciprocal of bulk modulus.

Compression, modulus of.—[m/lt^2]. *See* Bulk modulus.

Concentration.—1. The amount per unit of volume; may be called **volume concentration.** If amount is measured by mass, the symbol is C. 2. The mass of the material per unit of mass of the mixture containing it; may be called **mass concentration.** If both masses are expressed in terms of the same unit, this concentration is generally called the **titer** of the mixture.

Conductance.—Reciprocal of resistance.

Conductance, Specific.—*See* Conductivity, electrical.

Conductivity, Electrical.—Reciprocal of electrical resistivity (*q.v.*). 1. (κ) **Volume conductivity** = reciprocal of volume resistivity; specific conductance. 2. **Mass conductivity** = κ/d; d = density. 3. **Equivalent conductivity** (Λ) is κ/c; c = equivalents of solute per unit volume of solution. 4. **Molecular conductivity** (μ) is κ/m; m = moles of solute per unit volume of solution.

Conductivity, Thermal.—[(heat/area-time)/(T/l)]; [ml/Tt^3]. $dQ/dt = -k\,dx\,dy\frac{d\theta}{dz}$; k = thermal conductivity, dQ = amount of heat through $dx dy$, in direction dz, in time dt, $d\theta$ = increase in temperature in distance dz.

Coulomb.—The quantity of electricity transferred in one second by a current of one ampere.

Critical.—1. Any point, line, or region serving to locate a well marked **transition** may be described as critical. 2. As regards **condensation** of vapors, the temperature corresponding to the isotherm above which liquefaction is impossible is called the **critical temperature;** the vapor pressure at which the two phases are in equilibrium at the critical temperature is the **critical pressure;** volume of unit mass at the critical pressure and temperature is the **critical volume.** These three values are called the **critical constants.**

Cubic.—(cu.), (³). Used in conjunction with name of unit of length to form name of a related unit of volume; *e.g.*, cubic meter (cu. m) (m^3) is name of a unit of volume equivalent to volume of a cube with edges one meter long.

Cubic centimeter atmosphere.—*See* Liter-atmosphere.

Curie.—Internationally defined as amount of radon (radium emanation) which can exist in equilibrium with one gram of radium.

Current.—(I). The current of x through a surface S is $I = dx/dt$, where dx is the amount of x which passes through S in time dt. The density of the current through S at a given point is $\sigma_s = dI/dS$, where dI is the current at that point through an element of S of area dS. The value of σ varies with the orientation of dS, and for a certain orientation it is a maximum. The normal, in the direction of the flux, to the element so oriented is the **direction of the current;** and this maximum value of σ is called the **density,** or the **intensity,** of the current at that point.

Dalton.—[m]. A unit of mass, $1/16$ mass of atom of oxygen. Approximately 1.650×10^{-24} grams.

Day.—(da). [t]. 1. **Solar day** = interval between successive transits of sun across same meridian. It is not of uniform length. 2. **Mean solar day** = average length of all the solar days in a tropical year. This is the basis of all our time measurements and is what is meant by day unless the contrary is definitely indicated. 3. **Sidereal day** = interval between successive transits of true vernal equinox. 4. The day defined by successive transits of **same fixed star** is not used in astronomical computations, and appears to have no name.

Deci-.—Prefix denoting $1/10$.

Declination.—1. Of **celestial objects.** *See* Celestial sphere. 2. **Magnetic declination** = angular deviation of horizontal component of earth's magnetic field from northerly measured geographic meridian; easterly deviations, positive.

Degree.—1. (°), (deg). Unit of difference in **temperature**; size depends upon thermometric scale employed. 2. (°). Unit of angle, $\frac{1}{360}$ of complete circumference. 3. (°). **Hydrometer degree** is an arbitrary unit of difference in specific gravity; its value depends upon type of hydrometer (*see* p. 31).

Deka-.—Prefix denoting 10.

Demal.—A concentration of one g-equivalent per dm^3.

Density.—1. **Volume density** = dQ/dv, dQ = amount of the physical quantity considered which is contained in the element of volume dv. 2. **Density of a substance,** (d), (D), is dm/dv, m = mass. When, on a particular scale of operation, the density varies from point to point, it may be that on a larger scale it will not; then the density on the larger scale may properly be called the **apparent density** (sometimes called **bulk density**) when operations on the smaller scale are being considered. 3. **Surface density** = dQ/ds, ds = element of area of surface over which dQ is distributed.

Dielectric constant.—(ϵ). $[t^2/\mu l^2]$, $[\epsilon]$. The force (f) of repulsion between two point charges (e, e') of electricity at a distance (r) apart in a uniform medium of great extent is $f = ee'/\epsilon r^2$; ϵ depends upon the nature of the medium, and is called its dielectric constant.

Diffusion, Coefficient of.—*See* Diffusivity.

Diffusivity.—1. (Δ). $\left[\frac{\text{quantity}}{\text{area time}} \Big/ \frac{\text{vol. concen.}}{\text{distance}}\right]$, $[l^2/t]$. $dQ/dt = -\Delta(dc/dx)dydz$. dQ = amount of Q passing through area $dydz$ in direction of x in time dt, dc/dx = rate of increase, in direction of x, of volume concentration of Q. Also called **coefficient of diffusion.** 2. **Heat diffusivity.** $\left[\frac{\text{heat}}{\text{area} \times \text{time}} \div \frac{\text{specific heat} \times \text{density} \times \text{temp.}}{\text{distance}}\right]$, $\left[\frac{\text{heat conductivity}}{\text{density} \times \text{specific heat}}\right]$, $[l^2/t]$. $dQ/dt = -\Delta_t cd(dT/dx)dydz$, Δ_t = **heat diffusivity,** c = specific heat, d = density, T = temperature. $\Delta_t cd$ = **thermal conductivity.** Δ_t also called **temperature conductivity.**

Displacement constant, Wien's.—*See* Black body.

Displacement, Electric.—*See* Induction, electrostatic.

Draconic month.—*See* Nodical month.

Dyne.—$[ml/t^2]$. The cgs unit of force. The force which, when acting continuously upon a mass of one gram and not opposed by another, will impart to the mass a uniform acceleration of one cm per sec.^{2}

Dyne-centimeter.—[force · length], $[ml^2/t^2]$. The torque of one dyne acting on a lever-arm of one cm.

Ecliptic.—*See* Celestial sphere.

Elastic modulus.—Ratio of stress to resulting elastic strain. There are as many types of moduli as there are types of strain. 2. Occasionally used to denote **Young's modulus.**

Elasticity.—1. **Cubical**; *see* Bulk modulus. 2. **Longitudinal**; *see* Young's modulus. 3. **Shear**; *see* Rigidity. 4. **Torsional**; *see* Rigidity. 5. **Modulus of**; *see* Elastic modulus.

Electric displacement, field strength, etc.—*See* corresponding nouns.

Electromagnetic unit of quantity of electricity.—*See* Quantity of electricity.

Electromotive force.—(E), (emf). *See* Potential.

Electron.—Negative electrons are very small negatively charged particles observed under many, very diverse conditions. All appear to be alike in every way, including amount of charge carried. They appear to be one of the basic elements of which atoms are made.

Electronic charge.—(e). A quantity of electricity, of either sign, which is numerically equal to the electric charge carried by an electron.

Electronic mass.—(m_o). The mass of a negative electron when moving with a velocity much less than that of light.

Electronic ratio.—(e/m_o). Ratio of electronic charge to electronic mass.

Electrostatic unit of quantity of electricity.—*See* Quantity of electricity.

Elongation.—Distance of an oscillating, or of a revolving, body from a point of reference; *e.g.*, the distance of an electron from the nucleus about which it revolves.

Emissivity.—Ratio of radiance of the body to that of a black body at same temperature. If radiation of only one wave-length is considered, it is **monochromatic emissivity**; if all wave-lengths, it is **total emissivity.** The ratio of the radiances (or of the emissivities) of two non-black bodies is called **relative emissivity** of first with respect to second.

English sperm candle.—*See* Sperm candle.

Equation of time.—*See* Time.

Equator.—1. The intersection of surface of the **earth,** or other rotating spheroid, with the plane through its center perpendicular to its axis of rotation. 2. The intersection of the surface of a **spheroid** with a plane through its center and perpendicular to any diameter chosen as axis. 3. **Celestial equator.** *See* Celestial sphere.

Equinox.—*See* Celestial sphere.

Equivalent.—(equiv). Electrochemical equivalent (briefly equivalent) of an ion—actual or potential—is its formula weight divided by its valence.

Erg.—[force · distance], $[ml^2/t^2]$. Work done by a force of one dyne while acting through a distance of one centimeter in its own direction.

Erg-second.—[work · time], $[ml^2/t]$. The action produced by one dyne acting through one cm in one sec.

Expansion, coefficient of.—*See* Expansivity.

Expansivity.—$[T^{-1}]$. 1. **Volume expansivity** = $dv/(vdT)$. 2. **Linear expansivity** = $dl/(ldT)$. v, l, T = volume, length, temperature; $dv[dl]$ is change in $v[l]$ produced by change dT in temperature.

Fahrenheit.—(F). A thermometric system in which 32° denotes the freezing, and 212°, the boiling point of water under pressure of A_n.

Farad.—Capacity of electrical condenser which is charged to a potential difference of one volt by one coulomb.

Faraday.—(F). A subsidiary unit, the electrical charge carried in electrolysis by one gram-equivalent.

Field.—The field of a physical quantity is the region of space within which phenomena characteristic of the quantity exist. The strength, or intensity, of the field at any point is measured by the magnitude at that point of some chosen, characteristic phenomenon, and the complete designation of the field includes an indication of this phenomenon; *e.g.*, electrical field of force. As force is the phenomenon most frequently chosen, and in other cases the context indicates what is intended, the explicit designation of the chosen phenomenon is quite frequently omitted.

Field intensity.—The strength, or intensity, of a field of force at any point is df/dm, where df is the mechanical force experienced by dm, a vanishingly small amount of m placed at that point. For an **electrical field,** m is positive electricity; for a **magnetic field** it is a north magnetic pole; for a **gravitational field** it is mass. Magnetic field strength is frequently called **magnetizing force.**

Fluidity.—(φ). Reciprocal of viscosity. Also called **coefficient of fluidity.**

Flux.—1. Flux (ψ) of vector (V) through surface S is $\psi = \int_S V_n dS$; V_n = component of V normal to dS, integral is to be taken over S. 2. Flux of a **quantity** Q through surface is $\psi = dQ/dt$,

dQ = amount of Q which passes through S in time dt. 3. From **point source.** If $V = I/r^2$, where r = distance from source and I is a constant independent of direction, I is called **intensity of the source,** and $\psi = I\omega$; ω = solid angle subtended, at the source, by S (*cf.* Intensity, luminous).

Flux, Luminous.—(ψ). Flux of radiant energy expressed in terms of its power to produce luminous sensation in the human eye.

Flux, Magnetic.—Flux of magnetic induction.

Foot-candle.—[ψ/l^2]. Unit of illumination, one lumen per square foot.

Foot-lambert.—[$\psi/l^2\omega$]. Unit of brightness; *see* Lambert.

Foot-pound.—[ml^2/t^2]. Work required to raise one pound a vertical distance of one foot, where g = 980.665 cm/sec^2 (*cf.* meter-kilogram).

Foot-poundal.—[ml^2/t^2]. Work done by force of one poundal (*q.v.*) acting through a distance of one foot.

Force.—[ml/t^2]. That which imparts acceleration to material bodies.

Force, Electromotive.—*See* Potential.

Force, Magnetizing.—*See* Field intensity.

Force, Magnetomotive.—*See* Potential.

Force de cheval.—*See* Cheval-vapeur.

Frequency.—(ν). [N/t]. Number per unit of time. In case of vibrations, waves, etc., the frequency is the number of complete vibrations, of complete waves, etc., per unit of time.

Gamma.—(γ). [$\sqrt{m/\mu l t^2}$], [$\sqrt{ml\epsilon/t^4}$]. A unit of magnetic field intensity; 0.000 01 gauss.

Gas constant.—1. (R). [work/mass-degree], [l^2/t^2T]. The coefficient R in the ideal gas equation $pv = RTm$; p = pressure, v = volume of the mass m at absolute temperature T. 2. (R). [work/mole-degree]. **Gas constant per mole** obtained by expressing m in moles. 3. (k). [work/molecule-degree], [ml^2/t^2T]. **Boltzmann's molecular gas constant:** obtained by expressing m in terms of number of molecules.

Gas, Ideal.—One which strictly satisfies the equation ($pv = RTm$) and other relations deduced from the classical kinetic theory of gases on the assumption that the molecules are infinitely small and devoid of mutual attraction.

Gauss.—[$\sqrt{m/\mu l t^2}$], [$\sqrt{ml\epsilon/t^4}$]. The cgsm unit of magnetic field intensity.

Gaussian gravitation constant.—The square root of the intensity of the gravitational field of force of the sun at a point whose distance from the sun is the astronomical unit of length (*cf.* Gravitation constant).

Geepound.—*See* Slug.

Gilbert.—[$\sqrt{ml/\mu t^2}$], [$\sqrt{\epsilon m l^3/t^4}$]. Electromagnetic unit of magnetic potential, of magnetomotive force. Unless contrary is indicated, it is the cgsm unit. In precise work, the International gilbert, based upon the Int. elec. units, should be distinguished from the absolute, or cgsm, gilbert.

Grade.—[θ]. Unit of plane angle, 1/400 of complete circumference.

Gram atom.—*See* Mole.

Gram calorie.—*See* Calorie.

Gram equivalent.—*See* Mole.

Gram formula weight.—*See* Mole.

Gram weight.—*See* Weight.

Gravitation constant.—(G). [l^3/mt^2]. The coefficient G occurring in the equation $f = G\,(mm')/r^2$; f = force of gravitational attraction between two point masses (m, m') in vacuo, r = distance between m and m' (*cf.* Gaussian gravitation constant).

Gravity, Acceleration of.—(g), (g_s). [l/t^2]. Unless the contrary is indicated, this expression refers specifically to the earth, and denotes the resultant acceleration downward experienced by a freely falling body placed at the point considered. It includes centrifugal effects arising from the rotation of the earth, as well as the effects of gravitational attraction (*cf.* Gravity, standard).

Gravity, Specific.—*See* Specific gravity.

Gravity, Standard.—(g_s). [l/t^2]. Standard gravity is the value adopted by the International Committee on Weights and Measures as the "accepted" value of the acceleration of gravity to which all measurements involving this quantity are to be referred. Thus a pressure of x cm of mercury at t°C is to be understood as denoting the pressure exerted by x cm of mercury at t°C at a place where the acceleration of gravity is g_s. The accepted value is g_s = 980.665 cm/sec^2 (= 32.174 ft./sec^2).

Heat.—1. By the **heat of a process** is meant the amount of heat evolved, per unit quantity of material involved, during the isothermal process, the process proceeding in the direction indicated. The quantity of material may be expressed in terms of mass, of moles, of equivalents, etc., as may seem desirable. 2. By the **latent heat** of a transformation is meant the amount of heat absorbed per unit quantity of material transformed, the transformation proceeding in the direction indicated. Latent heat of transformation of A to B = −(heat of transformation of A to B) = heat of transformation of B to A.

Heat diffusivity.—*See* Diffusivity.

Heat, Specific.—*See* Capacity, and Specific heat.

Hecto-.—Prefix denoting 100.

Hefner unit.—A superseded unit of luminous intensity; approximately = 0.9 Int. candles.

Henry.—[μl], [$t^2/\epsilon l$]. Unit of electromagnetic inductance. Defined as that inductance for which an induced electromotive force of one volt is produced when the inducing current is changed at the uniform rate of one ampere per second.

Horsepower.—(h.p.). [work/time], [ml^2/t^3]. 1. (HP) **Primary definition** of the term is work done at the rate of 550 foot-pounds per second. 2. For electrical purposes it is regarded as exactly = 746 watts, which is frequently called the **electrical horsepower.** 3. **Continental horsepower.** *See* Cheval-vapeur.

Humidity.—1. **Absolute humidity** of a gas is the actual amount of water vapor per unit volume of the gas. Usually expressed in terms of the actual pressure of the water vapor present. 2. **Relative humidity** of a gas = ratio of the pressure of water vapor present to the pressure of water vapor which is in equilibrium with water at the same temperature. 3. **Dew-point** of a gas is the temperature at which the pressure of water vapor in equilibrium with water is equal to the actual pressure of the water vapor contained in the gas. If the temperature of the gas be varied while its absolute humidity remains unchanged, then the dew-point is that temperature at which the relative humidity is 100%. 4. If the bulb of a thermometer be encased in a fabric which is kept wet with water (**wet-bulb**), the thermometer will record a lower temperature than if the bulb were dry (**dry-bulb**). If the circulation over the wet bulb is sufficiently rapid, the difference in the temperatures depends solely upon the total pressure of the gas, its absolute humidity, and its temperature. Hence the humidity of the atmosphere, or of any other very large volume of gas, can be readily determined by the use of wet- and dry-bulb thermometers.

Hydrometer.—An instrument which, by the extent of its submergence, indicates the specific gravity of the liquid in which it floats. Frequently, its readings are expressed in degrees (°). Various systems of graduations are in use, *see* p. 31.

Hygrometric.—Pertaining to humidity of atmosphere.

Hypsometry.—The art of measuring the elevation above sea-level. More specifically, the use of the boiling-point of water for such measurements.

Ice point.—(T_0). Temperature at which water freezes when under the pressure of one normal atmosphere.

Ideal gas.—*See* Gas, ideal.

Illumination.—[ψ/l^2]. The illumination at a point of a surface is the surface density of the luminous flux incident at that point.

Inch of water [of mercury, etc.] at t°.—Analogous to cm of water (*q.v.*)

Index of absorption.—*See* Absorption.

Index of refraction.—*See* Refraction.

Inductance.—The electrical inductance of circuit A with reference to circuit B is ψ_A/I_B; ψ_A = flux of magnetic induction through A as a result of the current I_B in B. A and B may be the same circuit.

Induction.—1. That **modification** which is acquired by a medium when it becomes the seat of a field of force, and which is evidenced by the fact that its boundaries with other media exhibit distinctive properties which they do not possess in the absence of the field. 2. The distinctive **properties** mentioned in (1); as in magnetization by induction, induced electric charges, etc. 3. **Electrostatic induction.** [$\sqrt{m/\mu l^3}$], [$\sqrt{\epsilon m/lt^2}$]. ϵF, ϵ = dielectric constant, F = intensity of electrostatic field of force. **Electric displacement** = $\epsilon F/4\pi$. 4. **Magnetic induction** (B). [$\sqrt{\mu m/lt^2}$], [$\sqrt{m/\epsilon l^3}$]. $B = \mu H$, μ = magnetic permeability, H = intensity of magnetic field of force. 5. **Electromagnetic induction** is the phenomenon which is characterized by the appearance, in every circuit, of a cyclical emf which is proportional to the rate of change of the flux of magnetic induction through that circuit.

Intensity coefficient.—*See* Black body.

Intensity, Field.—*See* Field intensity.

Intensity, luminous.—1. Of a **point source in** a given direction = amount of luminous flux, per unit of solid angle, which the source emits in the direction considered. 2. Of a **point of an extended source** = brightness of that point of the source; also called intrinsic brightness. 3. Of an **extended source,** in a given direction, is its intensity at a point so distant in the stated direction that the source may be regarded as a point. For nearer points the **apparent intensity** will depend upon the distance, and is defined as the intensity of that point source which at the same distance will produce the same illumination (*cf.* flux).

Intensity of magnetization.—*See* Magnetization.

Intensity of radiation.—1. The intensity of the **radiation emitted** in a specified direction by a body is the amount of radiant energy emitted in that direction, per unit of time, per unit of area, and per unit of solid angle of emission. For spectral, or monochromatic, intensity, *See* Radiance. 2. Of **received radiation,** *See* Irradiation. 3. Of **radiation in transit.** The amount of radiant power per unit area which passes through an element of area which is normal to the direction of propagation; this equals the volume density of radiant energy at the point considered.

International electrical units.—A system of electrical and magnetic units based upon the ohm, the ampere, and secondarily upon the volt, all as realized by certain concrete standards which have been internationally agreed upon, and upon the cgs units for such other quantities as may be involved. The concrete standards have been so chosen as to make the international system nearly identical with the practical system; as now defined, the outstanding discrepancy in no case exceeds 52 parts in 100 000. In distinguishing between the two systems, the units of the practical system are described as absolute, those of the other, as international. The introduction of the volt as a secondary unit defined by a concrete standard (Weston normal cell = 1.018300 Int. volts at 20°C) introduces confusion when measurements of high precision are to be recorded. In these Tables, values based upon the Int. ohm and the Int. ampere (as defined by the silver voltameter) are denoted by (a). Those based on the Int. ohm and the Int. volt (as defined by the standard cell) are denoted by (v).

Irradiation.—The radiant power, per unit of area, incident upon a surface.

Joule.—[ml^2/t^2]. 1. **Absolute joule** = 10^7 ergs. 2. **International joule** = work expended per second by an Int. ampere in an Int. ohm.

Karat.—(K). Denotes the "fineness of gold" in terms of parts (by weight) of gold per 24 parts of the alloy. Twenty-four g of an n karat alloy contains n g of gold, the alloy is **"*n* carats fine."**

Kelvin.—(K). Name applied to the absolute centigrade scale of temperature.

Kilo-.—Prefix denoting 1000.

Kilogram calorie.—*See* Calorie.

Kilogram-meter.—A torque equivalent to that of one kilogram weight acting on a lever-arm one meter long.

Kilowatt-hour.—Work expended by one kilowatt in one hour. In Great Britain it is quite generally called **Board of Trade unit** (B.T.u.).

Kinematic viscosity.—[l^2/t]. Ratio of viscosity to density.

Lambert.—[$\psi/l^2\omega$]. The brightness of a surface which, radiating in accordance with Lambert's law, emits a total luminous flux of one lumen per cm². For such a surface, brightness is independent of direction of the line of sight and equals $1/\pi$ lumen, per steradian, per cm² = $1/\pi$ candles per cm². If the total emission is one lumen per sq. ft., the brightness is called one **foot-lambert.**

Lambert's law.— $I = I_o \cos\theta$; $I_o[I]$ = intensity of radiation emitted in direction normal [at angle θ with normal] to the surface. In many cases this law does not express the facts.

Latent heat.—(l, L). *See* Heat.

Latitude.—(lat.). 1. The angular distance of a point from the equator of a **spheroid,** measured along a great circle passing through the poles. 2. **Celestial latitude.** *See* Celestial sphere.

Legal ohm.—A unit of resistance; so designated by the International Conference of 1884, and defined as the resistance of a column of mercury 1 mm² in cross-section and 106 cm in length at the temperature of melting ice. It was never legalized.

Light-year.—Distance traveled by light in free space in one year.

Line.—Unit of flux of magnetic induction = one maxwell.

Liter-atmosphere.—The amount of external work done when a volume is increased by one liter against an external pressure of one atmosphere.

Longitude.—(long.). 1. The longitude of a point is the angle which its axial plane makes with a fiducial one. For the **earth,** angles measured from the fiducial plane towards the west are usually considered positive. 2. **Celestial** or **astronomical** longitude. *See* Celestial sphere.

Loschmidt's number.—(n_o). [l^{-3}]. Number of molecules per unit volume of an ideal gas at 0°C and pressure A_n.

Lumen.—[ψ]. Fundamental unit of luminous flux. A uniform point source of one candle emits 4π lumens.

Luminous flux.—*See* Flux, luminous.

Luminous intensity.—*See* Intensity, luminous.

Lunar month.—The time which elapses between successive new moons. Also called synodical month.

Lux.—A unit of illumination, one lumen per square meter.

Magnetic flux.—*See* Flux, magnetic.

Magnetic induction.—*See* Induction.

Magnetic moment.—*See* Moment.

Magnetization, Intensity of.—Magnetic moment per unit of volume (*cf.* moment).

Magnetomotive force.—(mmf). *See* Potential.

Magnitude.—The **magnitude,** or **apparent magnitude,** (m) of a star is primarily an indication of the amount of light the earth receives from it. The value to be assigned to the latter depends upon the characteristics of the perceptive apparatus: visual, photovisual, photographic, and radiometric magnitudes are to be distinguished. Certain stars near the north pole have been chosen as standards; the numerical magnitudes assigned to them are such as represent satisfactorily the range covered by early naked-eye estimates, and satisfy the equation $m = 2.5 (\log_{10} I_0 - \log_{10} I)$, I = intensity of light from a star of magnitude m, and I_0 = that from one of magnitude zero. For Vega, $m = 0.2$; a star of $m = 6$ is near the limit of naked-eye visibility. The **absolute magnitude** M is internationally defined as the apparent magnitude the star would have if its distance were 0.1 parsec; $M = m + 5 + 5 \log_{10}\pi$, π = parallax expressed in ″.

Mass, Engineers' unit of.—*See* Slug.

Maxwell.—The cgsm unit of flux of magnetic induction.

Mean distance.—In astronomical parlance, the mean distance of a planet from the sun denotes the mean of the greatest and the least distance from the sun to the path of the planet. Similarly in other cases.

Mean spherical candlepower.—Average candlepower of a source, in all directions.

Mega-.—Prefix = 1 000 000.

Megmho.—Conductance of one reciprocal microhm.

Meter-candle.—The illumination of an element of surface one meter distant from a uniform source of one candle situated upon the normal to the center of the element. One lux.

Meter-kilogram.—$[ml^2/t^2]$. Work required to raise one kilogram a vertical distance of one meter at a place where the acceleration of gravity is 980.665 cm/sec.^{2}

Mho.—An electrical conductance of one reciprocal ohm.

Micro-.—Prefix denoting $1/10^6$.

Microhm.—10^{-6} ohm.

Micromicro-.—Prefix denoting $1/10^{12}$.

Micron.—(μ). Unit of length = $1/10^6$ m = 0.001 mm.

Mil.—0.001 in. (*cf.* Circular inch).

Milli-.—Prefix = 0.001.

Millimicro-.—Prefix = 0.000 000 001.

Minute.—1. (min). **Time,** $1/1440$ of a day. 2. (′). **Unit of angle,** $1/60$ degree. 3. (`). **Centesimal minute** = unit of angle = 0.01 grade.

Modulus.—1. *See* Elastic modulus. 2. For the several elastic moduli—bulk, compression, elasticity, rigidity, torsion, Young's—*see* distinguishing name.

Mohs.—An arbitrary scale of hardness based upon a selected list of 10 native minerals.

Mole.—A variable, derived unit of mass; its mass is numerically equal to the molecular weight of the substance measured. The expressions **gram-mole, kilogram-mole,** etc. are used to designate the basic unit of mass employed. Similarly derived units based upon the atomic weight, the formula weight, or the equivalent are called the **gram-atom, gram-formula weight** or **gram-equivalent** when the gram is the basic unit, and correspondingly in other cases.

Molecular.—For molecular properties, *see* appropriate properties.

Molecular volume.—Volume occupied by one mole. Molecular weight divided by density.

Molecular weight.—(M). The sum of the atomic weights of all the atoms contained in a molecule.

Moment.—1. Of force (F) about a point = Fl, l = perpendicular distance from the point to the line of F. 2. Of a **couple** = product of either force times perpendicular distance between them. 3. Of a **magnet** = moment of couple acting upon it when it is at right angles to a magnetic field of unit intensity. 4. Of **inertia** about an axis = sum of the products of each element of mass times the square of its distance from the axis.

Month.—1. Period of time determined by motion of **moon.** *See* lunar, synodical, tropical, sidereal, anomalistic, nodical, draconic. 2. **Solar month** = $1/12$ of tropical year. 3. **Calendar month** = conventional subdivision of year.

Myria-.—Prefix = 10 000.

Node.—1. A point of a **standing wave** where the displacement is independent of the time. 2. In **astronomy,** the points where an orbital, or other, plane cuts the ecliptic; the **rising node** is the one at which the passage across the plane of the ecliptic is from south to north.

Nodical month.—Time required by the moon to pass from one rising node to the next. Also called **draconic month.**

Noon.—*See* Time.

Normal.—1. The normal to a **surface** is a line drawn perpendicular to the surface at the point considered. 2. Any **line** perpendicular to another may be said to be normal to it. 3. A **concentration** of one gram-equivalent per liter.

Normal atmosphere.—(A_n). *See* Atmosphere.

Numeric.—(N). A pure number. A dimensionless quantity.

Nutation.—*See* Celestial sphere.

Oersted.—The cgsm unit of magnetic reluctance.

Ohm.—(Ω). A unit of electrical resistance. 1. **Absolute ohm** = 10^9 cgsm units. 2. **International ohm** is the resistance, at the temperature of melting ice, offered to an unvarying electric current by a column of mercury, of constant sectional area, having a mass of 14.4521 grams and a length, at the temperature mentioned, of 106.300 cm.

Ohm-centimeter.—Unit of electrical volume resistivity. The resistivity of a material of which a uniform bar one cm^2 in sectional area has a longitudinal resistance of one ohm per cm of length. Frequently called one **ohm per centimeter cube.**

Ohm (cm, gram).—Unit of electrical mass resistivity. The resistivity of a material of which a bar, having such a uniform section that its mass per linear cm is one gram, has a longitudinal resistance of one ohm per cm of length.

Ohm (meter, mm).—Unit of electrical volume resistivity. The resistivity of a material of which a circular cylinder one mm in diameter has a longitudinal resistance of one ohm per meter.

Ohm (meter, mm^2).—Unit of electrical volume resistivity. The resistivity of a material of which a circular cylinder one square mm in sectional area has a longitudinal resistance of one ohm per meter.

Ohm (mil, ft.).—Analogous to ohm (meter, mm). Cylinder one mil in diameter, resistance of one ohm per foot.

Ohm (mile, pound).—Analogous to ohm (cm, gram).

Ohm-inch.—Analogous to ohm-centimeter.

Parallax.—1. The **annual parallax** of a star is defined as the maximum angle subtended by one astronomical unit of length at the distance of the star from the sun. 2. The **equatorial horizontal parallax** of a member of the solar system is the maximum angle subtended by the equatorial radius of the earth at the distance of the earth from the member considered.

Parsec.—The distance of a star for which the annual parallax is one second of arc.

Pentane candle.—A superseded unit of luminous intensity = one Int. candle.

Percent.—(%). The number of units of the constituent in 100 units of the mixture containing it. If units of volume are used, the ratio is called **volume percent;** if units of mass, it is called **mass percent, weight percent,** or simply **percent.** (% must be distinguished from ‰ which is frequently used to denote per thousand.)

Perigee.—That point of the moon's orbit which is nearest to the earth (*cf.* apogee).

Perihelion.—That point of a planet's, or comet's, orbit which is nearest to the sun (*cf* aphelion).

Permeability.—(μ.) The force (f) of repulsion between two rigidly magnetized poles (m, m') at a distance r apart is $f = (mm')/(\mu r^2)$; μ depends upon the material in which the poles are immersed, and is called its permeability.

Pferdekraft.—*See* Cheval-vapeur.

Phot.—An illumination of one lumen per cm^2.

Photoelectric constant.—1. **h/e.** It is $1/\nu$ of the rise in potential required to impart to a negative electron the energy it has when emitted under the action of radiation of frequency ν. 2. **hc/e.** This is λ times the rise in potential mentioned in (1). λ = wave-length in vacuo.

Planck's constant of action.—(h). $[ml^2/t]$. A universal constant which fixes the amount of energy contained in the individual bundles, or quanta, of radiation emitted by a radiating body. Each such bundle contains an amount of energy = $h\nu$, ν = vibration frequency of the radiation. **h** is also called **Planck's quantum.**

Poise.—$[m/lt]$. The cgs unit of viscosity. If the tangential force, per unit area, which one layer of a fluid exerts upon an adjacent one is one dyne when the space rate of variation of the tangential velocity from layer to layer is unity, the viscosity of the fluid is one poise.

Poisson's ratio.—If a bar of uniform section be subjected to a pure tensile stress, the ratio of its transverse contraction per unit of transverse thickness to its elongation per unit of length is called the Poisson's ratio of the material.

Pole strength.—*See* Quantity of magnetism.

Poncelet.—Unit of power = 100 meter-kilograms per second.

Potential.—The excess of the potential at the point A over that at B, with reference to any quantity m, is the mechanical work per unit of m which must be done in carrying a very small positive amount of m from B to A. The difference in electrical potential is called **electromotive force, emf, potential difference**; in magnetic potential, is called **magnetomotive force, mmf.**

Potential gradient.—The space rate of increase in the potential. If the direction in which the rate to be measured is not stated, that corresponding to the maximum gradient is to be understood.

Pound weight.—*See* Weight.

Poundal.—The unit of force in the fps system. It is the force which, if acting continuously upon a mass of one pound, will impart to it a uniform acceleration of one foot per second^2 (*cf.* Dyne).

Power.—1. The time **rate of doing work.** 2. If when the two junctions of a bimetallic circuit differ in temperature by a small amount (dt), there is an open circuit emf (dE) around the circuit, then $(dE)/(dt)$ is called the **thermoelectric power** of the circuit, corresponding to the average temperature of the two junctions. 3. The **ability** to do some specific thing; as in rotatory power.

Practical electric units.—A system of electrical units based upon 10^9 cm, 10^{-11} gram, sec, and the permeability of a vacuum, as fundamental units. The units of most interest are the ohm ($=10^9$ cgsm), ampere ($=0.1$ cgsm), and volt ($=10^8$ cgsm). Frequently described as absolute (*cf.* Int. elec. units).

Precession of the equinoxes.—*See* Celestial sphere.

Pressure.—(p), (P). $[m/lt^2]$. Normal force per unit of area. A **hydrostatic pressure** is a pressure which is the same in all directions. For critical pressures, *see* Critical.

Quadrant.—1. Unit of **angle** = 90°. 2. Formerly used occasionally to denote the **henry.**

Quantity of electricity.—1. (es). The **electrostatic unit** is that quantity which when concentrated to a point and placed at unit distance from an equal point charge will exert upon it a unit force, the surrounding medium being a vacuum. 2. (em). The **electromagnetic unit** is that quantity which is transferred per unit of time across any section of an infinitely long, straight, linear conductor when the current is such that the intensity of the resulting magnetic field at unit distance from the conductor is unity. 3. For **other units**—coulomb, electronic charge, faraday—*see* corresponding names.

Quantity of magnetism.—Also called **pole strength.** 1. The **electromagnetic unit** is that quantity which when concentrated to a point pole and placed at a unit distance from an equal point pole will exert upon it a unit force, the surrounding medium being a vacuum. 2. The **electrostatic unit** is that quantity which when concentrated to a point pole and placed at a unit distance from an infinitely long, straight, linear conductor would experience a unit force as a result of a current in the conductor such that one electrostatic unit of electricity per second is transferred across each section of the conductor. 3. The **Int. electric unit** is not named, it is the same as the cgsm unit.

Quantum.—1. Certain processes are essentially discrete, and consequently parcel out into bundles the several quantities involved. If for a certain quantity and a particular process these bundles are all alike, it is now customary to call them quanta, without implying that the quantity so bundled has in itself any atomistic properties. 2. **Planck's quantum.** *See* Planck.

Radian.—An angle which encloses, of the circumference of a concentric circle, an arc = radius.

Radiance.—The radiance of a body, within the spectral range λ_1 to λ_2, is defined as the intensity of the radiant energy, having wave-lengths lying between λ_1 and λ_2, which the body emits in a direction perpendicular to its radiating surface. If the spectral range is not mentioned, all wave-lengths are to be included; this is frequently called the **total radiance.** The **spectral,** or **monochromatic, intensity** of the radiance of wave-length λ is defined as the ratio of the radiance within the range $(\lambda - \frac{1}{2}d\lambda)$ to $(\lambda + \frac{1}{2}d\lambda)$ to $d\lambda$, when the latter is indefinitely small (*cf.* Emissivity).

Radiation constants.—*See* Black body.

Rankine.—A name sometimes applied to the absolute Fahrenheit scale of temperature.

Réaumur.—(R). A thermometric system in which the freezing point of water is called 0°, and the boiling point, 80°.

Reflectivity.—The ratio of the intensity of the light specularly reflected from a surface to the intensity of the light incident upon it. It is a pure numeric.

Refraction.—1. The **index of refraction, refractive index,** or **refractive exponent** is $n = \sin i/\sin r$; i = angle of incidence from a vacuum upon the substance, and r = angle of refraction, each measured from the normal to the surface. 2. **Refractivity** is $(n - 1)$. 3. **Specific refractivity** (r_G) is $(n - 1)/d$. **Specific refraction** (r_L) is $(n^2 - 1)/d(n^2 + 2)$. d = mass per unit of volume. 4. **Molecular refractivity** = Mr_G. **Molecular refraction** = Mr_L. M = molecular weight. By replacing M by the atomic weight, the corresponding **atomic values** are obtained. 5. **Refractive constant** of a solute is its specific refractivity computed on the assumption that the refractivity of the solution is equal to the sum of the refractivities of its pure constituents each multiplied by the ratio of its mass per unit volume of the solution to its own density when pure.

Reluctance.—The magnetic reluctance of a body between two specified equipotential surfaces is the ratio of the difference in the two potentials divided by the flux of magnetic induction from [to] either surface to [from] the body. It has no significance unless these two fluxes are the same.

Resistance.—1. The **electrical resistance** of a body between two specified equipotential surfaces is E/I, where E is the unchanging difference in the potentials of the surfaces and I is the resulting current across any transverse section between them. 2. **Specific resistance.** *See* Resistivity.

Resistivity.—1. [resistance × length]. **Resistivity,** or **volume resistivity,** of a substance is the longitudinal resistance per unit of length of a uniform bar of the substance of unit sectional area. 2. [resistance × mass/(length)^2]. **Mass resistivity** of a substance is the longitudinal resistance per unit of length of a uniform bar of the substance of such a sectional area that it contains one unit of mass per unit of length. 3. [resistance]. **Surface resistivity** is the resistance per unit of length of a strip of the surface of unit width. It has reference solely to the current which is restricted to the surface.

Rhe.—Name proposed for cgs unit of fluidity; = one reciprocal poise.

Right ascension.—*See* Celestial sphere.

Rigidity.—If to the four faces of a cube which are parallel to a given edge there be applied tangential stresses which are equal in absolute value, perpendicular to the given edge, and so directed as to produce a pure distortion, the other two faces will be deformed into diamond shaped figures if the material is isotropic. The modulus of rigidity is defined as the quotient of the stress on any one of the faces divided by the resulting change in any one of the angles of a distorted face. Also called **modulus of shear, Coulomb's modulus, modulus of torsion** (the last is undesirable).

Rotation.—*See* Rotatory power.

Rotatory power, Optical.—1. The **natural rotatory power** is θ/l, where θ is the rotation of the plane of polarization which occurs in a path of length l. The **specific rotatory power** ($[\alpha]$) is θ/dl, d = density. The **molecular** [or **atomic**] **rotatory power** is $M\theta/dl$ [or $A\theta/dl$]; M = molecular, A = atomic weight. 2. The **magnetic rotatory power** is $\theta/(lH \cos \alpha)$, where H = intensity of the magnetic field and α = angle between H and the path of the light. It is commonly called **Verdet's constant.** From the magnetic rotatory power, the **specific** ($[\omega]$), **molecular,** and **atomic magnetic rotatory powers** are derived exactly as in the case of natural rotation. The ratio of any one of these quantities to the corresponding one for a chosen reference substance is called the **relative power.** Water is the reference substance commonly chosen, and $[\Omega]$ is used to denote the molecular magnetic rotatory power relative to water.

Rydberg's fundamental frequency, and series constant.—*See* Series, spectral.

Secohm.—A superseded name for the henry.

Second.—1. (sec). **Time,** $\frac{1}{86400}$ day. Mean solar day, unless contrary is indicated. 2. (″). Unit of **angle,** $\frac{1}{3600}$ degree. 3. (``). **Centesimal second** = 0.0001 grade.

Seger cone.—One of a graded series of cones of refractory material which, by their softening and the resultant deformation, indicate the heat treatment to which they have been subjected.

Series, Spectral.—Spectral lines, or groups of lines, which occur in orderly sequence. Most of these sequences can be represented by an equation of the form $\frac{1}{\lambda} = A - \frac{BN}{(m + \alpha + \beta/m^2)^2}$; λ = wave-length in vacuo; m is an integer varying from one line (or group) to another; for any one series, A, B, N, α and β are constants; B is an integer; N is known as **Rydberg's constant,** its value is determined by the constitution of the radiating atom. On Bohr's theory, $N = N_\infty \frac{M}{M + \mathbf{m}_0}$, where M = mass of the atom, $\mathbf{m}_0$ = electronic mass, and $N_\infty = 2\pi^2\mathbf{m}_0\mathbf{e}^4/\mathbf{h}^3\mathbf{c}\epsilon_0{}^2$; N_∞ is known as **Rydberg's universal series constant;** $\mathbf{e}$ = electronic charge; $\mathbf{h}$ = Planck's constant; ϵ_o = dielectric constant of vacuum; $\mathbf{c}$ = velocity of light in vacuo. On this theory, B denotes the number of electrons displaced from their normal positions, m is the **principal quantum number,** α depends upon the subordinate, or azimuthal, quantum number, and $\beta = 0$. For atoms of the type of hydrogen, $\alpha = 0$, $\beta = 0$; for others $(m + \alpha + \beta/m^2)$ is frequently called the **effective quantum number,** generally it is not an integer. **Rydberg's fundamental frequency** is $\nu_\infty = \mathbf{c}N_\infty$.

Sidereal month.—The time required for the moon to complete one apparent circuit among the stars.

Siemens unit.—(S.E.). A superseded unit of electrical resistance proposed in 1860 by Werner von Siemens; defined as the resistance at 0°C of a column of mercury one meter long and of a uniform cross section = one mm^2.

Slug.—A unit of mass. 1. The mass which will acquire an acceleration of one foot per sec^2 when continuously acted upon by a force of one pound weight. Also called **geepound,** and **engineer's unit of mass.** 2. The **metric slug** is the mass which will acquire an acceleration of one meter per sec^2 when continuously acted upon by a force of one kilogram weight.

Solar month.—$\frac{1}{12}$ tropical year.

Solubility.—1. By solubility of the **non-gas** a in b is meant the mass of a per unit mass of b which is contained in the mixture which is in equilibrium with an excess of a. In this mixture b is said to be saturated with a. Data are frequently restricted to mass of a per unit mass of mixture, mass of a per unit volume of mixture, or moles of a per mole of mixture. 2. Solubility of a gas is C_s/C_g, C_s = concentration of gas in the solution, C_g = concentration of gas in overlying gas phase. 3. **Solubility product** of an ionized substance (A_nB_m) in a stated solvent = $[A]^n \cdot [B]^m$, where $[A]$ and $[B]$ denote the concentrations of the two ions when the solution is saturated with the substance.

Specific gravity.—($d_{t_1}^{t_2}$). The ratio of the mass of a certain volume of the substance at the temperature t_2 to that of the same volume of a reference substance (usually water) at temperature t_1. Frequently, but incorrectly, called density.

Specific heat.—1. **Heat capacity.** *See* Capacity. 2. **Specific heat of electricity.**—*See* Thomson effect. 3. **Einstein's specific heat constant** (β) = ratio of Planck's constant (h) to Boltzmann's molecular gas constant (k_0). 4. **Ratio of specific heats** = $\gamma = c_p/c_v$; c_p, c_v = specific heat at constant pressure and at constant volume, respectively.

Specific inductive capacity.—The ratio of the dielectric constant of the substance to that of a vacuum.

Specific refractive power.—Used indifferently to denote several of the refractive constants (*cf.* Refraction).

Sperm candle, English.—A superseded unit of luminous intensity = one Int. candle.

Spheradian.—*See* Steradian.

Spherical candlepower, Mean.—*See* Mean spherical candlepower.

Square.—(sq.), (^{2}). Used in conjunction with the name of a unit of length to form the name of a related unit of area; *e.g.*, square foot (sq. ft.), (ft.^{2}) is the name of a unit of area equivalent to the area of a square with edges one foot long.

Square degree.—The solid angle enclosed by a cone of vanishingly small vertex angle 2θ is $k\pi\theta^2$. If θ is expressed in radians and the unit of solid angle is so chosen that $k = 1$, that unit is called a **steradian.** If θ is expressed in degrees, and $k = 1$, the corresponding unit of solid angle is called a **square degree.** One square degree = $(\pi/180)^2$ steradians. This procedure defines a definite unit of solid angle although the solid angles enclosed in cones of finite vertex angles are not proportional to the squares of those angles.

Stefan's constant.—*See* Black body.

Steradian.—The solid angle which encloses on the surface of a concentric sphere an area = (radius)^2.

Stoichiometric.—Pertaining to the ratio of the masses of the several elements contained in a pure chemical compound.

Strain.—1. For pure distortion the strain is measured by the change in a significant angle. 2. The ratio of change in size to original size.

Stress.—The force per unit of area over which it acts.

Surface tension.—(γ). [m/t^2]. Owing to molecular attraction, two fluids in contact adjust themselves so that the area of their interface is a minimum, consistent with other requirements. This adjustment may be pictured as arising from a tension residing in the surface itself; to this is given the name **surface tension.** Its value is defined as the normal, tensile force, per unit of length, across any line traced on the surface.

Susceptibility.—(κ). In the electromagnetic systems of units, $4\pi\kappa$ is the excess of the magnetic permeability of the substance over that of a vacuum.

Synodical.—In astronomy, the synodical period of a body is the interval between its successive returns to the same position with reference to the plane which is perpendicular to the plane of the ecliptic and which continuously passes through the centers of the earth and the sun.

Synonical month.—*See* Lunar month.

Temperature conductivity.—*See* Diffusivity.

Tension, Surface.—*See* Surface tension.

Tenth-meter.—10^{-10} meter; one Ångstrom unit.

Thermal.—*See* Heat.

Thermoelectric power.—*See* Power.

Thomson effect.—In a region in which the temperature of a homogeneous metallic conductor varies from section to section, there exists a potential gradient which is proportional to the product of the temperature and its gradient. This is the Thomson (or Kelvin) thermoelectric effect. The constant of proportionality is called the coefficient of the effect. If the coefficient is positive, a positive electric current flowing from hot section to cooler section tends to make the temperature more uniform; it is as if the current carried heat from hot portion to cooler portion, as if the electricity had a certain specific heat. This is what Thomson called the **specific heat of electricity.** It may be either positive or negative, depending upon the metal.

Time.—**True noon,** or **local true noon,** is the instant at which the sun is bisected by the meridional plane of the observer. **Mean noon,** or **local mean noon,** is the instant at which a fictitious mean sun is bisected by the meridional plane. This **mean sun** is one endowed with such a uniform, apparent angular velocity in the equatorial plane that in one tropical year it will make exactly the same number of apparent revolutions around the earth as are made by the true sun. Time measured from the true noon is called **true, or apparent, solar time;** that from mean noon is called **mean time.** The excess of mean time over true time is called **equation of time.** The earth has been divided into a series of time zones, each 15° of longitude in width, so that intercourse may be facilitated by all places in each zone using the mean time corresponding to the center of the zone; this is known as **standard time.** The first zone is centered on Greenwich, England.

Titer.—*See* Concentration.

Torque.—The moment of a force.

Tropical month.—The yearly average of the time required for the moon to traverse 360° of astronomical longitude.

Twist.—If a uniform bar of free length l be clamped rigidly at one end and the other end be twisted, about the axis of the bar, through an angle θ, the twist of the bar is defined as θ/l. Similarly for other cases.

Units, Systems of.—The fundamental units in most absolute systems are those of mass, length, time, thermometric degree, and the dielectric constant (or the magnetic permeability) of a vacuum. Other units are defined in terms of these by the use of established relations, arbitrary factors being made unity. The most common systems are the centimeter-gram-second-degree Centigrade (cgs), and the foot-pound-second-degree Fahrenheit (fps) systems. *See also* International electric units, practical electric units, and absolute.

Van der Waals.—*See* Waals.

Violle unit.—A superseded unit of luminous intensity based upon the brightness of fused platinum at the temperature of solidification.

Viscosity.—If a fluid is flowing in the plane yz with velocity v it exerts upon an adjacent plane a tangential drag $= \eta(dv)/(dx)$, per unit of area. η is called the **viscosity, coefficient of viscosity, or coefficient of internal friction.** Unit: poise.

Viscosity, Kinematic.—Viscosity divided by density.

Volt.—The electrical potential difference which, when steadily applied to a conductor having a resistance of one ohm, will produce in it a current of one ampere (*cf.* absolute and international units). The Int. Committee authorized by the London Conference, 1908, agreed to regard the emf of the Weston normal cell at 20°C as exactly 1.0183 Int. volts. This furnishes a subsidiary definition which is slightly discordant with the primary one. These tables distinguish between the two, and between units derived from them, by using (a) to denote those based on ampere and ohm, and (v) to denote those based on volt as defined by the Weston cell.

Volt-electronic charge.—Analogous to volt-faraday.

Volt-faraday.—The work which must be done in order to transfer one faraday of positive electricity from any point to another having a potential one volt higher than the former.

Volt-second.—Unit of flux of magnetic induction. The amount defined by the change per second, of the magnetic induction through an area, required to induce around the area an emf of one volt.

Volume, Specific.—Reciprocal of the density.

Waals, Van der.—In the equation $(p + a/v^2)(v - b) = 1 + \alpha t$, a and b are known as Van der Waals' constants; $a[b]$ = pressure [volume] constant.

Watt.—Unit of power; work done at rate of one joule per second.

Watt-hour.—Work expended by one watt in one hour (*cf.* kilowatt-hour).

Wave-length.—(λ). Distance between consecutive corresponding points in a monofrequent wave train. Occasionally applied to complex waves.

Wave number.—Reciprocal of wave-length.

Weight.—The force with which a body, left to itself, is urged towards the earth. In the absolute systems of units it is numerically equal to the mass of the body multiplied by the acceleration of gravity (g) at the position considered; hence varies with position. Such expressions as **gram weight** [**pound weight**] are to be interpreted as meaning the weight of a gram [a pound] at a place where g has the standard value, 980.665 cm/sec.^{2}

Wien's displacement constant.—(w). *See* Black body.

Year.—(yr). Time required for earth to make one complete circuit of its orbit, as defined by its return to the same position as determined by the sun and some celestial point of reference. For the **tropical, equinoctial, or ordinary** year the reference point is the mean vernal equinox; for the **sidereal,** or **true,** year, it is a fixed star; for **anomalistic** year, it is perihelion of earth's orbit; for **eclipse** year, it is ascending node of moon's orbit.

Young's modulus.—If a bar of uniform section be subjected to a longitudinal tension, the ratio of this stress to the resulting elongation per unit of length is called its Young's modulus. Also called **modulus of elasticity, elastic modulus, longitudinal elasticity, coefficient of resistance to extension, modulus of traction.**

ELEMENTS AND ATOMS

ATOMIC WEIGHTS

The values given in column four were compiled for International Critical Tables (I. C. T.) by Prof. G. P. Baxter in 1923 and are those upon which all the data given in International Critical Tables are based.

Following these are shown the accepted atomic weights back to 1882. For the period since 1903 these are taken from the reports of the International Committee on Atomic Weights; for the period 1894 to 1903, from the reports of the American Chemical Society's Committee on Atomic Weights; for the year 1882, from F. W. Clarke's "A Recalculation of the Atomic Weights," reproduced in the first (1883) edition of "Landolt-Börnstein." These 1882 values (to two decimals) are given in parentheses. A date in parentheses indicates the first appearance of the element in the atomic weight table. All the values given are based upon O = 16.000.

Symbol	Atomic number	Name	I. C. T. at. wt.	Atomic weights (1925–1882)
A	18	Argon	39.91	'25, 39.91; '24–'19, 39.9; '18–'11, 39.88; '10–'03, 39.9; '02, 39.96 (1902)
Ac	89	Actinium	?	
Ag	47	Silver	107.880	'25, 107.880; '24–'09, 107.88; '08–'03, 107.93; '02–'94, 107.92 (107.92)
Al	13	Aluminium	26.96	'25, 26.97; '24–'22, 27.0; '21–'00, 27.1; '99–'96, 27.11; '95–'94, 27 (27.08)
As	33	Arsenic	74.96	'25–'10, 74.96; '09–'00, 75.0; '99–'97, 75.01; '96, 75.09; '95–'94, 75.0 (75.09)
Au	79	Gold	197.2	'25–'00, 197.2; '99–'97, 197.23; '96, 197.24; '95–'94, 197.3 (196.61)
B	5	Boron	10.82	'25, 10.82; '24–'19, 10.9; '18–'00, 11.0; '99–'96, 10.95; '95–'94, 11 (10.97)
Ba	56	Barium	137.37	'25–'09, 137.37; '08–'00, 137.40; '99–'94, 137.43 (137.01)
Be	4	Beryllium	9.02	'25, 9.02; '24–'00, 9.1; '99–'96, 9.08; '95–'94, 9 (9.11)
Bi	83	Bismuth	209.00	'25–'22, 209.0; '21–'07, 208.0; '06–'03, 208.5; '02–'00, 208.1; '99–'96, 208.11; '95, 208; '94, 208.9 (208.00)
Br	35	Bromine	79.916	'25, 79.916; '24–'09, 79.92; '08–'03, 79.96; '02–'94, 79.95 (79.95)
C	6	Carbon	12.000	'25, 12.000; '24–'16, 12.005; '15–'98, 12.00; '97–'96, 12.01; '95–'94, 12 (12.00)
Ca	20	Calcium	40.07	'25–'12, 40.07; '11–'09, 40.09; '08–'00, 40.1; '99–'97, 40.07; '96, 40.08; '95–'94, 40 (40.08)
Cb	41	Columbium	93.1	'25–'17, 93.1; '16–'09, 93.5; '08–'03, 94; '02–'00, 93.7; '99–'97, 93.73; '96–'94, 94.0 (94.03)
Cd	48	Cadmium	112.41	'25, 112.41; '24–'09, 112.40; '08–'00, 112.4; '99, 112.38; '98–'97, 111.95; '96, 111.93; '95–'94, 112 (112.09)
Ce	58	Cerium	140.25	'25–'04, 140.25; '03, 140; '02–'00, 139; '99–'98, 139.35; '97–'94, 140.25 (140.75)
Cl	17	Chlorine	35.458	'25, 35.457; '24–'09, 35.46; '08–'94, 35.45 (35.45)
Co	27	Cobalt	58.97	'25, 58.94; '24–'09, 58.97; '08–'00, 59.0; '99–'98, 58.99; '97, 58.93; '96, 58.95; '95, 59.5; '94, 59 (59.02)
Cp	71	Cassiopeium	175.0	*See* Lu
Cr	24	Chromium	52.01	'25, 52.01; '24–'10, 52.0; '09–'00, 52.1; '99–'96, 52.14; '95–'94, 52.1 (52.13)
Cs	55	Cesium	132.81	'25–'09, 132.81; '08–'04, 132.9; '03, 133.0; '02–'00, 132.9; '00–'96, 132.89; '95–'94, 132.9 (132.92)
Ct	72	Celtium		Same as Hf
Cu	29	Copper	63.57	'25–'09, 63.57; '08–'94, 63.6 (63.32)
Ds } Dy	66	Dysprosium	162.52	'25, 162.52; '24–'08, 162.5 (1908)
Em	86	Ra-emanation	222.	*See* Rn
Er	68	Erbium	167.7	'25–'12, 167.7; '11–'09, 167.4; '08–'00, 166.0; '99–'97, 166.32; '96–'94, 166.3 (166.27)
Eu	63	Europium	152.0	'25–'07, 152.0 (1907)
F	9	Fluorine	19.00	'25–'03, 19.0; '02–'00, 19.05; '99–'97, 19.06; '96, 19.03; '95–'94, 19 (19.03)
Fe	26	Iron	55.84	'25–'12, 55.84; '11–'09. 55.85; '08–'01, 55.9; '00, 56.0; '99–'96, 56.02; '95–'94, 56 (56.04)
Ga	31	Gallium	69.72	'25, 69.72; '24–'19, 70.1; '18–'09, 69.9; '08–'00, 70.0; '99–'97, 69.91; '96–'94, 69.0 (68.96)
Gd	64	Gadolinium	157.26	'25, 157.26; '24–'09, 157.3; '08–'03, 156; '02, 156.4; '01–'00, 157.0; '99–'97, 156.76; '96–'94, 156.1

Symbol	Atomic number	Name	I. C. T. at. wt.	Atomic weights (1925–1882)
Ge	32	Germanium	72.38	'25, 72.60; '24–'00, 72.5; '99–'97, 72.48; '96–'94, 72.3
Gl	4	Glucinium	9.02	*See* Be
H	1	Hydrogen	1.0077	'25, 1.0077; '24–'94, 1.008 (1.00)
He	2	Helium	4.00	'25–'16, 4.00; '15–'11, 3.99; '10–'03, 4.0; '02, 3.96 (1902)
Hf	72	Hafnium	178.6	
Hg	80	Mercury	200.61	'25, 200.61; '23–'12, 200.6; '11–'94, 200.0 (200.17)
Ho	67	Holmium	163.4	'25, 163.4; '23–'13, 163.5 (1913)
I (J)	53	Iodine	126.932	'25, 126.932; '24–'09, 126.92; '08–'05, 126.97; '04–'94, 126.85 (126.85)
In	49	Indium	114.8	'25–'09, 114.8; '08–'05, 115; '04–'00, 114; '99–'97, 113.85; '96–'94, 113.7 (113.66)
Ir	77	Iridium	193.1	'25–'09, 193.1; '08–'03, 193.0; '02–'00, 193.1; '99–'96, 193.12; '95–'94, 193.1 (193.09)
K	19	Potassium	39.095	'25, 39.096; '24–'09, 39.10; '08–'03, 39.15; '02–'94, 39.11 (39.11)
Kr	36	Krypton	82.9	'25, 82.9; '24–'11, 82.92; '10, 83.0; '09–'03, 81.8; '02, 81.76 (1902)
La	57	Lanthanum	138.91	'25, 138.90; '24–'09, 139.0; '08–'03, 138.9; '02–'00, 138.6; '99–'97, 138.64; '96, 138.6; '95–'94, 138.2 (138.84)
Li	3	Lithium	6.939	'25, 6.940; '24–'11, 6.94; '10–'09, 7.00; '08–'96, 7.03; '95–'94, 7.02 (7.02)
Lu	71	Lutecium	175.0	'25–'16, 175.0; '15–'09, 174.0 (1909)
Ma	43	Masurium		
Mg	12	Magnesium	24.32	'25–'09, 24.32; '08–'03, 24.36; '02–'00, 24.3; '99–'97, 24.28; '96, 24.29; '95–'94, 24.3 (24.01)
Mn	25	Manganese	54.93	'25–'09, 54.93; '08–'00, 55.0; '99–'96, 54.99; '95–'94, 55 (54.03)
Mo	42	Molybdenum	96.0	'25–'00, 96.0; '99–'97, 95.99; '96, 95.98; '95–'94, 96 (95.75)
N	7	Nitrogen	14.008	'25–'19, 14.008; '18–'07, 14.01; '06–'96, 14.04; '95, 14.05; '94, 14.03 (14.03)
Na	11	Sodium	22.997	'25, 22.997; '24–'09, 23.00; '08–'94, 23.05 (23.05)
Nb	41	Niobium	93.1	*See* Cb
Nd	60	Neodymium	144.27	'25, 144.27; '24–'09, 144.3; '08–'99, 143.6; '98–'97, 140.80; '96–'94, 140.5
Ne	10	Neon	20.2	'25–'09, 20.2; '10–'04, 20.0 (1904)
Ni	28	Nickel	58.69	'25, 58.69; '24–'09, 58.68; '08–'00, 58.7; '99–'96, 58.69; '95–'94, 58.7 (58.06)
Nt	86	Niton	222.	*See* Rn
O	8	Oxygen	16.000	'25–'94, 16.000 (16.00)
Os	76	Osmium	190.8	'25, 190.8; '23–'09, 190.9; '08–'00, 191.0; '99–'96, 190.99; '95–'94, 190.8 (198.95?)
P	15	Phosphorus	31.024	'25, 31.027; '24–'11, 31.04; '10–'00, 31.0; '99–'94, 31.02; '95–'94, 31 (31.03)
Pa	91	Protoactinium	?	
Pb	82	Lead	207.20	'25–'16, 207.20; '15–'09, 207.10; '08–'03, 206.9; '02–'96, 206.92; '95–'94, 206.95 (206.95)
Pd	46	Palladium	106.7	'25–'09, 106.7; '08–'03, 106.5; '02–'00, 107.0; '99–'96, 106.36; '95, 106.5; '94, 106.6 (105.98)
Po	84	Polonium	(210)	
Pr	59	Praseodymium	140.92	'25, 140.92; '24–'16, 140.9; '15–'09, 140.6; '08–'00, 140.5; '99–'97, 143.60; '96–'94, 143.5
Pt	78	Platinum	195.23	'25, 195.23; '24–'11, 195.2; '10–'09, 195.0; '08–'03, 194.8; '02–'00, 194.9; '99–'96, 194.89; '95–'94, 195 (194.87)
Ra	88	Radium	225.95	'25, 225.95; '24–'16, 226; '15–'09, 226.4; '08–'03, 225 (1903)
Rb	37	Rubidium	85.44	'25, 85.44; '24–'09, 85.45; '08–'05, 85.5; '04–'00, 85.4; '99–'96, 85.43; '95–'94, 85.5 (85.53)
Re	75	Rhenium		
Rh	45	Rhodium	102.91	'25, 102.91; '24–'09, 102.9; '08–'00, 103.0; '99–'96, 103.01; '95–'94, 103 (104.29)
Rn	86	Radon	222.	'25, 222; '24–'12, 222.4 (1912)
Ru	44	Ruthenium	101.7	'25–'00, 101.7; '99–'96, 101.68; '95–'94, 101.6 (104.46?)
S	16	Sulfur	32.065	'25, 32.065; '24–'16, 32.06; '15–'09, 32.07; '08–'03, 32.06; '02–'96, 32.07; '95–'94, 32.06 (32.06)
Sa	62	Samarium	150.43	'25, 150.43; '24–'09, 150.4; '08–'05, 150.3;

Symbol	Atomic number	Name	I. C. T. at. wt.	Atomic weights (1925–1882)
Sa	62	Samarium	150.43	'04–'03, 150; '02–'00, 150.3; '99–'97, 150.26; '96–'94, 150.0
Sb	51	Antimony	121.77	'25, 121.77; '24–'03, 120.2; '02–'00, 120.4; '99–'96, 120.43; '95–'94, 120 (120.23)
Sc	21	Scandium	45.10	'25–'21, 45.10; '20–'00, 44.1; '99–'97, 44.12; '96–'94, 44.0 (44.08)
Se	34	Selenium	79.2	'25–'00, 79.2; '99, 79.17; '98–'97, 79.02; '96–'94, 79.0 (78.98)
Si	14	Silicon	28.06	'25, 28.06; '24–'22, 28.1; '21–'09, 28.3; '08–'94, 28.4 (28.26)
Sm	62	Samarium	150.43	*See* Sa
Sn	50	Tin	118.70	'25–'16, 118.70; '15–'00, 119.0; '99–'96, 119.05; '95–'94, 119 (117.97)
Sr	38	Strontium	87.62	'25–'11, 87.63; '10–'09, 87.62; '08–'00, 87.6; '99–'96, 87.61; '95, 87.66; '94, 87.6 (87.58)
Ta	73	Tantalum	181.5	'25–'10, 181.5; '11–'07, 181.0; '06–03, 183; '02–'00, 182.8; '99–'97, 182.84; '96–'94, 182.6 (182.56)
Tb	65	Terbium	159.2	'25–'07, 159.2; '06–'94, 160
Te	52	Tellurium	127.5	'25–'09, 127.5; '08–'03, 127.6; '02, 127.7; '01–'00, 127.5; '99–'97, 127.49; '96, 127; '95–'94, 125 (128.252)
Th	90	Thorium	232.15	'25–'19, 232.15; '18–'11, 232.4; '10–'09, 232.42; '08–'03, 232.5; '02–'00, 232.6; '99–'96, 232.63; '95–'94, 232.6 (233.95)
Ti	22	Titanium	47.9	'25–'03, 48.1; '02–'96, 48.15; '95–'94, 48 (49.96?)
Tl	81	Thallium	204.4	'25, 204.39; '24–'09, 204.0; '08–'03, 204.1; '02–'96, 204.15; '95–'94, 204.18 (204.18)
Tm } Tu }	69	Thulium	169.4	'25, 169.4; '24–'22, 169.9; '21–'09, 168.5; '08–'03, 171; '02–'94, 170.7
U	92	Uranium	238.17	'25, 238.17; '24–'16, 238.2; '15–'03, 238.5; '02–'00, 239.6; '99–'96, 239.59; '95–'94, 239.6 (239.03)
UX_2	91	Uranium-X_2	(234)	Isotope of Pa
V	23	Vanadium	50.96	'25, 50.96; '24–'12, 51.0; '11, 51.06; '10–'03, 51.2; '02–'00, 51.4; '99–'96, 51.38; '95–'94, 51.4 (51.37)
W	74	Tungsten	184.0	'25–'00, 184.0; '99–'97, 184.83; '96, 184.84; '95, 184.9; '94, 184 (184.03)
Xe	54	Xenon	130.2	'25–'11, 130.2; '10, 130.7; '09–'02, 128 (1902)
Y } Yt }	39	Yttrium	89.0	'25, 88.9; '24–'19, 89.33; '18–'16, 88.7; '15–'00, 89.0; '99–'97, 89.02; '96, 88.95; '95–'94, 89.1 (90.02?)
Yb	70	Ytterbium	173.6	'25, 173.6; '24–'16, 173.5; '15–'09, 172.0; '08–'03, 173; '02–'00, 173.2; '99–'97, 173.19; '96–'94, 173.0 (173.16)
Zn	30	Zinc	65.38	'25, 65.38; '24–'10, 65.37; '09, 65.7; '08–'00, 65.4; '99–'96, 65.41; '95–'94, 65.3 (65.05)
Zr	40	Zirconium	91.	'25, 91; '24–'09, 90.6; '01–'97, 90.4; '96–'94, 90.6 (89.57)

TABLE OF ISOTOPES

F. W. Aston

Element	Atomic number	I. C. T. atomic weight	Minimum number of isotopes	Mass numbers in order of the intensities of the mass-spectrum lines	Lit.
A	18	39.91	2	40, 36	(3, 5, 21)
Ag	47	107.880	2	107, 109	(15, 26)
Al	13	26.96	1	27	(10)
As	33	74.96	1	75	(4, 22)
B	5	10.82	2	11, 10	(4, 22)
Ba	56	137.37	1	138, **136**	(17, 18)
Be	4	9.02	1	9	(33)
Bi	83	209.00	1	209	(19)
Br	35	79.916	2	79, 81	(4, 22)
C	6	12.000	1	12	(2, 21)
Ca	20	40.07	2	40, 44	(31, 32)
Cd	48	112.41	6	110, 111, 112, 113, 114, 116	(19)
Ce	58	140.25	2	140, 142	(18)
Cl	17	35.458	2	35, 37	(2, 21, 23)
Co	27	58.97	1	59	(15, 26)
Cr	24	52.01	1	52	(15, 26)
Cs	55	132.81	1	133	(6, 24)
Cu	29	63.57	2	63, 65	(14, 26)
F	9	19.00	1	19	(4, 22)
Fe	26	55.84	2	56, 54	(9, 17)
Ga	31	69.72	2	69, 71	(15, 26)
Ge	32	72.38	3	74, 72, 70	(13, 26)
Gl	4	9.02	1	9	(33)
H	1	1.0077	1	1	(3, 21)
He	2	4.00	1	4	(3, 21)
Hg	80	200.61	2,6	**197–200**, 202, 204	(2, 3, 21)
I	53	126.932	1	127	(5, 23)
In	49	114.8	1	115	(16)
K	19	39.095	2	39, 41	(6, 24)
Kr	36	82.9	6	84, 86, 82, 83, 80, 78	(3, 21)
La	57	138.91	1	139	(17)

Continued on p. 47.

PERIODIC CHART OF THE ELEMENTS WITH ATOMIC NUMBERS AND ATOMIC WEIGHTS

I	II	III	IV	V	VI	VII	VIII or 0			
1 H 1.0077							2 He 4.00			
3 Li 6.939	4 Be 9.02	5 B 10.82	6 C 12.00	7 N 14.008	8 O 16.000	9 F 19.00	10 Ne 20.2			
11 Na 22.997	12 Mg 24.32	13 Al 26.96	14 Si 28.06	15 P 31.024	16 S 32.065	17 Cl 35.458	18 A 39.91			
19 K 39.095	20 Ca 40.07	21 Sc 45.10	22 Ti 47.9	23 V 50.96	24 Cr 52.01	25 Mn 54.93		26 Fe 55.84	27 Co 58.97	28 Ni 58.69
29 Cu 63.57	30 Zn 65.38	31 Ga 69.72	32 Ge 72.38	33 As 74.96	34 Se 79.2	35 Br 79.916	36 Kr 82.9			
37 Rb 85.44	38 Sr 87.62	39 Yt 89.0	40 Zr 91	41 Cb 93.1	42 Mo 96.0	43 Ma		44 Ru 101.7	45 Rh 102.91	46 Pd 106.7
47 Ag 107.880	48 Cd 112.41	49 In 114.8	50 Sn 118.70	51 Sb 121.77	52 Te 127.5	53 I 126.932	54 Xe 130.2			
55 Cs 132.81	56 Ba 137.37	★ 57 La 138.91	72 Hf (178.6)	73 Ta 181.5	74 W 184.0	75 Re		76 Os 190.8	77 Ir 193.1	78 Pt 195.23
79 Au 197.2	80 Hg 200.61	81 Tl 204.4	82 Pb 207.20	83 Bi 209.00	84 Po (210)	85	86 Rn 222			
87	88 Ra 225.95	89 Ac	90 Th 232.15	91 Pa	92 U 238.17					

★			
★	57 La 138.91	58 Ce 140.25	59 Pr 140.92
60 Nd 144.27	61	62 Sa 150.43	63 Eu 152.0
64 Gd 157.26	65 Tb 159.2	66 Dy 162.52	67 Ho 163.4
68 Er 167.7	69 Tu 169.4	70 Yb 173.6	71 Lu 175.0

★ Indicates rare earths. See above

THE RADIOACTIVE ELEMENTS

FREDERICK SODDY

α – ray ⟵ ⟶ β – ray (or rayless)

Group	III	IV	V	VI	VII	VIII or 0	I	II	III	IV	V	VI
Principal element	Tl	Pb	Bi	Po	—	Rn	—	Ra	Ac	Th	Pa	U
Atomic number	81	82	83	84	85	86	87	88	89	90	91	92

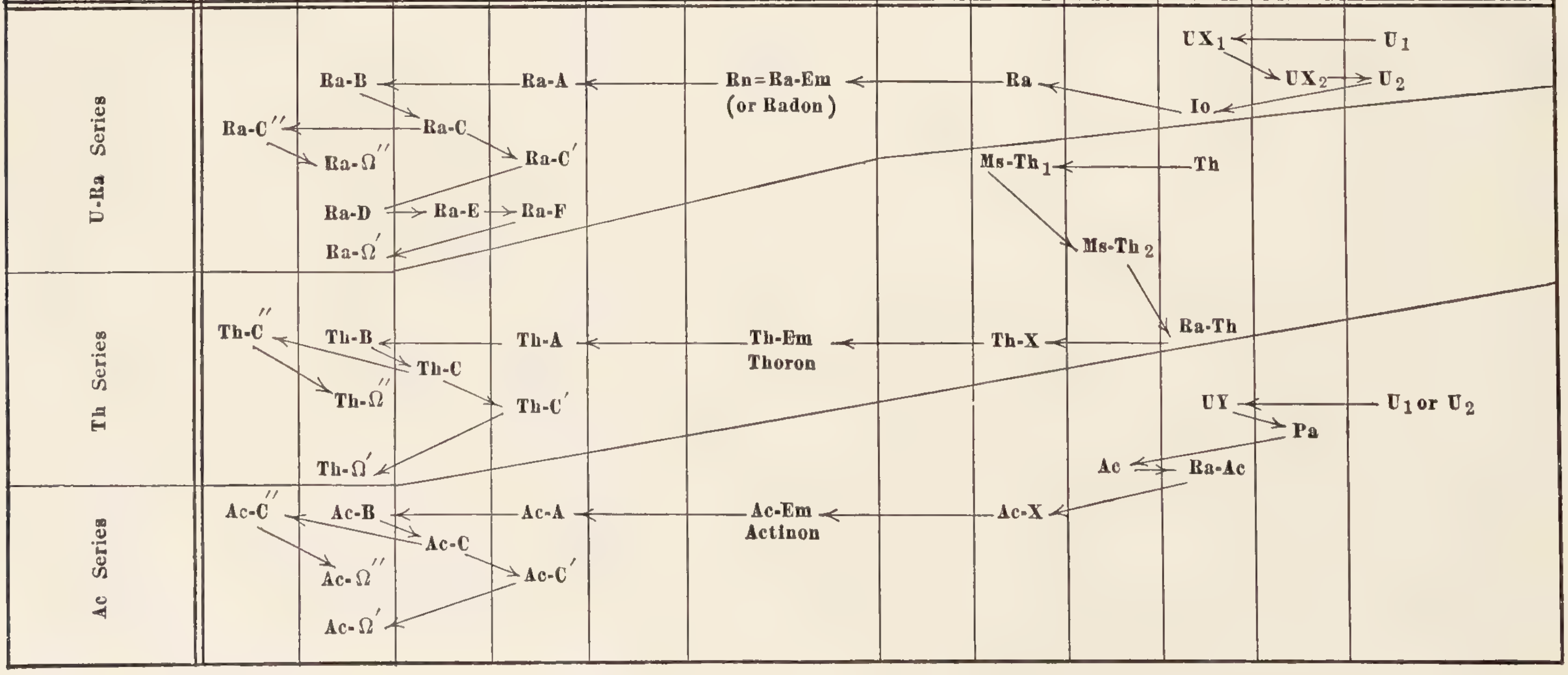

TABLE OF ISOTOPES.—*Continued*

Element	Atomic number	I. C. T. atomic weight	Minimum number of isotopes	Mass numbers in order of the intensities of the mass-spectrum lines	Lit.
Li	3	6.939	2	7, 6	(24, 27, 29, 30)
Mg	12	24.32	3	24, 25, 26	(28, 30)
Mn	25	54.93	1	55	(15, 26)
N	7	14.008	1	14	(3, 21)
Na	11	22.997	1	23	(6, 24)
Nd	60	144.27	3	142, 144, 146, 145	(17, 18)
Ne	10	20.2	2	20, 22	(1, 20, 21)
Ni	28	58.69	2	58, 60	(7)
O	8	16.000	1	16	(2, 21)
P	15	31.024	1	31	(4, 22)
Pr	59	140.92	1	141	(17)
Rb	37	85.44	2	85, 87	(6, 24)
S	16	32.065	1	32	(4, 22)
Sb	51	121.77	2	121, 123	(11, 25)
Sc	21	45.10	1	45	(15, 26)
Se	34	79.2	6	80, 78, 76, 82, 77, 74	(10)
Si	14	28.06	3	28, 29, 30	(4, 18, 22)
Sn	50	118.70	7,8	120, 118, 116, 124, 119, 117, 122, 121	(8)
Sr	38	87.62	2	88, 86	(15, 17, 26)
Te	52	127.5	3	128, 130, 126	(19)
Ti	22	47.9	1	48	(15, 26)
V	23	50.96	1	51	(15, 26)
Xe	54	130.2	7,9	129, 132, 131, 134, 136, 128, 130, 126, 124	(3, 5, 10, 21, 23)
Yt	39	89.0	1	89	(15, 26)
Zn	30	65.38	4	64, 66, 68, 70	(31)
Zr	40	91	3	90, 94, 92	(18)

LITERATURE

(For a key to the periodicals see end of volume)

(1) Aston, *58*, **104**: 334; 19. (2) *Ibid.*, **104**: 393; 19. (3) *Ibid.*, **105**: 8; 20. (4) *Ibid.*, **105**: 547; 20. (5) *Ibid.*, **106**: 468; 20. (6) *Ibid.*, **107**: 72; 21. (7) *Ibid.*, **107**: 520; 21. (8) *Ibid.*, **109**: 813; 22. (9) *Ibid.*, **110**: 312; 22.
(10) Aston, *58*, **110**: 664; 22. (11) *Ibid.*, **110**: 732; 22. (12) *Ibid.*, **111**: 739; 23. (13) *Ibid.*, **111**: 771; 23. (14) *Ibid.*, **112**: 162; 23. (15) *Ibid.*, **112**: 449; 23. (16) *Ibid.*, **113**: 192; 24. (17) *Ibid.*, **113**: 856; 24. (18) *Ibid.*, **114**: 273; 24. (19) *Ibid.*, **114**: 717; 24.
(20) Aston, *3*, **39**: 449; 20. (21) *Ibid.*, **39**: 611; 20. (22) *Ibid.*, **40**: 628; 20. (23) *Ibid.*, **42**: 140; 21. (24) *Ibid.*, **42**: 436; 21. (25) *Ibid.*, **45**: 924; 23. (26) *Ibid.*, **47**: 385; 24. (27) Aston and Thomson, *58*, **106**: 827; 21. (28) Dempster, *166*, **52**: 559; 20. (29) Dempster, *166*, **53**: 363; 21.
(30) Dempster, *2*, **18**: 415; 21. (31) *Ibid.*, **19**: 431; 22. (32) *Ibid.*, **20**: 631; 22. (33) Thomson, *3*, **42**: 837; 21.

THE STRUCTURE OF THE ISOLATED ATOM

(Symbols, p. 50)

H. A. Kramers

According to the fundamental postulates of Bohr's atomic theory, a series of discrete "stationary states" has to be correlated with each atom. A definite "energy-content" can be assigned to every state, and an atom in a given state can change its energy only by performing a process of "transition" to another state. The emission of a spectral line of frequency ν is correlated with a spontaneous transition from a stationary state of energy content E_1 to another of energy content E_2 by equation (1)

$$\nu = \frac{1}{\mathbf{h}}(E_1 - E_2) \tag{1}$$

The stationary state with the smallest energy is termed the "normal state" of the atom. The properties of the stationary states can, to a considerable extent, be accounted for by assuming that the electrons surrounding the nucleus have definite motions, characterized by integral values of certain quantities. These integers are called the "quantum numbers" of the stationary state in question; by their values the energy of the state is completely fixed. For general treatment of the subject, see (1, 3, 4, 10, 11, 18).

Of special interest are the recent attempts (21) to develop a rational "quantum mechanics" of the atom. This work clearly demonstrates the limited applicability of a picture of atomic structure, in which the behavior of the electrons inside the atom is visualized by orbits possessing definite kinematical properties.

Atoms Containing One Electron.—Only for atoms containing a single electron, can a fairly complete description of the electronic motion in the stationary state, and of the significance of the quantum numbers be given. The motion of the electron obeys quite approximately the laws of electrodynamics, and can be described as a Keplerian elliptic motion, with the centre of gravity of the nucleus and the electron in one focus. On this motion, a slow uniform precession in the plane of motion is superposed (effect of variability of mass or "relativity-effect"). Two quantum numbers (n, k) define the stationary states $(n, k = 1, 2, 3 \ . \ . \ .; k \leq n)$, k/n being the ratio of the minor to the major axis of the ellipse. The states are denoted by the symbol n_k.

In the **normal state**, $1_1(n = k = 1)$, the orbit is circular; and, omitting the correction due to the relativity effect, its constants are given by equations (2)

$$a_1 = \frac{1}{Z}\cdot\frac{\mathbf{h}^2}{4\pi^2\mathbf{e}^2\mathbf{m}_0} = \frac{r_1}{Z} = \frac{0.53}{Z} \times 10^{-8}\ \mathrm{cm}$$

$$\omega_1 = \frac{Z^2}{1 + \frac{\mathbf{m}_0}{M}} \times \frac{4\pi^2\mathbf{e}^4\mathbf{m}_0}{\mathbf{h}^3} = \frac{2\nu_\infty Z^2}{1 + \frac{\mathbf{m}_0}{M}} = \frac{6.6Z^2}{1 + \frac{\mathbf{m}_0}{M}} \times 10^{15}\ \mathrm{sec}^{-1} \tag{2}$$

$$W_1 = \frac{Z^2}{1 + \frac{\mathbf{m}_0}{M}} \times \frac{2\pi^2\mathbf{e}^4\mathbf{m}_0}{\mathbf{h}^2} = \frac{Z^2\nu_\infty\mathbf{h}}{1 + \frac{\mathbf{m}_0}{M}} = \frac{2.15Z^2}{1 + \frac{\mathbf{m}_0}{M}} \times 10^{-11}\ \mathrm{erg.}$$

In **higher quantum states**, the orbital constants are, with the same approximation, given by (3, 4):

$$a_n = n^2a_1 = \frac{n^2}{Z}r_1$$

$$\omega_n = \frac{\omega_1}{n^3} = \frac{2Z^2\nu_\infty}{n^3\left(1 + \frac{\mathbf{m}_0}{M}\right)} \tag{3}$$

$$W_n = \frac{W_1}{n^2} = \frac{Z^2\nu_\infty\mathbf{h}}{n^2\left(1 + \frac{\mathbf{m}_0}{M}\right)}$$

$$b_{n,k} = nka_1 = \frac{nkr_1}{Z};\ p_k = k^2a_1 = \frac{k^2r_1}{Z} \tag{4}$$

The number of revolutions corresponding to one rotation of the major axis, is, to a first approximation, given by (5):

$$\frac{\omega_n}{\sigma_{n,k}} = \frac{k^2}{Z^2} \times \frac{2}{\alpha^2} = \frac{k^2}{Z^2} \times 37{,}700 \tag{5}$$

$$\left(\alpha = \frac{2\pi\mathbf{e}^2}{\mathbf{hc}} = 7.30 \times 10^{-3} \cong \frac{1}{137};\ \alpha^2 = 5.31 \times 10^{-5}\right)$$

The exact energy formula, neglecting terms containing $\mathbf{m}_0/M$, is given by (6):

$$W_{n,k} = \mathbf{m}_0\mathbf{c}^2\left[\left\{1 + \left(\frac{\alpha Z}{n - k + \sqrt{k^2 - \alpha^2Z^2}}\right)^2\right\}^{-1/2} - 1\right] \tag{6}$$

$$= \frac{Z^2}{n^2} \times \frac{2\pi^2\mathbf{e}^4\mathbf{m}_0}{\mathbf{h}^2}\left\{1 + \alpha^2Z^2\left(\frac{1}{kn} - \frac{3}{4n^2}\right) + \ . \ . \ . \right\}$$

(For general formula for W, including terms in $\mathbf{m}_0/M$, see (9).) Figure 1 illustrates the stationary states in the hydrogen atom for which $n = 1, 2, 3, 4$. The arrows indicate the transitions giving rise to the fine-structure components of the spectral lines, H_α and H_β. The numerical constants for these states are given in Table 1.

TABLE 1.—HYDROGEN ORBITS; $r_1 = 5.286 \times 10^{-9}$ cm ([11])

n_k	a/r_1	b/r_1	p/r_1	$\omega \times 10^{-14}$	$\sigma \times 10^{-8}$	ω/σ
1_1	1	1	1	65.78	1746	37 700
2_1	4	2	1	8.222	218.3	37 700
2_2	4	4	4	8.222	54.57	150 700
3_1	9	3	1	2.436	64.68	37 700
3_2	9	6	4	2.436	16.17	150 700
3_3	9	9	9	2.436	7.187	339 300
4_1	16	4	1	1.029	27.29	37 700
4_2	16	8	4	1.029	6.822	150 800
4_3	16	12	9	1.029	3.032	339 300
4_4	16	16	16	1.029	1.705	603 200

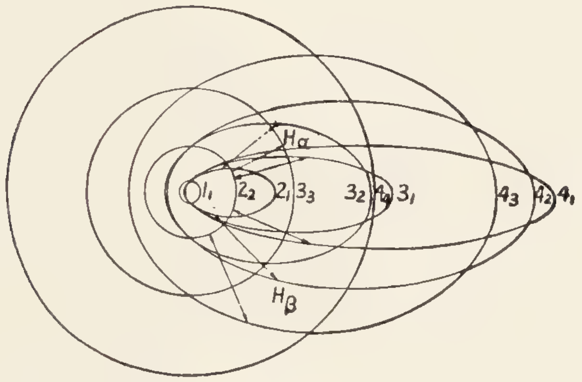

FIG. 1.—Orbits in hydrogen to $n = 4$. (*Reproduced by permission from The Journal of the Franklin Institute.*)

Atoms Containing More than One Electron.—A complete theory of stationary states is lacking. Many properties of these states can be accounted for, however, on the basis of the principles applied to atoms containing one electron. As a first approximation, each electron may be considered as moving in a central field of force due to the nucleus and the other electrons, its motion being characterized by a "principal quantum number" n and a "subordinate quantum number" k. The electronic orbit can be described as a plane periodic orbit on which a uniform precession in the plane is superposed ("central orbit" *cf.* Fig. 2).

If the position of the electron in the orbital plane is defined by polar coordinate (r, φ), the quantum numbers are defined by Sommerfeld's quantum conditions (7)

$$k = \frac{2\pi \mathbf{m}_0 \beta r^2}{\mathbf{h}} \frac{d\phi}{dt} = \frac{2\pi P}{\mathbf{h}} \qquad (n - k) = \frac{1}{\mathbf{h}} \oint \mathbf{m}_0 \beta \left(\frac{dr}{dt}\right)^2 dt \quad (7)$$

where the factor β becomes equal to 1 if the relativity effect is neglected. P is equal to the angular momentum of the electron with respect to the nucleus; the integral has to be taken over a complete period of the radial motion, from A to B (Fig. 2).

In the normal state the electrons are distributed in groups, each of which is characterized by its quantum numbers (n, k). On passing from the nucleus to the surface of the atom, the successive groups correspond to successive integral values of the main quantum number n ("n-quantum group"), the innermost group being characterized by $n = 1$; each group is divided into subgroups corresponding to the different values which k may take. The possibility of reconciling such a picture with the dynamical properties of quantized central orbits is closely connected with the fact that in an orbit for which $k < n$ the electron will, in each revolution, dive into and leave again all regions occupied by electronic orbits for which the principal quantum number is smaller than n but equal to or greater than k (conception of "penetrating orbits").

The maximum number of electrons which an n-quantum group can contain is equal to $2n^2$. If it contains this number, it contains sub-groups corresponding to all possible values for k ($k = 1, 2 \ldots n$), and it is said to be a **"finally completed"** group. If a group, due to the dynamical properties of the atom under consideration, contains only sub-groups corresponding to $k = 1$,

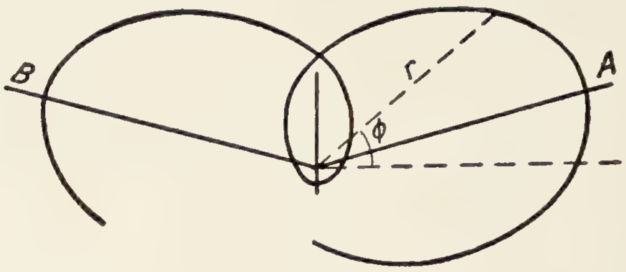

FIG. 2.—Central orbit.

$2 \ldots k_0$ $(k_0 < n)$ it will be in a state which is termed **"provisionally completed,"** if it contains $2k_0^2$ electrons. For example, the 4-quantum group has reached the state of a 2-group ($k_0 = 1$) in Ca (20), the state of an 8-group or 8-shell ($k_0 = 2$) in Kr (36), the state of an 18-group or 18-shell ($k_0 = 3$) in Ag (47), and its final state of a completed 32-group or 32-shell ($k_0 = 4$) in Lu (71). With the exception of the 2-groups it seems impossible to assign definite values to the number of electrons in the several sub-groups of a provisionally, or finally, completed group; in fact, the actual properties of the electronic groups seem to show that the simple conception of central orbits characterized by the symbol n_k is essentially insufficient for their description. (Originally Bohr assumed that a group of $2k_0^2$ electrons contained $2k_0$ electrons in each sub-group.) Closely connected herewith is the impossibility of assigning definite spatial arrangements to the orbits belonging to one and the same group. In Table 2 the number of electrons in each group is given as far as the theory allows of a definite statement; those in parentheses are uncertain.

From calculations based on Sommerfeld's quantum conditions and certain simplifying assumptions, a rough estimate of the dimensions of the different types of orbits may be made. Such estimates for neutral atoms and for positive ions containing only finally, or provisionally, completed groups are schematically represented in Fig. 3. The small vertical lines are so drawn that their distances from the dot at the left are proportional to the radius of the sphere inside which the electrons belonging to the respective groups are moving. The symbols $g\ (n_{1,2 \ldots k_0})$ means that the corresponding groups contain g electronic orbits of principal quantum number n, and of subordinate quantum numbers from 1 to k_0.

For the calculation of the dimensions of the outermost groups it has been necessary to consider also experimental data relative to the effective gas-kinetic radii of the atoms of the inert gases, the effective radii of ions in crystals, ionic refraction, etc. As a rule the effective radii are 1.5 to 2.5 times larger than the orbital dimensions. As regards the inner groups, the estimate is rather accurate; for the outer groups, errors of the order of 10% might be expected Special mention must be made of the uncertainty in the radius of the 5-quantum group for elements heavier than barium; the radii of this group as given in Fig. 3 for the elements (72), 79, 80, 81, 82 are perhaps some 10% too high, as compared with radii of the homologous elements 47, 48, 49, 50.

For atoms containing only one electron in the outermost group, the dimensions of the orbit of this electron, and its frequency of revolution can with considerable accuracy be derived from the

TABLE 2

	1_1	2_1 2_2	3_1 3_2 3_3	4_1 4_2 4_3 4_4	5_1 5_2 5_3 5_4 5_5	6_1 6_2 6_3 6_4 6_5 6_6	7_1 7_2
1 H	1						
2 He	2						
3 Li	2	1					
4 Be	2	2					
5 B	2	2 1					
6 C	2	2 (2)					
— —	—	— —					
10 Ne	2	8					
11 Na	2	8	1				
12 Mg	2	8	2				
13 Al	2	8	2 1				
14 Si	2	8	2 (2)				
— —	—	— —	— —				
18 A	2	8	8				
19 K	2	8	8	1			
20 Ca	2	8	8	2			
21 Sc	2	8	8 1	(2)			
22 Ti	2	8	8 2	(2)			
— —	—	— —	— — —	—			
29 Cu	2	8	18	1			
30 Zn	2	8	18	2			
31 Ga	2	8	18	2 1			
— —	—	— —	— — —	— —			
36 Kr	2	8	18	8			
37 Rb	2	8	18	8	1		
38 Sr	2	8	18	8	2		
39 Y	2	8	18	8 1	(2)		
40 Zr	2	8	18	8 2	(2)		
— —	—	— —	— — —	— — —	—		
47 Ag	2	8	18	18	1		
48 Cd	2	8	18	18	2		
49 In	2	8	18	18	2 1		
— —	—	— —	— — —	— — —	— —		
54 X	8	8	18	18	8		
55 Cs	2	8	18	18	8	1	
56 Ba	2	8	18	18	8	2	
57 La	2	8	18	18	8 1	(2)	
58 Ce	2	8	18	18 1	8 1	(2)	
59 Pr	2	8	18	18 2	8 1	(2)	
— —	—	— —	— — —	— — — —	— — —	—	
71 Lu	2	8	18	32	8 1	(2)	
72 Hf	2	8	18	32	8 2	(2)	
— —	—	— —	— — —	— — — —	— — —	—	
79 Au	2	8	18	32	18	1	
80 Hg	2	8	18	32	18	2	
81 Tl	2	8	18	32	18	2 1	
— —	—	— —	— — —	— — — —	— — —	— —	
86 Rn	2	8	18	32	18	8	
87 —	2	8	18	32	18	8	1
88 Ra	2	8	18	32	18	8	2
89 Ac	2	8	18	32	18	8 1	(2)
90 Th	2	8	18	32	18	8 2	(2)
— —	—	— —	— — —	— — — —	— — —	— — —	—
— —	—	— —	— — —	— — — —	— — — —	— — —	—
[118 —	2	8	18	32	32	18	8]

frequency of the lowest frequency term in the corresponding spectral series, provided we may adhere to the simple central orbit model. Figure 4 contains a schematic picture of the orbits of the outer electron in the normal state of neutral atoms of the alkali metals, and of Cu, Ag, Au. They are all penetrating orbits, since they correspond to $k = 1$. The regions inside which the electrons of the completed groups are moving are designated by circles. The atoms of the inert gases are added for the sake of comparison. The numbers at the left of the nucleus indicate the number of electrons contained in each group; the symbols $n_{1,2}$ . . . at the right indicate the quantum numbers of the orbits contained in each group.

[For detailed calculations of electronic orbits, based on simplifying assumptions, see ([12, 13, 20]) (Cs and U); the work is semi-empirical. For detailed calculations on purely theoretical basis, see ([15]) (Ne, Na, Mg^+, Al^{++}, Si^{+++}, P^{++++}) and ([16]) (alkali metals); in Lindsay's work, the radii of outer groups in K^+, Rb^+, and Cs^+ seem too large, probably on account of inadequacy of assumptions regarding numbers of electrons in sub-groups, as well as of the simplifying assumptions made. For critical review of work on effective atomic radii, see ([14]) and for recent work ([8]). There is no simple direct connection between effective atomic radii and the magnitude of the space occupied by electronic orbits.]

In experiments on optical and X-ray spectra, we meet neutral atoms or atomic ions in **higher quantum states.** Several features of these states can be described on the simple central orbit model. In the case of "single excitation" all electronic orbits except one remain normal, and the other electron describes an orbit with quantum numbers which differ from those of the normal state. "Double excitation" corresponds to two electrons describing orbits different from those in the normal state, etc. We will here consider only singly-excited states.

In the stationary states (energy levels) involved in the emission of the ordinary X-ray spectra, one electron in the inner groups of the atom is lacking. In the states involved in the emission of the ordinary series-spectra, one electron belonging to the outermost group of the atom, the "series electron," moves in a central n_k orbit the dimensions of which are large as compared with those of the rest of the atom. It may move either quite outside the atomic residue or it may penetrate into it in each revolution.

As a first approximation, a non-penetrating orbit may be described as a Keplerian elliptical orbit performing a uniform precession in its plane, the shape of the ellipse being very nearly that of an n_k-orbit in an atom containing only one electron and having a nuclear charge Z^*e equal to the net-charge of the atomic residue. If the electron orbit is of the penetrating type, it may, as a first approximation, be described as a set of congruent outer Keplerian elliptical loops, connected by congruent inner loops, the angular distance between successive loops being the same. The semi-major axis, the semi-parameter p, and the semi-minor axis b of the outer loop can be found from the value of the corresponding spectral term (T) by means of the formulae

$$a = \frac{Z^*Nr_1}{T} \qquad p = \frac{k^2}{Z^*}r_1 \qquad b = \sqrt{ap} \qquad (8)$$

where $N\left(= \frac{\nu_\infty}{c} \times \frac{1}{1 + m_0/M}\right)$ is the Rydberg constant for the element in question, and Z^*e is the net-charge of the atomic residue. If we introduce the effective quantum number n^* ($n^{*2} = Z^{*2}N/T$), these formulae may be written:

$$a = \frac{n^{*2}}{Z^*}r_1 \qquad p = \frac{k^2}{Z^*}r_1 \qquad b = \frac{n^*k}{Z^*}r_1 \qquad (9)$$

The greater the ratio n^*/k (or a/b) the closer the approximation to which this description of the outer loops may be considered to hold. The maximum distance of the electron from the nucleus is equal to $a + \sqrt{a^2 - b^2}$, or very nearly equal to $2a - \frac{1}{2}p$.

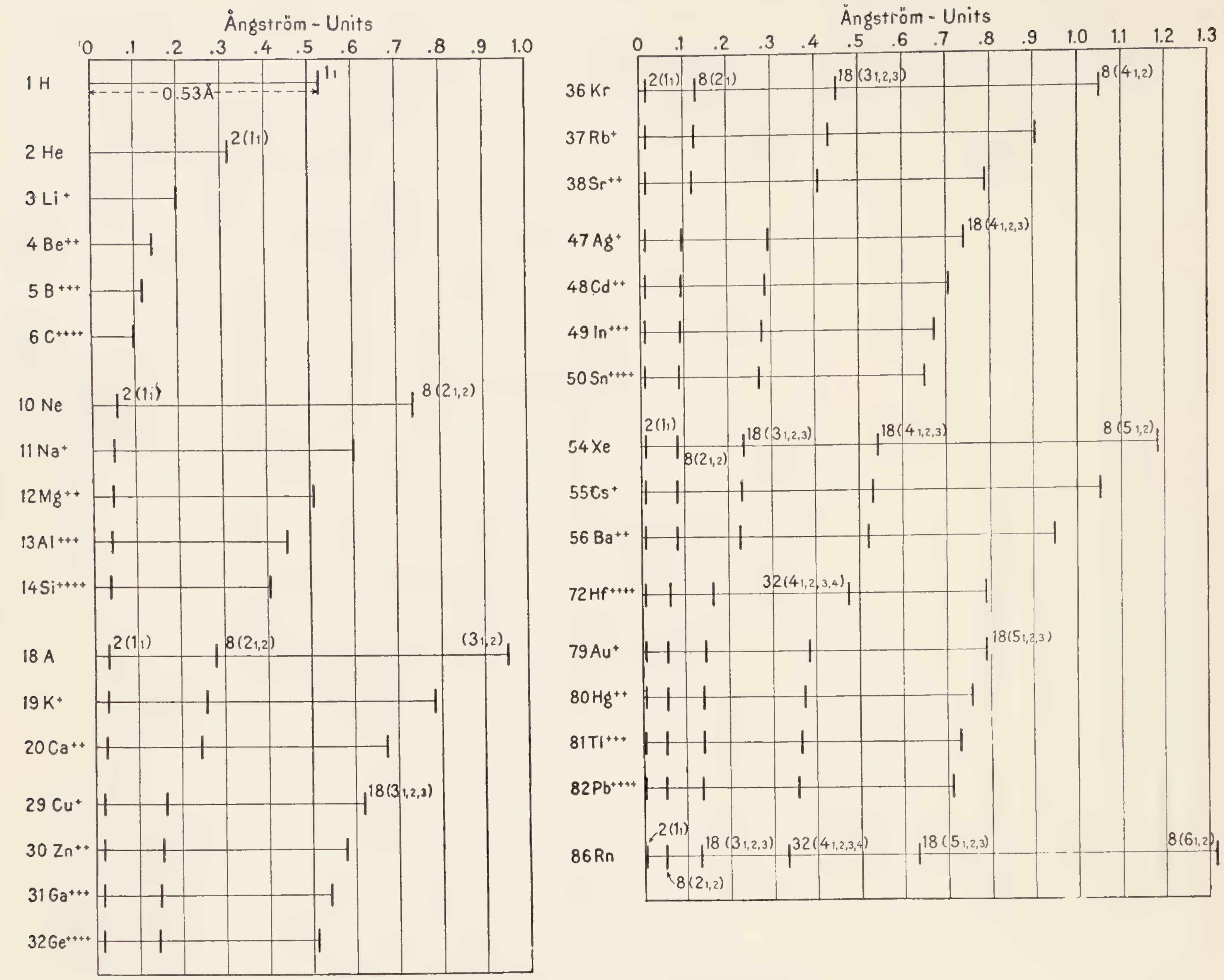

FIG. 3.—Maximum elongations of electrons of several groups.

The values to be assigned to the precessional frequency characterizing the penetrating central orbits are very uncertain. For the alkali elements, the ratio ω/σ for the n_1 orbits probably lies between 0.3 and 0.5, for the n_2 orbits (except lithium) between 0.5 and 1.0. Based on the above formulae, an illustration of the shapes of the orbits of the series electron corresponding to the stationary states of the K-atom, is given in Fig. 5. [For connection between spectra and the group structure of atoms, see (6, 5); for spectra and central field of force, see (12, 13); for series spectra and electronic orbits, see (2, 7); for recent development of formal theory of electronic groups, see (17, 19)].

SYMBOLS

The symbols **c**, **e**, **h**, $\mathbf{m}_0$, λ have their usual significance (see p. 16); others which occur more than once are:

a_n Semi-major axis of electronic orbit, state n.
$b_{n,k}$ Semi-minor axis of electronic orbit, state n, k.
k Subordinate, or azimuthal, quantum number defining a stationary state.
M Nuclear mass.
n Principal quantum number defining a stationary state.

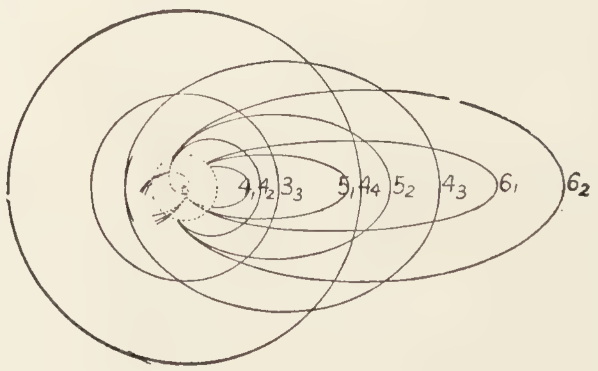

FIG. 5. —Orbits of the series electron of potassium. (*Reproduced by permission from The Journal of the Franklin Institute.*)

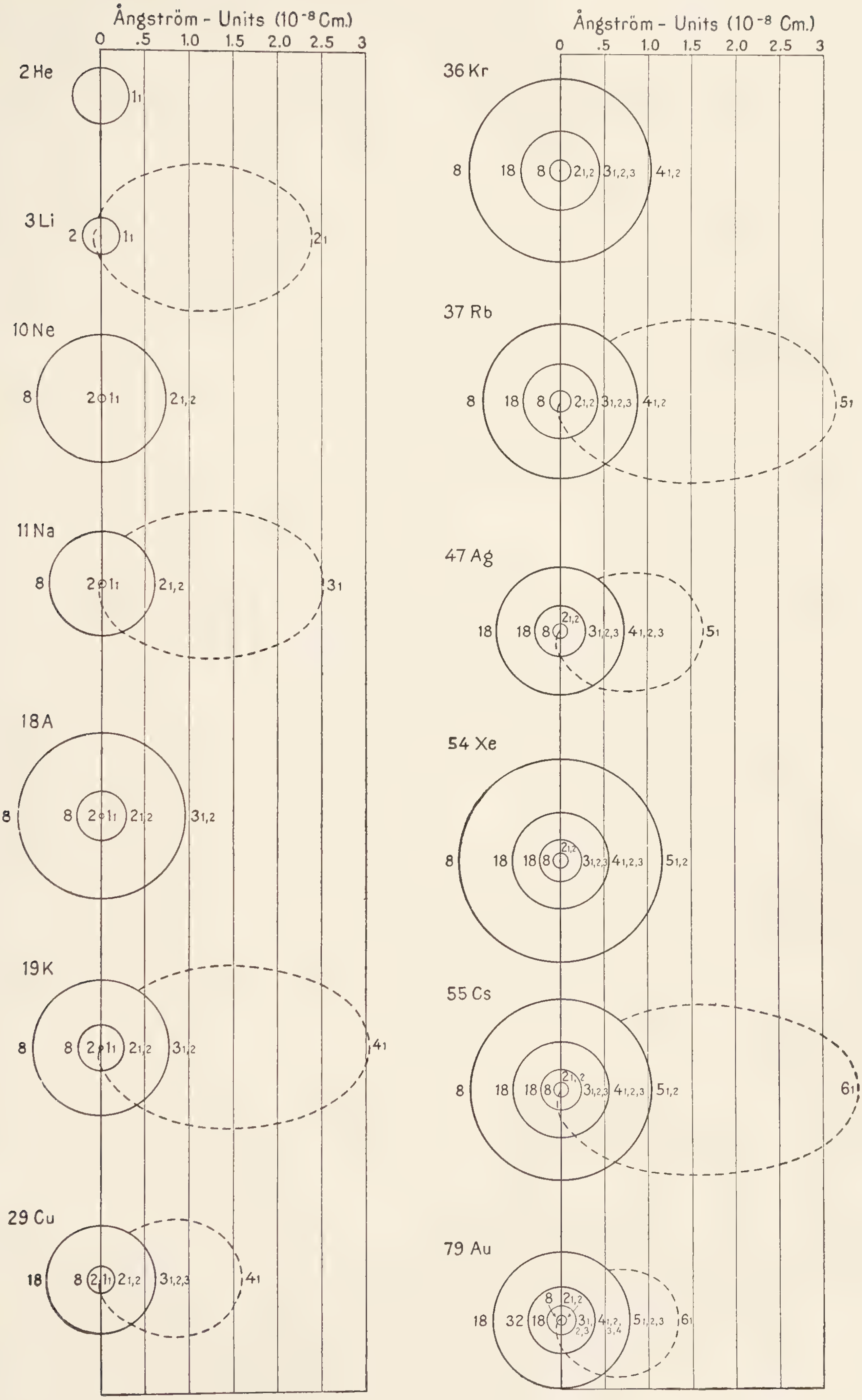

Fig. 4.—Normal orbit of outer electron.

n^* Effective quantum number $= Z^*N/T$.
n_k Designation of the state characterized by the numbers n, k.
N_∞ Rydberg constant.
p Semi-parameter of the electronic orbit (semi-latus rectum).
r_1 Radius of first Bohr ring for hydrogen.
T Spectral term = a wave number $(1/\lambda)$ of a spectral series.
v Speed of electron in its orbit.
W_n Energy expenditure required to remove the electron to infinity.
Z Atomic number: Ze = nuclear charge.
Z^*e Charge of atomic residue.
α $2\pi e^2/hc$.
β $(1 - v^2/c^2)^{-1/2}$
ν Frequency of emitted radiation.
ν_∞ Rydberg fundamental frequency.
$\sigma_{n,k}$ Frequency of precession of electronic orbit.
ω_n Frequency of revolution of electron; for penetrating orbits, the radial frequency, one revolution being from A to B, Fig. 2.

LITERATURE

(For a key to the periodicals, see end of volume)

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(10) Foote and Mohler, Origin of Spectra, 1923. (11) Foote, *143*, **198**: 344, 517; 24. (12) Fuess, *96*, **11**: 364; 22. **12**: 1; 22. **21**: 265; 24. *8*, **76**: 299; 25. (13) Hartree, *201*, **21**: 630; 23. **22**: 409, 464; 24. *5*, **106**: 552; 24. (14) Herzfeld, *200*, **19**: 259; 23. (15) Kramers and Urey, *O*. (16) Lindsay, *2*, **23**: 552; 24. *285*, **3**: 191; 24. *2*, **25**: 239; 25. (17) Pauli, Jr., *96*, **31**: 765; 25. (18) Sommerfeld, Atombau und Spektrallinien, 4th ed., 1925. (19) Stoner, *3*, **48**: 719; 24.
(20) Urey, *O*. (21) Heisenberg, *96*, **33**: 879; 25.

THERMOMETRY

E. F. Mueller, L. H. Adams, F. O. Fairchild and H. T. Wensel

1. THERMOMETRIC SCALES

E. F. Mueller

Centigrade or Celsius scale, °C
Fahrenheit scale, °F
Réamur scale, °R
Centigrade absolute or Kelvin scale, °K
Fahrenheit absolute or Rankine scale, °R′

By definition or as basic values adopted for I. C. T., the ice and steam points under a pressure of $1A_n$ have the following values:

Ice point: 0°C = 32°F = 0°R = 273.1°K = 491.58°R′.
Steam point: 100°C = 212°F = 80°R = 373.1°K = 703.58°R′.
$°C = 5/9\,(°F - 32) = 5/4\,°R = °K - 273.1$.
$°F = 9/5\,°C + 32 = °R' - 459.58$.

2. THE STANDARD THERMODYNAMIC SCALE

E. F. Mueller

The thermodynamic scale, which is based solely on the laws of thermodynamics and is independent of the properties of any material substance, is accepted as the standard scale of temperature. Temperatures on the thermodynamic scale are proportional to the pressures (or to the volumes) of an ideal gas in a perfect constant volume (or constant pressure) gas thermometer. The standard scale is realized in practice by use of gas thermometers, the indications of which can be reduced to the standard scale, or for higher temperatures, by use of the relations between the intensity of radiation from a black body and its temperature.

The experimental difficulties in the use of gas thermometers and the relatively low precision attainable in a single measurement have led to the introduction of a standard practical or working scale. This working scale is defined by certain base points, the temperatures of which have been determined by gas thermometer measurements, and by the indications of suitable instruments used for interpolation between the base points or for extrapolation to higher temperatures. It is possible in this way, without actually using a gas thermometer, to establish a working scale which does not differ to a demonstrable extent from the standard scale at any temperature within the range of the working scale. The practice of the various national standardizing laboratories in defining the working scale is substantially uniform at present, and it requires only minor adjustments and formal agreement to give the working scales of these laboratories the status of an international temperature scale. Such a scale would bear essentially the same relation to the standard scale, as do the international electric units to the absolute units.

The standard working scale may be defined by assigning numerical values to the temperatures defined by the boiling point of oxygen, the melting point of ice, the boiling point of water, the boiling point of sulfur, and the freezing points of antimony, silver and gold. The platinum resistance thermometer is the standard for interpolation in the range −195° to 0°C and from 0° to 650°C; the platinum-platinum rhodium thermocouple for the range from 650° to 1063°; and the luminous filament pyrometer above 1063°C.

Wien's law is accepted as expressing the brightness-temperature relation for a black body. For the purpose of defining the temperature scale above 1063°C the present practice of the national laboratories tends to favor the use of the value 1.430 cm degrees for the constant C_2 in this equation but the value 1.433 cm degrees has been adopted for I. C. T.

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(For a key to the periodicals, see end of volume)

(1) Reichsanstalt, *8*, **48**: 1034; 15. (2) Griffiths and Schofield, *83*, **13**: 222; 18. (3) Waidner, Mueller and Foote, Pyrometry, p. 46 (pub. by Am. Soc. Min. and Met. Engrs., 1920). (4) Day and Sosman, Dictionary of Applied Physics, **1**: 836; 22. (5) Henning, *243*, **44**: 349; 24. (6) Riechsanstalt, *243*, **44**: 517; 24.

Reduction of Gas Thermometer Indications to the Thermodynamic Scale

The temperature t_g on the scale of a constant volume or constant pressure gas thermometer filled with any real gas, is proportional to the pressure the gas would exert or the volume it would occupy, respectively, if all of the gas were at the uniform temperature to be measured, and if the volume or the pressure, respectively, were the same at all temperatures. At 0° and 100°C, the temperature t_g is by definition identical with the thermodynamic temperature t, while at other temperatures t_g departs from t by amounts which are proportional to the pressure at 0°, called the initial pressure. The tabular values are accordingly given only for an initial pressure equivalent to 1 m of mercury.

The values of $t - t_g$ obtained by various methods cover a wide range, so that only the order of magnitude of the values can be considered as known with any certainty. The tendency in modern work in gas thermometry has been to employ hydrogen or helium as the thermometric gas, and for these gases the magnitude of $t - t_g$ is comparable with the experimental error of the gas thermometer itself, so that the importance of an exact knowledge of the departure of the scales of these gas thermometers from the thermodynamic scale is correspondingly reduced.

Reduction of Gas Thermometer Indications, t_g, to the Thermodynamic Centigrade Scale, t

Values of $t - t_g$ for an initial pressure of 1 meter of mercury

t °C	Helium		Hydrogen		Nitrogen	
	Const. vol.	Const. press.	Const. vol.	Const. press.	Const. vol.	Const. press.
−250	+0.04	....	+0.12			
−200	+ .02	+0.04	+ .06	+0.3	+0.5	
−150	+ .01	+ .02	+ .03	+ .1	+ .2	+1.3
−100	+ .005	+ .005	+ .015	+ .04	+ .06	+ .4
−50	+ .002	+ .002	+ .005	+ .02	+ .03	+ .12
0	.000	.000	.000	.000	.00	.00
+25	− .001	− .001	− .001	− .003	− .008	− .02
50	− .001	.000	− .002	− .004	− .010	− .03
75	− .001	.000	− .001	− .003	− .005	− .02
100	.000	.000	.000	.000	.000	.00
150	+ .002	+ .001	+ .01	+ .01	+ .01	+ .05
200	+ .006	+ .001	+ .02	+ .02	+ .02	+ .12
250	+ .01	+ .002	....	+ .03	+ .04	+ .2
300	+ .02	+ .003	....	+ .04	+ .07	+ .3
350	+ .03	+ .005	....	....	+ .10	+ .4
400	+ .04	+ .006	....	....	+ .14	+ .5
450	+ .05	+ .008	....	....	+ .17	+ .6
500	....	....	....	....	+ .2	+ .7
600	....	....	....	....	+ .3	+ .9
800	....	....	....	....	+ .5	+1.3
1000	....	....	....	....	+ .7	+1.8
1200	....	....	....	....	+1.0	+2.3

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(For a key to the periodicals see end of volume)

(1)Rose-Innes, *3*, **2**: 131; 01. **15**: 301; 08. (2)Callendar, *3*, **5**: 48; 03. (3) Berthelot, *238*, **13B**: 113p.; 07. (4)Buckingham, *31A*, **3**: 237; 07. (5)Cath and Onnes, *168*, No. **156a**; 22. *18*, **6**: 1; 22. (6)Holborn and Otto, *96*, **23**: 77; 24. **30**: 320; 24. (7)Keesom and Onnes, *B60*: 15; 24.

3. FIXED POINTS

E. F. Mueller

t = Temperature on standard scale.
p = Pressure in millimeters of Hg (1 mm Hg = 1/760 A_D) where p is between 680 and 780 mm.

Base Points Used in Defining the Standard Working Scale
(I. C. T. temperature scale)

Substance	Phenomenon	Temperature, °C
Liquid O_2	Vapor pressure	$t = \left[-183.00 + 0.245\,(t + 273.1)\log_{10} p/760 \text{ or } -183.00 + 0.0126\,(p - 760) - 0.0000065\,(p - 760)^2 \right]$
Solid CO_2*	Vapor pressure	$t = \left[-78.51 + 0.1443\,(t + 273.1)\log_{10} p/760 \text{ or } -78.51 + 0.01595\,(p - 760) - 0.000011\,(p - 760)^2 \right]$
Mercury*	Freezing	$t = -38.87°$
Ice	Melting	$t = 0.000°$
Steam	Condensing	$t = \left[100.000 + 0.1727\,(t + 273.1)\log_{10} p/760 \text{ or } 100.000 + 0.0367\,(p - 760) - 0.000023\,(p - 760)^2 \right]$
Sulfur	Condensing	$t = \left[444.60 + 0.2215\,(t + 273.1)\log_{10} p/760 \text{ or } 444.60 + 0.0909\,(p - 760) - 0.000048\,(p - 760)^2 \right]$
Antimony	Freezing	To be determined with resistance thermometer. t = approx. 630.5°
Silver	Freezing	t = 960.5° (reducing atmosphere).
Gold	Freezing	t = 1063°

* Not needed according to one suggested definition of the scale.

Secondary Fixed Points Useful in Calibrating Temperature Measuring Instruments
(I. C. T. temperature scale)

Substance	Phenomenon	Temperature °C
Hydrogen	Boiling	$t = -252.75 + 0.0044\,(p - 760)$
Nitrogen	Vapor pressure	$t = -195.80 + 0.0109\,(p - 760)$
Naphthalene	Condensing	$t = 217.96 + 0.2075\,(t + 273.1)\log_{10}(p/760)$
Tin	Freezing	t = 231.85
Benzophenone	Condensing	$t = 305.9 + 0.194\,(t + 273.1)\log_{10}(p/760)$
Cadmium	Freezing	t = 320.9
Lead	Freezing	t = 327.4
Zinc	Freezing	t = 419.45
Aluminum (99.85 %)	Freezing	t = 658.9
Copper	Freezing	t = 1083 (reducing atmosphere)
Palladium	Freezing	$t = 1555 \pm 2$
Platinum	Melting	$t = 1755 \pm 6$
Tungsten	Melting	$t = 3370 \pm 30$

The above values are in accord with the temperature scale used throughout I. C. T. For the last three points the following slightly different values have been suggested for future adoption as secondary points on an international practical scale.

Palladium	Freezing	$t = \left[1555 \text{ for } C_2 = 1.430;\ 1554 \text{ for } C_2 = 1.433 \right]$
Platinum	Melting	$t = \left[1765 \text{ for } C_2 = 1.430;\ 1763 \text{ for } C_2 = 1.433 \right]$
Tungsten	Melting	$t = \left[3400 \text{ for } C_2 = 1.430;\ 3386 \text{ for } C_2 = 1.433 \right]$

Additional Useful Secondary Points

Substance	Formula	Phenomenon	Temperature, °C
Isopentane	C_5H_{12}	Freezing	− 159.6
Methylcyclohexane	$C_6H_{11}CH_3$	Freezing	− 126.3
Ether	$(C_2H_5)_2O$	Slow freezing (unstable)	− 123.3
Ether	$(C_2H_5)_2O$	Rapid freezing or slow melting	− 116.3
Carbon disulfide	CS_2	Freezing	− 111.6
Toluene	C_7H_8	Freezing	− 95.1
Ethyl acetate	$CH_3CO_2C_2H_5$	Freezing	− 83.6
Chloroform	$CHCl_3$	Freezing	− 63.5
Chlorobenzene	C_6H_5Cl	Freezing	− 45.2
Carbon tetrachloride	CCl_4	Freezing	− 22.9
Sodium sulfate	$Na_2SO_4 \cdot 10H_2O$	Transition	32.384
Potassium dichromate	$K_2Cr_2O_7$	Melting	397.5
30.5 NaCl + 69.5 Na_2SO_4	....	Melting	637.0
Potassium chloride	KCl	Melting	770.3
Sodium chloride	NaCl	Melting	800.4
Sodium sulfate	Na_2SO_4	Melting	884.7
Potassium sulfate	K_2SO_4	Inversion	583.0
Potassium sulfate	K_2SO_4	Melting	1069.1
Nickel	Ni	Melting or freezing	1452
Cobalt	Co	Melting or freezing	1490
Lithium metasilicate	Li_2SiO_3	Melting	1202
Diopside	$CaMgSi_2O_6$	Melting	1395
Anorthite	$CaAl_2Si_2O_8$	Melting	1555

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(For a key to the periodicals see end of volume)

(1)Holborn and Day, *8*, **2**: 505; 00. *12*, **10**: 171; 00 (Sb, Ag, Au, Cu). (2)Buckingham, *31A*, **3**: 281; 07 (Review of values for S boiling point). (3)Waidner and Burgess, *31A*, **7**: 1; 11 (Naphthalene, benzophenone, Sn, Cd, Zn). (4)Holborn and Henning, *8*, **35**: 761; 11 (Naphthalene, benzophenone, S, Sn, Cd, Zn). (5)Day and Sosman, *152*, No. **157**; 11 (Zn, Sb, Ag, Au, Cu, Pd, Pt). (6)Day and Sosman, *12*, **33**: 517; 12. *8*, **38**: 849; 12 (Benzophenone, Zn, Sb, S). (7)Henning, *8*, **43**: 282; 14 (O, CO_2, Hg). (8)Eumorfopoulous, *5*, **90A**: 189; 14 (S). (9)Wilhelm, *31A*, **13**: 655; 16. (Hg).

(10)Chappuis, *238*, **16**: 17 (S). (11)Bureau of Standards, Cir. No. **66**; 17 (Sn, Zn, Al, Cu). (12) Cath, *168*, No. **152d**; 18. *64P*, **21**: 656; 19 (O, N). (13)Martinez and Onnes, *168*, No. **156b**; 22. *18*, **6**: 31; 22 (H). (14)Worthing, *96*, **22**: 9; 24 (W). (15)Henning and Heuse, *8*, **23**: 104; 24 (O, N, H). (16)Finck and Wilhelm, *1*, **47**: 25 (Naphthalene, benzophenone). *See also* References under Standard Scale of Temperature.

Additional Fixed Points: Timmermans, Van der Horst and Onnes, *168*, No. **157**; 22 (Organic liquids below 0°). Dickinson and Mueller, *31A*, **3**: 641; 07 (Na_2SO_4 transition). Roberts, *2*, **23**: 386; 24 (Salts). Day and Sosman, Dictionary of Applied Physics, **1**: 836; 22 (Metals and silicates). Richards, *et al*, *1*, **36**: 485; 14 (Na_2CO_3 hydrates transitions). **40**: 89; 18 ($SrCl_2$ and $SrBr_2$ transitions). **41**: 2019; 19 (C_6H_6).

The Leiden Temperature Scale

In certain sections of International Critical Tables (where so indicated) the Leiden temperature scale will be employed. (Onnes and Hoist, *168*, No. **141a**. *64V*, **23**: 175; 14. Cath and Onnes, *168*, No. **152a**. *64V*, **26**: 437, 490; 17. Cath, *168*, No. **152d**. *64V*, **27**: 553; 18.) The relation between the Leiden and the I. C. T. scales is shown by the following table:

Point	I. C. T.	Leiden	Leiden − I. C. T.
H_2 (B. P.)	−252.8°	−252.74°	+0.06°
O_2 (B. P.)	−183.0°	−182.95°	+0.05°
ca. −40°			+0.04

4. RESISTANCE THERMOMETERS

E. F. Mueller

Standard methods of calibration have been developed only for platinum resistance thermometers. Data on the resistance-temperature relation for particular thermometers of other metals, such as gold and lead, are available, and formulae to represent the relation have been published, but standardized methods for the calibration of such thermometers have not been developed.

The standard working scale, in the interval 0° to 650°C, is defined by means of a resistance thermometer of pure platinum, for which the relation between resistance R and temperature t is given by the equation:

$$R = R_0(1 + at + bt^2). \qquad (1)$$

This may be transformed into the Callendar equations:

$$(\text{pt}) = \left(\frac{R - R_0}{R_{100} - R_0}\right)100; \; t - (\text{pt}) = \delta\left[\left(\frac{t}{100} - 1\right)\frac{t}{100}\right]. \qquad (2)$$

The three constants in these equations, namely R_0, a, and b or R_0, R_{100} and δ respectively, are determined by calibration at the ice point, the steam point, and the sulfur boiling point.

The purity of the platinum must be such that $R_{100}/R_0 > 1.390$ and $R_{444.6}/R_0 > 2.645$, the latter requirement being equivalent to $\delta < 1.50$.

The Callendar equations were devised to facilitate computations by the method of successive approximations. The platinum temperature, symbol (pt), is proportional to the resistance above R_0 and the amount by which it differs from the true temperature is given by the correction term,

$$\delta\left(\frac{t}{100} - 1\right)\frac{t}{100}.$$

Consequently, a value of t sufficiently exact for use in computing the value of the correction term is readily obtained, if not by the first, then certainly by a second or third approximation.

In the interval −195° to 0°C the standard reference scale is defined by means of the platinum resistance thermometer, using the equation

$$t - (\text{pt}) = \delta\left[\left(\frac{t}{100} - 1\right)\frac{t}{100}\right] + \beta\left[\left(\frac{t}{100} - 1\right)\frac{t^3}{100^3}\right]. \qquad (3)$$

The constants R_0, R_{100} and δ are determined just as for the range above 0° and the additional constant β is determined by a calibration at the boiling point of oxygen. A criterion for the purity of the platinum is that $R_{-183}/R_0 < 0.250$.

Thermometers which are not to be heated above ordinary temperatures may be calibrated at the freezing point of mercury, the CO_2 point and the oxygen point, using the interpolation formula:

$$R = R_0(1 + \text{a}t + \text{b}t^2 + \text{c}t^4). \qquad (4)$$

The constant c in the equation is approximately equal to 5×10^{-12} and when this value is assumed, calibration at the CO_2 point may be omitted.

Equations (3) and (4) will yield substantially equivalent results, but they are not algebraically interconvertible.

Equation (1) or equation (2) may be used for temperatures up to 1000° or even 1100°C and the temperatures so determined will not depart appreciably from the standard scale.

LITERATURE

(For a key to the periodicals see end of volume)

(1) Callendar, *62*, **178**: 160; 87. (2) Waidner and Burgess, *31A*, **6**: 149; 09. (3) Holborn and Henning, *8*, **35**: 761; 11. (4) Henning, *8*, **40**: 635; 13 (Pt and Pb at low temperatures). (5) Henning, *8*, **43**: 282; 14. (6) Cath, Onnes and Burgers, *168*, No. **152c**; 17. *64*P, **20**, 1163; 18 (Pt and Au at low temperatures). (7) Henning and Heuse, *96*, **23**: 95; 24. (8) Van Dusen, *1*, **47**: 326; 25.

5. TEMPERATURE SCALES DEFINED BY LIQUID-IN-GLASS THERMOMETERS

E. F. Mueller

The readings of any particular thermometer, taken when all of the liquid in the thermometer is at a uniform temperature, may be reduced to those which would have been obtained if the thermometer had been perfect and used under ideal conditions, by applying corrections for non-uniformity of the capillary bore, corrections for the change of reading due to departure of the external and internal pressures from arbitrary constant values, a correction for the departure of the ice-point reading, taken immediately *after* the temperature measurement, from the 0° mark, and a correction to allow for the value of the mean scale degree, in case the difference between the readings of the thermometer taken first at 100°C and then at 0°C, does not correspond to 100 scale degrees. The reading of a thermometer, when so corrected, may be defined as the temperature on the liquid-in-glass scale for the particular liquid and the particular kind of glass of which the thermometer is made.

The temperature scales of mercury thermometers made of French hard glass (verre dur), Jena 16^{III}, Jena 59^{III}, Jena 1565^{III} and Jena combustion tubing are defined as above. For Kew glass, the temperature scale is defined in a somewhat different way, in that the point of reference is the (single) ice point reading taken after the thermometer has been held for a sufficiently long period at ordinary temperature (about 10°C) instead of the (variable) ice point reading taken immediately after each temperature measurement. It is apparent that temperatures on the mercury-in-glass scale are not proportional to the relative increase of volume of mercury-in-glass.

Constants characteristic of the several glasses are the ice-point depression, the softening point, and the average coefficient of expansion of mercury-in-glass, between 0° and 100°C.

The ice point depression is the difference between the ice point reading of the thermometer taken after it has been kept a sufficiently long time (a few days or weeks) at 0° and the ice point reading taken immediately after the thermometer has been kept a sufficiently long time (a few minutes or hours) at 100°C. Good thermometric glasses are characterized by small ice point depression (less than 0.1°C) and rapid recovery. Some glasses have an ice point depression of nearly 1°C.

The softening point determines the upper limit of temperature at which thermometers made of the glass can be used.

The expansion coefficient is useful in calculating corrections for emergent stem.

Values of these characteristic constants are:

Glass	Ice point depression °C	Softening point °C	Coefficient of cubical exp. of mercury-in-glass 0° to 100°C
Verre dur	0.07–0.11	500	0.000158
"Kew" glass	0.20		
Jena 16^{III}	0.04–0.08	505	0.000158
Jena 59^{III}	0.03–0.04	510	0.000164
Jena 1565^{III}	0.01	660	0.000172
Jena combustion	0.03	560	

Thermometers containing alcohol, toluene or pentane are not adapted for observation at 100°C, and for such thermometers the mean scale degree is conveniently referred to the interval 0° to −78.5°, the sublimation temperature of carbon dioxide serving to fix the latter temperature.

The tabular values are the result of comparisons of mercury-in-glass thermometers with gas thermometers or platinum resistance thermometers which served to establish the standard scale of temperature. The data for Jena 16^{III} glass and Jena 59^{III} glass may be used for Corning normal and Corning borosilicate thermometer glasses respectively.

Data of this kind were of great importance during the latter part of the 19th and even during the early part of this century, when calibrated mercury-in-glass thermometers were used to distribute the standard scale of temperature. At present the data are useful principally for minor purposes, such as calculation of factors for determining emergent stem correction, calculation of setting factors for metastatic thermometers, such as the Beckmann thermometer, graduation of thermometers by mercury thread calibration in the absence of standards and thermally controlled baths, etc.

In the tables, t represents the temperature on the standard working scale (platinum resistance thermometer) except for verre dur, where t represents temperatures on the former International hydrogen scale, which in practice is not distinguishable from the standard reference scale, while t_{gl} represents corresponding temperatures on the several liquid-in-glass scales.

Values of $t - t_{gl}$ for Mercury-in-glass Thermometers

t = temperature on standard scale, t_{gl} = temperature on mercury-in-glass scale.

t°C	French hard (verre dur)	Kew glass	Jena 16^{III}	Jena 59^{III}	Jena 1565^{III}	Jena combustion
− 39	+0.420					
− 30	+ .290		+0.28	+ 0.13		
− 20	+ .172		+ .16	+ .07		
− 10	+ .073		+ .07	+ .03		
0	.000	0.00	.00	.00	0.00	0.00
+ 10	− .052	.00	− .06	− .02	− .03	
20	− .085	.00	− .09	− .04	− .05	
30	− .102	+ .005	− .11	− .04	− .06	
40	− .107	+ .01	− .12	− .03	− .06	
50	− .103	+ .01	− .12	− .03	− .05	
60	− .090	+ .01	− .10	− .02	− .04	
70	− .072	+ .015	− .08	− .01	− .03	
80	− .050	+ .02	− .06	.00	− .02	
90	− .026	+ .025	− .03	+ .02	− .01	
100	.000	.00	.00	.00	.00	0.00
120	+ .06		+ .03	− .05	+ .06	
140	+ .07		+ .02	− .16	+ .03	
160	+ .03		− .02	− .31	− .13	
180	− .04		− .12	− .52	− .38	
200	− .12		− .29	− .84	− .90	− 1.13
220			− .5	− 1.3	− 1.3	− 1.6
240			− .9	− 1.9	− 1.8	− 2.2
260			−1.4	− 2.6	− 2.4	− 3.0
280			−2.0	− 3.4	− 3.1	− 4.0
300			−2.7	− 4.4	− 3.9	− 5.1
320				− 5.8	− 4.8	− 6.4
340				− 7.2	− 5.9	− 7.8
360				− 8.8	− 7.3	− 9.5
380				−10.6	− 8.9	−11.4
400				−12.6	−10.5	−13.5
420				−14.9	−12.4	−15.9
440				−17.4	−14.7	−18.6
460				−20.2	−17.2	−21.5
480				−23.3	−20.0	−24.8
500				−26.9	−23.1	−28.4
550					−32.	−39.
600					−44.	
650					−58.	

Values of $t - t_g$ for Liquid-in-glass Thermometers

t	Pentane in 16^{III} glass	Toluene in verre dur	Alcohol in verre dur
−190	−23.4		
−180	−21.0		
−170	−18.6		
−160	−16.2		
−150	−13.9		
−140	−11.6		
−130	− 9.4		
−120	− 7.3		
−110	− 5.3		

Values of $t - t_1$ for Liquid-in-glass Thermometers.—*Continued*

t	Pentane in 16^{III} glass	Toluene in verre dur	Alcohol in verre dur
−100	− 3.4		
− 90	− 1.7		
− 80	− 0.2	0.0	
− 78.5	0.0	0.0	0.0
− 70	+ 1.0	+ .4	+0.3
− 60	+ 2.0	+ .8	+ .6
− 50	+ 2.6	+ 1.1	+ .7
− 40	+ 3.0	+ 1.2	+ .9
− 30	+ 2.9	+ 1.2	+ .9
− 20	+ 2.4	+ 1.0	+ .8
− 10	+ 1.5	+ 0.6	+ .5
0	0.0	0.0	.0
+ 10	− 2.0		
20	− 4.4		
30	− 7.6		−3.6
100		−24.4	

LITERATURE

(For a key to the periodicals see end of volume)

Guillaume, Traite pratique de la thermometerie. Gauthier-Villars, Paris, 1889 (General). Chappuis, *238*, **6**: 1; 88 (Verre dur −25° to 100°). Harker, *5*, **78A**: 225; 06 (Kew glass). Scheel, *Deut. Mechan. Ztg.*, **1916**: 170 and Holborn, Scheel and Henning, *B63* (Jena glasses and organic liquids in glass).

Emergent Stem Correction for Liquid-in-glass Thermometers

If a liquid-in-glass thermometer standardized for total immersion is used with a portion of the liquid column at a temperature below that of the bulb, the reading will be too low for this reason, and an emergent stem correction should be applied to the observed reading.

The emergent stem correction is calculated by the formula,

$$\text{Correction} = Kn(t - t_s)$$

in which

K = coefficient of cubical expansion of mercury-in-glass, per °C,

t = temperature of bulb, °C,

t_s = average temperature °C of the mercury column n°C degrees in length.

The value of t is to be determined by means of an auxiliary thermometer or thermometers, preferably with a capillary thermometer. The sign as well as the magnitude of the correction is given by the formula.

For many purposes, in using mercury-in-glass thermometers K may be treated as a constant of the glass, using the values given above for the apparent coefficient of expansion of mercury-in-glass. The value of K does, however, change with temperature. For purposes of computing the emergent stem correction, it may be considered as depending on the average of t and t_s, that is $\frac{t + t_s}{2}$ and is here so tabulated.

If the coefficients of expansion of mercury and of glass were both constant, K would also be constant. Most of the change in K is the result of the varying coefficient of the mercury, so that the change in K with temperature for one glass may with some certainty be inferred from the change for some other glass.

The use of the formula requires that t, the temperature of the bulb, be known. In case t is not known, but is to be determined from the indication of the thermometer, the reading of the thermometer may be substituted in the formula in place of t, as a first approximation and the true magnitude of the correction then calculated by means of a second, or if necessary, a third approximation.

In many cases, in calculating the emergent stem correction for thermometers containing organic liquids, it is sufficient to use the approximate value, $K = 0.001$. The tables show to what extent this is justified for pentane, toluene, and alcohol. In such thermometers, K is practically independent of the kind of glass used.

With the abandonment of the mercury-in-glass thermometer as an instrument of high precision there has been an increasing tendency to use partial immersion thermometers, graduated and standardized for a particular depth of immersion, thus avoiding the necessity of determining and applying the correction for emergent stem.

Table of Emergent Stem Correction Factors

Mercury-in-glass Thermometers

$\frac{t + t_s}{2}$ °C	Verre dur	Jena 16^{III}	Jena 59^{III}	Jena 1565^{III}	Jena combustion
50	0.000158	0.000158	0.000164	0.000172	0.000164
100	158	158	164	172	164
150	158	158	165	173	165
200	159	159	167	175	167
250		161	170	177	171
300		164	174	180	174
350			177	184	178
400			182	188	182
450			187	194	188
500			195	200	195

Liquid-in-glass Thermometers

$\frac{t + t_s}{2}$	Pentane	Toluene	Alcohol
−180	0.0009		
−160	09		
−140	09		
−120	10		
−100	10		
− 80	10	0.0009	0.0010
− 60	11	09	10
− 40	12	10	10
− 20	13	10	10
0	14	10	10
+ 20	15	11	10

LITERATURE

(For a key to the periodicals see end of volume)

Buckingham, *31a*, **8**: 239; 12.

Example: A thermometer of Jena 59^{III} (or Corning borosilicate glass) indicated a temperature, t, of 470° after application of corrections peculiar to the instrument. The thermometer was immersed to the 150° mark, and the *average* temperature t_s of the 320° (n°) of exposed mercury column was found to be 190°. The average of t and t_s is 330° and the value of the factor K for this temperature is 0.000176. Accordingly

$$\text{Correction} = 0.000176(320)(470 - 190) = 15.8°$$

The corrected temperature is therefore 470° + 15.8° = 485.8°. Since the bulb temperature was considerably higher than 470° a second approximation may be tried:

$$\text{Correction} = 0.000176(320)(486 - 190) = 16.7°$$

The second approximation yields a corrected temperature of 470° + 16.7° = 486.7° which in view of the rather large emergent stem correction, may properly be reported as 487°.

Possible short cuts in making the second approximation will be readily apparent.

The example given is purposely somewhat exaggerated by assuming an unusually high temperature (190°) for the emergent stem, in order to show that the factor K may differ appreciably from the conventional value of 0.00016.

For computations in Fahrenheit temperatures, the proper value of K is 5/9 of the tabulated value.

6. THERMOCOUPLES

L. H. Adams

"Standard" Calibration Tables (for Use with Deviation Curve)

Standard tables such as these do not necessarily have any absolute significance; primarily, they are arbitrary reference curves which, although representing fairly well the temperature-emf functions for certain thermocouples, are intended for use with an appropriate deviation-curve. This correction-curve is determined for each couple by calibration at several—preferably three or more—fixed points within the "applicability range of the couple." This curve is constructed by plotting ΔE as ordinate ($\Delta E = E_{obs.} - E_{stand.}$) against $E_{stand.}$ as abscissa. In order to obtain the temperature corresponding to the emf indicated by the couple, the appropriate value of ΔE (as obtained from *its* deviation curve) is subtracted algebraically from the observed value of E before the latter is converted into degrees by means of the table. Example: At a certain temperature a copper-constantan couple gave an emf of 8720 microvolts. From the previously determined deviation curve of the particular couple the value of ΔE at 8720 microvolts is found to be 12 microvolts. The "standard" emf is therefore 8720 − 12 or 8708 microvolts and from the copper-constantan table this may be seen to correspond to 189.08°, which is the required temperature.

The fixed (*i.e.*, cold) junction is supposed to be maintained at 0°C.

Temperatures and Temperature Differences for Every 100 Microvolts

Platinum: Platinrhodium (90–10). Standard range, 630°–1083°C. Applicability range, 0–1754°C

E μv	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	E μv
0	0	147.1	265.4	374.3	478.1	578.3	675.3	769.5	861.1	950.4	0
	17.8	*12.6*	*11.2*	*10.6*	*10.2*	*9.8*	*9.5*	*9.3*	*9.0*	*8.8*	
100	17.8	159.7	276.6	384.9	488.3	588.1	684.8	778.8	870.1	959.2	100
	16.7	*12.4*	*11.1*	*10.5*	*10.1*	*9.8*	*9.5*	*9.2*	*9.0*	*8.8*	
200	34.5	172.1	287.7	395.4	498.4	597.9	694.3	788.0	879.1	968.0	200
	15.8	*12.3*	*11.0*	*10.5*	*10.1*	*9.8*	*9.5*	*9.2*	*9.0*	*8.7*	
300	50.3	184.3	298.7	405.9	508.5	607.7	703.8	797.2	888.1	976.7	300
	15.1	*12.0*	*11.0*	*10.4*	*10.1*	*9.7*	*9.5*	*9.2*	*9.0*	*8.7*	
400	65.4	196.3	309.7	416.3	518.6	617.4	713.3	806.4	897.1	985.4	400
	14.6	*11.8*	*10.9*	*10.4*	*10.0*	*9.7*	*9.4*	*9.2*	*9.0*	*8.7*	
500	80.0	208.1	320.6	426.7	528.6	627.1	722.7	815.6	906.1	994.1	500
	14.1	*11.6*	*10.9*	*10.4*	*10.0*	*9.7*	*9.4*	*9.1*	*8.9*	*8.7*	
600	94.1	219.7	331.5	437.1	538.6	636.8	732.1	824.7	915.0	1002.8	600
	13.7	*11.5*	*10.8*	*10.3*	*10.0*	*9.7*	*9.4*	*9.1*	*8.9*	*8.7*	
700	107.8	231.2	342.3	447.4	548.6	646.5	741.5	833.8	923.9	1011.5	700
	13.4	*11.5*	*10.7*	*10.3*	*9.9*	*9.6*	*9.4*	*9.1*	*8.9*	*8.6*	
800	121.2	242.7	353.0	457.7	558.5	656.1	750.9	842.9	932.8	1020.1	800
	13.1	*11.4*	*10.7*	*10.2*	*9.9*	*9.6*	*9.3*	*9.1*	*8.8*	*8.6*	
900	134.3	254.1	363.7	467.9	568.4	665.7	760.2	852.0	941.6	1028.7	900
	12.8	*11.3*	*10.6*	*10.2*	*9.9*	*9.6*	*9.3*	*9.1*	*8.8*	*8.6*	
1000	147.1	265.4	374.3	478.1	578.3	675.3	769.5	861.1	950.4	1037.3	1000

E μv	10,000	11,000	12,000	13,000	14,000	15,000	16,000	17,000	18,000		E μv
0	1037.3	1122.2	1205.9	1289.3	1372.4	1454.8	1537.5	1620.9	1704.3	......	0
	8.6	*8.4*	*8.3*	*8.4*	*8.3*	*8.2*	*8.3*	*8.3*	*8.3*	....	
100	1045.9	1130.6	1214.2	1297.7	1380.7	1463.0	1545.8	1629.2	1712.6	......	100
	8.5	*8.4*	*8.4*	*8.3*	*8.3*	*8.2*	*8.3*	*8.4*	*8.4*	....	
200	1054.4	1139.0	1222.6	1306.0	1389.0	1471.2	1554.1	1637.6	1721.0	......	200
	8.5	*8.4*	*8.3*	*8.3*	*8.3*	*8.2*	*8.3*	*8.3*	*8.3*	....	
300	1062.9	1147.4	1230.9	1314.3	1397.3	1479.4	1562.4	1645.9	1729.3	......	300
	8.5	*8.4*	*8.4*	*8.3*	*8.3*	*8.3*	*8.4*	*8.4*	*8.4*	....	
400	1071.4	1155.8	1239.3	1322.6	1405.6	1487.7	1570.8	1654.3	1737.7	......	400
	8.5	*8.4*	*8.3*	*8.3*	*8.2*	*8.3*	*8.3*	*8.3*	*8.3*	....	
500	1079.9	1164.2	1247.6	1330.9	1413.8	1496.0	1579.1	1662.6	1746.0	......	500
	8.5	*8.3*	*8.3*	*8.3*	*8.2*	*8.3*	*8.4*	*8.3*	*8.3*	....	
600	1088.4	1172.5	1255.9	1339.2	1422.0	1504.3	1587.5	1670.9	1754.3	......	600
	8.5	*8.4*	*8.4*	*8.3*	*8.2*	*8.3*	*8.3*	*8.4*	....	....	
700	1096.9	1180.9	1264.3	1347.5	1430.2	1512.6	1595.8	1679.3	......	......	700
	8.5	*8.3*	*8.3*	*8.3*	*8.2*	*8.3*	*8.4*	*8.3*	....	....	
800	1105.4	1189.2	1272.6	1355.8	1438.4	1520.9	1604.2	1687.6	......	......	800
	8.4	*8.4*	*8.4*	*8.3*	*8.2*	*8.3*	*8.3*	*8.4*	....	....	
900	1113.8	1197.6	1281.0	1364.1	1446.6	1529.2	1612.5	1696.0	......	......	900
	8.4	*8.3*	*8.3*	*8.3*	*8.2*	*8.3*	*8.4*	*8.3*	....	....	
1000	1122.2	1205.9	1289.3	1372.4	1454.8	1537.5	1620.9	1704.3	......	......	1000

Temperatures and Temperature Differences for Every 100 Microvolts

Copper: Constantan

E μv	−5000	−4000	−3000	−2000	−1000	−0	0	1000	2000	3000	4000	5000	6000
0	−169.14	−124.46	− 87.86	−55.81	−26.82	0	0	25.27	49.20	72.08	94.07	115.31	135.91
	5.20	*4.01*	*3.42*	*3.05*	*2.79*	*2.60*	*2.59*	*2.45*	*2.33*	*2.23*	*2.16*	*2.09*	*2.03*
100	−174.34	−128.47	− 91.28	−58.86	−29.61	− 2.60	2.59	27.72	51.53	74.31	96.23	117.40	137.94
	5.40	*4.09*	*3.46*	*3.08*	*2.81*	*2.62*	*2.57*	*2.43*	*2.32*	*2.23*	*2.15*	*2.08*	*2.02*
200	−179.74	−132.56	− 94.74	−61.94	−32.42	− 5.22	5.16	30.15	53.85	76.54	98.38	119.48	139.96
	5.64	*4.18*	*3.51*	*3.11*	*2.84*	*2.63*	*2.56*	*2.42*	*2.31*	*2.22*	*2.14*	*2.08*	*2.02*
300	−185.38	−136.74	− 98.25	−65.05	−35.26	− 7.85	7.72	32.57	56.16	78.76	100.52	121.56	141.98
	5.89	*4.28*	*3.57*	*3.15*	*2.86*	*2.65*	*2.55*	*2.41*	*2.30*	*2.21*	*2.14*	*2.07*	*2.01*
400	−191.27	−141.02	−101.82	−68.20	−38.12	−10.50	10.27	34.98	58.46	80.97	102.66	123.63	143.99
	6.17	*4.39*	*3.63*	*3.19*	*2.89*	*2.67*	*2.53*	*2.40*	*2.30*	*2.20*	*2.13*	*2.06*	*2.01*
500	−197.44	−145.41	−105.45	−71.39	−41.01	−13.17	12.80	37.38	60.76	83.17	104.79	125.69	146.00
	6.51	*4.50*	*3.68*	*3.22*	*2.90*	*2.69*	*2.52*	*2.39*	*2.28*	*2.20*	*2.12*	*2.06*	*2.00*
600	−203.95	−149.91	−109.13	−74.61	−43.91	−15.86	15.32	39.77	63.04	85.37	106.91	127.75	148.00
	6.97	*4.61*	*3.74*	*3.26*	*2.93*	*2.71*	*2.51*	*2.38*	*2.27*	*2.19*	*2.11*	*2.05*	*2.00*
700	−210.92	−154.52	−112.87	−77.87	−46.84	−18.57	17.83	42.15	65.31	87.56	109.02	129.80	150.00
	7.55	*4.73*	*3.30*	*3.29*	*2.96*	*2.73*	*2.49*	*2.36*	*2.27*	*2.18*	*2.10*	*2.04*	*1.99*
800	−218.47	−159.25	−116.67	−81.16	−49.80	−21.30	20.32	44.51	67.58	89.74	111.12	131.84	151.99
		4.87	*3.86*	*3.33*	*2.99*	*2.75*	*2.48*	*2.35*	*2.25*	*2.17*	*2.10*	*2.04*	*1.99*
900		−164.12	−120.53	−84.49	−52.79	−24.05	22.80	46.86	69.83	91.91	113.22	133.88	153.97
		5.02	*3.93*	*3.37*	*3.02*	*2.77*	*2.47*	*2.34*	*2.25*	*2.16*	*2.09*	*2.03*	*1.98*
1000		−169.14	−124.46	−87.86	−55.81	−26.82	25.27	49.20	72.08	94.07	115.31	135.91	155.95

E μv	7000	8000	9000	10,000	11,000	12,000	13,000	14,000	15,000	16,000	17,000	18,000	19,000
0	155.95	175.50	194.62	213.36	231.74	249.82	267.60	285.13	302.42	319.49	336.36	353.08	369.61
	1.97	*1.93*	*1.89*	*1.85*	*1.82*	*1.79*	*1.76*	*1.74*	*1.72*	*1.70*	*1.68*	*1.66*	*1.64*
100	157.92	177.43	196.51	215.21	233.56	251.61	269.36	286.87	304.14	321.19	338.04	354.74	371.25
	1.97	*1.93*	*1.89*	*1.85*	*1.82*	*1.79*	*1.76*	*1.74*	*1.71*	*1.69*	*1.68*	*1.66*	*1.64*
200	159.89	179.36	198.40	217.06	235.38	253.40	271.12	288.61	305.85	322.88	339.72	356.40	372.89
	1.97	*1.92*	*1.88*	*1.85*	*1.82*	*1.78*	*1.76*	*1.74*	*1.71*	*1.69*	*1.68*	*1.66*	*1.64*
300	161.86	181.28	200.28	218.91	237.20	255.18	272.88	290.35	307.56	324.57	341.40	358.06	374.53
	1.96	*1.92*	*1.88*	*1.84*	*1.81*	*1.78*	*1.76*	*1.73*	*1.71*	*1.69*	*1.67*	*1.66*	*1.64*
400	163.82	183.20	202.16	220.75	239.01	256.96	274.64	292.08	309.27	326.26	343.07	359.72	376.17
	1.96	*1.91*	*1.88*	*1.84*	*1.81*	*1.78*	*1.76*	*1.73*	*1.71*	*1.69*	*1.67*	*1.65*	*1.63*
500	165.78	185.11	204.04	222.59	240.82	258.74	276.40	293.81	310.98	327.95	344.74	361.37	377.80
	1.95	*1.91*	*1.87*	*1.84*	*1.81*	*1.78*	*1.75*	*1.73*	*1.71*	*1.69*	*1.67*	*1.65*	*1.63*
600	167.73	187.02	205.91	224.43	242.63	260.52	278.15	295.54	312.69	329.64	346.41	363.02	379.43
	1.95	*1.91*	*1.87*	*1.83*	*1.80*	*1.77*	*1.75*	*1.72*	*1.70*	*1.68*	*1.67*	*1.65*	*1.63*
700	169.68	188.93	207.78	226.26	244.43	262.29	279.90	297.26	314.39	331.32	348.08	364.67	381.06
	1.94	*1.90*	*1.86*	*1.83*	*1.80*	*1.77*	*1.75*	*1.72*	*1.70*	*1.68*	*1.67*	*1.65*	*1.63*
800	171.62	190.83	209.64	228.09	246.23	264.06	281.65	298.98	316.09	333.00	349.75	366.32	382.69
	1.94	*1.90*	*1.86*	*1.83*	*1.80*	*1.77*	*1.74*	*1.72*	*1.70*	*1.68*	*1.67*	*1.65*	*1.63*
900	173.56	192.73	211.50	229.92	248.03	265.83	283.39	300.70	317.79	334.68	351.42	367.97	384.32
	1.94	*1.89*	*1.86*	*1.82*	*1.79*	*1.77*	*1.74*	*1.72*	*1.70*	*1.68*	*1.66*	*1.64*	*1.63*
1000	175.50	194.62	213.36	231.74	249.82	267.60	285.13	302.42	319.49	336.36	353.08	369.61	385.95

Temperatures and Temperature Differences for Every 0.5 Millivolt

Chromel-alumel

E mv	0	10	20	30	40
0	0.0	244.5	482.8	719.2	970.4
	12.3	*12.2*	*11.7*	*12.2*	*13.0*
0.5	12.3	256.7	494.5	731.4	983.4
	12.1	*12.2*	*11.7*	*12.3*	*13.1*
1.0	24.4	268.9	506.2	743.7	996.5
	12.0	*12.1*	*11.7*	*12.3*	*13.2*
1.5	36.4	281.0	517.9	756.0	1009.7
	12.0	*12.1*	*11.7*	*12.3*	*13.3*
2.0	48.4	293.1	529.6	768.3	1023.0
	12.0	*12.0*	*11.7*	*12.4*	*13.3*
2.5	60.4	305.1	541.3	780.7	1036.3
	12.0	*12.0*	*11.7*	*12.4*	*13.4*
3.0	72.4	317.1	553.0	793.1	1049.7
	12.0	*12.0*	*11.7*	*12.5*	*13.5*
3.5	84.4	329.1	564.7	805.6	1063.2
	12.0	*11.9*	*11.7*	*12.5*	*13.6*
4.0	96.4	341.0	576.4	818.1	1076.8
	12.1	*11.9*	*11.8*	*12.5*	*13.7*
4.5	108.5	352.9	588.2	830.6	1090.5
	12.1	*11.9*	*11.8*	*12.6*	*13.7*
5.0	120.6	364.9	600.0	843.2	1104.2
	12.2	*11.9*	*11.8*	*12.6*	*13.8*
5.5	132.8	376.8	611.8	855.8	1118.0
	12.4	*11.9*	*11.8*	*12.6*	*13.8*
6.0	145.2	388.6	623.6	868.4	1131.8
	12.5	*11.8*	*11.8*	*12.6*	*13.9*
6.5	157.7	400.4	635.4	881.0	1145.7
	12.6	*11.8*	*11.8*	*12.7*	*13.9*
7.0	170.2	412.2	647.2	893.7	1159.6
	12.5	*11.8*	*11.9*	*12.7*	*14.*
7.5	182.7	424.0	659.1	906.4	(1174.)
	12.5	*11.8*	*11.9*	*12.7*	*14.*
8.0	195.2	435.8	671.0	919.1	(1188.)
	12.4	*11.8*	*12.0*	*12.8*	*14.*
8.5	207.7	447.6	683.0	931.9	(1202.)
	12.3	*11.8*	*12.0*	*12.8*	
9.0	220.0	459.4	695.0	944.7	
	12.3	*11.7*	*12.1*	*12.8*	
9.5	232.3	471.1	707.1	957.5	
	12.2	*11.7*	*12.1*	*12.9*	
10.0	244.5	482.8	719.2	970.4	

Fixed-junction Corrections

If the fixed or "cold" junction be not maintained at 0°C, a correction must be applied. This may be done by any one of several methods, of which the following are suggested:

A. Let the temperature of the fixed junction be t_c and that of the variable or "hot" junction be t. Then to the emf as read E_{t-tc}, add the emf corresponding to t_c. This gives E_t which may at once be converted into degrees by means of the proper table.

B. Multiply the fixed-junction temperature by the factor, $f = (dE/dt)_0/(dE/dt)$, which is the ratio of the mean emf-temperature gradient between 0° and t_c to the gradient at t, and add the product to t', the uncorrected temperature. That is, $t = t' + ft_c$. These emf-temperature gradients may be obtained by taking the reciprocals of the numbers appearing in the difference columns of the calibration tables.

Comparison of the More Common Thermocouples

E mv	Temperature, °C: Iron: constantan	Chromel (X): copel	Chromel (P): alumel	Platinrhodium:* gold-palladium	*E* mv	Temperature, °C: Platinum: platinrhodium (Heraeus)	Platinum: Platinrhodium (Johnston-Matthey)	Copper: constantan
0	0	0	0	0	0	0	0	0
5	95	105	121	131	1	147	146	25
10	186	195	244	237	2	265	260	49
15	277	277	365	335	3	374	364	72
20	367	353	483	429	4	478	461	94
25	457	425	600	513	5	578	553	115
30	546	495	719	607	6	675	641	136
35	632		843	694	7	769	725	156
40	713		970	779	8	861	806	176
45	792		1104	866	9	950	884	195
50	871			954	10	1037	959	213
55	950			1044	11	1122	1032	232
60				1136	12	1206	1103	250
					13	1289	1173	268
					14	1372	1242	285
					15	1455	1311	302
					16	1537	1379	320
					17	1620	1447	336
					18	1704	1515	353

* 10 % Rh; 40 % Pd.

LITERATURE

(For a key to the periodicals see end of volume)

([1]) Adams, *128*, **3**: 469; 13. *1*, **36**: 65; 14. *255*, **1919**: 2111. ([2]) Adams, *O.* ([3]) Adams and Johnston, *12*, **32**: 534; 12. ([4]) Foote, Fairchild and Harrison, *32*, No. **170**; 21. ([5]) Hoskins Mfg. Co., Catalog D; 24. ([6]) Roberts, *O.* ([7]) Sosman, *12*, **30**: 7; 10.

OPTICAL PYROMETRY

C. O. Fairchild and H. T. Wensel

The temperature scale above the melting point of gold is based upon Wien's Law, $J_\lambda = c_1\lambda^{-5} e^{\frac{-C_2}{\lambda T}}$, in which the constant C_2 (1.433 cm deg) and the value 1336°K for the melting point of gold determine the scale. In optical pyrometry temperatures are usually measured by comparing the brightness of a glowing object with that of the filament of a lamp mounted in the image plane of a simple telescope. For highest accuracy the current through the lamp is kept at or near the value corresponding to 1336°K and higher temperatures are measured by reducing the brightness of the image of the object to match that of the filament by means of a suitable screen such as a rotating sector or an absorption glass of known transmission. The temperature is then found from the following formula derived from Wien's Law:

$$\frac{1}{T} = \frac{1}{1336} + \lambda_e \cdot \frac{\log_{10} R}{6222},$$

in which R is the transmission of the absorption device and λ_e is the "mean effective wave-length" of a color filter in the pyrometer for the temperature interval 1336° to T. Values of λ_e can be obtained in some cases by the use of Table 2.

For practical purposes the pyrometer is ordinarily calibrated in the range 700° to 1400°C (occasionally to 1550°C) in terms of filament current. A satisfactory empirical relation between the current I through the lamp filament and temperature t°C is:

$I = a + bt + ct^2 + dt^3$. For tungsten lamps with short 3 mil filaments dI/dt varies from about 0.00015 ampere per degree at 700°C ($I = 0.3$) to 0.0003 ampere per degree at 1400° ($I = 0.5$). For measurements above 1400° an absorption glass of such type is employed that $A(= \lambda_e \log_{10} R/6223)$ is a constant or varies slightly with temperature. If the spectral transmission, Tr, of the absorption device is of the form $Tr_\lambda = e^{\frac{K}{\lambda}}$, A will be a constant and equal to K/c_2. For sector discs A = constant · λ_e.

Table I

Temperatures extrapolated from 1336°K, using Wien's Law, compared with those obtained using Planck's Law. The values in this table were computed from the relation:

$$T_p = \frac{C_2}{\lambda \log_e \left[1 + e^{\frac{c_2}{\lambda T_w}}\right]}$$

taking $\lambda = 0.65\mu$.

T_w	T_p	$T_w - T_p$	T_w	T_p	$T_w - T_p$
1336	1336.000	.....	4500	4493	7
2000	1999.997	0.003	5000	4986	14
2500	2499.958	.042	6000	5959	41
3000	2999.74	.26	8000	7825	175
3500	3499.0	1.0	10 000	9550	450
4000	3997	3	∞	31 800	∞

Table 2

Effective wave-length and mean effective wave-length of optical pyrometer red glass filters. The effective wave-length λ_T is found from the formula

$$\frac{1}{\lambda_T} = a - \frac{b}{T}.$$

Equation*	Corning H. T. red glasses				Visibility
	A	B	C	D	
a	1.5509	1.5415	1.5369	1.5319	
b	29.6	28.2	28.0	26.8	
Wave-length microns	Transmission				
0.615	0.000	0.000	0.000	0.000	0.442
.625	.085	.007	.000	.000	.323
.635	.520	.270	.141	.080	.220
.645	.730	.533	.389	.350	.141
.655	.798	.637	.508	.520	.084
.665	.815	.664	.541	.580	.046
.675	.823	.677	.557	.605	.024
.685	.828	.686	.567	.605	.0126
.695	.830	.689	.572	.603	.0061
.705	.830	.689	.572	.598	.0031
.715	.826	.682	.564	.590	.00158
.725	.824	.679	.559	.580	.00078
.735	.822	.676	.555	.572	.00038
.745	.820	.672	.551	.567	.00018
.755	.818	.669	.547	.550	.00009
.765	.815	.664	.541	.535	.00003
.775	.813	.661	.537	.510	.00000

* The constants a and b are given for four typical red glasses of the transmissions indicated. The change in effective wave-length with temperature of glass filter itself is closely 0.00009μ per deg C at ordinary room temperatures.

Angular apertures required in the telescope of the disappearing filament type of optical pyrometer for a balance between reflection and diffraction at the filament. Under such conditions disappearance of the filament is obtained without resorting to low magnification or very low resolving power.

Table 3.—Tungsten Filament of Circular Cross-section

Exit aperture radians	Entrance aperture, radians	
	Filament diameter 0.04 to 0.06 mm	Filament diameter 0.1 mm
0.005	very low resolving power	
.01	0.04 and larger	0.04 and larger
.02	.06 to .16	.055 to .07
.04	.08 to .13	
.06	non-disappearance	

Table 4.—Brightness Temperature versus true Temperature for Red Light($\gamma = 0.65\mu$)

Observed brightness temperature	True temperature						
	Platinum[1]	Iron[2]	Iron oxide[3]	Nickel oxide[4]	Copper[5]	Copper oxide[5]	Nichrome or chromel[6]
700	745		700	701			702
800	857		801	802			804
900	972		902	904		903	906
950					1083	958	
975					1181		
1000	1090		1004	1007	1156	1020	1010
1025					1193		
1050					1231	1087	
1100	1210	1183	1106	1110		1159	1116
1150						1233	
1200	1332	1296	1210	1215			1224
1300	1455	1410		1320			
1400		1525					
1500		1641					
1600		1758					
1700		1877					
1750		1936					

LITERATURE

(For a key to periodical see end of volume)

(1) Waidner and Burgess, *31a*, **3**: 163; 07. (2) Computed for an emissivity of 0.4; *cf.* Burgess, *32*, No. **91**: 17. (3) Burgess and Foote, *31a*, **12**: 83; 15. (4) Burgess and Foote, *31a*, **11**: 41; 15. (5) Burgess, *31a*, **6**: 111; 09. (6) Foote, Bureau of Standards, *O*. For data on C, Ta, W and other substances see sections on emissivity, color temperature, etc.

General References

Burgess and Le Chatelier, Measurement of High Temperature, 1912. Pyrometry: Symposium of American Institute of Mining and Metallurgical Engineers, 1919. Foote, Fairchild and Harrison, *32*, No. **170**: 21. Foote, Mohler and Fairchild, *128*, **7**: 18; 17. Foote, *83*, **13**: 3; 18. Forsythe, *83*, **15**: 3; 20. Fairchild and Hoover, *48*, **7**: 7; 23.

LABORATORY METHODS FOR PRODUCING AND MAINTAINING CONSTANT TEMPERATURE

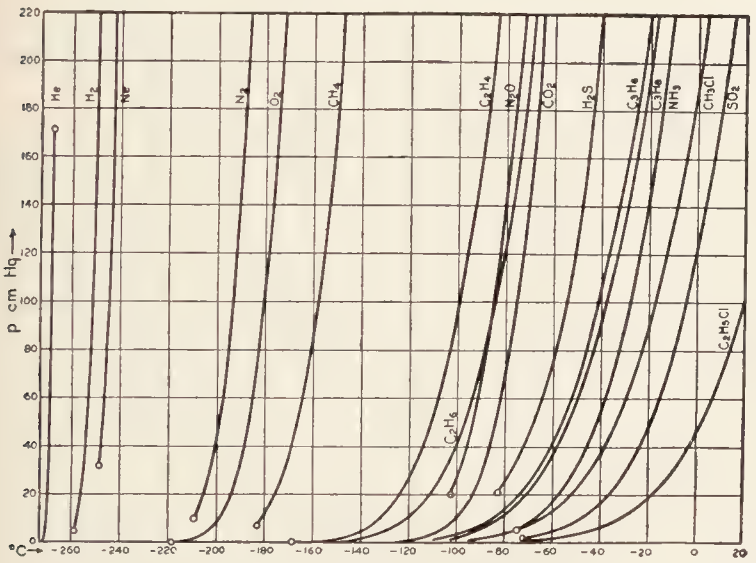
C. W. Kanolt, Olaf A. Hougen, Roland A. Ragatz and W. E. Forsythe

The successful application of the methods described in this section involves careful attention to the details of construction and operation of the auxiliary apparatus. For these details the reader is referred to the original literature.

1. TEMPERATURES BELOW 0°C

C. W. Kanolt

(*a*) *Bath Liquids Boiling at Constant Pressure.*—The temperature-pressure data for a number of suitable liquids are displayed graphically in Fig. 1. For further data concerning these liquids consult the index of I. C. T. Solid CO_2 mixed with a suitable low-freezing liquid may also be used. *Cf.* Sec. (*b*) *infra,* also (42).



Bath liquids for the maintenance of constant temperatures by boiling at a constant pressure.

(*b*) *Bath Liquids with Thermostatic Control.*—In some cases the liquid-solid mixture with proper thermal insulation may be conveniently used to automatically maintain the temperature of the invariant point (M.P. or eutectic). For general discussion of low temperature baths *v.* (16). The systems given below are arranged approximately in ascending order of their minimum working temperatures.

Abbreviations and Signs.—B. = "boils;" Cor. = "corrosiveness" or "corrosive;" E. = "eutectic composition;" Fl. = "flammable," hazardous, especially if cooled by means of liquid air. S. = "solidifies" or "solidification;" SS. = "suggested for use at its solidifying temperature;" η = "viscosity;" + = "high," − = "moderate or low," thus, η − = "moderate or low viscosity."

Below −150°.—1. *Petroleum distillate,* d_4^{15} 0.647: S. < −190° (3). *Ibid.,* d_4^{17} = 0.651: S. < −190°. B. 33°. η + at −190° (22). 2. *Amylene, techn.:* S. < −188°. Fl. η > petrol ether, *q.v.* (18, 22). 3. *Propane:* S. at −187.8°. B. at −37°. Fl. 4. *Propylene:* S. at −185.2°. B. at −47°. Fl. May be used −190° to −160°. Moisture causes turbidity (25). 5. *Butane, techn.:* η − at −180°. Fl. Gas at ordinary temp. (24). 6. *Methyl chloride* 25% + *methyl ether* 75%, E.: S. at −154°. B. < −20°. Fl (4). 7. *Isopentane:* S. at −159.6°. B. at 28.0°. Fl. SS. (37).

From −150° to −125°.—8. *Pentane, techn.:* S. < −190° for some samples. B. *ca.* 25°. Fl. (16). η varies with diff. samples. *Cf.* (5, 7, 16, 17, 22, 24, 31). 9. *Petroleum ether:* one sample S. at −160° (7). Other samples used down to −130° (16); −135° (5); −150° (15, 30); −160° (25). Fl. 9a. *Chloroform* 18% + *trans-dichloroethylene* 13% + *trichloroethylene* 20% + *ethyl bromide* 41% + *ethyl chloride* 8%: S < −150°. Non-Fl. η_{-140} 0.71 poises, η_{-150} 6.3 poises (21). 10. *Chloroform* 15% + *methylene chloride* 25% + *trans-dichloroethylene* 11% + *trichloroethylene* 16% + *ethyl bromide* 33%: S. *ca.* −150°. Non-Fl. η_{-140} = 0.85 poises, η_{-150} = 15 poises (21). 11. *Ethyl chloride:* S. at −138.7°. B. 12.2°. Fl. η − at −138.7° (21). Cor. − (20, 19). Non-Fl. by adding methyl bromide (13). 12. *Chloroform* 20% + *trans-dichloroethylene* 14% + *trichloroethylene* 21% + *ethyl bromide* 45%. E.: S. at −139°. Non-Fl. η_{-130} = 0.29 poises; η_{-140} = 0.81 poises (21). 13. *Methyl ether:* S. at −138.5°. B. at −23.7°. Fl. 14. *n-Pentane:* S. at −130.8°. Fl. Very volatile. 15. *Ethyl ether* 75 vol. % + *toluene* 25 vol. %: S. *ca.* −130° (7). 16. *Methylcyclohexane:* S. at −126.3° Fl. SS. (37). 17. *Petroleum distillate,* d_4^{23} 0.713: pasty *ca.* −125°. S. *ca.* −147° (6).

From −125° to −100°.—18. *Chloroform* 23% + *ether* 77%, E.: S. at −121.7° (35). 19. *Ethyl bromide:* S. at −119°. Non-Fl. Becomes Cor. under action of light (10). η_{-119} = 0.053 poises (21). 20. *Ethyl ether:* S. at −116.3° and (metastable) at −123.3°. Fl. SS. (37). 21. *Carbon disulfide:* S. at −111.6°. Fl. toxic. SS. (37). 22. *Chloroform* 27% + *methylene chloride* 60% + *carbon tetrachloride* 13%. E.: S. at −111°. Non-Fl. η − at − 111° (21).

From −100° to −90°.—23. *Chloroform* 31% + *trichloroethylene* 69%. E.: S. at −100°. Non-Fl. η − at −100° (21). 24. *Chloroform* 71% + *ether* 29%. E.: S. at −97.4° (35). 25. *Methylene chloride:* S. at −97°. Volatile but non-Fl. η − at −97° (21). Addition of alcohol recommended to avoid formation of HCl in light (28). 26. *Chloroform* 79% + *ether* 21%. E.: S. at −95° (35). 27. *Toluene:* S. at −95.1°. Fl. η + at −80° (24). SS. (37). 28. *Acetone:* S. at −94.6°. Fl. $\eta_{-89.7}$ = 0.0205 poise (1). 29. *Methyl chloride:* S. at −91.5°. B. at −24.1°. Fl.−, and non-Fl. by adding methyl bromide (14). Cor. −.

From −90° to −80°.—30. *Ethyl alcohol:* S. at −114.1°. Fl. η + near −114° (18, 39). η increased by presence of H_2O (24). Used down to −80° (15, 16) and to −90° (24). 31. *Trichloroethylene:* S. at −86.4°. Non-Fl. η − at −86°. Cor. −, when pure but + when ox. by air. 32. *Ethyl acetate:* S. at −83.6°. Fl. SS. (37). 33. *Carbon tetrachloride* 49% + *chloroform* 51%. E.: S. at −81°. Non-Fl. η − at −81° (21). 34. *trans-Dichloroethylene:* S. at −80.5°. Fl. (9), but less so than vol. hydrocarbons (21). Cor −.

From −80° to −50°.—35. *Ethyl ether* 80% + *ethyl alcohol* 20%: Fl. Used down to −78°. η < alcohol. Less turbid from moisture than is ether ([25]). 36. *H_2SO_4, 38% in H_2O*, E.: S. at −75°. η+ at low temps. Cor. ([23]). 37. *Chloroform:* S. at −63.5°. Non-Fl. η− at −63° ([21]). Cor−. SS. ([37]). A small quantity of alcohol prevents decomposition. 38. *$CaCl_2$* 29.8% *in H_2O*. E.: S. at −55°. η+ at −55° ([38]). Cor.+ ([32, 41]). Cor. diminished by addition of K_2CrO_4 ([27]).

From −50° to −25°.—39. *Gasolene + CCl_4:* Depending upon the density of the gasolene the following %'s of CCl_4 should be used to reduce Fl. 0.765, 30%; 0.725, 45%; 0.700, 60%; 0.680, 70% ([2, 28]). The 65% CCl_4 may be used at −50°. Flash pt. *ca.* 50°. Cor- ([8]). 40. *Chlorobenzene:* S. at −45.2°. Fl. SS. ([37]). 41. *NaCNS* 500 g per l H_2O, E.: S. at *ca.* −33°. Cor. < NaCl or $CaCl_2$ ([36]). 42. *Ethyl alcohol* 25% + *glycerine* 25% + *water* 50%: Used to −30° ([40]).

From −25° to 0°.—43. *Carbon tetrachloride:* S. at −22.9°. Non-Fl. η− at −23° ([21]). Cor−. SS. ([37]). 44. *NaCl* 22.4% in water, E.: S. at −21.2°. η−. Cor.

Distillates from Galician Petroleum([11])

Fractionation temp.	24°–40°	40°–60°	60°–80°	80°–100°	100°–120°
d_4^{15}	0.6324	0.6593	0.7005	0.7351	0.7495
S. at	−203°	−198°	−185°	−170°	−151°

Fractionation temp.	120°–140°	140°–160°	160°–180°	180°–200°	200°–220°
d_4^{15}	0.7625	0.7738	0.7872	0.7962	0.8072
S. at	−139°	−127°	−112°	−104°	−93°

LITERATURE

(For a key to the periodicals see end of volume)

(1) Archibald and Ure, *4*, **125**: 726; 24. (2) Associated Factory Mutual Fire Insurance Cos., Quart. Nat. Fire Protect. Assoc. **11**: 173; 17. (3) Baudin, *34*, **133**: 1207; 01. (4) Baume, *42*, **12**: 216; 14. (5) Beckmann and Waentig, *93*, **67**: 17; 10. (6) Cabot, *54*, **26**: 813; 07. (7) Cardosi, *42*, **13**: 312; 16. (8) Cragoe, McKelvy and O'Connor, *31A*, **18**: 707; 23. (9) Fabre, *42*, **21**: 268; 20.

(10) Fischer, Die neueren Arzneimittel, 6th ed., p. 74. (11) Formánek, Knop and Korber, *136*, **41**: 731; 17. (12) Hammerl, *75*, **78**: 59; 78. (13) Hennig, U. S. Pat. 1,393,124; Brit. Pat. 158,494; 20. (14) Henning, U. S. Pat. 1,386,497; Canadian Pat. 213,825. (15) Henning, *243*, **33**: 33; 13. (16) Henning, *B61*, p. 261. (17) Hoffmann and Rothe, *243*, **27**: 265; 07. (18) Holborn and Wien, *8*, **59**: 213; 96. (19) Jenkin, *83*, **18**: 197; 22.

(20) Jenkin and Shorthose, *115*, **116**: 761; 23. *246*, **66**: 347; 24. (21) Kanolt, Bur. Stands., *O*. (22) Kohlrausch, *8*, **60**: 463; 97. (23) Pickering, *4*, **57**: 331; 90. (24) Loomis and Walters, Bur. Mines, *O*. (25) Maass and Wright, *1*, **43**: 1098; 21. (26) Meyerhoffer and Saunders, *7*, **31**: 381; 99. (27) Pedersen, U. S. Pat. 1,405,320. (28) Remington and Wood, U. S. Dispensatory, 20th ed.; 18. (29) Roozeboom, *7*, **4**: 42; 99.

(30) Rothe, *243*, **22**: 14, 33; 02. (31) Rothe, *243*, **22**: 192; 02. (32) Rudnick, *45*, **11**: 668; 19. (33) Ruff and Fischer, *25*, **36**: 421; 03. (34) Saposhnikov, *245*, **6**: 384. (35) Smits and Berckmans, *64P*, **21**: 401; 19. (36) Sperr, U. S. Pat. 1,473,327. (37) Timmermans, Van der Horst and Onnes, *34*, **174**: 365; 22. Timmermans, *28*, **32**: 95; 23. (38) Tucker, *67*, **25**: 111; 13. (39) Wahl, *5*, **87**: 371; 12.

(40) Walton and Judd, *50*, **18**: 717; 14. (41) Zimmerman, *244*, **9**: 307; 21. (42) Thiele and Schulte, *7*, **96**: 312; 20.

LABORATORY METHODS FOR THE PRODUCTION OF COLD

C. W. Kanolt

(a) Liquids for Cooling by Vaporization into the Atmosphere

The liquid may be sprayed onto the object to be cooled ([2, 3, 4]); it may be vaporized by a current of air passed through it, forming a bath in which the object to be cooled is immersed ([5]); it may be vaporized from a porous vessel ([1]); or in other ways. The temperatures obtainable from the liquids are approximately in the order of their boiling points given below, but are much lower. Gases with critical temperatures above 20° are not included.

The data given below are, in the order given; boiling point, name of liquid, remarks, and literature.

Remarks: 1. Harmless. 2. Harmful. 3. Flammable. 4. Non-flammable. 5. Anaesthetic.

100°, *Water* (1, 4). 61.2°, *Chloroform* (4, 5). 46.2°, *Carbon disulphide* (2, 3). 40°, *Methylene chloride* (4, 5). 38.4°, *Ethyl bromide* (4, 5). 35°–39°, *Amylene, techn.* (3, 5). 34.6°, *Ethyl ether* (3, 5) produces −15° to −20° ([2, 5]). 13.1°, *Ethyl chloride* (3, 5) produces −35°([2]). 0°—70°, *Volatile petroleum distillates* (1, 3). −10.0°, *Sulfur dioxide* (2, 4). −24.1°, *Methyl chloride* (3, 5) produces −55° to −60° ([1, 2]). −33.4°, *Ammonia* (2, 3). *Carbon dioxide* (1, 4). (The liquid can not exist at atmospheric pressure. Solid can be obtained by the release of liquid from pressure. Sublimation temperature −78.5°. Used mixed with a liquid ([6]), produces −112° to −115° ([1]). −89.8°, *Nitrous oxide* (4, 5).

LITERATURE

(For a key to the periodicals see end of volume)

(1) d'Arsonval, *34*, **133**: 980; 01. (2) Braun, Die Lokalanästhesie, Chapt. 4. (3) Kanolt, *48*, **9**: 416; 24. (4) Krause, *B61*, **6**: 635; 19. (5) Lawrence, *247*, No. **18**: 10; 16. (6) Thiele and Schulte, *7*, **96**: 312; 20.

(b) Freezing Mixtures

To absorb the largest amount of heat, an aqueous freezing mixture should be made with ice, rather than with water, and the other substance used should be cooled to 0°, or as low as possible, before mixing with the ice. To absorb at a given temperature the maximum amount of heat per unit mass of mixture, the proportions of ice and the other cooling agent should be those of a solution, the freezing point of which is the required temperature ([8]). The eutectic (cryohydric) temperature is the lowest attainable, if the ingredients are precooled sufficiently. Most, if not all, salts when mixed at room temperature with ice, produce sufficient cooling to reach this temperature.

For more extensive information than given here relative to the freezing points of solutions, together with the literature references, see the separate tables of freezing points.

The following mixtures are among the most useful:

(*a*) Sodium chloride with ice for temperatures down to −21.2°.

(*b*) Hydrated calcium chloride, $CaCl_2.6H_2O$, with ice, for temperatures down to −55°.

Aqueous solutions of sulfuric acid or hydrochloric acid with ice have an advantage over salts with ice in avoiding the delay incident to the solution of the salt.

Substances	Composition of mixture (% anhydrous salt, unless otherwise stated). E = eutectic composition	Freezing point of solution	Initial condition of freezing mixture	Lowest attained temperature recorded	Heat absorbed at temperature of mixing, cal. per g of mixture	Heat absorbed (at freezing or saturation point of solution) from objects to be cooled, cal. per g of mixture. The * values are heats of fusion of the eutectic, v. (5)
$NaCl—H_2O$ (4, 12)	22.4 (E for $NaCl.2H_2O$)	−21.2°				56.4*
	23.1 (E for NaCl)	−22.4°				
	24.8		salt and ice at −1°	−21.3°		
			with ice	−21°		
$NaNO_3—H_2O$ (12, 13)	33.3		salt and ice at −1°	−17.75°		
	37.E	−18.5°				57.5*
	42.9		water and salt 13.2°	− 5.3°		
$Na_2CO_3.10H_2O—H_2O$ (12)	5.93E	− 2.1°				77.2*
	16.7		salt and ice at −1°	− 2.0°		
$Na_2SO_4.10H_2O—H_2O$	3.8E	− 1.2°				80.1*
$Na_2S_2O_3.5H_2O—H_2O$ (13)	30.0E	−11°				
	52.4		water and salt 10.7°	− 8.0°		
$NaOOCCH_3.H_2O—H_2O$ (13)	45.9		water and salt 10.7°	− 4.7°		
$KCl—H_2O$ (12)	19.3	− 9.0°				71.2*
	23.1		salt −1° ice 0°	−10.9°		
$KNO_3—H_2O$ (12)	11.2E	− 3.0°				80.7*
	11.5		salt and ice at −1°	− 2.85°		
$K_2SO_4—H_2O$ (12)	6.54E	− 1.55°				
	9.1		salt and ice at −1°	− 1.9°		
$KSCN—H_2O$ (13)	60.0		water and salt 10.8°	−23.7°		
$NH_4Cl—H_2O$ (12)	18.7E	−15.8°				75.0*
	20.0		salt and ice at −1°	−15.4°		
$NH_4NO_3—H_2O$ (12, 13, 15)	16.6	− 6°	water and salt 0°	−14.0°	12.2	2.6
			ice and salt 0°		78.8	73.6
	31.0		ice and salt at −1°	−16.75°		
	31.2	−12°	water and salt 0°	−26.0°	19.7	6.8
			ice and salt 0°		74.6	65.6
	37.5		water and salt 13.6°	−13.6°		
	41.2	−17.4°				68.4*
	43.3E	−17.5°	water and salt 0°	−33.9°	24.3	8.2
			ice and salt 0°		69.5	57.1
	46.8	−12° (Salt separates)	water and salt 0°	−36.4°	25.5	13.6
			water and salt 20°			3.1
			ice and salt 0°		68.1	59.8
	50.3	−6° (Salt separates)	water and salt 0°	−39.3°	26.5	19.0
			water and salt 20°			8.9
			ice and salt 0°		66.2	62.1
	54.1	0° (Salt separates)	water and salt 0°	−42.2°	27.6	24.3
			water and salt 20°			14.5
			ice and salt 0°		64.4	64.4
	57.1	5° (Salt separates)	water and salt 0°	−44.7°	28.4	28.4
			water and salt 20°			18.8
$NH_4SCN—H_2O$ (13)	57.1		water and salt at 13.2°	−18.0°		
$Ca_2Cl_26HO—H_2O$ (6)	% of hydrated salt 16.9	− 4.0°	ice and salt 0°		69.9	66.2

Substances	Composition of mixture (% anhydrous salt, unless otherwise stated). E = eutectic composition	Freezing point of solution	Initial condition of freezing mixture	Lowest attained temperature recorded	Heat absorbed at temperature of mixing, cal. per g of mixture	Heat absorbed (at freezing or saturation point of solution) from objects to be cooled, cal. per g of mixture. The * values are heats of fusion of the eutectic, v. (5)
$CaCl_2 6H_2O—H_2O$ (6).—*Continued*	26.8	− 8.1°	ice and salt 0°		63.8	57.3
	34.6	−12.4°	ice and salt 0°		59.3	50.2
	45.7	−22.7°	ice and salt 0°		53.0	38.4
	54.9	−39.9°	ice and salt 0°		48.0	26.0
	58.8E	−54.9°	ice and salt 0°		45.8	17.7
	63.7	−33.3° (Salt separates)	ice and salt 0°		43.7	27.9
			water and salt 0°		14.4	none
	67.1	−19.7°	ice and salt 0°		41.9	33.2
			water and salt 0°		15.4	6.7
	69.0	−14.1°	ice and salt 0°		41.0	35.0
			water and salt 0°		16.0	10.1
			water and salt 20°		none	1.5
	74.1	0°	ice and salt 0°		38.7	38.7
			water and salt 0°		17.7	17.7
			water and salt 20°		none	10.2
	77.5	7.6°	water and salt 0°		19.0	21.6
			water and salt 20°		none	14.7
$MgSO_4.12H_2O—H_2O$(5)	% anhyd. salt 19.0	− 3.9°			58.2	
$CuSO_4.5H_2O—H_2O$(15)	11.9	− 1.6°			69.0	
$ZnSO_4.7H_2O—H_2O$(5)	27.2	− 6.55°			50.9	
$FeSO_4.7H_2O—H_2O$(5)	13.0	− 1.8°			67.2	
66.19% $H_2SO_4—H_2O$ (11)	% of 66.19% H_2SO_4 7.1		ice and acid at 0°	−16°	− 2.1°†	68.6
	11.2		ice and acid at 0°	−20°	− 3.1°†	62.0
	17.2		ice and acid at 0°	−24°	− 5.5°†	52.9
	23.9		ice and acid at 0°	−28°	− 9.5°†	43.0
	33.6		ice and acid at 0°	−32°	−16.5°†	24.5
	44.2		ice and acid at 0°	−36°	−30.2°†	7.5
	47.7		ice and acid at 0°	−37°	−37°†	0
$HCl—H_2O$	% HCl 24.8E	−86°				
$Na_2SO_4.10H_2O$—36.69% HCl (14)	% of $Na_2SO_4.10H_2O$ 21.05		0°		6.09	
	30.33		0°		9.17	
	36.59		0°		11.15	
	37.69		21.2°	− 8.1°		
	42.37		0°		13.15	
	50.22		21.6°	−12.2°		
	62.67		15°			21.2 at 0°; 12.0 at −15°
	62.96		21.6°	−15.3°		
	63.88		0°		28.89	
	74.64		15°			30.6 at 0°; 19.1 at −15°
	74.68		0°		30.85	
	75.30		21.5°	−14.8°		
	78.90		0°		27.43	
	86.63		15°			24.5 at 0°; 13.4 at −15°
	86.72		0°		19.44	
	88.53		20.1°	−15.6°		

† Temperature when all ice is melted.

Substances	Composition of mixture (% anhydrous salt, unless otherwise stated). E = eutectic composition	Freezing point of solution	Initial condition of freezing mixture	Lowest attained temperature recorded	Heat absorbed at temperature of mixing, cal. per g of mixture	Heat absorbed (at freezing or saturation point of solution) from objects to be cooled, cal. per g of mixture. The * values are heats of fusion of the eutectic, v. (5)
$Na_2SO_4.10H_2O$—30.13% HCl (14)	% of $Na_2SO_4.10H_2O$ 46.04		19 7°	−11.8°		
	49.74		19.7°	−11.8°		
	63.46		19.7°	−14.4°		
	65.23		20.4°	−15.6°		
	75.43		20.0°	−14.8°		
	82.54		19.9°	−17.2°		
	86.31		20.0°	−12.6°		
	89.88		20.4°	*ca.* 0°		
$Na_2SO_4.10H_2O$—24.47% HCl (14)	% of $Na_2SO_4.10H_2O$ 35.54		0°		12.67	
	38.16		19.9°	− 8.2°		
	50.42		19.8°	−10.0°		
	62.22		0°		26.84	
	63.86		20 5°	−12.0°		
	67.57		0°		27.18	
	71.46		0°		25.72	
	75.36		21.0°	−11.8°		
	78.40		0°		20.21	
C_2H_5OH—H_2O (10)	% alc. 50	−37°	alc. at 2° ice at 0°	−24.2°		
			alc. at 1.5° ice at −1°	−29.4°		
	51.3	−38°	alc. at 4° ice at 0°	*ca.* −30°		
CS_2—$(CH_3)_2CO$	A temperature of −43.5° in a volume of 20 cc was maintained by mixing 100 cc of carbon disulfide and 70 cc of acetone per hour, using a heat interchanger (3).					

Salts	Temperature produced by mixing salts with water	Lit.	Reduction of temperature produced by water with an equal weight of a salt or of a mixture of salts in equal parts (7)
NH_4Cl			14°
NaCl			4°
KCl			12°
NH_4NO_3			25°
$NaNO_3$			9.5°
KNO_3			10°
NH_4SO_4			8°
$Na_2SO_4.10H_2O$			7.5°
K_2SO_4			4.5°
NH_4Cl—KNO_3	−18.2°	(9)	20°
NH_4Cl—$NaNO_3$	−31.5°	(9)	17°
NH_4Cl—NH_4NO_3			22°
NH_4Cl—$Na_2SO_4.10H_2O$	−17.6°	(9)	19°
NH_4Cl—K_2SO_4	−18.0°	(9)	
NaCl—KNO_3			10°
$NaCl.2H_2O$—KNO_3	−24.9°	(9)	
KCl—$NaNO_3$			11°
KCl—NH_4NO_3			20°
NH_4NO_3—KNO_3			22°
NH_4NO_3—$Na_2SO_4.10H_2O$	−19.5°	(9)	26°
Na_2NO_3—$NaSO_4.10H_2O$			10°

Salts	Temperature produced by mixing salts with water	Lit.	Reduction of temperature produced by water with an equal weight of a salt or of a mixture of salts in equal parts (7)
$NaNO_3$—KCNS	−37.4°	(1)	
KNO_3—NH_4CNS	−28.2°	(1)	
NH_4Cl—NH_4NO_3—KNO_3	−22.6°	(9)	
NH_4Cl—NH_4NO_3—$NaNO_3$	−30.1°	(9)	
NH_4Cl—$Na_2SO_4.10H_2O$—KNO_3			17°–23°
NH_4Cl—$(NH_4)_2SO_4$—K_2SO_4	−15.2°	(9)	
NH_4Cl—$(NH_4)_2SO_4$—$Na_2SO_4.10H_2O$	−19.9°	(9)	
$NaCl.2H_2O$—$NaNO_3$—KNO_3	−24.6°	(9)	
KCl—KNO_3—K_2SO_4	−11.55°	(2)	
NH_4NO_3—KNO_3—$NaNO_3$			16°–27°,
NH_4NO_3—KNO_3—$Na_2SO_4.10H_2O$			17°–26°
NH_4NO_3—$(NH_4)_2SO_4$—$Na_2SO_4.10H_2O$	−19.5°	(9)	

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(For a key to the periodicals see end of volume)

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2. TEMPERATURES ABOVE 0°C

Olaf A. Hougen and Roland A. Ragatz

(*a*) *Bath Liquids or Vapor Baths with Boiling under Constant External Pressure.*—For heterogeneous systems and solutions *v.* ([13]). For fire hazards on certain of these liquids *v.* p. 61. For a more extensive series of liquids arranged in order of boiling points *v.* p. 310.

Substance	Boiling point		Actual range used	Lit.
	At 760 mm	At 100 mm		
Ethyl chloride	12.2°	−31.3°	13° to −30°	(23)
Ethyl ether	34.5°	−12.1°		(2, 11, 13)
Carbon disulfide	46.3°	−4.8°	46° to −26°	(3, 11, 13, 26, 27, 31, 41)
Acetone	56.1°	7.5°		(13, 21)
Chloroform	61.2°	9.7°		(11, 21)
Methyl alcohol	64.5°	20.62°	65° to 49°	(2, 10, 11, 13, 21, 30)
Ethyl alcohol	78.5°	34.4°	78° to 40°	(2, 10, 11, 13, 21, 31)
Benzene	79.8°	25.8°	81° to 40°	(10, 11, 13, 39)
Water	100°	51.7°	145° to 25°	(2, 3, 9, 11, 13, 16, 18, 26, 27, 29, 30, 32, 43)
Toluene	110.5°	51.8°	130° to 70°	(10, 13, 21, 29, 32, 39, 45)
Chlorobenzene	132.1°	70.3°	132° to 70°	(31, 39)
m-Xylene	139.0°	77.8°	140° to 70°	(10, 21, 28, 32, 39, 45)
Isoamyl acetate	142.5°		141° to 119°	(30, 45)
Bromobenzene	156.2°	90.7°	160° to 120°	(28, 31)
Aniline	184.4°	119.4°	184° to 150°	(27, 31, 32, 39, 42, 45)
Ethyl benzoate	213.2°	142°		(21, 27, 45)
Naphthalene	217.9°	144.3°		(28, 39)
Methyl salicylate	223.3°	151°	225° to 175°	(31)
Quinoline	237.7°	166.7°	238° to 170°	(15, 21, 39, 45)
Isoamyl benzoate	262°			(21, 28, 45)
α-Bromonaphthalene	281.1°	198.8°	281° to 215°	(28, 31)
Diphenylamine	302.0°	221°		(5, 15, 28, 39, 45)
Benzophenone	305.4°	224°	306° to 257°	(28, 39)
Mercury	356.9°	261.5°	Various ranges	(2, 5, 31, 39)
Sulfur	444.6°	330.7°	Various ranges	(2, 5, 8, 39)
Phosphorus pentasulfide	52°			(5)
Zinc	907°	758°		(2)

(*b*) *Solid-liquid Non-variant Points.*—1. Ice-water, *v.* ([11, 24, 29, 46]). 2. Transformation temperatures of crystalline hydrates.

Salt	Hydration temperature °C	Lit.
Sodium chromate	19.71	(12, 33)
Sodium sulfate	32.383	(11, 12, 32, 33, 34, 35)
Sodium carbonate	35.3	(12, 33)
Sodium thiosulfate	48.0	(12, 33)
Sodium bromide	50.8	(12, 33)
Manganese chloride	57.8	(12, 33)
Trisodium phosphate	73.4	(12, 33)
Barium hydroxide	78.0	(12, 33)

(*c*) *Bath Liquids with Thermostatic Control.*

Liquid	Useful range	Lit.
Water	0° to 90°	(17, 18, 21, 40)
Mineral oils	To 20° below the flash point	(5, 19, 22, 37, 38, 40)
Paraffin	M.P. to 300°	(5, 27, 29, 40)
10 parts cottonseed oil, 1 part beeswax	M.P. to 300°	(7)
Hydrogenated sesame oil	60° to 300°	(36)
Hydrogenated cottonseed oil	60° to 285°	(36)

Fused salts	Melting point	Lit.
$NaNO_3$ (45%), KNO_3 (55%)	218°	(8, 14, 21, 32, 44)
$NaNO_3$ (55%), $NaNO_2$ (45%)	221°	(44)
KNO_3	337°	(1)
NaCl (28%), $CaCl_2$ (72%)	500°	(44)
NaCl (50%), K_2CO_3 (50%)	560°	(44)
Na_2CO_3 (50%), KCl (50%)	560°	(44)
$CaCl_2$ (50%), $BaCl_2$ (50%)	600°	(44)
NaCl (35%), Na_2CO_3 (65%)	620°	(44)
NaCl (22%), $BaCl_2$ (78%)	654°	(44)
NaCl (44%), KCl (56%)	663°	(44)

Molten metals	Useful range	Lit.
Lead	327° to 700°	(4, 5, 6, 29)
Lead (30%), Tin (70%)	Above 183°	(14)
Lead (50%), Tin (50%)		(5)

Other liquids	Useful range	Lit.
Naphthalene	80° to 217°	(20, 21, 25)
Benzophenone	49° to 305°	(20, 21, 25)
Sulfur	113° to 444°	(20, 25)

(*d*) *Metal Blocks.*—Aluminum and copper blocks have been used up to 600°, with a uniformity of temperature of 1° ([39]).

(*e*) *Gas Baths and Furnaces.*—For temperatures above 900°, an electrically heated gas bath is usually employed, although for the higher temperatures a bath material is not essential since heat transfer takes place primarily by radiation. For lower temperatures, heat transfer and temperature uniformity are promoted by packing with a granular non-oxidizing metal.

The following references (compiled by the Geophysical Laboratory) deal with the construction and temperature regulation of high temperature furnaces: Kolovrat, *51*, **8**: 495; 09. Haughton and Hanson, *47*, **14**: 145; 15. **18**: 173; 17. White and Adams, *2*, **14**: 44; 19. Haagn, *101*, **40**: 670; 19. Roberts, *128*, **11**: 409; 21. *48*, **6**: 965; 22. Bunting, *38*, **6**: 1209; 23. Adams, *48*, **9**: 599; 24. Roberts, *48*, **10**: 723; 25.

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([10]) Forster, *135*, **106**: 80; 12. ([11]) Freas, Thesis, Chicago; 11. ([12]) Geer, *50*, **6**: 85; 02. ([13]) Golodetz, *136*, **38**: 1253; 14. ([14]) Goodwin and Mailey, *2*, **25**: 469; 07. ([15]) Gordon, *7*, **28**: 305; 99. ([16]) Grutzmacher, Deutsch. Mech.-Ztg. **1902**: 193. ([17]) Grutzmacher, Deutsch. Mech.-Ztg. **1902**: 184. ([18]) Grutzmacher, *89*, **3**: 248, 260; 00. ([19]) Holborn and Henning, *8*, **23**: 810; 07.

([20]) Holborn and Henning, *8*, **26**: 860; 08. ([21]) Holborn, Scheel and Henning, *B63*. ([22]) Holborn and Schultze, *8*, **47**: 1101; 15. ([23]) Jenkin, *83*, **18**: 197; 22. ([24]) Marshall, *83*, **7**: 249: 11. ([25]) Meisner, *8*, **39**: 1230; 12. ([26]) Meyer, *13*, **165**: 303; 73. ([27]) Moser, *92*, **34**: 625; 21. ([28]) Noyes, *152*, No. **63**: 12, 73, 194, 240; 07. ([29]) Ostwald-Luther, *B64*, p. 100.

([30]) Pomplun, *243*, **11**: 1; 91. ([31]) Ramsay and Young, *4*, **47**: 640; 85. ([32]) Richards, *45*, **4**: 910; 12. ([33]) Richards and Churchill, *7*, **28**: 313; 99. ([34]) Richards and Mark, *65*, **38**: 417; 02. ([35]) Richards and Wells, *65*, **38**: 431; 02. ([36]) Robertson, *45*, **15**: 701; 23. ([37]) Rothe, *243*, **19**: 144; 99. ([38]) Shaw, *69*, **11**, III: 129; 17. ([39]) Stähler, *B65*, **1**: 501.

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MAXIMUM TEMPERATURES THAT CAN BE REACHED AND MAINTAINED FOR OBSERVATIONAL PURPOSES BY VARIOUS MEANS

W. E. Forsythe

	Maximum temperature, °C
Electric furnaces operating in open air	
Iron tube or iron wire wound furnace	500
Nicrome wound refractory tube	800
Platinum wound refractory tube—double winding (2)	1530
Iridium tube	1900
Carbon resistor furnace	2200
Carbon arc furnace	3200
Electric furnaces operating in vacuo or inert gas	
Tungsten wound refractory tube limited by refractory tube	2000
Carbon tube furnace	2700
Tungsten tube furnace (in vacuo)	2200
Tungsten tube furnace (in inert gas)	2800
Gas-fired furnaces	
Special makes of furnaces(5) with flames entering the furnace in tangential direction so as to give a good distribution of the heat, if gas and air are well mixed, can be raised up to about	1700
The regenerative furnaces, such as are used in open hearth steel furnaces, can be heated up to about the same temperature of	1700
Special furnaces and methods	
High-frequency induction furnace. Limited only by melting point of refractory or metal used	
Filament in vacuum or inert gas limited only by rate of vaporization or melting point of filament used	
Arc under pressure	
Carbon (4)	5790
Tungsten (3)	4785
Exploding fine wires by discharging a condenser charged to high voltage through them gives a temperature up to about (1)	19700

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(For a key to the periodicals see end of volume)

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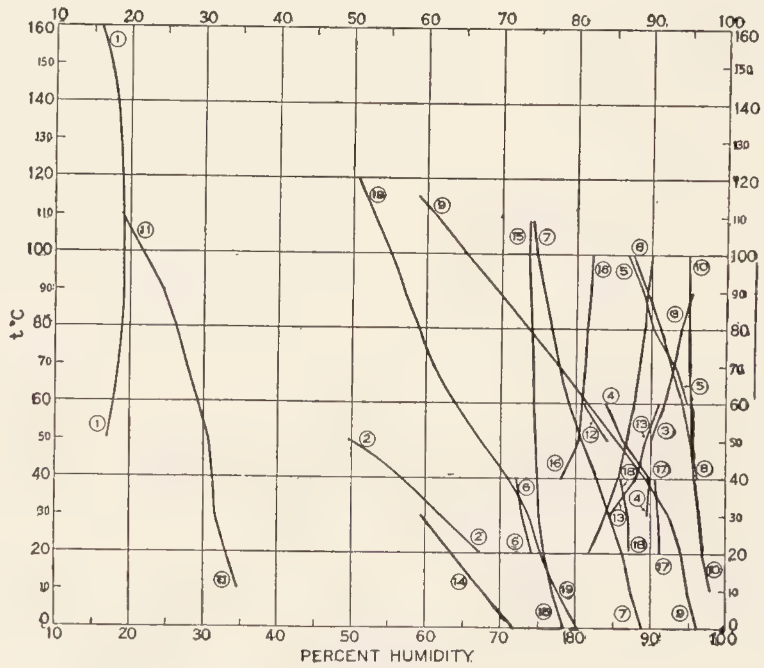
LABORATORY METHODS FOR MAINTAINING CONSTANT HUMIDITY

Hugh M. Spencer

A saturated aqueous solution in contact with an excess of a definite solid phase at a given temperature will maintain a constant humidity within any enclosed space around it. By properly selecting the salt to be used almost any desired degree of humidity can be secured and controlled in this way. A number of salts suitable for this purpose are displayed in the accompanying chart and tables, together with the % humidity prevailing above their saturated solutions at different temperatures. To convert "% humidity" into "aqueous tension" multiply it by the vapor pressure of pure water at the same temperature.



SOLID PHASE

1. $CaCl_2.2H_2O$ (19).
2. $CoCl_2.6H_2O$ (8).
3. $CoSO_4.6H_2O$ (7).
4. $CuCl_2.2H_2O$ (8, 13, 22).
5. $CuSO_4.5H_2O$ (11, 16).
6. $K_2C_4H_4O_6.\frac{1}{2}H_2O$ (4).
7. KCl (4, 5, 9, 18, 21).
8. $KClO_3$ (5, 11, 16).
9. KNO_3 (4, 5, 9, 16).
10. K_2SO_4 (4, 5, 15, 20).
11. $MgCl_2.6H_2O$ (8, 13).
12. $MgSO_4.6H_2O$ (7).
13. $MnSO_4.H_2O$ (7).
14. NH_4NO_3 (9, 18).
15. NaCl (4, 5, 18, 21).
16. $Na_2CO_3.H_2O$ (10, 22).
17. $Na_2C_4H_4O_6.2H_2O$ (14).
18. $NaKC_4H_4O_6.4H_2O$ (14).
19. $NaNO_3$ (4, 5, 9, 18, 21).
20. Na_2SO_4 (4, 16, 24, 26).

Solid phases	t, °C	% humidity	Lit.
$BaCl_2.2H_2O$	24.5	88	(15)
$CaCl_2.6H_2O$	5	39.8	(20)
	10	38	(19)
	18.5	35	(15)
	20.0	32.3	(19)
	24.5	31	(15)
$Ca(NO_3)_2.4H_2O$	18.5	56	(15)
	24.5	51	(15)
$CaSO_4.5H_2O$	20	98	(15)
CrO_3	20	35	(15)
$H_2C_2O_4.2H_2O$	20	76	(15)
$H_3PO_4.\frac{1}{2}H_2O$	24.5	9	(15)
$KC_2H_3O_2$	20	20	(15)
	168	13	(11)
KBr	20	84	(15)
	100	69.2	(5)

Solid phases	t, °C	% humidity	Lit.
$K_2CO_3.2H_2O$	18.5	44	(15)
	24.5	43	(15)
KCNS	20	47	(15)
K_2CrO_4	20	88	(15)
KF	100.0	22.9	(5)
K_2HPO_4	20	92	(15)
$KHSO_4$	20	86	(15)
KI	100.0	56.2	(5)
KNO_2	20	45	(15)
$LiCl.H_2O$	20	15	(15)
$Mg(C_2H_3O_2)_2.4H_2O$	20	65	(15)
$Mg(NO_3)_2.6H_2O$	18.5	56	(15)
	24.5	52	(15)
NH_4Cl	20.0	79.2	(9)
	25.0	79.3	(9)
	30.0	79.5	(9)
NH_4Cl and KNO_3	20.0	72.6	(9)
	25.0	71.2	(9)
	30.0	68.6	(9)
$NH_4H_2PO_4$	20.0	93.1	(9)
	25.0	93.0	(9)
	30.0	92.9	(9)
$(NH_4)_2SO_4$	20.0	81.0	(9)
	25.0	81.1	(9)
	30.0	81.1	(9)
	108.2	75	(11)
NaBr	100.0	22.9	(5)
$NaBr.2H_2O$	20	58	(15)
$NaBrO_3$	20	92	(15)
NaCl and $KClO_3$	16.39	36.58	(6)
NaCl and KNO_3	16.39	32.57	(6)
NaCl, KNO_3 and $NaNO_3$	16.39	30.49	(6)
$NaC_2H_3O_2.3H_2O$	20	76	(15)
$Na_2CO_3.10H_2O$	18.5	92	(15)
	24.5	87	(15)
$NaClO_3$	20	75	(15)
	100.0	54	(5)
$Na_2Cr_2O_7.2H_2O$	20	52	(15)
NaF	100.0	96.6	(5)
$Na_2HPO_4.12H_2O$	20	95	(15)
$NaHSO_4.H_2O$	20	52	(15)
NaI	100.0	50.4	(5)
$NaNO_2$	20	66	(15)
$Na_2SO_3.7H_2O$	20	95	(15)
$Na_2S_2O_3.5H_2O$	20	78	(15)
$Na_2SO_4.10H_2O$	20	93	(15)
$Pb(NO_3)_2$	20	98	(15)
	103.5	88.4	(11)
TlCl	100.097	99.7	(4)
$TlNO_3$	100.317	98.7	(4)
Tl_2SO_4	104.7	84.8	(4)
$ZnCl_2.1\frac{1}{2}H_2O$*	20	10	(15)
$Zn(NO_3)_2.6H_2O$	20	42	(15)
$ZnSO_4.7H_2O$	5	94.7	(20)
	20	90	(15)

* Unstable at this temperature.

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(For a key to the periodicals see end of volume)

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BAROMETRY AND MANOMETRY

H. H. KIMBALL

1. *Gravity Correction.*—The equivalent barometric, or other manometric, height (B_s) corresponding to standard gravity (g_s = 980.665 cm sec^{-2}) is related to the height (B_l) corresponding to local gravity (g_l) as shown by equation (1):

$$B_s = B_l\frac{g_l}{g_s} = B_l + C_g; \quad C_g = B_l\frac{g_l - g_s}{g_s} \tag{1}$$

When g_l and g_s are expressed in cm sec^{-2},

$$C_g = B_l\left[\frac{(g_l - g_s)(1.0197)}{1000}\right]$$

Any desired unit may be used for B_l; C_g and B_s are in the same unit as B_l. [For most barometric purposes, a sufficiently accurate correction (within ±0.01% of B_l) is obtained by the use of the approximate correction $C_g' = B_n\frac{g_l - g_s}{g_s}$, in which B_n is the usual barometric pressure at the station.]

Example: $B_l = 29.851$, $g_l = 978.053$ cm sec^{-2}. Then $(g_l - g_s) = -2.612$ cm sec^{-2}; $0.0197(g_l - g_s) = -0.0515$ cm sec^{-2}; $1000\,C_g = -2.663B_l = -79.49$. $\therefore B_s = 29.851 - 0.079 = 29.772$.

2. *Temperature Correction.*—The equation by which the equivalent barometric, or other manometric, height (B) at the standard temperature (t_m) can be computed from the nominal height (B') at the temperature t, is generally written in the form

$$B = B' + C_t; \quad C_t \equiv B'\frac{l(t - t_s) - m(t - t_m)}{1 + m(t - t_m)} \tag{2}$$

where t_m = standard temperature of the manometric liquid, t_s = temperature at which the scale, after correction for errors of graduation, reads correctly, m = coefficient of cubical expansion of the manometric liquid, l = coefficient of linear expansion of the material on which the scale is engraved.

The value of m which is generally used for mercury, and which has been adopted by the International Meteorological Tables, is $m = 181.8 \times 10^{-6}$ per °C. For temperatures between 0°C and 30°C this value appears (5, 6, 8, 15, 17) to be correct within $\pm 0.1 \times 10^{-6}$ per °C. The value of l, for brass, which has been adopted by the International Meteorological Tables, is $l = 18.4 \times 10^{-6}$ per °C. The best determinations (1, 2, 11) of this coefficient for temperatures between 0° and 30° yield values varying from

17.5×10^{-6} per °C to 19.3×10^{-6} per °C, or by ±5%. For glass scales the approximate value $l = 8.5 \times 10^{-6}$ per °C is usually satisfactory. (For silicate flint glasses (13) l varies from 7.88×10^{-6} per °C to 9.35×10^{-6} per °C; for crown glasses (13) it varies from 6.75×19^{-6} to 9.54×10^{-6} per °C.

For barometers with metric scales, the combined effect of an error of $\pm 0.1 \times 10^{-6}$ per °C in m and of $\pm 0.9 \times 10^{-6}$ per °C in l will cause an error in C_t of $\pm \frac{B't \times 10^{-6}}{1 + mt}$. For $t = 30$°C and $B' = 760$ mm, the error would be ±0.023 mm; while for $t = 10$°C, $B' = 100$ mm, it would be only ±0.001 mm. At ordinary room temperatures, the error so produced in C_t will be less for barometers graduated in inches than for one graduated in millimeters. (For barometers graduated in inches $t_s = 62$°F, $t_m = 32$°F).

TABLE 1.—TEMPERATURE CORRECTION (C_t) FOR MERCURIAL MANOMETERS AND BAROMETERS

$B = B' + C_t$; (B' = nominal height at t°; B = equivalent height for mercury at 0°C; B, B', and C_t are all in the same unit, which may be anything desired)

A. Brass scale correct at 62°F, inches, °F; $t_m = 32$°F, $t_s = 62$°F, $m = 181.8 \times 10^{-6}$ per °C, $l = 18.4 \times 10^{-6}$ per °C
(Applies directly to commercial barometers graduated in inches)

t(°F) \ B'	10	20	30	40	50	60	70	80	90
+12	+0.015	+0.030	+0.045	+0.061	+0.076	+0.091	+0.106	+0.121	+0.136
22	+0.006	+0.012	+0.018	+0.024	+0.030	+0.036	+0.042	+0.048	+0.054
32	−0.003	−0.006	−0.009	−0.012	−0.015	−0.018	−0.021	−0.024	−0.028
42	−0.012	−0.024	−0.036	−0.049	−0.061	−0.073	−0.085	−0.097	−0.109
52	−0.021	−0.042	−0.064	−0.085	−0.106	−0.127	−0.148	−0.169	−0.191
62	−0.030	−0.060	−0.091	−0.121	−0.151	−0.181	−0.211	−0.242	−0.272
72	−0.039	−0.078	−0.118	−0.157	−0.196	−0.235	−0.275	−0.314	−0.353
82	−0.048	−0.096	−0.145	−0.193	−0.241	−0.289	−0.338	−0.386	−0.434
92	−0.057	−0.114	−0.172	−0.229	−0.286	−0.343	−0.400	−0.458	−0.515

B. Brass scale correct at 0°C, millimeters, °C; $t_m = t_s = 0$°C, $m = 181.8 \times 10^{-6}$ per °C, $l = 18.4 \times 10^{-6}$ per °C

t(°C) \ B'	100	200	300	400	500	600	700	800	900
−10	+0.16	+0.33	+0.49	+0.65	+0.82	+0.98	+1.15	+1.31	+1.47
− 5	+0.08	+0.16	+0.25	+0.33	+0.41	+0.49	+0.57	+0.65	+0.74
0	0.00								
+ 5	−0.08	−0.16	−0.24	−0.33	−0.41	−0.49	−0.57	−0.65	−0.73
10	−0.16	−0.33	−0.49	−0.65	−0.82	−0.98	−1.14	−1.30	−1.47
15	−0.24	−0.49	−0.73	−0.98	−1.22	−1.47	−1.71	−1.96	−2.20
20	−0.33	−0.65	−0.98	−1.30	−1.63	−1.95	−2.28	−2.60	−2.93
25	−0.41	−0.81	−1.22	−1.63	−2.03	−2.44	−2.85	−3.25	−3.66
30	−0.49	−0.98	−1.46	−1.95	−2.44	−2.93	−3.41	−3.90	−4.39
35	−0.57	−1.14	−1.70	−2.27	−2.84	−3.41	−3.98	−4.55	−5.11
40	−0.65	−1.30	−1.95	−2.60	−3.24	−3.89	−4.54	−5.19	−5.84

C. Glass scale correct at 0°C, $t_m = t_s = 0$°C, $m = 181.8 \times 10^{-6}$ per °C, $l = 8.5 \times 10^{-6}$ per °C

t(°C) \ B'	100	200	300	400	500	600	700	800	900
−10	+0.17	+0.35	+0.52	+0.69	+0.87	+1.04	+1.22	+1.39	+1.56
− 5	+0.09	+0.17	+0.26	+0.35	+0.43	+0.52	+0.61	+0.69	+0.78
0	0.00								
+ 5	−0.09	−0.17	−0.26	−0.35	−0.43	−0.52	−0.61	−0.69	−0.78
10	−0.17	−0.35	−0.52	−0.69	−0.86	−1.04	−1.21	−1.38	−1.56
15	−0.26	−0.52	−0.78	−1.04	−1.30	−1.56	−1.81	−2.07	−2.33
20	−0.34	−0.69	−1.04	−1.38	−1.73	−2.07	−2.42	−2.76	−3.11
25	−0.43	−0.86	−1.29	−1.73	−2.16	−2.59	−3.02	−3.45	−3.88
30	−0.52	−1.03	−1.55	−2.07	−2.59	−3.10	−3.62	−4.14	−4.65
35	−0.60	−1.21	−1.81	−2.41	−3.01	−3.62	−4.22	−4.82	−5.42
40	−0.69	−1.38	−2.06	−2.75	−3.44	−4.13	−4.82	−5.51	−6.19

Example: Barometer graduated in inches, brass scale correct at 62°F; $B' = 29.564$ in., $t = 76.8$°F. From section A it is found that at 72°, C_t for $B' = 29.564$ is −0.1155, at 82° it is −0.1421; hence at 76.8°, $C_t = -0.1155 + \frac{4.8}{10}(-0.0266) = -0.1155 - 0.0128 = -0.128$. Hence $B = 29.564 - 0.128 = 29.436$ in.

3. *Capillary Corrections.*—The curvature of the surfaces of the manometric liquid introduces pressures directed towards the centers of curvature of the surfaces. For each surface, this pressure is

$$\gamma\left(\frac{1}{r_1} + \frac{1}{r_2}\right)\text{dynes cm}^{-2} = \frac{\gamma}{dg}\left(\frac{1}{r_1} + \frac{1}{r_2}\right)\text{cm of the manometric liquid.}$$

[γ = surface tension (in dynes cm^{-1}), d = density of the liquid (in g cm^{-3}), g is the acceleration of gravity (in cm sec^{-2}), and r_1 and r_2 are the principal radii of curvature (in cm) of the surface at the point considered.] At the vertex of the meniscus in a tube of circular section, $r_1 = r_2 = r$, and if the angle of contact of the liquid with the tube is either 0° or 180°, and if the tube is not too large, r is practically equal to the internal radius of the tube. If the liquid surface is in an annular space between coaxial, circular cylinders (as in the reservoir of a Fortin barometer), if the angle of contact is 0°, and if neither r_1 nor $(r_3 - r_2)$ is very great as compared with the capillary constant, [18], then $h' = \frac{2dhr_1}{(r_3 - r_2)^2}$, approximately; h' and h are the respective capillary pressures (in terms of unit column of the liquid) at the vertices of the surfaces in the annular space of width $(r_3 - r_2)$, and in a tube of radius r_1; and d is the depth of the annular meniscus.

Laplace [12] has shown that, except for sign, the equations for a convex meniscus are the same as those for a concave one. Hence, this expression can probably be accepted as a first approximation to the value for h' for any liquid, provided that the angle of contact of the liquid with the solid is the same at all three surfaces, and that r_1 and $(r_3 - r_2)$ are not too great. In the case of the ordinary mercurial cistern barometers, $(r_3 - r_2)$ is quite large as compared with the capillary constant of mercury, and the angles of contact may not be the same at all three surfaces; for these reasons, no great confidence can be placed in the actual value of h', as so computed, for such barometers, but its order of magnitude will probably be correct.

TABLE 2.—CAPILLARY DEPRESSION OF THE APEX OF A MERCURIAL COLUMN IN A GLASS TUBE OF CIRCULAR SECTION*

Depression in millimeters

Radius of the tube, mm	Height of the meniscus, mm								
	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6	1.8
1.0	2.46	4.40							
1.4	1.26	2.36	3.22						
1.8	0.75	1.44	2.02	2.48					
2.2	0.49	0.95	1.36	1.70	1.98				
2.6	0.34	0.66	0.96	1.22	1.44	1.61			
3.0	0.24	0.48	0.70	0.90	1.07	1.21	1.32		
3.5	0.17	0.34	0.49	0.64	0.76	0.87	0.96	1.04	
4.0	0.12	0.24	0.35	0.46	0.56	0.64	0.71	0.77	0.82
4.5	0.09	0.18	0.26	0.34	0.41	0.47	0.53	0.58	0.62
5.0	0.07	0.13	0.19	0.25	0.30	0.35	0.40	0.44	0.47
5.5	0.05	0.10	0.14	0.19	0.23	0.27	0.30	0.33	0.36
6.0	0.04	0.07	0.11	0.14	0.18	0.20	0.23	0.25	0.27
6.5	0.03	0.06	0.09	0.11	0.14	0.16	0.18	0.20	0.21
7.0	0.02	0.04	0.06	0.08	0.10	0.12	0.14	0.15	0.16

* From the Schleiermacher-Delcros [4, 9, 10] table, as revised by Süring [14]. The values are about 5 % larger than those obtained from Bravais's [3] table, in which the arguments are the diameter of the tube, and the angle of incidence of the meniscus of the mercurial column with the walls of the tube.

Example: In a barometer cistern for which $r_2 = 6$ mm, $r_3 = 16$ mm, d was found to be 0.5 mm.; the radius of the barometer tube was $r_1 = 5$ mm, and the height of the meniscus in it was 1.0 mm. From Table 2 it is found that the depression h, due to the meniscus in the 5 mm tube, is 0.30 mm; hence $h' = 0.015$ mm. That is, the pressure due to the annular surface is of the order of 0.02 mm; and the total depression of the column is $H = 0.30 - 0.02 = 0.28$ mm, subject to the uncertainty regarding the actual value of h'.

4. *Possible Residual-gas Error in Good Barometers.*—Under ordinary laboratory conditions, errors amounting to as much as 4.1 mm (0.163 in.) have been observed, and errors of 1.1 mm (0.043 in.) are not uncommon; but in most barometers, this error does not exceed 0.25 mm (0.010 in.) when the instrument is shipped by the manufacturer. Air may be introduced during shipment and by handling. The smaller the tube of the barometer, the more likely is the error to be large. The magnitude of the error varies with the temperature and with the volume of the space above the mercury column, as indicated by equation (3):

$$x = x_0 \frac{V_0}{V}[1 + 0.00367(t - t_0)] \qquad (3)$$

where x_0 and x are, respectively, the errors corresponding to the volume V_0 temperature t_0, and to the volume V temperature t; temperatures being expressed in °C.

5. *Conversion of Water Column at t°C to the Equivalent Water Column at 4°C.*—If h_t and h_4 are the equivalent true heights (corrected for scale errors of graduation and expansion, and for capillary pressures), and if d_t and d_4 are the respective densities [7, 16] then, if $\delta = (d_4 - d_t)/d_4$, $h_4 = h_t(1 - \delta)$.

TABLE 3.—VALUES OF 100δ

t (°C)	Units of t				
	0	2	4	6	8
tens					
0	0.013	0.003	0.000	0.003	0.012
1	0.027	0.048	0.073	0.103	0.138
2	0.177	0.221	0.268	0.320	0.375
3	0.435	0.497	0.563	0.633	0.706

Example.—$h_{25} = 67.53$ cm. At 25°, $100\delta = 0.294$. $\therefore \delta h_{25} = 0.199$, $h_4 = h_{25}(1 - \delta) = 67.53 - 0.20 = 67.33$ cm.

6. *Conversion of Water Column at 4°C to Equivalent Mercury Column at Standard Density* (13.5951 $g\ cm^{-3}$); *and the Reverse.*—If h_w and h_m are the equivalent true heights (corrected for the scale errors of graduation and expansion, and for all capillary effects) of the water and the mercury, respectively, $h_m = 0.073554h_w$.

TABLE 4.—EQUIVALENT COLUMNS OF WATER (h_w) AND OF MERCURY (h_m)

(Density of water = 0.999973 g cm^{-3}; of mercury = 13.5951 g cm^{-3})

h_w	h_m	h_w	h_m	h_m	h_w	h_m	h_w
100	7.3554	600	44.132	1	13.5955	6	81.573
200	14.7108	700	51.488	2	27.1909	7	95.168
300	22.0662	800	58.843	3	40.7864	8	108.764
400	29.4216	900	66.199	4	54.3818	9	122.359
500	36.7770	1000	73.554	5	67.9773	10	135.955

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(For a key to the periodicals see end of volume)

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PSYCHROMETRY; DENSITY OF MOIST AIR; CHANGE IN BAROMETRIC PRESSURE WITH ALTITUDE

F. W. J. Whipple

B; B_h	Barometric pressure, in general; at h
C	Instrumental constant
d; d_h; d_o	Density of air, in general; at h; at T_o and A_n
e; e'	Pressure of water vapor, present; when in equilibrium with water (or ice) at temperature t'
g; g_s	Acceleration of gravity, actual; standard value
h; H	Altitude above sea level, cm; meters
t; t'	Readings of dry bulb; of wet bulb
T; T_o; T'	Absolute temperatures in °C, general; of ice point; "virtual"
x	Ratio (mass of vapor)/(mass of dry air)

1. Psychrometry.—The pressure of the water vapor contained in the air is commonly deduced from the simultaneous readings of wet bulb and of dry bulb thermometers. The difference in these two readings depends upon the heat received by radiation as well as upon that furnished directly by the air. When the air flow is slow, the radiation is an important factor. In the Assmann psychrometer the bulb is surrounded by a double metal sheath; this largely eliminates radiation effects. It is important to secure adequate ventilation by the use of a thermometer with a bulb much smaller than the sheath. The standard bulb is 12 mm long and 4 mm in diameter. Alternatively, the thermometers may be "slung," *i.e.*, whirled on a suitable holder. In this case, direct radiation from sun or sky should be avoided as it affects the dry-bulb readings and therefore the psychometric difference.

The general formula for the computation of vapor pressure is

$$e' - e = CB(t - t') \times 10^{-4}$$

B, e, and e' are expressed in the same units, which may be anything desired. Within the order of accuracy of psychrometer observations, C is constant for a given velocity of the air-flow past the wet bulb. The relation of C to the air velocity has not been determined very precisely. The variation of C with temperature is negligible. If temperatures are expressed in °C, the value of C for thermometers with adequate ventilation (a relative velocity of 3 m per second or more) is 6.6 when the cover of the wet-bulb is saturated with water. On theoretical grounds, a lower factor, 5.8, is appropriate for an ice-covered bulb, but in the tables in general use 6.6 is adopted in this case as well. (Aspirations Psychrometer Tafeln, Braunschweig. 1908. Ferrel, Report of Chief Signal Officer, p. 248. Washington, 1886.) For the reduction of the readings of thermometers exposed in a Stevenson screen, Regnault's values of C, 8 for water and 7 for ice, are generally recommended (Études sur l'Hygrométrie, p. 102. Paris, 1845.) As, however, the ventilation is indeterminate, the accuracy obtainable is of a lower order.

Relative Humidity is computed by expressing e, determined by the psychrometric formula, as a percentage of the pressure of vapor in equilibrium with water (not ice) at the temperature of the dry bulb.

2. Density of Moist Air*

$$T,\ T_o = \text{absolute temperature in °C}$$

Pressure unit	d
Any unit	$\frac{d_o T_o}{T}\left(\frac{B - 0.3783e}{A_n}\right)$;
	$\frac{d_o T_o B}{T B_o}\left(\frac{0.6217(1 + x)}{0.6217 + x}\right)$
Mm Hg	$\frac{464.6}{10^6}\left(\frac{B - 0.3783e}{T}\right)$ g/cm³;
	$\frac{288.9}{10^6}\left(\frac{B(1 + x)}{(0.6217 + x)T}\right)$ g/cm³
Kilodynes per cm²	$\frac{348.5}{10^6}\left(\frac{B - 0.3783e}{T}\right)$ g/cm³
	$\frac{216.7}{10^6}\left(\frac{B(1 + x)}{(0.6217 + x)T}\right)$ g/cm³

$$x = \frac{\text{mass of vapor}}{\text{mass of dry air}} = \frac{0.6217\,e}{B - e}$$

Tables in Dictionary of Applied Physics **3**: 76, and in paper by Shaw and Fahmy in Quart. J. Roy. Meteorological Soc., 1925, 210.

$$\text{Specific humidity} = \frac{\text{mass of vapor}}{\text{total mass}} = \frac{0.6217\,e}{B - 0.3783\,e}$$

3. Relations Connecting Pressure and Altitude.—V. Bjerknes defines "virtual" temperature (T') as $T' = TB/(B - 0.3783e)$.

$$\frac{dB}{B} = d\,(\log_e B) = -\frac{gd}{B}dh = -0.03416\frac{g}{g_s}\cdot\frac{dH}{T'} = -\frac{g}{29.26\,g_s}\cdot\frac{dH}{T'} \quad (1)$$

$$d(\log_{10} B) = -\frac{0.014842\,g}{g_s}\cdot\frac{dH}{T'} = -\frac{g}{67.38\,g_s}\cdot\frac{dH}{T'} \quad (2)$$

If suffix $_1$ refers to the lower station and $_2$ to the upper, then

$$\log_{10}\frac{B_1}{B_2} = 0.014842\frac{g}{g_s}\cdot\frac{2(H_2 - H_1)}{T'_1 + T'_2},\ \text{approx.} \quad (3)$$

$$B_1 = B_2\left[1 + 0.03416\frac{g}{g_s}\cdot\frac{2(H_2 - H_1)}{T'_1 + T'_2 - 0.03416\,(H_2 - H_1)\frac{g}{g_s}}\right],\ \text{approx.} \quad (4)$$

$$H_2 - H_1 = \frac{29.26\,g_s}{g}\cdot\frac{B_1 - B_2}{B_1 + B_2}(T'_1 + T'_2),\ \text{approximately.} \quad (5)$$

For $(H_2 - H_1)$ not exceeding 1000 m, equations (4) and (5) are equivalent to the logarithmic formula. The factor $g/g_s = (1 - 0.002640\cos 2\phi)(1 - 3.14H \times 10^{-7})$ may generally be taken as unity. The distinction between virtual and actual temperature may be ignored except when high temperatures are involved.

In the determination of heights in an extended barometric survey of a country, allowance must be made for the horizontal pressure gradient. When daily weather maps are available, B_1 may be taken from them as the pressure at sea-level in the neighborhood. If T_1 is not known, the conventional value (adopted by Intern. Meterological Conference, Innsbruck, 1905) $T_1 = T_2 + 0.005\ (H_2 - H_1)$ may be used, but in hot weather $T_1 = T_2 + 0.01\ (H_2 - H_1)$ is a better approximation. Value of T_2 observed at a mountain station may differ considerably from the temperature of free atmosphere at same level; this is especially true in calm weather, at night, and in the early morning. (*cf.* Hesselberg, Int. Meterol. Conference, Utrecht, 1923, App. L.) Tables of

* If d_w, d_a = density of vapor and of dry air at same pressure and temperature, $d_w/d_a = 0.6217$ and $(d_a - d_w)/d_a = 0.3783$.

virtual temperatures: V. Bjerknes, Dynamic Meteorology, etc., Washington, 1911. Values of $0.01484/T$: Computer's Handbook of Meteorological Office, London, **2**: 45.

Graduation of Aneroids.—The height scales on aneroids designed for the use of travellers, are graduated on the assumption that the temperature of the atmosphere is constant and independent of the altitude. Various standard temperatures, such as 50°F and 0°C have been used. For such scales, especially when applied to aircraft use, the difference between the indicated and the true height may be excessive.

The International Commission for Aerial Navigation adopted in 1925 a scale based on the following conventions (*cf.* Dict. Applied Physics **3**: 182): (*a*) Pressure at sea-level is $A_n = 1.0132 \times 10^6$ dynes/cm²; (*b*) temperature at sea-level is 15°C; (*c*) temperature decreases by 6.5°C per km, up to 11 km; and above 11 km is constant at −56.5°C; (*d*) humidity may be ignored; (*e*) value of g is same at all heights and $= g_{45}$ (essentially g_s). Whence, denoting the pressure and density at sea-level by B_1, and d_1; those at 11 000 m by $B_{11\,000}$ and $d_{11\,000}$:

$$\frac{B}{B_1} = \left(\frac{288 - 0.0065\,H}{288}\right)^{5.256};\ \frac{d}{d_1} = \left(\frac{288 - 0.0065\,H}{288}\right)^{4.256};\quad \text{if } H \not> 11\,000\text{ m.}$$

$$\log_{10}\frac{B_{11\,000}}{B} = \log_{10}\frac{d_{11\,000}}{d} = \frac{H - 11\,000}{14\,600},\ \text{if } H > 11\,000\text{ m}$$

	Unit	Value	$\log_{10}$
B_1	mm	760	2.88081
B_1	kilodyne/cm²	1013.2	3.00570
d_1	g/m³	1226	3.08849
$B_{11\,000}$	mm	169.6	2.22943
$B_{11\,000}$	kilodyne/cm²	226.1	2.35432
$d_{11\,000}$	g/m³	364	2.56104

As the regulations drawn up by the I. C. A. N. are ambiguous, attention must be drawn to the fact that whilst the altimeter reading, H, gives the pressure uniquely, it cannot give the temperature and density of the air. Hence the formulae for d are on quite a different footing from those for B. (*Cf.* Section on Aerodynamics, Ed.)

VOLUMES OF LIQUID MENISCI

F. A. Gould

As used in this section, the volume (V_m) of the liquid meniscus in a vertical, circular cylinder = volume of the liquid which lies below the capillary surface and between two horizontal planes, one tangent to the meniscus, and the other passing through the line in which the meniscus meets the wall of the tube. The value of V_m depends upon the surface tension (γ), the acceleration of gravity (g), the difference (ρ) in the densities of the fluids separated by the surface, the radius (r) of the cylinder, and the angle (θ) at which the capillary surface meets the wall of the cylinder. If θ is variable and not too small, it is more convenient to use the height (h_m) of the meniscus (= distance between the planes mentioned), than θ, as one of the variables. This has been done in Tables 1 and 2, which give the volume of the mercury meniscus for $\gamma = 400$ mg wt./cm (=392.27 dynes/cm, $g = 980.665$), ρ = 13.55g/cm³. This value of γ is close to the mean of the values corresponding to the experimental determinations of V_m by Scheel and Heuse (*8*, **33**: 295; 10) (425 mg/cm), and by Palacios (*139*, **17**: 295; 19. *63*, **24**: 152; 23) (406 to 326 mg/cm); an idea of the error which is associated with a departure of the actual value of γ from that assumed may be obtained by comparing their values with those here given. (*See also* Schalkwijk, *168*, No. **67**, and *64 V*, **8**: 462; 00. **9**: 512; 01.)

If $\theta = 0$, it is convenient to tabulate the dimensionless quantities V_m/r^3 and $h_c/r = V_m/\pi r^3$ as functions of $g\rho r^2/\gamma$, as is done in Table 3. [$g\rho r^2/\gamma = r^2/a_1^2$. where a_1 is capillary constant (British usage), *see* section Technical Terms (p. 34); h_c = length of circular cylinder of radius r and volume V_m].

Table 1.—Volume (V_m) of Mercury Meniscus

h_m = height of meniscus, d = internal diameter of tube. Accuracy for the larger menisci = 0.3 %, for the smaller = 1 %. Unit of V_m = 0.001 cm³; of h_m and d = 1 mm. Assumes γ = 400 mg wt./cm

h_m \ d	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	d / h_m
0.1	0.040	0.159	0.360	0.646	1.02	1.50	2.08	2.75	3.55	4.46	5.49	6.67	7.97	9.42	11.1	12.8	14.8	16.9	19.2	21.6	24.2	27.0	30.0	33.1	0.1
0.2	0.083	0.321	0.723	1.30	2.05	3.00	4.16	5.53	7.12	8.95	11.0	13.4	16.0	18.9	22.2	25.7	29.6	33.9	38.5	43.4	48.6	54.1	60.0	66.3	0.2
0.3	0.134	0.490	1.09	1.95	3.09	4.52	6.26	8.32	10.7	13.5	16.6	20.2	24.1	28.5	33.4	38.7	44.6	51.0	57.8	65.2	73.0	81.3	90.2	99.6	0.3
0.4	0.195	0.669	1.47	2.63	4.14	6.04	8.37	11.1	14.3	18.0	22.3	27.0	32.3	38.1	44.7	51.8	59.6	68.1	77.3	87.1	97.5	109	120	133	0.4
0.5		0.861	1.87	3.31	5.21	7.59	10.5	14.0	18.0	22.7	28.0	33.9	40.6	47.9	56.1	65.0	74.7	85.4	96.9	109	122	136	151	167	0.5
0.6		1.07	2.29	4.01	6.30	9.16	12.7	16.8	21.7	27.3	33.7	40.9	48.9	57.8	67.6	78.3	90.0	103	117	131	147	164	181	200	0.6
0.7		1.31	2.72	4.74	7.43	10.8	14.9	19.7	25.4	32.0	39.5	47.9	57.4	67.8	79.2	91.7	105	120	136	154	172	191	212	234	0.7
0.8		1.56	3.17	5.50	8.58	12.4	17.1	22.6	29.2	36.8	45.4	55.1	65.9	77.8	91.0	105	121	138	156	176	197	219	243	268	0.8
0.9		1.85	3.67	6.29	9.77	14.1	19.4	25.6	33.0	41.6	51.4	62.3	74.5	88.0	103	119	137	160	177	199	222	248	274	303	0.9
1.0			4.19	7.12	11.0	15.8	21.7	28.6	36.9	46.5	57.3	69.6	83.2	98.3	115	133	153	174	197	222	248	276	306	337	1.0
1.1			4.76	7.99	12.3	17.6	24.1	31.8	40.9	51.4	63.5	77.0	92.1	109	127	147	169	192	218	245	274	305	338	372	1.1
1.2			5.39	8.90	13.6	19.5	26.6	35.0	44.9	56.5	69.7	84.5	101	119	139	161	185	211	238	268	300	334	369	407	1.2
1.3			6.07	9.88	15.0	21.4	29.1	38.2	49.1	61.7	76.0	92.1	110	130	152	176	201	229	260	292	326	363	402	443	1.3
1.4				10.9	16.4	23.4	31.7	41.7	53.3	66.9	82.4	99.9	119	141	164	190	218	248	281	316	353	392	434	478	1.4
1.5				12.1	18.0	25.4	34.5	45.2	57.8	72.3	89.0	108	129	152	177	205	235	268	303	340	380	422	468	515	1.5
1.6				13.3	19.6	27.6	37.3	48.8	62.3	77.8	95.7	116	138	163	190	220	253	287	325	365	407	453	501	552	1.6
1.7					21.4	29.8	40.2	52.6	67.0	83.6	103	124	148	175	204	236	270	307	347	390	436	484	535	589	1.7
1.8					23.2	32.2	43.3	56.4	71.7	89.5	110	133	158	186	218	251	288	328	370	415	464	515	570	628	1.8
1.9						34.8	46.5	60.4	76.7	95.5	117	141	168	199	232	268	306	349	393	441	493	547	605	666	1.9
2.0						37.4	49.8	64.6	81.9	102	124	150	179	211	246	284	325	370	417	468	522	580	641	706	2.0
2.1							53.4	69.1	87.3	108	132	159	190	224	261	301	344	391	441	495	552	614	678	746	2.1
2.2								73.7	93.0	115	140	169	201	237	276	318	364	413	466	523	583	648	716	787	2.2
2.3									98.9	122	149	179	213	250	291	336	384	436	492	552	615	683	754	829	2.3
2.4										130	158	189	225	264	307	354	405	459	518	581	648	719	794	872	2.4
2.5											167	200	237	279	324	373	427	484	546	612	681	755	833	915	2.5

Table 2.—Height (h_c) of Cylinder Equivalent to Volume (V_m) of Mercury Meniscus

$h_c = V_m/\pi r^2$ = length of tube of radius r and volume V_m; h_m = height of meniscus; $d = 2r$ = diameter of tube. Accuracy and basis are same as for Table 1

Unit of h_c, h_m, and d = 1 mm. Assumes γ = 400 mg wt./cm

h_m \ d	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	d / h_m
0.1	0.051	0.051	0.051	0.051	0.052	0.053	0.054	0.055	0.056	0.057	0.058	0.059	0.060	0.061	0.063	0.064	0.065	0.066	0.068	0.069	0.070	0.071	0.072	0.073	0.1
0.2	0.106	0.102	0.102	0.103	0.104	0.106	0.108	0.110	0.112	0.114	0.116	0.118	0.121	0.123	0.126	0.128	0.131	0.133	0.136	0.138	0.140	0.142	0.144	0.147	0.2
0.3	0.171	0.156	0.155	0.155	0.157	0.160	0.163	0.165	0.168	0.172	0.175	0.178	0.182	0.185	0.189	0.192	0.196	0.200	0.204	0.208	0.211	0.214	0.217	0.220	0.3
0.4	0.248	0.213	0.209	0.209	0.211	0.214	0.218	0.221	0.225	0.230	0.234	0.239	0.243	0.248	0.253	0.257	0.263	0.268	0.273	0.277	0.281	0.286	0.290	0.294	0.4
0.5		0.274	0.265	0.263	0.265	0.268	0.273	0.278	0.283	0.288	0.294	0.300	0.306	0.311	0.318	0.323	0.329	0.336	0.342	0.348	0.353	0.358	0.363	0.368	0.5
0.6		0.341	0.323	0.319	0.321	0.324	0.329	0.335	0.341	0.348	0.355	0.362	0.368	0.375	0.383	0.389	0.397	0.404	0.411	0.418	0.424	0.430	0.437	0.443	0.6
0.7		0.416	0.385	0.377	0.378	0.381	0.386	0.392	0.400	0.408	0.416	0.424	0.432	0.440	0.448	0.456	0.465	0.473	0.481	0.489	0.496	0.504	0.511	0.518	0.7
0.8		0.497	0.449	0.438	0.437	0.440	0.444	0.450	0.459	0.468	0.478	0.487	0.496	0.506	0.515	0.524	0.533	0.542	0.551	0.561	0.569	0.577	0.585	0.593	0.8
0.9		0.588	0.519	0.501	0.497	0.499	0.503	0.510	0.519	0.530	0.540	0.551	0.561	0.572	0.582	0.592	0.602	0.613	0.623	0.633	0.642	0.651	0.660	0.669	0.9
1.0			0.593	0.567	0.559	0.560	0.563	0.570	0.580	0.592	0.604	0.615	0.627	0.638	0.650	0.661	0.673	0.684	0.695	0.706	0.716	0.726	0.736	0.746	1.0
1.1			0.674	0.636	0.624	0.623	0.626	0.632	0.643	0.655	0.668	0.681	0.694	0.706	0.719	0.731	0.743	0.756	0.767	0.779	0.790	0.802	0.812	0.823	1.1
1.2			0.762	0.708	0.692	0.689	0.691	0.696	0.707	0.720	0.733	0.747	0.761	0.775	0.788	0.802	0.815	0.828	0.841	0.854	0.866	0.878	0.889	0.900	1.2
1.3			0.859	0.786	0.763	0.756	0.757	0.761	0.772	0.785	0.799	0.815	0.829	0.844	0.859	0.873	0.887	0.902	0.915	0.929	0.942	0.955	0.967	0.979	1.3
1.4				0.896	0.837	0.826	0.825	0.829	0.839	0.852	0.867	0.883	0.899	0.915	0.930	0.946	0.961	0.976	0.991	1.01	1.02	1.03	1.05	1.06	1.4
1.5				0.961	0.915	0.899	0.896	0.900	0.908	0.921	0.936	0.953	0.969	0.986	1.00	1.02	1.04	1.05	1.07	1.08	1.10	1.11	1.13	1.14	1.5
1.6				1.06	1.00	0.976	0.969	0.972	0.980	0.991	1.01	1.02	1.04	1.06	1.08	1.10	1.11	1.13	1.15	1.16	1.18	1.19	1.21	1.22	1.6
1.7					1.09	1.06	1.04	1.05	1.05	1.06	1.08	1.10	1.12	1.13	1.15	1.17	1.19	1.21	1.22	1.24	1.26	1.27	1.29	1.30	1.7
1.8					1.18	1.14	1.12	1.12	1.13	1.14	1.15	1.17	1.19	1.21	1.23	1.25	1.27	1.29	1.31	1.32	1.34	1.36	1.37	1.39	1.8
1.9						1.23	1.21	1.20	1.21	1.22	1.23	1.25	1.27	1.29	1.31	1.33	1.35	1.37	1.39	1.40	1.42	1.44	1.46	1.47	1.9
2.0						1.32	1.30	1.29	1.29	1.30	1.31	1.33	1.35	1.37	1.39	1.41	1.43	1.45	1.47	1.49	1.51	1.53	1.54	1.56	2.0
2.1							1.39	1.37	1.37	1.38	1.39	1.41	1.43	1.45	1.47	1.50	1.52	1.54	1.56	1.58	1.59	1.61	1.63	1.65	2.1
2.2								1.47	1.46	1.47	1.48	1.50	1.52	1.54	1.56	1.58	1.60	1.62	1.64	1.66	1.68	1.70	1.72	1.74	2.2
2.3									1.55	1.56	1.57	1.58	1.60	1.63	1.65	1.67	1.69	1.71	1.73	1.76	1.78	1.80	1.82	1.83	2.3
2.4										1.65	1.66	1.68	1.69	1.72	1.74	1.76	1.78	1.80	1.83	1.85	1.87	1.89	1.91	1.93	2.4
2.5											1.76	1.77	1.79	1.81	1.83	1.86	1.88	1.90	1.92	1.95	1.97	1.99	2.01	2.02	2.5

Table 3.—Volume (V_m) of Liquid Meniscus, $\theta = 0$

(Meniscus concave upwards)

As quantities tabulated are dimensionless, any consistent system of units may be used. g = acceleration of gravity, r = radius of tube, h_c = length of tube of radius r and volume V_m. (Computed from tables of Bashforth and Adams as given in their "Capillary Action.")

$g\rho r^2/\gamma$	V_m/r^3	h_c/r	$g\rho r^2/\gamma$	V_m/r^3	h_c/r
0	1.048	0.333	4.0	0.649	0.206
0.1	1.029	0.327	4.5	0.623	0.198
0.2	1.010	0.321	5.0	0.599	0.190
0.4	0.978	0.311	5.5	0.578	0.184
0.6	0.947	0.301	6.0	0.557	0.177
0.8	0.919	0.292	6.5	0.537	0.171
1.0	0.894	0.284	7.0	0.518	0.165
1.5	0.837	0.266	7.5	0.501	0.159
2.0	0.789	0.251	8.0	0.484	0.1540
2.5	0.747	0.238	8.5	0.470	0.1493
3.0	0.711	0.226	9.0	0.456	0.1449
3.5	0.678	0.216	9.5	0.442	0.1406
			10.0	0.429	0.1365

Example 1: A gas is collected in a eudiometer over mercury. The volume to the plane through the line of contact of the mercury with the wall of the tube = V_o. If this portion of the eudiometer is a vertical, circular cylinder of diameter d = 10 mm, and if height of meniscus is h_m = 1.5 mm, then V_m = 0.0723 cm³ (Table 1), and the actual volume of the gas is $V = V_o - 0.072$ cm³.

If volumes are expressed in terms of a linear scale engraved upon the cylindrical portion of the eudiometer, and if the scale reading at the line of contact is h_o, and if d = 10 mm, h_m = 1.5 mm, then h_c = 0.921 mm (Table 2), and the actual volume of the gas corresponds to $h_o - h_c = h_o - 0.921$ mm.

Example 2: A gas is collected in a eudiometer over water. The volume to the plane tangent to the bottom of the meniscus = V_o. If this portion of the eudiometer is a vertical, circular cylinder of radius r = 0.5 cm, if γ = 73 dynes/cm, g = 980.7 cm/sec², ρ = 1.000, and $\theta = 0$ (the tube is perfectly wetted by the water), then $g\rho/\gamma$ = 13.43 cm⁻², $g\rho r^2/\gamma$ = 3.36. Hence V_m/r^3 = 0.689 (Table 3), and V_m = 0.086 cm³. Hence the actual volume of the gas is $V_o - V_m = V_o - 0.086$ cm³.

If volumes are expressed in terms of a linear scale engraved upon the cylindrical portion of the eudiometer, and if the scale reading corresponding to the bottom of the meniscus is h_o, then for $g\rho r^2/\gamma$ = 3.36, h_c/r = 0.219 (Table 3), and if r = 5 mm, h_c = 1.10 mm, and the actual volume of the gas corresponds to $h_o - h_c = h_o - 1.10$ mm.

WEIGHTS AND WEIGHING

A. T. Pienkowsky

In this section are considered:—(*A*) Weights—the basis upon which they are adjusted or tested, and their constancy; (*B*) the correcting of weighings for the buoyant effect of the air, including the weighing of substances in containers; and (*C*) the correcting of density determinations for the buoyant effect of the air.

WEIGHTS

Basis of Adjustment.—Most weights are adjusted by the maker according to their apparent weight in air against brass standards. This is equivalent to adjusting brass weights according to their real mass (or "weight in vacuo"), but the true mass values of other weights (*e.g.*, those of platinum, aluminum, or quartz) may be much different from their nominal values. When a set of weights is calibrated, however, the values found may be either true mass or apparent values, depending on the standard used and the method of conducting the test. Certificates from different standardizing laboratories may give values on either basis, or on both.

"Weight in Air against Brass."—Commercial weighing is all based on apparent weight in air against brass standards, this basis being more or less accurately defined in some countries. Precise scientific weighing is based on true mass values (*i.e.*, on "weight in vacuo"), but weights below one gram may be tested and used as if they were of brass, even for work of rather high precision. In so testing these weights, their apparent "values" are computed on the assumption that their density is Δ_b = density of brass (generally Δ_b is taken as 8.4 g per cm³); and in using them the apparent values so found are used as though they were the true masses of the weights, Δ_b being at the same time used just as though it were the true density of the weights. In such cases the error $(m_f - m)$ so introduced, arises solely from the fact that the density (σ_1) of the air at the time the values of the weights were determined differs from that (σ) at the time they were used in weighing the object. This error is given approximately by equation (1) in which m is the correct, and m_f is the false mass, s is the nominal value of the weight, Δ_b is the density assumed for brass weights and Δ the actual density of the weights used.

$$m_f - m = s\left(\frac{1}{\Delta_b} - \frac{1}{\Delta}\right)(\sigma_1 - \sigma) \qquad (1)$$

Example: If the value of a platinum 500 mg weight (Δ = 21.5 g/cm³) is determined according to "weight in air against brass" (Δ_b = 8.4 g/cm³) at sea level (σ_1 = 0.0012 g/cm³), and this value is used at an altitude of 5000 ft. (σ = 0.0010 g/cm³) the error in the mass of a body as so weighed will be $m_f - m$ = 0.007 mg.

"Apparent" densities or specific gravities determined according to apparent "weight in air against brass" are subject not merely to variations in the density of the air, but also to differences in experimental technique (see p. 78 to 80).

Constancy.—Data on changes in weights can indicate only the order of magnitude of such changes, and as a rule can show only what *may* happen, since such changes are extremely irregular.

Ordinary brass weights with knobs screwed in (whether gold plated, platinum plated, or lacquered) may continue to gain in weight for many years, and may do so without developing any visible signs of such change. The following examples are typical of extreme changes that sometimes occur. Larger changes have been recorded.

Denomination..	g	100	50	20	10	5	2	1
Gain in 6 yr....	mg	1.7	1.2	0.8	0.7	0.6	0.8	0.3
Gain in 14 yr...	mg	3.3	3.9	1.8	2.5	0.8	0.3	1.1

The following is typical of what has often happened when new weights were not used and were carefully protected.

Denomination..	g	100	50	20	10	5	2	1
Gain in 5 mo...	mg	0.1	0.1	0.0	0.1	0.1	0.0	0.0
Gain in 1 yr....	mg	0.2	0.1	0.0	0.0	0.1	0.0	0.0

Lacquered weights of good quality are less subject to spotting and general surface tarnishing than are the gold or platinum plated weights often sold. Lacquered weights, however, are subject to rapid variations caused by changes in the relative humidity of the air. Lacquered weights of about 20 to 100 g may be expected to vary 0.1 or 0.2 mg with large variations in humidity. Changes of over 0.5 mg have been recorded.

Sets of weights of the ordinary type may, however, be very constant. For example, one set was used for over a year with changes less than 0.02 mg and few changes over half that amount; and two sets were used occasionally for 17 and 18 yr, respectively, with no changes over 0.2 mg.

For reference standards, one-piece weights are very much more reliable than the common screw-knob type. The following changes in a high grade, gold plated, bronze set of this type are typical for weights used little and with great care. Positive changes are gains, negative changes losses.

Denomination.....	g	50	20	20	10	5	2	2	1
Changes in 15 yr..	mg	−0.12	0.00	0.02	−0.01	−0.006	0.001	0.008	−0.007

Solid platinum or platinum-iridium weights of moderate size may be expected to remain constant within about 0.01 mg if handled with sufficient care and protected from dust and other deposits. The sheet metal weights below one g are not much more constant than this; very good weights kept with extreme care as reference standards may stay within 0.001 mg for some years, but this cannot safely be assumed. If these small weights are much used, even with good care, losses of 0.01 mg may soon be expected in the larger ones.

CORRECTING OF WEIGHINGS FOR BUOYANT EFFECT OF THE AIR

("Reduction of Weighings to Vacuo")

In addition to a sufficiently sensitive balance, accurate weighing requires (1) that the balance itself maintain a sufficiently constant zero point and ratio of arms of the beam; (2) that the effect of inequality of the arms of the beam be eliminated by the method of weighing, since it cannot as a rule be corrected for with sufficient accuracy; (3) that the object and the weights have definite constant values, free from such effects as variable surface films, evaporation, magnetic attractions, etc.; (4) that surrounding conditions be maintained free from sources of disturbance and error, such as electrostatic attractions, convection currents, variable or unsymmetrical heat radiations, etc.; and (5) that proper correction be made for the buoyant effect of the air.

The first four types of requirements are matters of technique, and no general methods of correction can be used for errors arising from them. They are therefore outside the scope of these tables.

The fifth requirement demands definite formulae and facts, some of the most fundamental or general of which are given below.

The phrase "apparent weight" is commonly used for the result of a weighing in which no correction has been made for the buoyant effect of the air. The phrase is ambiguous[1] and often leads to a confusion of ideas. Therefore this term is not used in the equations of this section, but reference is made directly to the weights that would be used on an equal-arm balance to make the weighings. The phrase "weights needed" must be understood to include the proper fraction of the rider or other small weights needed to make up the total amount; and it refers to *actual* values of the weights, which may or may not equal the nominal values marked on them.

Symbols.—

- a mass of the contents of the "empty" portions of the container. (In weighing gases a is zero. In weighing solids or liquids it may be the mass of air or of vapor of the solid or liquid. In weighing a pyknometer with the liquid which fills it at a temperature different from that at which it is weighed, the volume occupied by a results from the unequal expansion of pyknometer and liquid)
- b $(v_e - v_c)/v_e$. Relative size of the container and its counterpoise
- c mass of counterpoise
- k buoyancy reduction factor
- l mass of liquid that fills the pyknometer at the established filling temperature
- m mass of object; in general or where its volume is not fixed by the volume of a pyknometer
- p mass of pyknometer or other container
- r error resulting from use of approximate buoyancy formula

[1] Compare equations (8) and (9); in each case $s'' - s'$ would be called the apparent weight, but its value in (9) is $v_m\sigma$ greater than in (8).

s mass of weights needed on an equal arm balance, whether with or without special counterpoise, to balance the objects being weighed. (Regarding use of other than true mass values, *see* p. 73)

s_e $s - v_s\sigma = s\,(1 - \sigma/\Delta)$. This is *not* "weight in vacuo" as that phrase is often used

t temperature. If accented it is the temperature at the time of the indicated weighing; if unaccented, it is the temperature at which the pyknometer is filled. In so far as their temperatures have any effect upon the operation considered, all objects (*e.g.*, the balance, its loads, and the surrounding air) are assumed to be at the same temperature

v volume or capacity; when without subscript it is capacity of the container at time of weighing; with one of the subscripts a, c, l, m, p, s, or w, it is volume of the object whose mass is indicated by the subscript (*e.g.*, v_m = volume of the object whose mass is m)

v_t capacity of the pyknometer at the temperature of filling

v_p volume of the pyknometer itself, excluding the space that would be filled by liquid at the temperature of filling. (Ordinarily v_p = volume of the material of which the pyknometer is constructed)

v_e "exterior volume" of the pyknometer or other container. With pyknometers, at temperature of filling, $v_e = v_p + v_t$; at another temperature, t'', $v_e''\text{-}v_p'' + v'' = v_p'' + v_w'' + v_a''$

w mass of the calibrating liquid (*e.g.*, water) which is used to determine a volume or to serve as a standard of density

β cubical coefficient of thermal expansion

Δ density of the weights at the time of weighing

σ density of the air at the time of weighing

ρ density of object being studied or of calibrating liquid. If accented it is density at time of weighing; if unaccented it is density at temperature (t) at which the pyknometer was filled

Density is true mass per unit of volume.

Accents denote the weighing to which the quantity applies. In general $'$ denotes the weighing of the object alone or of the container; $''$ denotes the weighing of the combined container and object studied, or of the container filled with the calibrating liquid or of the object suspended in the calibrating liquid; $'''$ denotes the weighing of the pyknometer "filled" with liquid to be studied, or "filled" with object studied plus calibrating liquid.

Subscripts.—$_f$ denotes false or erroneous values. For $_e$ see above (s_e and v_e). Other subscripts indicate the object to which the quantity applies; *e.g.*, ρ_a = density of material whose mass is a.

Fundamental Exact Equation.—The use of the direct, fundamental, exact equation (2) avoids many complications and approximations introduced by most formulae based on densities.

$$m = s + (v_m - v_s)\sigma \qquad (2)$$

The equation using densities, in one of the exact forms (3) given below, is useful chiefly for computing exact tables, or the effect of errors, approximations, etc. As a rule, either the densities are not known well enough to warrant its use, or the volumes involved will have been measured, thus going back to equation (2).

$$m = s\left(\frac{1 - \dfrac{\sigma}{\Delta}}{1 - \dfrac{\sigma}{\rho_m}}\right) = s\frac{\rho_m(\Delta - \sigma)}{\Delta(\rho_m - \sigma)} = s\left\{1 + \frac{\sigma(\Delta - \rho_m)}{\Delta(\rho_m - \sigma)}\right\} = s + s\frac{\sigma(\Delta - \rho_m)}{\Delta(\rho_m - \sigma)} \qquad (3)$$

In the last form of (3), the second term is the exact "buoyancy correction term," and in this correction term the factor (fraction) by which s is multiplied is the exact "buoyancy reduction factor" (k). See Tables 2 and 3.

Common Equation Using Densities.—Some form of equation (4) is commonly used for reducing weighings. This equation is not exact. It is entirely inapplicable to weighing gases, but is amply accurate for much work with solids and liquids.

$$m = s + s\sigma\left(\frac{1}{\rho_m} - \frac{1}{\Delta}\right) \qquad (4)$$

The factor $\sigma\left(\frac{1}{\rho_m} - \frac{1}{\Delta}\right)$ is the "buoyancy reduction factor" commonly given. When the densities lie between 0.5 and 21.5 g per cm³, and are known with sufficient accuracy, the error (r) introduced by the use of this formula does not exceed one part in 100 000 of the mass of the object weighed. Its value, and that of the proportional error ($r' = r/s$) may be calculated by formula (5); their orders of magnitude may readily be determined from Table 1, which is based on σ = 0.0012 g/cm³.

$$r' \equiv \frac{r}{s} = \frac{\sigma^2(\Delta - \rho_m)}{\Delta\rho_m(\rho_m - \sigma)} \qquad (5)$$

TABLE 1

Unit of Density is g/cm³

ρ_m	100 r'		
	Δ = 21.5	Δ = 8.4	Δ = 2.65
1.00	0.0001	0.0001	0.0001
0.5	0.0006	0.0005	0.0005
0.05	0.06	0.06	0.06
0.005	8.	8.	7.

Density of the Air.—Variations in the density of the air under standard conditions,[1] as well as the uncertainties of its experimental determination, limit the precision with which very large or extremely precise buoyancy corrections can be calculated from tables of air density. The former seems at present to be the larger, and therefore sets a fixed limit which can be exceeded only by eliminating or reducing the size of the correction, or by making an experimental determination of the density of the air at the time of the weighing. These limiting uncertainties are of the order of 5 in 10^4 and affect the total buoyancy correction in the same ratio. Since they affect only the fourth significant figure in the buoyancy reduction factor they are negligible in the use of Tables 2 and 3.

In weighing gases, the density of the air must be found from precise tables (consult index). When the volume of the gas is not compensated by a counterpoise of the same size, the density of the air must be known with approximately the same precision as is desired for that of the gas; when it is so compensated, the buoyancy correction is generally the total buoyancy on the weights, and therefore is still relatively large.

For most work with solids and liquids an approximate value of the density of the air is sufficient. The precision to which it must be known can be found from an examination of Table 2. It should be noted that a precision of 1 in 10^n in the mass to be determined requires a precision of 1 in the n'th decimal place of the buoyancy reduction factor (*i.e.*, in the actual factor k, not in the printed value of $1000k$). In getting the buoyancy reduction factor from Table 2, and in similar work, to a precision not greater than one in about 10^5, the density of the air may be found from the "Air Density Chart," Fig. 1.

The precision to which temperature, pressure, and humidity must be known in order to find the density of the air to the necessary precision, may be inferred from Fig. 1, except in the case of very large corrections, or of corrections to be determined with extreme precision. In the latter cases this information must be sought in other places.

Density of the Weights.—If the density of the air in which the weights are used is the same as that in which their values were determined, errors in the density assumed for the weights will have

[1] Treuthart, *34*, **172**: 1598; 21. Moles, *34*, **172**: 1600; 21.

no effect on the accuracy with which the mass of the object may be determined, provided the same density that was assumed for them in determining their values is assumed for them when they are used. It is not necessary, therefore, to know the density of the weights as accurately as that of the object weighed.

If weights are used in air whose density differs by not more than 20% from that of the air in which their values were determined, the amount by which the density of ordinary weights is likely to differ from the values used in Tables 2 and 3 will not cause errors greater than one part in about 100,000 in the determination of the mass of the object weighed; provided that the density used in determining the value of the weight is the same as that used in the computation of the mass.

For a precision above one part in a million, it is frequently necessary to measure the volume or density of each weight.

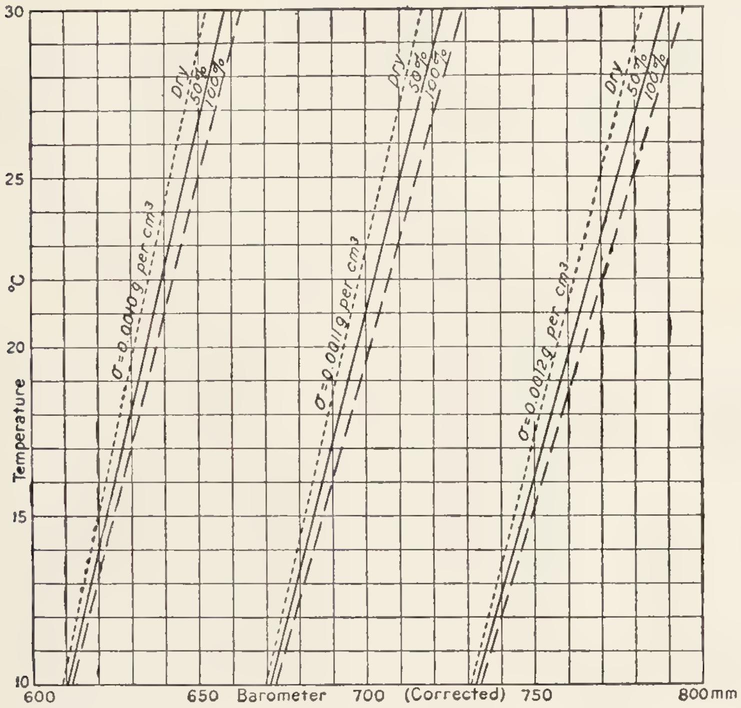


Fig. 1.—Air density chart. (For use with Tables 2 and 3.)

Ordinary two-piece weights are not used for such work because they cannot safely be put into liquids for hydrostatic weighing.

Aluminum is not used for weights above 0.02 g in high quality weights, nor above 0.5 g in second quality sets. When the values of such weights have been determined on the assumption of a density of 2.7 g per cm³ at 0°C, the use of the buoyancy reduction factors given for quartz in Table 2 introduces an error in the mass of the object weighed, of less than 0.0002 mg for amounts up to 0.02 g, and of less than 0.005 mg for amounts up to 0.5 g.

The densities of most gold alloys used for weights lie between 16 and 18 g per cm³. For gold within this range, the use of the factors given in Tables 2 and 3 will not introduce errors greater than one part in 200,000, or not over 0.005 mg in weighing amounts under one g.

In Tables 2 and 3, the densities used for weights of platinum or platinum-iridium, for those of brass or bronze, and for those of aluminum, are those which were adopted many years ago for certifying weights at the National Bureau of Standards of the United States of America, and were assumed as the densities at 0°C. The following coefficients of cubical expansion are assumed in reducing the volumes of such weights to the volumes at 20°C.

Platinum and Platinum-iridium	0.000 026 per deg. C
Brass or bronze	0.000 054 per deg. C
Aluminum	0.000 069 per deg. C

The densities of gold and of crystal quartz are assumed as the densities at 20°C. All buoyancy reduction factors are based on differences in volume at 20°C.

Density of Object Weighed.—A change of one in 10^n of the mass of the object corresponds to a change of one in the n'th decimal place of the buoyancy reduction factor. Therefore, to the precision obtainable by the use of Table 2, the precision required in the density of the object may be found by noting in that table what change in density (at approximately the density under consideration) corresponds to the allowable variation in the buoyancy reduction factor.

The use of "standard" or "adopted" densities for the object weighed may give an accuracy which is entirely fictitious. There is no compensation as in the case of weights, and the actual error or uncertainty in the density of the particular object weighed has its full effect in the error or uncertainty of the calculated mass

A fictitious "apparent" density derived from weighings uncorrected for buoyancy of the air must be corrected to true density before being inserted in the formulae given in this section unless only an approximate value of density is needed (see p. 78).

Temperature of Objects and Weights.—In weighing gases, and to secure the highest precision in many other cases, it is necessary to compute all volumes or densities at the actual temperature of the observations, unless the coefficient of expansion of the object happens to be nearly the same as that of the weights. If the temperature is entirely neglected, and weighings are made at room temperatures, the extreme error likely to be introduced in the mass calculated for solids and liquids is less than three in 10^4. (This would be the error for material having a density of 0.2 g per cm³ at 0°C, and a coefficient of cubical expansion of 1.6×10^3, when compared with weights whose actual volumes or densities are those used in the calculation.)

Example 1: The actual mass of the weights used was s = 10.0105 g; the corrected barometric height was 758 mm; air temperature, 19.6°C; relative humidity 25%; density of object 3.5 g/cm³; weights were of brass.

Referring to Fig. 1, the air density corresponding to these conditions is seen to be close to 0.0012 g/cm³. Entering Table 2 with $\rho_m = 3.5$ and the column for brass weights, under 1000σ = 1.2, it is found that 1000 k is 0.20; hence the mass of the object is $m = s + ks = 10.0105 + 0.000\,20 \times 10.0105 = 10.0105 + 0.0020 = 10.0125$ g.

Example 2: The factor for $\rho_m = 3.0$ differs by 6 in the fifth decimal place from that for $\rho_m = 3.5$. The error in mass produced by using 3.0 in place of 3.5 as the density of the object is therefore 6 parts in 10^5. For the object in Example 1 this would be an error of 0.000 6 g. Similarly the use of 7.0 instead of 7.5 for ρ_m would produce an error of about one part in 10^4 in the mass of the object.

Example 3: In Fig. 1 the point corresponding to barometric height 720 mm, air temperature 21°C, and relative humidity 50%, lies to the right of the line for 0.0011 g/cm³, 50%, by $^{10}/_{32}$ of the distance between the 0.0011 and the 0.0012 lines. Hence, $\sigma = 0.0011 + 0.0001 \times {}^{10}/_{32} = 0.00113_1$ g/cm³. (For most work for which Table 2 is suited the density can be estimated by eye with sufficient accuracy; as in this case, 0.00113 g/cm³.) The factor from Table 2 may then be found either by multiplying the factor for $1000\sigma = 1.0$ by 1.13 or by interpolating between the factor for $1000\sigma = 1.1$ and that for $1000\sigma = 1.2$. For brass weights and $\rho_m = 3.5$ the former gives $0.17 \times 1.13 = 0.19_2$ as the value of $1000k$. A calculated interpolation between 0.18 and 0.20 gives 0.18_6, which agrees with the other value within the accuracy of such tabular interpolations.

Weighing Objects in Containers.—Two weighings are required; one of the container alone and the other with the object in the

Table 2.—Buoyancy Reduction Factor (k)

$$m = s + ks, \text{ where } k = \frac{\sigma(\Delta - \rho_m)}{\Delta(\rho_m - \sigma)}$$

(*Cf.* equation (3). Symbols, p. 74.) Unit of density is g/cm³ or, to precision of this table, g/ml)

Density of object weighed ρ_m	1000 k											
	$\Delta = 21.5$ Pt or Pt-Ir			$\Delta = 17$ Gold			$\Delta = 8.4$ Brass or bronze			$\Delta = 2.65$ Crystal quartz or aluminum*		
	1000 σ =			1000 σ =			1000 σ =			1000 σ =		
	1.0	1.1	1.2	1.0	1.1	1.2	1.0	1.1	1.2	1.0	1.1	1.2
0.2	4.98	5.48	5.98	4.97	5.47	5.97	4.91	5.40	5.89	4.65	5.11	5.58
0.3	3.30	3.63	3.96	3.29	3.62	3.95	3.22	3.55	3.87	2.97	3.26	3.56
0.4	2.46	2.71	2.95	2.45	2.69	2.94	2.39	2.63	2.87	2.13	2.34	2.55
0.5	1.96	2.15	2.35	1.95	2.14	2.34	1.88	2.07	2.26	1.63	1.79	1.95
0.6	1.62	1.79	1.95	1.61	1.77	1.93	1.55	1.71	1.86	1.29	1.42	1.55
0.7	1.38	1.52	1.66	1.37	1.51	1.65	1.31	1.44	1.57	1.05	1.16	1.26
0.75	1.29	1.42	1.55	1.28	1.40	1.53	1.22	1.34	1.46	0.96	1.05	1.15
0.80	1.20	1.33	1.45	1.19	1.31	1.43	1.13	1.25	1.36	0.87	0.96	1.05
0.82	1.17	1.29	1.41	1.16	1.28	1.39	1.10	1.21	1.32	0.84	0.93	1.01
0.84	1.15	1.26	1.37	1.13	1.25	1.36	1.07	1.18	1.29	0.81	0.90	0.98
0.86	1.12	1.23	1.34	1.11	1.22	1.33	1.04	1.15	1.25	0.79	0.86	0.94
0.88	1.09	1.20	1.31	1.08	1.19	1.29	1.02	1.12	1.22	0.76	0.83	0.91
0.90	1.07	1.17	1.28	1.05	1.16	1.26	0.99	1.09	1.19	0.73	0.81	0.88
0.91	1.05	1.16	1.26	1.04	1.15	1.25	0.98	1.08	1.18	0.72	0.79	0.87
0.92	1.04	1.15	1.25	1.03	1.13	1.24	0.97	1.06	1.16	0.71	0.78	0.85
0.93	1.03	1.13	1.24	1.02	1.12	1.22	0.96	1.05	1.15	0.70	0.77	0.84
0.94	1.02	1.12	1.22	1.01	1.11	1.21	0.95	1.04	1.13	0.69	0.76	0.82
0.95	1.01	1.11	1.21	0.99	1.09	1.19	0.93	1.03	1.12	0.68	0.74	0.81
0.96	1.00	1.10	1.20	0.98	1.08	1.18	0.92	1.02	1.11	0.67	0.73	0.80
0.97	0.99	1.08	1.18	0.97	1.07	1.17	0.91	1.00	1.09	0.65	0.72	0.79
0.98	0.97	1.07	1.17	0.96	1.06	1.16	0.90	0.99	1.08	0.64	0.71	0.77
0.99	0.96	1.06	1.16	0.95	1.05	1.14	0.89	0.98	1.07	0.63	0.70	0.76
1.00	0.95	1.05	1.15	0.94	1.04	1.13	0.88	0.97	1.06	0.62	0.69	0.75
1.01	0.94	1.04	1.13	0.93	1.03	1.12	0.87	0.96	1.05	0.61	0.67	0.74
1.02	0.93	1.03	1.12	0.92	1.01	1.11	0.86	0.95	1.03	0.60	0.66	0.72
1.03	0.93	1.02	1.11	0.91	1.00	1.10	0.85	0.94	1.02	0.59	0.65	0.71
1.04	0.92	1.01	1.10	0.90	0.99	1.08	0.84	0.93	1.01	0.58	0.64	0.70
1.05	0.91	1.00	1.09	0.89	0.98	1.07	0.83	0.92	1.00	0.58	0.63	0.69
1.06	0.90	0.99	1.08	0.89	0.97	1.06	0.82	0.91	0.99	0.57	0.62	0.68
1.07	0.89	0.98	1.07	0.88	0.96	1.05	0.82	0.90	0.98	0.56	0.61	0.67
1.08	0.88	0.97	1.06	0.87	0.95	1.04	0.81	0.89	0.97	0.55	0.60	0.66
1.09	0.87	0.96	1.05	0.86	0.94	1.03	0.80	0.88	0.96	0.54	0.59	0.65
1.10	0.86	0.95	1.04	0.85	0.94	1.02	0.79	0.87	0.95	0.53	0.59	0.64
1.12	0.85	0.93	1.02	0.83	0.92	1.00	0.77	0.85	0.93	0.52	0.57	0.62
1.14	0.83	0.91	1.00	0.82	0.90	0.98	0.76	0.83	0.91	0.50	0.55	0.60
1.16	0.82	0.90	0.98	0.80	0.88	0.96	0.74	0.82	0.89	0.49	0.53	0.58
1.18	0.80	0.88	0.96	0.79	0.87	0.95	0.73	0.80	0.87	0.47	0.52	0.56
1.20	0.79	0.87	0.95	0.78	0.85	0.93	0.71	0.79	0.86	0.46	0.50	0.55
1.25	0.75	0.83	0.91	0.74	0.82	0.89	0.68	0.75	0.82	0.42	0.47	0.51
1.30	0.72	0.80	0.87	0.71	0.78	0.85	0.65	0.72	0.78	0.39	0.43	0.47
1.35	0.69	0.76	0.83	0.68	0.75	0.82	0.62	0.68	0.75	0.36	0.40	0.44
1.40	0.67	0.74	0.80	0.66	0.72	0.79	0.60	0.66	0.71	0.34	0.37	0.40
1.50	0.62	0.68	0.74	0.61	0.67	0.73	0.55	0.60	0.66	0.29	0.32	0.35
1.6	0.58	0.64	0.69	0.57	0.62	0.68	0.51	0.56	0.61	0.25	0.27	0.30
1.7	0.54	0.60	0.65	0.53	0.58	0.64	0.47	0.52	0.56	0.21	0.23	0.25
1.8	0.51	0.56	0.61	0.50	0.55	0.60	0.44	0.48	0.52	0.18	0.20	0.21
1.9	0.48	0.53	0.58	0.47	0.51	0.56	0.41	0.45	0.49	0.15	0.16	0.18
2.0	0.45	0.50	0.54	0.44	0.49	0.53	0.38	0.42	0.46	0.12	0.14	0.15
2.2	0.41	0.45	0.49	0.40	0.44	0.48	0.34	0.37	0.40	0.08	0.08	0.09
2.4	0.37	0.41	0.44	0.36	0.39	0.43	0.30	0.33	0.36	0.04	0.04	0.05
2.6	0.34	0.37	0.41	0.33	0.36	0.39	0.27	0.29	0.32	0.01	0.01	0.01
2.8	0.31	0.34	0.37	0.30	0.33	0.36	0.24	0.26	0.29	−0.02	−0.02	−0.02
3.0	0.29	0.32	0.34	0.27	0.30	0.33	0.21	0.24	0.26	−0.04	−0.05	−0.05
3.5	0.24	0.26	0.29	0.23	0.25	0.27	0.17	0.18	0.20	−0.09	−0.10	−0.11
4	0.20	0.22	0.24	0.19	0.21	0.23	0.13	0.14	0.16	−0.13	−0 14	−0.15
5	0.15	0.17	0.18	0.14	0.16	0.17	0.08	0.09	0.10	−0.18	−0.20	−0.21
6	0.12	0.13	0.14	0.11	0.12	0.13	0.05	0.05	0.06	−0.21	−0.23	−0.25
7	0.10	0.11	0.12	0.08	0.09	0.10	0.02	0.03	0.03	−0.23	−0.26	−0.28
8	0.08	0.09	0.09	0.07	0.07	0.08	0.01	0.01	0.01	−0.25	−0.28	−0.30
9	0.06	0.07	0.08	0.05	0.06	0.06	−0.01	−0.01	−0.01	−0.27	−0.29	−0.32
10	0.05	0.06	0.06	0.04	0.05	0.05	−0.02	−0.02	−0.02	−0.28	−0.31	−0.33
12	0.04	0.04	0.04	0.02	0.03	0.03	−0.04	−0.04	−0.04	−0.29	−0.32	−0.35
14	0.02	0.03	0.03	0.01	0.01	0.02	−0.05	−0.05	−0.06	−0.31	−0.34	−0.37
16	0.02	0.02	0.02	0.00	0.00	0.00	−0.06	−0.06	−0.07	−0.31	−0.35	−0.38
18	0.01	0.01	0.01	0.00	0.00	0.00	−0.06	−0.07	−0.08	−0.32	−0.35	−0.39
20	0.00	0.00	0.00	−0.01	−0.01	−0.01	−0.07	−0.08	−0.08	−0.33	−0.36	−0.39
22	0.00	0.00	0.00	−0.01	−0.01	−0.02	−0.07	−0.08	−0.09	−0.33	−0.37	−0.40

* See Density of Weights, p. 75.

container. The exact equations connecting the masses and corresponding to equation (2) are:

$$(p' + a') = (s' + c') + [v_e' - (v_s' + v_c')]\sigma'$$

and

$$(p'' + m + a'') = (s'' + c'') + [v_e'' - (v_s'' + v_c'')]\sigma''$$

Assuming p and c to be constant, as must generally be done, and subtracting, gives the general equation (6).

$$m = (s'' - s') - (a'' - a') + [v_e'' - (v_s'' + v_c'')]\sigma'' - [v_e' - (v_s' + v_c')]\sigma' \quad (6)$$

If also v_e, v_c, Δ and σ are the same for both weighings, which requires the same temperature and equivalent atmospheric conditions,

$$m = (s'' - s') - (a'' - a') - (v_s'' - v_s')\sigma \quad (7)$$

TABLE 3.—BUOYANCY REDUCTION FACTOR (k) FOR USE IN INTERCOMPARISON OF WEIGHTS

(For other factors and for symbols, see Table 2 and p. 74)

$m = s + ks$ Unity of density = g/cm³

Density of weight tested ρ_m	1000k														
	Δ* = 21.5 Pt or Pt-Ir			Δ† = 17 Gold			Δ* = 8.4 Brass or bronze			Δ* = 2.7 Aluminum			Δ† = 2.65 Crystal quartz		
	1000σ =			1000σ =			1000σ =			1000σ =			1000σ =		
	1.0	1.1	1.2	1.0	1.1	1.2	1.0	1.1	1.2	1.0	1.1	1.2	1.0	1.1	1.2
21.5*	0.000	0.000	0.000	−0.012	−0.014	−0.015	−0.073	−0.080	−0.087	−0.324	−0.357	−0.389	−0.331	−0.364	−0.397
17†	0.012	0.014	0.015	0.000	0.000	0.000	−0.060	−0.066	−0.072	−0.312	−0.343	−0.374	−0.319	−0.350	−0.382
8.4*	0.073	0.080	0.087	+0.060	+0.066	+0.072	0.000	0.000	0.000	−0.252	−0.277	−0.302	−0.258	−0.284	−0.310
2.7*	0.324	0.357	0.389	0.312	0.343	0.375	+0.252	+0.277	+0.302	0.000	0.000	0.000	−0.006	−0.007	−0.008
2.65†	0.331	0.364	0.397	0.319	0.351	0.382	0.258	0.284	0.310	+0.006	+0.007	+0.008	0.000	0.000	0.000

* Density at 0°C, see "Density of Weights," p. 75.
† Density at 20°C, see "Density of Weights," p. 75.

If also $\rho_a'' = \rho_a' = \sigma$, as when the "empty" portion of the container is filled with air of the same density as the surrounding atmosphere, and the vapor of the "object" weighed is negligible or should be included in m,

$$m = (s'' - s') + (v_m - v_{s''-s'})\sigma \qquad (8)$$

or

$$m = (s'' - s')\left(1 - \frac{\sigma}{\Delta}\right) + v_m\sigma = (s'' - s')\left(\frac{1 - \frac{\sigma}{\Delta}}{1 - \frac{\sigma}{\rho_m}}\right) \qquad (8')$$

In equations (8) and (8′) the effect of the container has been eliminated; the equation is of the form of equation (2), and the buoyancy reduction factor from Table 2 may be used.

If the container is exhausted[1] when weighed alone; and if, when the object is being weighed there is in the container only material whose mass should be part of m, then $a' = a'' = 0$ and instead of equations (8) and (8′) we have

$$m = (s'' - s') - v_{s''-s'}\,\sigma = (s'' - s')\left(1 - \frac{\sigma}{\Delta}\right) \qquad (9)$$

In this case the buoyant effect of the air on the object weighed has been eliminated, and the ordinary buoyancy reduction factors or equations do not apply (*cf.* (2) and (3)); Table 2 can not be used.

CORRECTING DENSITY DETERMINATIONS FOR THE BUOYANT EFFECT OF THE AIR

Correcting "Apparent" Values.—Radical differences in the constancy of temperatures or air densities, or such differences as that between equations (8) and (9) above, make it impossible to develop any single correction formula for correcting what are often called "apparent" values of specific gravity, or of density—values which have been determined without proper correction for the buoyant effect of the air. Such values can, however, be corrected in so far as the method and conditions of their determination are known.

Limitations.—In general: (1) It is impossible to correct each weighing on which the determination depends, because some unknown mass, volume, or density will generally be needed in order to find the volume of the air displaced. In some cases, however, approximate values may be known with sufficient accuracy for this purpose.

(2) Some special experimental requirements are always involved. Among these may be equal temperatures for two operations, constant volumes (*e.g.*, of pyknometer), negligible changes in the density of the air, etc., or a combination of several of them. A variety of combinations of such requirements may be used, each having its peculiar advantages, and each leading to a different equation.

[1] As v_s is assumed to remain constant, pressure effects must be suitably eliminated.

(3) If the number of experimental requirements is made very small, the resulting equation for true density is very complex. Simplification of the final solution can be accomplished only by increasing the experimental requirements or by introducing approximations into the solution.

No method can be selected as "best."[1] Hence, the material given here is limited to the general fundamental equations, and to the exact solutions for certain cases that are of wide applicability in work of moderate precision. From these it is possible to arrange procedures suited to many different conditions, and to determine the accuracy of the corresponding solutions, and the effects of different errors under various circumstances.

In every case, ρ_m is obtained in the same units as those in which ρ_w is expressed. For the purposes of the following equations, σ may, in general, be expressed either as g/cm³ or as g/ml.

Density of Gases.—The general equations for weighing gases are the same as those for pyknometer determinations of liquids, particularly those for cases in which the pyknometer is exhausted when weighed alone, as in equation (17).

Experimental Requirements.—All the following equations involve two general requirements: (1) That in any one weighing or other operation all objects involved are at the same temperature (in weighing, the temperature of the atmosphere is involved); and (2) that changes in pressure produce no change in any of the volumes; *e.g.*, the volume of the pyknometer or other container must not change when it is exhausted. In addition, each equation involves one or more of the following special requirements:

A. Mass of pyknometer and its counterpoise remains constant: $p' = p'' = p'''$ and $c' = c'' = c'''$.

B. Coefficient of expansion of counterpoise is the same as that of the pyknometer: $\beta_p = \beta_c$. This makes b the same for all weighings.

C. Temperature at which pyknometer is filled is the same for the material being studied as for the calibrating liquid. Therefore $w'' = \rho_w v_t$ and $l''' = \rho_l v_t$.

D. Temperature for all three weighings is the same as that at which the pyknometer is filled. This results in all volumes being constant, in $v_w'' = v_l''' = v'' = v'''$, in $a'' = a''' = 0$, and in the density of each material being constant.

E. Density of the atmosphere the same for all three weighings: $\sigma' = \sigma'' = \sigma'''$.

F. Density of the weights the same in all weighings. This demands that the temperature be the same for all three weighings. *See also* p. 75.

[1] The advantages and disadvantages of different experimental arrangements, such as the size and mass of the counterpoise used, or the temperature control, do not depend on the form of solution of the equations so much as on the effect of variations and errors that are *not* shown in the fundamental equations.

G. Density of air or other material in the "empty" portion of the pyknometer equal to that of the surrounding atmosphere: $\rho_a' = \sigma'$, $\rho_a'' = \sigma''$, $\rho_a''' = \sigma'''$.

H. Pyknometer evacuated when weighed empty.

I. Volume of counterpoise equal to "exterior" volume of pyknometer. $v_c = v_e$.

J. Volume of counterpoise equals that of the pyknometer itself, excluding the space that would be filled by liquid at the temperature of filling: $v_c = v_p$.

Pyknometer Determinations.—(1) *Liquids.*—Three weighings are required, from which, under experimental requirement *A*, w'' and l''' are obtained directly by equation (6). Under requirement *C*, $\rho_l = \frac{l'''}{w''}\rho_w$.

Therefore under requirements *A* and *C*:

$$\rho_l = \frac{(s'''-s')-(a'''-a')+[v_e'''-(v_s'''+v_c''')]\sigma'''-[v_e'-(v_s'+v_c')]\sigma'}{(s''-s')-(a''-a')+[v_e''-(v_s''+v_c'')]\sigma''-[v_e'-(v_s'+v_c')]\sigma'}\rho_w \qquad (10)$$

and

$$v_t = \frac{(s''-s')-(a''-a')+[v_e''-(v_s''+v_c'')]\sigma''-[v_e'-(v_s'+v_c')]\sigma'}{\rho_w} \qquad (11)$$

Under requirement *B*, *b* may be introduced for $\frac{v_e - v_c}{v_e}$. If also a part of the buoyancy correction for each weighing is made by calculating s_e', s_e'', and s_e''', then the remaining buoyancy reduction terms can be combined and simplified. Then under requirements *A*, *B*, and *C* the equations may be put in the form

$$\rho_l = \frac{s_e'''-s_e'}{s_e''-s_e'}\left[\rho_w+\frac{a''-a'}{v_t}-\frac{b}{v_t}(v_e''\sigma''-v_e'\sigma')\right]-\frac{a'''-a'}{v_t} + \frac{b}{v_t}(v_e'''\sigma'''-v_e'\sigma') \qquad (12)$$

and

$$v_t = \frac{(s_e''-s_e')-(a''-a')+b(v_e''\sigma''-v_e'\sigma')}{\rho_w} \qquad (13)$$

Under the conditions noted, these equations are perfectly general. They do not involve any mathematical approximations in their derivation and therefore show the proper effect of each quantity. However, in using them, approximate data must, in general, be used, because v_e which is needed in computing v_t cannot be accurately known until after v_t has been computed. If a first approximation is not sufficiently accurate the accuracy may be increased by successive approximations.

{The values of v_e', v_e'' and v_e''' may be computed from the relation $v_e = v_p + v_t = \frac{p}{\rho_p} + \frac{w}{\rho_w}$, and if the capacity depends solely on temperature (and not on pressure or other factors),

$$v_e' = v_e[1 + \beta_p(t' - t)];\ v_e'' = v_e[1 + \beta_p(t'' - t)];\ v_e''' = v_e[1 + \beta_p(t''' - t)] \qquad (14)$$

The values of a', a'', and a''' may be computed from known values of ρ_a and the equations

$$\left.\begin{aligned} v_a' &= v' = v_t[1 + \beta_p(t' - t)] \\ v_a'' &= v'' - v_w'' = v_t(\beta_p - \beta_w)(t'' - t) \\ v_a''' &= v''' - v_l''' = v_t(\beta_p - \beta_l)\ (t''' - t) \end{aligned}\right\} \qquad (15)$$

Under requirements *D*, *E*, *F*, and *G*, in addition to *A*, *B*, and *C*, (12) becomes

$$\rho_l = \frac{s''' - s'}{s'' - s'}(\rho_w - \sigma) + \sigma \qquad (16)$$

And under requirement *H* in addition to *A*, *B*, *C*, *D*, *E*, *F*, and *G*

$$\rho_l = \frac{s''' - s'}{s'' - s'}\rho_w \qquad (17)$$

As shown in equations (16) and (17), experimental requirements *A* to *G* inclusive render the results independent of the size or nature of the counterpoise and of the value of the density of the weights used, though these quantities must be the same for all observations. Including requirement *H* renders the results independent of the actual value of the density of the air also, but still requires that this value shall be the same for all three weighings.

Under requirement *I*, with *A*, *B*, and *C*, (10) becomes

$$\rho_l = \frac{(s_e''' - s_e') - (a''' - a')}{(s_e'' - s_e') - (a'' - a')}\rho_w \qquad (18)$$

and its equivalent (12), and (13) become

$$\rho_l = \frac{s_e''' - s_e'}{s_e'' - s_e'}\left[\rho_w + \frac{a'' - a'}{v_t}\right] - \frac{a''' - a'}{v_t} \qquad (19)$$

and

$$v_t = \frac{(s_e'' - s_e') - (a'' - a')}{\rho_w} \qquad (20)$$

Under requirement *J*, with *A*, *B*, and *C*, (10) becomes

$$= \frac{(s''' - s') - (a''' - a') + [v''' - v_s''']\sigma''' - [v' - v_s']\sigma'}{(s'' - s') - (a'' - a') + [v'' - v_s'']\sigma'' - [v' - v_s']\sigma'}\rho_w \qquad (21)$$

and its equivalent (12), and (13) become

$$\rho_l = \frac{s_e''' - s_e'}{s_e'' - s_e'}\left[\rho_w + \frac{a'' - a'}{v_t} - \frac{1}{v_t}(v''\sigma'' - v'\sigma')\right] - \frac{a''' - a'}{v_t} + \frac{1}{v_t}(v'''\sigma''' - v'\sigma') \qquad (22)$$

and

$$v_t = \frac{(s_e'' - s_e') - (a'' - a') + v''\sigma'' - v'\sigma'}{\rho_w} \qquad (23)$$

Pyknometer Determinations.—(2) *Solids.*—The following equations are based on two pyknometer weighings and a separate determination of the mass of the object. If the pyknometer is used as a container for weighing the object this requires two weighings. (*See* p. 76 to 78.)

The symbol $''$ refers to the weighing with the calibrating liquid alone; $'''$ to the weighing with both this liquid and the object being studied.

Under requirements *A* and *C* only,

$$\rho_m'' = \frac{m\rho_w''}{m-(s'''-s'') + (a'''-a'') - [v_e'''-v_s'''-v_c''']\sigma''' + [v_e''-v_s''-v_c'']\sigma''} \qquad (24)$$

Under requirement *B*, in addition to *A* and *C*, equation (24) may be put into the form (25) by combining the terms in *s* with those in $v_s\sigma$.

$$\rho_m'' = \frac{m\rho_w''}{m - (s_e''' - s_e'') + (a''' - a'') - b(v_e'''\sigma''' - v_e''\sigma'')} \qquad (25)$$

Under requirements *D* and *E*, in addition to *A*, *B*, and *C*,

$$\rho_m = \frac{m\rho_w}{m - (s_e''' - s_e'')} \qquad (26)$$

This equation is independent of the magnitudes of σ, c, and v_c, merely requiring their constancy.

Hydrostatic Weighings for Density of Solids.—These equations are based on two weighings; one with the object in air and one with it suspended in a liquid (*e.g.*, water) of known density. The equilibrium equations for these weighings are

$$m' - v_m'\sigma' = s' - v_s'\sigma'$$

and

$$m'' - v_m''\rho_w'' = s'' - v_s''\sigma''$$

the notation being similar to that used for pyknometer weighings. If the mass of the object remains constant (*i.e.*, $m' = m''$), (27) is an exact solution of these equations.

$$\rho_m' = \frac{s_e'}{s_e' - s_e''}(\rho_w''[1 + \beta_m(t'' - t')] - \sigma') + \sigma' \qquad (27)$$

If also all temperatures, the air density, and the density of the weights are the same in the two weighings,

$$\rho_m = \frac{s'}{s' - s''}(\rho_w - \sigma) + \sigma \qquad (28)$$

Correction Formula.—When the result of a density determination is calculated without any correction for the buoyant effect of the air, a false value (ρ_f) is obtained except for pyknometer determinations in which the conditions of the work are those specified for equation (17).

If for pyknometer determinations, these false values were computed by means of the equation $\rho_f = \frac{s''' - s'}{s'' - s'} \rho_w$ and for hydrostatic weighings of solids by means of the equation $\rho_f = \frac{s'}{s' - s''} \rho_w$, then to the precision attainable by assuming that the conditions were those specified for equations (16) or (28) the values may be corrected by the equation

$$\rho = \rho_f \left(1 - \frac{\sigma}{\rho_w}\right) + \sigma \qquad (29)$$

VOLUME OF A MASS OF LIQUID OF KNOWN WEIGHT IN AIR

(See also p. 73)

Verney Stott and Philip H. Bigg

Symbols.—$F = \frac{1 - \frac{\sigma}{\Delta}}{\rho - \sigma}$; t = temperature of the liquid when its volume is V; t_o = temperature of the liquid when weighed; V = volume of the liquid at temperature t; W = weight of the liquid in air against weights of density Δ; ρ, ρ_o = density of the liquid at $t°$ and at $t_o°$, respectively; σ = density of air at time of weighing.

If densities are expressed in g/cm³, and W in g, V is in cm³; if densities are in g/ml and W in g, V is in ml; if densities are in lb./gal., and W in lb., V is in gal.; etc.

The exact relations connecting these quantities are given by the equation

$$V = \frac{W}{\rho}\left(\frac{1 - \frac{\sigma}{\Delta}}{1 - \frac{\sigma}{\rho_o}}\right) = \frac{W}{\rho}\left(\frac{1 - \frac{\sigma}{\Delta}}{1 - \frac{\sigma}{\rho}}\right)\left(\frac{1 - \frac{\sigma}{\rho}}{1 - \frac{\sigma}{\rho_o}}\right) = FW\left(\frac{1 - \frac{\sigma}{\rho}}{1 - \frac{\sigma}{\rho_o}}\right)$$

Values of F for Water and Mercury

(Liquids are air-free)

$$V = FW \frac{1 - \frac{\sigma}{\rho}}{1 - \frac{\sigma}{\rho_o}}$$

In many cases the factor $\left(\frac{1 - \frac{\sigma}{\rho}}{1 - \frac{\sigma}{\rho_o}}\right)$ does not differ significantly from unity. If t_o = 20°C, the greatest value of this factor for the temperature range covered by the following table differs from unity by only 7.3 × 10^{-6} for water and by 0.48 × 10^{-6} for mercury.

If $t_o = t$, $V = FW$. For water, $F = 1 + 0.001\ K_{H_2O}$; for mercury, $F = 0.07 + 0.001\ K_{Hg}$

Unit of F = milliliter per g of W; of t = °C. Assumes* σ = 0.0012 g/ml; Δ = 8.3 g/ml.

t	K_{H_2O}	K_{Hg}	t	K_{H_2O}	K_{Hg}	t	K_{H_2O}	K_{Hg}	t	K_{H_2O}	K_{Hg}	t	K_{H_2O}	K_{Hg}
0	1.189	3.550	10	1.330	3.683	20	2.832	3.817	30	5.410	3.951	40	8.890	4.085
1	1.130	3.563	11	1.425	3.697	21	3.044	3.830	31	5.720	3.964	41		4.098
2	1.089	3.576	12	1.533	3.710	22	3.267	3.844	32	6.038	3.977	42		4.111
3	1.065	3.590	13	1.654	3.723	23	3.501	3.857	33	6.366	3.991	43		4.125
4	1.057	3.603	14	1.788	3.737	24	3.744	3.870	34	6.702	4.004	44		4.138
5	1.065	3.616	15	1.933	3.750	25	3.998	3.884	35	7.046	4.018	45		4.152
6	1.089	3.630	16	2.090	3.763	26	4.261	3.897	36	7.399	4.031	46		4.165
7	1.127	3.643	17	2.259	3.777	27	4.534	3.910	37	7.760	4.044	47		4.178
8	1.181	3.656	18	2.438	3.790	28	4.817	3.924	38	8.129	4.058	48		4.192
9	1.248	3.670	19	2.630	3.803	29	5.109	3.937	39	8.505	4.071	49		4.205
												50		4.219

* The increase (dK) produced in K by changing Δ to $\Delta(1 + \delta)$ and σ to $\sigma(1 + s)$ is closely given (± *ca* 1 %) for the range of this table by the equations:

$$dK_{H_2O} = 0.145(7.3s + 0.997\delta + 8.3s\delta)\frac{1}{1 + \delta}$$

$$dK_{Hg} = 0.00078(-5.3s + 13.6\delta + 8.3s\delta)\frac{1}{1 + \delta},$$

units being those of this table. For uncertainties in σ, and for the variation of σ with pressure, temperature, and humidity, see p. 78. When brass weights are not used, δ will, in general, be large ; in such cases it is desirable to transform the equations once for all by inserting the proper value for δ; they will take the convenient form $dK = a + bs$. If $\delta = 0$, $dK_{H_2O} = 1.06\,s$; $dK_{Hg} = 0.00414\,s$. If $s = 0$, $dK_{H_2O} = 0.145\frac{\delta}{1 + \delta}$; $dK_{Hg} = 0.0106\frac{\delta}{1 + \delta}$.

Example.—(1) If $\sigma = 0.00132$ and $\Delta = 8.383$, $s = 0.1$, $\delta = 0.01$ and $dK_{H_2O} = 0.145(0.73 + 0.01 + 0.008)\frac{1}{1.01} = 0.144(0.75) = 0.108$. Hence, if t = 19°C, $K_{H_2O} = 2.63 + 0.108 = 2.74$.

(2) If $\sigma = 0.00132$ and $\Delta = 2.65$ (quartz), $s = 0.1$, $(1 + \delta) = \frac{2.65}{8.3}$, $\delta = -\frac{5.65}{8.3}$, and $dK_{Hg} = 0.00078(-0.53 - 9.26 - 0.565)(3.13) = -0.0253$. Hence, if t = 25°C, $K_{Hg} = 3.884 - 0.025 = 3.859$.

STANDARD BUFFER SOLUTIONS AND ACID-BASE INDICATORS

Mansfield Clark

In the following tables pH represents (formalistically) $\log_{10} \frac{1}{[H^+]}$ where $[H^+]$ is the symbol for grams of hydrogen ions per liter. Since there is a disagreement concerning the precise interpretation of experimental values, the experimental meaning of pH is defined by the set of conditions described below (8, 57).

The normal hydrogen-electrode is regarded as a properly coated, noble metal, under one atmosphere partial-pressure of hydrogen, immersed in a solution normal with respect to hydrogen ions. The difference of potential between electrode and solution is regarded as zero at all temperatures.

The following values are regarded as *standard* differences of potential (E_c) (liquid-junction potential-difference being eliminated) between the tenth-normal KCl—Hg_2Cl_2—Hg half-cell and the hypothetical, normal hydrogen-electrode.

$T°$	18	20	25	30	37.5	40	50	60
E_c	0.3380	0.3379	0.3376	0.3372	0.3364	0.3360	0.3341	0.3317

For present purposes it is assumed that the liquid-junction potential-difference between an Hg_2Cl_2 half-cell solution and the solution the pH of which is under measurement has been eliminated when there has been interposed a saturated solution of KCl, or when there has been employed the Bjerrum extrapolation (4) from measurements made with $3.5N$ KCl and $1.75N$ KCl as interposed solutions.

When the electromotive force, e.m.f., of the "chain":

H_2Pt	$[H^+]$	KCl saturated	KCl $0.1N$	Hg_2Cl_2Hg

is measured under the above conditions, and the Hg is positive to the Pt, pH is calculated from the equation

$$\frac{\text{E.M.F.} - E_c}{0.000\,198\,37(273.09 + t)} = \text{pH}.$$

(See (8, 37, 45, 64) and references therein on potentiometric measurement of pH.)

The chief modes of employing indicators for the determination of pH may be illustrated by the following examples.

I. A solution having been found to induce a blue color with brom thymol blue (see No. 139, Table 3A), a yellow color with thymol blue (No. 129), and a color intermediate between yellow and red with phenol red (No. 142) is judged to have a pH value between 7.0 and 7.8. Then to 10 ± 0.05 cc of solution are added 5 drops 0.04% phenol red solution (made by dissolving 0.1 g phenol red in 28.5 cc $0.01N$ NaOH solution and diluting to 250 cc). The resulting mixture is then compared with standards made by adding 5 drops of the same phenol red solution to each of 10 ± 0.05 cc portions of buffers having pH values of 7.0, 7.2, 7.4, 7.6, etc. (See Table 1A.)

The comparison is made in containers of identical dimensions and under uniform illumination. It is found that the tested solution has a color intermediate and half-way between those of buffers 7.4 and 7.6, and since the total salt contents of the tested solution and of the buffers are of the same order of magnitude, and since the solution contains no protein or substance known to affect the indicator, 7.5 is judged to be the true pH value of the tested solution (8, 11, 31, 37, 45, 53, 54, 56).

II. A solution is found to induce a partial color transformation of phenol red. Using uniform containers (*e.g.*, test tubes) there are prepared:

(1) A mixture of 10 ± 0.05 cc solution under test and 10 drops standard phenol red solution (see I).

(2) A mixture of x drops of indicator and sufficient buffer solution of the value shown in column B of Table 3A to equal the total volume of solution 1.

(3) A mixture of $10 - x$ drops of indicator and sufficient buffer of the value shown in column C of Table 3A to equal the total volume of solution 1.

X is varied and there is found at $x = 4$ a match in color between solution 1 and superposed solutions 2 and 3. From the relation: $\text{pH} = \text{pK} + \log \frac{x}{10 - x}$, and the value 7.8 for pK given in Table 3A it is calculated that the value of the tested solution is 7.6 (see in addition to the general references under I (2, 19, 20, 22, 34, 63).

III. A solution is found to induce a partial color-transformation in *m*-nitrophenol (No. 15, Table 3C). It is found that 10 cc of the tested solution plus 1 cc of 0.3% *m*-nitrophenol matches in color 11 cc of an alkalinized solution containing 0.2 cc of 0.3% *m*-nitrophenol. It is thus shown that the tested solution has induced a 20% transformation. If a is the percentage transformation of the indicator, pH is calculated from

$$\text{pH} = \text{pK} + \log \frac{a}{100 - a}$$

In the case at hand $a = 20$, the temperature of the measurement was 25° and the total salt content of the solution was of the order of magnitude of $0.15M$. Hence from Table 3C, pK is taken as 8.16. By the above equation pH = 7.56.

The equation $\text{pH} = \text{pK} + \log \frac{a}{100 - a}$ cannot be used with picric acid, phenolphthalein or Alizarine yellow GG listed in Table 3C, since these indicators do not behave as monoacidic within the range of pH specified. Empirical data (38) for phenolphthalein and Alizarine yellow GG are shown in Table 4. It is best to vary the amounts of indicator used till the most favorable color-differences are found. (In addition to the material found in the general references under I see (30, 31, 38, 39) for method III.)

pK in the tables represents the pH at which there is an apparent half-transformation of the indicator. For indicators behaving as monoacidic or monobasic, within the zone of pH designated, pK is log 1/Ka when Ka is the "apparent dissociation constant" (43). When an indicator, such as phenolphthalein, is known not to behave as monoacidic within the range of pH designated, pK is bracketed.

pK values listed in Tables 3A and 3C are uniform with respect to the bases of reference. Those of the indicators in the general list (Table 2) are referred to such a variety of bases that tabulation is impracticable. The reader is therefore referred to original articles (8, 31, 37, 43, 45, 51, 58, 59, 60, 61, 67).)

The values assigned to useful pH ranges are somewhat arbitrary, depending upon concentration of indicator, the spectral distribution of illumination, and psychological preferences.

Indicator solutions are affected to various degrees by

a. Total salt content.

b. Specific ions: *e.g.*, alizarine red S is affected by borates differently than by phosphates (67).

c. Colloidal suspensions, protein solutions, etc.: *e.g.*, congo red in a gelatine solution of pH 3.6 behaved as if the pH were 5.6 (53). Neutral red in soap solutions forms a fatty acid complex (27).

d. Presence of immiscible solvents: *e.g.*, chloroform used for disinfection removes benzene-azo-benzyl-aniline from the aqueous phase (53).

e. Mixed solvents and change of solvent (3, 31, 32, 40, 62).
f. Temperature. See Table 3A, 3C.
g. Time: *e.g.*, water blue changes color slowly and propyl red precipitates.
h. Destructive agents: *e.g.*, methyl red is irreversibly reduced in some bacterial cultures.

Since it is impracticable to tabulate all available data, only representative "salt" and temperature effects are given in Tables 3A, 3B and 4.

The indicators of Table 3 include the better of those which may be used in acidimetric and alkalimetric titration. (For principles see (5, 31, 43, 45).)

Table 1.—Standard Buffer Solutions

The following tables give the compositions of solutions which furnish, at the temperatures indicated, values of pH which conform in essential respects to the specifications listed in the general notes above. Recalculation to make the conformity rigid would involve changes in the original data which would be less than the uncertainties of the working standards used in the experiments. The solutions listed may serve as standards for the colorimetric measurements of pH. The solutions suffer relatively slight displacement of pH with addition or subtraction of small proportions of acid or alkali. This property is referred to as that of a *buffer* (*puffer, tampon*). (For buffer solutions see (8, 37, 45, 64).)

A. Standard Buffer Solutions of Clark and Lubs (10) at 20°

50 cc A + x cc B diluted to 200 cc

A = 0.2*M* KCl* B = 0.2*M* HCl		A = 0.2*M* KH *o*-phthalate B = 0.2*M* HCl		A = 0.2*M* KH *o*-phthalate B = 0.2*M* NaOH		A = 0.2*M* KH_2PO_4 B = 0.2*M* NaOH		A = 0.2*M* H_3BO_3† + 0.2*M* KCl B = 0.2*M* NaOH	
pH	cc B	pH	cc B	pH	cc B	pH	cc B	pH	cc B
1.2	64.5	2.2	46.70	4.0	0.40	5.8	3.72	7.8	2.61
1.4	41.5	2.4	39.60	4.2	3.70	6.0	5.70	8.0	3.97
1.6	26.3	2.6	32.95	4.4	7.50	6.2	8.60	8.2	5.90
1.8	16.6	2.8	26.42	4.6	12.15	6.4	12.60	8.4	8.50
2.0	10.6	3.0	20.32	4.8	17.70	6.6	17.80	8.6	12.00
2.2	6.7	3.2	14.70	5.0	23.85	6.8	23.65	8.8	16.30
		3.4	9.90	5.2	29.95	7.0	29.63	9.0	21.30
		3.6	5.97	5.4	35.45	7.2	35.00	9.2	26.70
		3.8	2.63	5.6	39.85	7.4	39.50	9.4	32.00
				5.8	43.00	7.6	42.80	9.6	36.85
				6.0	45.45	7.8	45.20	9.8	40.80
				6.2	47.00	8.0	46.80	10.0	43.90

B. Sørensen's Glycocoll-NaCl-HCl Mixtures (56)

Glycocoll solution: 0.1*M* Glycocoll + 0.1*M* NaCl per l; HCl: 0.1*N*. Values hold between 10°–70° (66)

Glycocoll (cc)	0.0	1.0	2.0	3.0	4.0	5.0
HCl (cc)	10.0	9.0	8.0	7.0	6.0	5.0
pH	1.04	1.15	1.25	1.42	1.65	1.93

Glycocoll (cc)	6.0	7.0	8.0	9.0	9.5
HCl (cc)	4.0	3.0	2.0	1.0	0.5
pH	2.28	2.61	2.92	3.34	3.68

C. Sørensen's Citrate-HCl Mixtures (56)

Citrate solution: 21.008 g crystn. citric acid + 200 cc *N* NaOH per l; HCl: 0.1*N*. Values hold between 10°–70° (66)

Citrate (cc)	0.0	1.0	2.0	3.0	3.33	4.0	4.5	4.75	5.0	5.5	6.0	7.0	8.0	9.0	9.5	10.0
HCl (cc)	10.0	9.0	8.0	7.0	6.67	6.0	5.5	5.25	5.0	4.5	4.0	3.0	2.0	1.0	0.5	0.0
pH	1.04	1.17	1.42	1.93	2.27	2.97	3.36	3.53	3.69	3.95	4.16	4.45	4.65	4.83	4.89	4.96

* The pH values of these mixtures are given by Clark and Lubs as *preliminary* measurements.

† The old atomic weight (11.0) of boron is used throughout these tables.

D. Sørensen's Phosphate Mixtures (55, 56)

9.078 g KH_2PO_4, 11.876 g $Na_2HPO_4.2H_2O$ each per l. Values hold between 10°–70° (66).

Na_2HPO_4 (cc)	0.25	0.5	1.0	2.0	3.0	4.0
KH_2PO_4 (cc)	9.75	9.5	9.0	8.0	7.0	6.0
pH	5.29	5.59	5.91	6.24	6.47	6.64
Na_2HPO_4 (cc)	5.0	6.0	7.0	8.0	9.0	9.5
KH_2PO_4 (cc)	5.0	4.0	3.0	2.0	1.0	0.5
pH	6.81	6.98	7.17	7.38	7.73	8.04

E. Sørensen's Citrate-NaOH Mixtures (56); Walbum's Values (66)

Citrate solution; 21.008 g crystn. citric acid + 200 cc *N* NaOH per l; NaOH: 0.1*N*

Volume parts		Temperature						
Citrate	NaOH	10°	20°	30°	40°	50°	60°	70°
10.0	0.0	4.93	4.96	5.00	5.04	5.07	5.10	5.14
9.5	0.5	4.99	5.02	5.06	5.10	5.13	5.16	5.20
9.0	1.0	5.08	5.11	5.15	5.19	5.22	5.25	5.29
8.0	2.0	5.27	5.31	5.35	5.39	5.42	5.45	5.49
7.0	3.0	5.53	5.57	5.60	5.64	5.67	5.71	5.75
6.0	4.0	5.94	5.98	6.01	6.04	6.08	6.12	6.15
5.5	4.5	6.30	6.34	6.37	6.41	6.44	6.47	6.51
5.25	4.75	6.65	6.69	6.72	6.76	6.79	6.83	6.86

F. Sørensen's Borate-HCl Mixtures (56); Walbum's Values (66)

Borate: 12.404 g H_3BO_3 + 100 cc *N* NaOH per l; HCl: 0.1*N*

Volume parts		Temperature						
Borate	HCl	10°	20°	30°	40°	50°	60°	70°
10.0	0.0	9.30	9.23	9.15	9.08	9.00	8.93	8.86
9.5	0.5	9.22	9.15	9.08	9.01	8.94	8.87	8.80
9.0	1.0	9.14	9.07	9.01	8.94	8.87	8.80	8.74
8.5	1.5	9.06	8.99	8.92	8.86	8.80	8.73	8.67
8.0	2.0	8.96	8.89	8.83	8.77	8.71	8.65	8.59
7.5	2.5	8.84	8.79	8.72	8.67	8.61	8.55	8.50
7.0	3.0	8.72	8.67	8.61	8.56	8.50	8.45	8.40
6.5	3.5	8.54	8.49	8.44	8.40	8.35	8.30	8.26
6.0	4.0	8.32	8.27	8.23	8.19	8.15	8.11	8.08
5.75	4.25	8.17	8.13	8.09	8.06	8.02	7.98	7.95
5.5	4.5	7.96	7.93	7.89	7.86	7.82	7.79	7.76
5.25	4.75	7.64	7.61	7.58	7.55	7.52	7.49	7.47

H. Sørensen's Borate-NaOH Mixtures (56); Walbum's Values (66)

Borate: 12.404 g H_3BO_3 + 100 cc *N* NaOH per 1; NaOH: 0.1*N*

Volume parts		Temperature							
Borate	NaOH	10°	14°	18°	22°	26°	30°	34°	37°
10	0.0	9.30	9.27	9.24	9.21	9.18	9.15	9.13	9.11
9	1	9.42	9.39	9.36	9.33	9.29	9.26	9.23	9.20
8	2	9.57	9.54	9.50	9.46	9.43	9.39	9.35	9.32
7	3	9.76	9.72	9.68	9.63	9.59	9.55	9.50	9.47
6	4	10.06	10.02	9.97	9.91	9.86	9.80	9.75	9.71
5	5	11.24	11.16	11.08	10.99	10.91	10.82	10.74	10.68
4	6	12.64	12.51	12.38	12.25	12.13	12.00	11.87	11.77

Continued on p. 84.

G. Sørensen's Glycocoll-NaCl-NaOH Mixtures (56); Walbum's Values (66)

Glycocoll: 7.505 g glycocoll + 5.85 g NaCl per l; NaOH: 0.1N

Volume parts		Temperature														
Glycocoll	NaOH	10°	12°	14°	16°	18°	20°	22°	24°	26°	28°	30°	32°	34°	37°	40°
9.5	0.5	8.75	8.70	8.66	8.62	8.58	8.53	8.49	8.45	8.40	8.37	8.32	8.28	8.24	8.18	8.12
9.0	1.0	9.10	9.06	9.02	8.97	8.93	8.88	8.84	8.79	8.75	8.71	8.67	8.62	8.58	8.52	8.45
8.0	2.0	9.54	9.50	9.45	9.40	9.36	9.31	9.26	9.22	9.17	9.13	9.08	9.04	9.00	8.92	8.85
7.0	3.0	9.90	9.85	9.80	9.75	9.71	9.66	9.61	9.56	9.51	9.46	9.42	9.37	9.32	9.25	9.18
6.0	4.0	10.34	10.29	10.24	10.18	10.14	10.09	10.03	9.98	9.93	9.88	9.83	9.78	9.73	9.66	9.58
5.5	4.5	10.68	10.63	10.58	10.53	10.48	10.42	10.37	10.32	10.27	10.22	10.17	10.12	10.07	9.99	9.91
5.1	4.9	11.29	11.24	11.18	11.12	11.07	11.01	10.96	10.90	10.85	10.79	10.74	10.68	10.62	10.54	10.46
5.0	5.0	11.53	11.48	11.42	11.36	11.31	11.25	11.20	11.14	11.09	11.03	10.97	10.92	10.86	10.78	10.70
4.9	5.1	11.80	11.74	11.68	11.62	11.57	11.51	11.45	11.39	11.33	11.27	11.22	11.16	11.10	11.02	10.93
4.5	5.5	12.34	12.28	12.22	12.16	12.10	12.04	11.98	11.92	11.86	11.80	11.74	11.68	11.62	11.53	11.44
4.0	6.0	12.65	12.59	12.52	12.46	12.40	12.33	12.27	12.21	12.15	12.09	12.03	11.96	11.90	11.81	11.72
3.0	7.0	12.92	12.86	12.80	12.73	12.67	12.60	12.54	12.48	12.42	12.35	12.29	12.23	12.17	12.07	11.98
2.0	8.0	13.12	13.06	12.99	12.92	12.86	12.79	12.73	12.66	12.60	12.53	12.47	12.41	12.34	12.25	12.15
1.0	9.0	13.23	13.16	13.09	13.03	12.97	12.90	12.83	12.77	12.70	12.64	12.57	12.51	12.45	12.35	12.25

Volume parts		Temperature														
Glycocoll	NaOH	42°	44°	46°	48°	50°	52°	54°	56°	58°	60°	62°	64°	66°	68°	70°
9.5	0.5	8.07	8.03	7.99	7.95	7.91	7.86	7.82	7.78	7.74	7.69	7.65	7.61	7.56	7.52	7.48
9.0	1.0	8.41	8.37	8.32	8.28	8.24	8.19	8.14	8.10	8.06	8.02	7.97	7.93	7.88	7.84	7.79
8.0	2.0	8.81	8.76	8.72	8.67	8.63	8.58	8.53	8.49	8.44	8.40	8.35	8.30	8.26	8.21	8.16
7.0	3.0	9.13	9.08	9.03	8.99	8.94	8.89	8.84	8.79	8.74	8.70	8.65	8.60	8.55	8.50	8.45
6.0	4.0	9.53	9.48	9.43	9.38	9.33	9.28	9.23	9.18	9.13	9.08	9.03	8.98	8.93	8.88	8.82
5.5	4.5	9.86	9.81	9.76	9.71	9.66	9.61	9.56	9.51	9.46	9.41	9.35	9.30	9.25	9.20	9.15
5.1	4.9	10.40	10.35	10.29	10.24	10.18	10.13	10.07	10.02	9.96	9.90	9.85	9.79	9.74	9.68	9.62
5.0	5.0	10.64	10.59	10.54	10.48	10.43	10.37	10.32	10.26	10.20	10.14	10.09	10.04	9.98	9.93	9.87
4.9	5.1	10.87	10.81	10.75	10.69	10.64	10.58	10.52	10.46	10.40	10.35	10.29	10.23	10.17	10.11	10.05
4.5	5.5	11.38	11.32	11.26	11.20	11.14	11.08	11.02	10.96	10.90	10.84	10.78	10.72	10.66	10.60	10.54
4.0	6.0	11.65	11.59	11.53	11.47	11.41	11.34	11.28	11.22	11.16	11.10	11.03	10.97	10.91	10.84	10.78
3.0	7.0	11.91	11.85	11.79	11.73	11.66	11.60	11.54	11.47	11.41	11.35	11.28	11.22	11.16	11.09	11.03
2.0	8.0	12.08	12.02	11.96	11.89	11.83	11.77	11.70	11.64	11.57	11.51	11.44	11.38	11.31	11.25	11.18
1.0	9.0	12.19	12.13	12.06	12.00	11.94	11.87	11.80	11.74	11.67	11.61	11.54	11.48	11.41	11.35	11.28

J. pH Values of Borax-borate Mixtures at 18°C and "Salt-effects" for Phenolphthalein and α-Naphtholphthalein Palitzsch (44)

Borax solution: 19.108 g $Na_2B_4O_7.10H_2O$ in 1 l. Boric acid solution: 12.404 g H_3BO_3 + 2.925 g NaCl in 1 l

Standard solutions			True pH values of sea water containing S parts per 1000 salinity at color-match with standard											
Borax cc	Boric acid cc	pH	S = 36	S = 30	S = 26	S = 22	S = 18	S = 14	S = 10	S = 6	S = 4	S = 2	S = 1	
6.0	4.0	8.69	8.48	8.49	8.50	8.52	8.54	8.57	8.59	8.63	8.66	8.69	8.72	Phenolphthalein
5.5	4.5	8.60	8.39	8.40	8.41	8.43	8.45	8.48	8.50	8.54	8.57	8.60	8.63	
5.0	5.0	8.51	8.30	8.31	8.32	8.34	8.36	8.39	8.41	8.45	8.48	8.51	8.54	
4.5	5.5	8.41	8.20	8.21	8.22	8.24	8.26	8.29	8.31	8.35	8.38	8.41	8.44	
4.0	6.0	8.31	8.10	8.11	8.12	8.14	8.16	8.19	8.21	8.25	8.28	8.31	8.34	
3.5	6.5	8.20	7.99	8.00	8.01	8.03	8.05	8.08	8.10	8.14	8.17	8.20	8.23	
4.5	5.5	8.41	8.19	8.20	8.21	8.23	8.25	8.28	8.32	8.37	8.40	8.45	8.48	α-Naphtholphthalein
4.0	6.0	8.31	8.09	8.10	8.11	8.13	8.15	8.18	8.22	8.27	8.30	8.35	8.38	
3.5	6.5	8.20	7.98	7.99	8.00	8.02	8.04	8.07	8.11	8.16	8.19	8.24	8.27	
3.0	7.0	8.08	7.86	7.87	7.88	7.90	7.92	7.95	7.99	8.04	8.07	8.12	8.15	
2.5	7.5	7.94	7.72	7.73	7.74	7.76	7.78	7.81	7.85	7.90	7.93	7.98	8.01	
2.3	7.7	7.88	7.66	7.67	7.68	7.70	7.72	7.75	7.79	7.84	7.87	7.92	7.95	
2.0	8.0	7.78	7.56	7.57	7.58	7.60	7.62	7.65	7.69	7.74	7.77	7.82	7.85	
1.5	8.5	7.60	7.38	7.39	7.40	7.42	7.44	7.47	7.51	7.56	7.59	7.64	7.67	
1.0	9.0	7.36	7.14	7.15	7.16	7.18	7.20	7.23	7.27	7.32	7.35	7.40	7.43	
0.6	9.4	7.09	6.87	6.88	6.89	6.91	6.93	6.96	7.00	7.05	7.08	7.13	7.16	
0.3	9.7	6.77	6.55	6.56	6.57	6.59	6.61	6.64	6.68	6.73	6.76	6.81	6.84	

H. Sörensen's Borate-NaOH Mixtures.—(*Continued*)

Volume parts		Temperature							
Borate	NaOH	40°	44°	48°	52°	56°	60°	64°	70°
10	0.0	9.08	9.05	9.02	9.00	8.97	8.93	8.90	8.86
9	1	9.18	9.15	9.11	9.08	9.05	9.01	8.98	8.94
8	2	9.30	9.26	9.22	9.18	9.15	9.11	9.08	9.02
7	3	9.44	9.40	9.35	9.31	9.27	9.22	9.18	9.12
6	4	9.67	9.62	9.56	9.51	9.46	9.40	9.35	9.28
5	5	10.61	10.53	10.44	10.36	10.27	10.19	10.10	9.98
4	6	11.68	11.55	11.42	11.29	11.17	11.04	10.91	10.72

I. Acetic Acid-acetate Mixtures; Walpole's Values (Recalculated) (68)

CH_3CO_2H *M*	0.185	0.176	0.164	0.147	0.126	0.102
CH_3CO_2Na *M*	0.015	0.024	0.036	0.053	0.074	0.098
pH	3.6	3.8	4.0	4.2	4.4	4.6
CH_3CO_2H *M*	.....	0.080	0.059	0.042	0.029	0.019
CH_3CO_2Na *M*	.....	0.120	0.141	0.158	0.171	0.181
pH	.....	4.8	5.0	5.2	5.4	5.6

TABLE 2.—GENERAL LIST OF INDICATORS

The following list of indicators includes all those for which data on the pH-ranges have been found. Many of the data of this table are to be regarded with caution, because in some cases the names proposed are inadequate for complete identification, and in others names have been given to materials of uncertain composition (8, 11, 31, 37, 45, 53, 54, 56, 64).

The Schultz (S......) and Rowe (R......) numbers are taken from the 1923 (52) and 1924 (48) editions, respectively, of these works. Delicate shades of meaning in the color nomenclature have been avoided, as data regarding the purity of the compounds have often been lacking. The abbreviations used are as follows: b, blue; br, brown; c, colorless; f, fades; fl, fluorescent; g, green; o, orange; p, pink; pu, purple; r, red; v, violet; y, yellow. pK is the pH at which there is an apparent half-transformation of the indicator. * indicates that the indicator has been studied in sufficient detail to be used in supplementing the lists of Table 3.

Nitro Compounds

Index No.	Indicator	Color and useful range pH	Lit.
1	2, 4, 6-Trinitrophenol; Picric acid [S. 5; R. 7]	c 0.0– 1.3 y	(31, 39)
2	2, 6-Dinitrophenol [Michaelis' β]	c 2.0– 4.0 y	(31, 38, 39)
3	2, 4-Dinitro-α-naphthol; Manchester yellow [S. 6; R. 9]	y 2.0– 4.0 y	(9)
4	2, 4-Dinitrophenol [Michaelis' α]	c 2.6– 4.4 y	(31, 38, 39)
5	Dinitrohydroquinol	3–10	(23, 46)
6	Nitrohydroquinol	3–11	(46)
7	2, 3-Dinitrophenol [Michaelis' ε]	c 3.9– 5.9 y	(31, 38, 39)
8	2, 5-Dinitrophenol [Michaelis' γ]	c 4.0– 5.8 y	(31, 38, 39)
9	2, 6-Dinitro-4-aminophenol; Isopicramic acid	p 4.1– 5.6 y	(67)
10	3, 4-Dinitrophenol [Michaelis' δ]	c 4.3– 6.3 y	(38, 39)
11	4-Nitro-6-aminoguaiacol	y 4.5– 8.0 r	(35)
12	*p*-Nitrophenol	c 5.6– 7.6 y	(31, 38, 39, 56)
13	*o*-Nitrophenol	c 5.0– 7.0 y	(46)
14	* Dinitrobenzoylene urea	c 6.0– 8.0 y	(6)
15	*m*-Nitrophenol	c 6.8– 8.6 y	(31, 38, 39)
16	2, 4, 6-Trinitrophenyl-methyl-nitroamine; Nitramine	c 10.8–13.0 br	(31, 33)
17	*sym.*-Trinitrobenzene	c 12.0–14.0 o; f	(50)
18	2, 4, 6-Trinitrotoluene	p 11.5–14.0 o	(9)

Mono-azo Compounds

Index No.	Indicator	Color and useful range pH	Lit.
19	*p*-Toluene-azo-phenyl-aniline	1.0– 2.0	(53, 54, 56)
20	*p*-Carboxybenzene-azo-dimethylaniline; Para methyl red	r 1.0– 3.0 y	(9, 60)
21	*p*-Toluene-azo-phenyl-α-naphthylamine	1.1– 1.9	(53, 54, 56)
22	Benzene-azo-diphenylamine	p 1.2– 2.1 y	(56)
23	*m*-Benzenesulfonic acid-azo-diphenylamine; Metanil yellow [S. 134; R. 138]	r 1.2– 2.3 y	(56)
24	Benzene-azo-phenyl-α-naphthylamine	v 1.4– 2.6 o	(53, 54, 56)
25	*p*-Benzenesulfonic acid-azo-diphenylamine; Tropaeolin OO [S. 139; R. 143]	r 1.4– 2.6 y	(56, 60)
26	*o*-Toluene-azo-*o*-toluidine; Spirit yellow R [S. 68; R. 17]	1.4– 2.9	(53, 54, 56)
27	*p*-Toluene-azo-benzyl-α-naphthylamine	1.6– 2.6	(53, 54, 56)
28	*p*-Toluene-azo-benzyl-aniline	1.6– 2.8	(53, 54, 56)
29	Benzene-azo-benzyl-α-naphthylamine	1.9– 2.9	(53, 54, 56)
30	Benzene-azo-aniline; Amino-azo-benzene [S. 31; R. 15]	y 1.9– 3.3 y	(53, 54, 56, 60)
31	*p*-Benzenesulfonic acid-azo-aniline	r 1.9– 3.3 y	(52, 53, 54, 60)
32	*p*-Benzenesulfonic acid-azo-benzylaniline	r 1.9– 3.3 y	(56, 60)
33	*m*-Carboxybenzene-azo-dimethylaniline	r 2.0– 4.0 y	(11)
34	Benzene-azo-benzylaniline	p 2.3– 3.3 y	(56)
35	*p*-Benzenesulfonic acid-azo-*m*-chlorodiethylaniline	r 2.6– 4.0 y	(56, 60)
36	*m*-Nitrobenzene-azo-β-naphthol-3, 6-disulfonic acid; Orange III [S. 47; R. 39]	r 2.6– 4.6 y	(9)
37	Benzene-azo-dimethylaniline; Töpfer's indicator [S. 32; R. 19]	r 2.9– 4.0 y	(56, 60)
38	*o*-Carboxybenzene-azo-α-naphthylamine	r 2.9– 5.8 y	(61)
39	*p*-Benzenesulfonic acid-azo-*o*-toluidine	mid-point 2.9	(60)

MONO-AZO COMPOUNDS.—(*Continued*)

Index No.	Indicator	Color and useful range pH	Lit.
40	*p*-Benzenesulfonic acid-azo-*m*-xylidine	mid-point 2.9	(60)
41	*o*-Carboxybenzene-azo-diphenylamine	p 3.0– 4.6 y	(11)
42	*p*-Benzenesulfonic acid-azo-methylaniline	r 3.1– 4.2 y	(53, 54, 56, 60)
43	*p*-Benzenesulfonic acid-azo-ethyl aniline	r 3.1– 4.4 y	(53, 54, 56, 60)
44	*p*-Benzenesulfonic acid-azo-dimethylaniline; Methyl orange [S. 138; R. 142]	r 3.1– 4.4 y	(56, 60)
45	*p*-Benzenesulfonic acid-azo-diethylaniline; Ethyl orange	r 3.5– 4.5 y	(53, 54, 56, 60)
46	*o*-Benzenesulfonic acid-azo-dimethylaniline	mid-point 3.5	(60)
47	*p*-Benzenesulfonic acid-azo-*m*-toluidine	mid-point 3.5	(60)
48	*p*-Benzenesulfonic acid-azo-*p*-xylidine	mid-point 3.6	(60)
49	**p*-Sulfo-*o*-methoxybenzene-azo-dimethyl-α-naphthylamine	b 3.5– 4.9 o	(42)
50	*p*-Benzenesulfonic acid-azo-α-naphthylamine	r 3.5– 5.7 y	(56, 61)
51	*p*-Benzenesulfonic acid-azo-phenyl-α-naphthylamine	v 3.5– 6.5 o	(61)
52	*o*-Carboxybenzene-azo-phenyl-α-naphthylamine	v 3.5– 6.5 o	(61)
53	Benzene-azo-α-naphthylamine	r 3.7– 5.0 y	(56, 61)
54	*p*-Toluene-azo-α-naphthylamine	3.7– 5.0	(53, 54, 56)
55	*o*-Carboxybenzene-azo-methylaniline	r 4.0– 6.0 y	(11)
56	Benzene-azo-*m*-phenylenediamine; Chrysoidine [S. 33; R. 20]	o 4.0– 7.0 y	(9)
57	*o*-Carboxybenzene-azo-ethylaniline	r 4.2– 6.2 y	(11)
58	*o*-Carboxybenzene-azo-*n*-propylaniline	r 4.2– 6.2 y	(11)
59	*o*-Carboxybenzene-azo-dimethylaniline; Methyl red [R. 211]	r 4.2– 6.3 y	(11, 14, 56, 60)
60	*o*-Carboxybenzene-azo-diethylaniline; Ethyl red	r 4.4– 6.2 y	(11, 60)
61	**o*-Carboxybenzene-azo-di-*n*-propylaniline; Propyl red	r 4.6– 6.6 y	(11)
62	*o*-Carboxybenzene-azo-*m*-phenylenediamine	o 4.6– 7.6 y	(9)
63	Benzene-azo-dimethyl-α-naphthylamine	4.8– 5.5	(53, 54, 56)
64	*p*-Benzenesulfonic acid-azo-dimethyl-α-naphthylamine	r 5.0– 5.7 o	(53, 54, 56, 61)
65	*o*-Carboxybenzene-azo-α-naphthylamine	p 5.6– 7.0 y	(11)
66	*o*-Carboxybenzene-azo-(di or mono?)-amyl aniline	o 5.6– 7.6 y	(11)
67	*o*-Carboxybenzene-azo-dimethyl-α-naphthylamine	r 5.6– 7.6 o	(11, 61)
68	4-Sulfo-α-naphthalene-azo-α-naphthol; Naphthylamine brown [S. 160; R. 175]	o 6.0– 8.4 p	(9)
69	Tropaeolin?	y 7.0– 9.0 r	(50)
70	6-Sulfo-α-naphthol-1-azo-*m*-hydroxybenzoic acid	o 7.0– 8.0 b v 12 –13 r	(67)
71	Curcumine?	y 7.4– 8.6 b	(31)
72	*p*-Benzenesulfonicacid-azo-α-naphthol; Tropaeolin OOO No. 1 [S. 144; R. 150]	y 7.6– 8.9 p	(56)
73	*p*-Benzenesulfonicacid-azo-β-naphthol; Tropaeolin OOO No. 2 [S. 145; R. 151]	7.6– 8.9(?)	(45)
74	*m*-Nitrobenzene-azo-salicylic acid; Alizarine yellow GG [S. 48; R. 36]	c(?)10.0–12.0 y	(38, 39)
75	*p*-Nitrobenzene-azo-salicylic acid; Alizarine yellow R [S. 58; R. 40]	y 10.0–12.1 y	(56)
76	α-Naphthylaminosulfonic acid-azo-β-naphthol; Red I [S. 161; R. 176]	10.5–12.1	(53, 54, 56)
77	α-Naphthalene-azo-β-naphthol-3, 6-disulfonic acid; Bordeaux B [S. 112; R. 88]	p 10.5–12.5 o	(9)
78	*p*-Benzenesulfonic acid-azo-resorcinol; Tropaeolin O [S. 143; R. 148]	y 11.1–12.7 o	(56)
79	Benzene-azo-β-naphthol-6, 8-disulfonic acid; Orange GG [S. 38; R. 27]	y 11.5–14.0 p	(9)
80	Crocein?	p 12.0–14.0 v	(50)
81	Helianthin (Grübler)?	o 11.0–12.0 r	(9)
82	Helianthin I?	o 11.0–13.0 r	(50)
83	Helianthin II?	y 13.0–14.0 v	(50)
84	Curcumein?	o 0.0– 1.0 y y 13.0–15.0 g	(50)

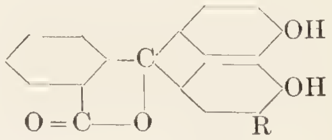
DIS-AZO COMPOUNDS

Index No.	Indicator	Color and useful range pH	Lit.
85	Ditolyl-disazo-bis-β-naphthylamine-6-sulfonic acid; Benzopurpurin B [S. 365; R. 450]	b 0.3– 1.0 v v 1.0– 5.0 y y 12.0–14.0 r	(50)
86	Ditolyl-disazo-bis-α-naphthylamine-4-sulfonic acid; Benzopurpurin 4B [S. 363; R. 448]	v 1.3– 4.0 r	(31)
87	Diphenyl-disazo-bis-α-naphthylamine-4-sulfonic acid; Congo red [S. 307; R. 370]	b 3.0– 5.0 r	(50)
88	Ditolyl-disazo-bis-α-naphthol-4-sulfonic acid; Azo blue [S. 377; R. 463]	v 10.5–11.5 p	(9)
89	Curcumin W [Probably Rowe, 364 (21)]	mid-point 7.3 mid-point 7.6	(49) (18)

Triphenylmethane Derivatives

Index No.	Indicator	Color and useful range pH	Lit.
90	Methylated pararosaniline; Crystal violet [S. 516; R. 681]	g 0.0– 2.0 b	(9)
91	*p, p′*-Tetramethyldiamino-triphenylcarbinol; Malachite green [S. 495; R. 657]	y 0.0– 2.0 g b 11.5–14.0 f	(50)
92	Hofmann's violet; Methylated rosanilines and pararosanilines [S. 514; R. 679]	g 0.0– 2.0 b	(9)
93	Tetraethyl-diamino-triphenyl-carbinol; Brilliant green [S. 499; R. 662]	y 0.0– 2.6 g	(9)
94	Heptamethylrosaniline; Iodine green [R. 686]	y 0.0– 2.6 b	(9)
95	Hexaethylpararosaniline; Ethyl violet [S. 518; R. 682]	y 0.0– 3.6 b	(9)
96	Ethyl-hexamethyl-pararosaniline; Ethyl green [R. 685]	y 0.3– 2.0 b	(31)
97	Methyl violet 6B; Benzylated tetra- and pentamethyl-pararosaniline [S. 517; R. 683]	y 0.15– 3.2 v	(56)
98	Gentian violet; mixture	0.4– 2.7	(53, 54, 56)
99	Aniline red; Rosaniline and pararosaniline [S. 512; R. 677]	pu 1.2– 3.0 f	(9)
100	Red violet 5RS; Di- and tri-sulfonate of ethylrosaniline [S. 525; R. 693]	p 3.6– 6.0 c	(9)
101	Resazurin [R. 727 note]	o 3.8– 6.5 v	(31)
102	China blue [S. 539; R. 707]; Mixture	b 4.7– 7.0 c	(9)
103	Rosolic acid [S. 555; R. 724]; Mixture	br 6.9– 8.0 r	(56)
104	Alkali blue 4B [S. 536; R. 704]; Mixture	v 9.4–14.0 p	(9)
105	XL Soluble blue [S. 538; R. 706]; Mixture	b 10.0–13.0 p	(9)
106	Poirrier's blue	b 11.0–13.0 r	(8)
107	Acid fuchsin; Di- and tri-sulfonic acids of rosaniline and pararosaniline [S. 524; R. 692]	r 12.0–14.0 f	(50)

Phthaleins and Related Compounds

Index No.	Indicator	Color and useful range pH	Lit.
108	Diethyl-*m*-amino-phenolphthalein; Rhodamine B [S. 573; R. 749]	o 0.1– 1.2 p	(9)
109	Pyrogallol-phthalein; Galleïn [S. 599; R. 781]	variable 0–14	(50)
110	Tetrabromofluorescein; Eosine Y S [S. 587; R. 768]	y 0 – 3.0 fl	(9)
111	Erythrosin (iodeosin); Di- or tetra iodated fluorescein [S. 591, 592?; R. 772, 773?]	o 0.0– 3.6 fl	(9)
112	Phloxin red B.H. (Grübler)?	p 1.4– 3.6 r	(9)
113	Dihydroxyfluoran; Uranin (fluorescein) [S. 585; R. 766]	y 3.6– 5.6 fl	(9)
114	Dichlorofluorescein	y 4.0– 6.6 fl	(9)
115	*o*-α-Naphthol phthalein	y 8.9– 9.5g(f)	(17)
116	*p*-α-Naphthol phthalein	y 7.0– 9.0 b	(56)
117	Tetrabromophenol phthalein	c 8.0– 9.0 v	(45)
118	*o*-Cresoltetrachlorophthalein	c 8.5– 9.0 pu	(1)
119	*o*-Cresolphthalein	c 8.2– 9.8 r	(11, 14)
120	Phenolphthalein [R. 764]	c 8.3–10.0 r	(38, 39, 56)
121	*1, 2, 3-Xylenolphthalein	c 8.9–10.2 b	(17)
122	Thymolphthalein	c 9.3–10.5b(f)	(56)
123	Dibromo-dinitrofluorescein; Eosin BN [S. 590; R. 771]	p 10.5–14.0 y	(9)
124	R = SCH_3 	c 8.4–10.0 v	(25)
125	R = SC_4H_9	c 8.6– 9.8 v	(25)
126	R = SC_6H_5	c 9.0–10.0 v	(25)

Sulfonphthaleins

Index No.	Indicator	Color and useful range pH	Lit.
127	Catecholsulfonphthalein	p 0.2– 0.8 o y 4.0– 7.0 g v 8.5–10.2 b	(41)
128	*m*-Cresolsulfonphthalein; Metacresol purple	r 0.8– 2.4 y y 7.6– 9.2 pu	(11, 14)
129	Thymolsulfonphthalein; Thymol blue	r 1.2– 2.8 y y 8.0– 9.6 b	(11, 14)
130	Tetranitrophenolsulfonphthalein	2.8– 3.8?	(11)
131	Tetrabromophenolsulfonphthalein; Bromphenol blue	y 3.0– 4.6 b	(11, 14)
132	*Tetrachlorophenolsulfonphthalein	y 3.0– 4.6 b	(11)
133	*Dichloro-dibromo-phenol-sulfonphthalein; Brom-chlorphenol blue	y 3.2– 4.8 b	(14)
134	Tetrabromo-*m*-cresolsulfonphthalein; Bromcresol green	y 3.8– 5.4 b	(11, 14)
135	Dichlorophenolsulfonphthalein; Chlorphenol red	y 5.0– 6.6 r	(11, 14)
136	Dibromo-*o*-cresolsulfonphthalein; Bromcresol purple	y 5.2– 6.8 pu	(11, 14)
137	Dibromophenolsulfonphthalein; Bromphenol red	y 5.4– 7.0 r	(11, 14)
138	*Diiodophenolsulfonphthalein	y 5.7– 7.3 pu	(9)
139	Dibromothymolsulfonphthalein; Bromthymol blue	y 6.0– 7.6 b	(11, 14)
140	*Brom Xylenol Blue, dibrominated No. 145	y 6.0– 7.6 b	(11, 14)
141	Phenol-nitrosulfonphthalein	y 6.6– 8.4 pu	(11)

Sulfonphthaleins.—(*Continued*)

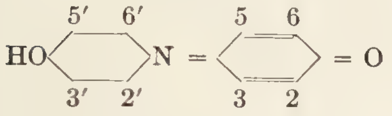
Index No.	Indicator	Color and useful range pH	Lit.
142	Phenolsulfonphthalein; Phenol red	y 6.8– 8.4 r	(11, 14)
143	*o*-Cresolsulfonphthalein; Cresol red	y 7.2– 8.8 r	(11, 14)
144	Salicylsulfonphthalein	y 7.2– 9.2 p	(9)
145	*1.4-Dimethyl-5-hydroxybenzenesulfonphthalein; Xylenol blue	y 8.0– 9.6 b	(12)
146	α-Naphtholsulfonphthalein	y 7.5– 9.0 b	(11)
147	Carvacrolsulfonphthalein	y 7.8– 9.6 b	(11)
148	Orcinsulfonphthalein	y 8.6–10.0 fl	(11)
149	Nitro-thymolsulfonphthalein	v 9.2–11.5 y	(11)

Quinoline Compounds

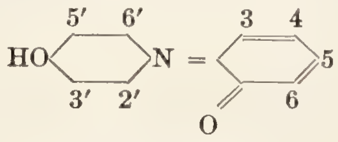
Index No.	Indicator	Color and useful range pH	Lit.
150	α-(*p*-Dimethylaminophenylethylene)-quinoline ethiodide; Quinaldine red. Eastman Kodak Co. No. 1361	1.0– 2.0	(36)
151	Quinoline blue (cyanin); 1, 1′ Disoamyl-4, 4′-quinocyanine iodide [S. 611; R. 806]	c 7.0– 8.0 v	(52, 54, 56)

Index No. 152 Indophenols (15)

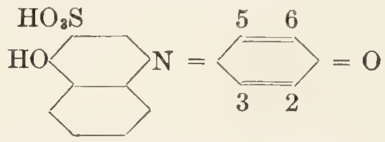
Color changes: from brownish or clear red in acid to deep blue in alkali. All indophenols are somewhat unstable



Indophenol



Orthoindophenol



Indonaphthol-2′-sulfonic acid

Substituents	pK
2, 6, 3′ Tribromo-	5.1
2, 6-Dibromo-3′-chloro-	5.4
2, 6-Dibromo-3′-methyl-	5.4
2, 6-Dichloro-3′-chloro-	5.8
2, 6-Dichloro-3′-methyl-	5.5
2, 6-Dibromo-3′-methoxy-	5.6
2, 6-Dichloro-	5.7
2, 6-Dibromo-	5.7
2, 6-Dibromo-2′-methyl-	5.9
2, 6-Dibromo-2′-bromo-	6.3
2-Chloro-	7.0
2-Bromo-	7.1
3-Bromo-	7.8
Indophenol	8.1
2-Methyl-	8.4
3-Methyl-	8.6
2-Methoxy-	8.7
2-Isopropyl-5-methyl-	8.8
2-Methyl-5-isopropyl	8.9

Substituents	pK
3′ Bromo-	7.1
Orthoindophenol	8.4
2′-Methyl-	8.8

Substituents	pK
2, 6 Dichloro-	6.1
Indonaphthol-2′-sulfonic acid	8.7
2-Methyl-	9.0

Azines

Index No.	Indicator	Color and useful range pH	Lit.
153	Safranine (Which?)	b −0.3– 1.0 r	(50)
154	Amino-dimethylamino-phenyl-diphenazonium chloride; Methylene violet B.N. [S. 680; R. 842]	pu 0.0– 1.2 v	(9)
155	Amino-phenylamino-*p*-tolyl-ditolazonium sulphate; Mauve [S. 688; R. 846]	0.1– 2.9	(56)
156	Magdala red; Mixture amino- and diamino-naphthyl-dinaphthazonium chlorides [S. 694; R. 857]	p 3.0– 4.0 fl	(50)
157	Induline, spirit soluble [S. 697; R. 860]; Mixture	b 5.6– 7.0 v	(9)
158	Amino-dimethylamino-toluphenazonium chloride; Neutral red [S. 670; R. 825]	r 6.8– 8.0 y	(56)
159	Dimethylamino-phenyl-naphtho-phenazonium chloride; Neutral blue [S. 676; R. 832]	9.3–10.2	(52, 54, 56)

Oxazine Compounds

Index No.	Indicator	Color and useful range pH	Lit.
160	Dihydroxy-dinaphthazoxonium sulfonate; Alizarin green B [S. 657; R. 918]	v −0.3– 1.0 p y 12.0–14.0 br	(60)
161	Diethylamino-benzylamino-naphtho-phenazoxonium chloride; Nile blue 2B [S. 654; R. 914]	b 7.2– 8.6 p	(9)
162	Diethylamino-aminonaphtho-phenazoxonium sulfate; Nile blue A [S. 653; R. 913]	b 10.2–13.0 p	(9)

Anthraquinone Compounds

Index No.	Indicator	Color and useful range pH	Lit.
163	1, 2-Dihydroxy-anthraquinone-β-quinoline; Alizarin blue ABI [S. 803; R. 1066]	p 0.0– 1.6 y y 6.0– 7.6 g	(9)
164	1, 2, 4-Trihydroxy-anthraquinone; Purpurin [S. 783; R. 1037]	y 0.0– 4.0 o o 4.0– 8.0 p	(9)
165	Alizarin sulfonic acid; Alizarin red S [S. 780; R. 1034]	y 3.7– 4.2 p	(67)
166	1, 2-Dihydroxy-anthraquinone; Alizarin [S. 778; R. 1027]	y 5.5– 6.8 r v 10.1–12.1 pu	(53, 54, 56)
167	Alizarin blue S	various 6–14	(45)

Indigos

Index No.	Indicator	Color and useful range pH	Lit.
168	Indigo disulfonate; Indigo carmine [S. 877; R. 1180]	b 11.6–14.0 y	(9)

Miscellaneous and Natural Indicators

Index No.	Indicator	Color and useful range pH	Lit.
169	Echtrot?	y 0 – 1.0 r	(50)
170	Logwood [S. 938; R. 1246]	various 0–14	(45)
171	*Red cabbage extract	r 2.4– 4.5 g	(65)
172	1-Oxynaphtho-quinomethane; Nierenstein's indicator	c 2.7– 3.7 pu	(67)
173	Tröger and Hille's Indicator, $C_{14}H_{15}N_4SO_3H$	o 2.8– 3.9 y	(67)
174	Phenacetolin	y 3.0– 6.0 r r 10.0–13.0 c	(45)
175	Lacmosol	r 4.4– 5.5 b	(26)
176	Lacmoid [R. 908 note]	r 4.4– 6.2 b	(53, 54, 56)
177	Azolitmin (litmus) [R. 1242]	r 4.5– 8.3 b	(53, 54, 56)
178	Cochineal [S. 932; R. 1239]	y 4.8– 6.2 v	(53, 54, 56)
179	Archil (orchil) [S. 934; R. 1242]	p 5.6– 7.6 v	(9)
180	Brazilein [S. 935; R. 1243]	c 6.0– 8.0 p	(9)
181	Di-*o*-hydroxy-styryl ketone; Lygosine	y 7.3– 8.7 g	(67)
182	Mimosa flower extract	7.7– 9.6	(67)
183	Turmeric (curcuma) [S. 927; R. 1238]	y 7.8– 9.2 br	(31)
184	Alkannin [R. 1240, note] *cf.* alizarin	8.3–10.0	(53, 54, 56)
185	α-Naphtholbenzein	y 8.5– 9.8 g	(53, 54, 56)

Common Synonyms of Indicators

Among synonyms given in this table are several which apply to dyes which are not listed in preceding table or which have been applied to two or more of the indicators listed. Such cases are indicated by*.

Acid bordeaux, 77
Acid brown R,* 68
Acid fuchsin,* 107
Acid magenta II, 107
Acid roseine, 107
Alizarin, 166
Alizarin blue ABI, 163
Alizarin blue S, 167
Alizarin blue X, 163
Alizarin carmine, 165
Alizarin green B, 160
Alizarin red S, 165
Alizarin sulfonate or S, 165
Alizarin yellow GG, 74
Alizarin yellow R, 75
Alkali blue 4B, 104
Alkanet, 184
Alkanin, Alkannin, 184
Alphanaphtholbenzein, 185
Alphanaphtholphthalein,* 116
Amido-azo-benzol, 30
Amido-azo-toluol, 26
Amino-azo-benzene, 30
Amino-azo-toluene, 26
Amyl red, 66
Anchusin, 184
Aniline orange,* 31
Aniline red, 99
Aniline yellow,* 3, 25, 30
Archil, 179
Aurin, 103
Azo blue, 88
Azolitmin, 177
Azoresorcin, 101
Benzopurpurin B, 85
Benzopurpurin 4B, 86
Benzyl violet, 97
Beta naphthol orange, 73
Bitter almond oil green, 91
Blauholz, 170
Boettger's indicator, 184
Bordeaux B, 77
Brasilein, brasilin, brazilin, 180
Brazil wood, 180
Brilliant green, 93
Brilliant yellow,* 89
Brom-chlor-phenol blue, 133
Brom cresol green, 134
Brom cresol purple, 136
Brom phenol blue, 131
Brom phenol red, 137
Brom thymol blue, 139
Brom xylenol blue, 140
Butter yellow,* 26, 37
Cabbage red, 171
Campeachy wood, 170
Carmine, 178
Carminic acid, 178
Catechol sulphonphthalein, 127
China blue, 102
Chlor phenol red, 135
Chrome printing orange R, 75
Chrome printing yellow G, 74
Chrysoidine,* 56
Chrysoine, 78
Coccus, 178
Cochenille, cochineal, 178
Congo, 87
Congo red, 87
Corallin, 103
Cresol red, 143
Cresolphthalein,* 119
Cresolsulphonphthalein,* 143
Crismer's indicator, 101
Crocein,* 80
Crystal violet, 90
Curcuma, 183
Curcumein,* 84
Curcumin,* 183
Curcumin W, 89
Curcummin,* 183
Cyanin, 151
Dechan's indicator, 109
Degener's indicator, 174
Dianil red,* 87
Dichlorofluorescein, 114
Diethylaniline orange, 45
Dihydroxyanthraquinone, 166
Dimethylaniline orange, 44
Dimethyl orange, 44
Dimethyl yellow, 37
Dinitroaminophenol, 9
Dinitrohydroquinone, 5
Echtrot,* 169
Echtrot A, 76
Echtrot B, 77
Eosine, 110
Eosine BN, 123
Eosine YS, 110
Erythrosine,* 111
Ethyl green,* 96
Ethyl orange, 45
Ethyl red,* 60
Ethyl violet, 95
Fast red A, 76
Fast red B,* 77
Fluorescein, 113
Formanek's indicator, 160
Fuchsia, 154
Fuchsin,* 99
Fuchsin S, 107
Galeine, 109
Gallein, 109
Gentian violet, 98
Golden orange, 44
Haematein,* [1] 170
Haematoxylin,* [1] haematoxylon,* 170
Helianthine,* 44, 81, 82, 83
Hematein,* [1] hematine,* [1] 170
Hematoxylin, * [1] 170
Henderson & Forbes' indicator, 5
Herzberg's indicator, 87
Hofmann's violet, 92
Holt & Reid's indicators, 124–126
Indigo carmine, 168
Indigo disulphonate, 168
Indophenols, 152
Induline spirit-soluble, 157
Iodeosine,* 111
Isopicramic acid, 9
Iodine green, 94
Kosmos red, 87

[1] Haematoxylin is the leuco-compound of Haematein or Hematine as obtained from logwood although the name is sometimes given to the oxidized form. Haematein or Hematine should not be confused with Hematin of the blood pigment.

TABLE 3

A. Clark and Lubs' Selection of Indicators Supplemented by Cohen (11, 14)

A = Cubic centimeters of $0.01N$ NaOH required per 0.1 g acid indicator to form sodium salt. Dilute to 250 cc for 0.04 % reagent. Use alcoholic solutions of methyl red (59) and cresolphthalein (119).

B = Approximate pH value of solution required for full "acid color" appertaining to range indicated.

C = Approximate pH value of solution required for full "alkaline color" appertaining to range indicated.

Index No.	A	B	C	Useful range pH	pK†
129	see below	conc. HCl	6	1.2–2.8	1.5
131	15.0	0	7	3.0–4.6	4.0
134	14.5	1	8	4.0–5.6	4.7*
59		?	9	4.4–6.0	[5.0]
135	23.5	3	10	5.0–6.6	6.2*
136	18.5	3	10	5.2–6.8	6.3
139	16.0	4	10	6.0–7.6	7.1
142	28.5	5	11	6.8–8.4	7.8
143	26.3	5	11	7.2–8.8	8.2
128	26.5	5	11	7.6–9.2	8.4*
129	21.5	6	12	8.0–9.6	8.9
119		6	12	8.2–9.8	[9.4]

* No salt and protein errors determined.
† pK values are weighted means of values found in (2, 7, 11, 14, 19, 20, 24, 34).

Representative Corrections of Colorimetric Readings with Indicators of Table 3A to Bring Readings to Electrometric pH

	Peptone-beef infusion	10 % gelatine sol.	2 % egg-white	Urine
131 Brom phenol blue	0.05			
59 Methyl red	−0.10		0.24	0.05
136 Brom cresol purple	0.01	0.04		0.01
139 Brom thymol blue	0.10	0.04		0.02
142 Phenol red	0.04	0.20		0.00
143 Cresol red	0.03	0.20		
129 Thymol blue	0.04	0.20		
119 Cresolphthalein	−0.03	0.20		

Corrections at different salt content [after Kolthoff (29)]

Thymol blue (acid range)	$0.1N$ KCl	−0.06
	$1.0N$ KCl	+0.05
Brom phenol blue	$0.1N$ KCl	−0.05
	$1.0N$ KCl	−0.35
Methyl red	$0.5N$ NaCl	+0.10
Brom cresol purple	$0.5N$ NaCl	−0.25
Phenol red	$0.5N$ NaCl	−0.15
Thymol blue	$0.5N$ NaCl	−0.17

With color match between a solution at 70° and a standard buffer at 20° the solution at 70° will have the pH of the standard corrected by the following values according to Kolthoff (28).

Thymol blue (acid range)	0.0
Brom phenol blue	0.0
Methyl red	−0.2
Brom cresol purple	0.0 to +0.2
Phenol red	−0.3
Thymol blue (alk.)	−0.4

Corrections in sea water of salinity S [parts per 1000] after Ramage and Miller 1925 (unpublished).

S	5	10	15	20	25	30	35
Cresol red	−.11	−.17	−.21	−.24	−.25	−.26	−.27

B. Sørensen's Selection of Indicators (56)

Index No.	Composition of test solution	Useful range pH	Sensitivity to neutral salts	Usefulness in presence of: True proteins	High conc. of products of proteolysis	Chloroform and toluene	Stability on standing
97	0.01%–0.05% aqueous	0.1–3.2	high	fair	good	with chloroform not, with toluene useful	acid solutions fade
155	0.01%–0.05% aqueous	0.1–2.9	high	fair	good	as above	as above
22	0.01 g in 1 cc N HCl + 50 cc alcohol + 49 cc water	1.2–2.1	low	not	fair	not	moderate
25	0.01% aqueous	1.4–2.6	low	not	fair	good	good
23	0.01% aqueous	1.2–2.3	low	not	fair	good	good
34	0.02 g in 1 cc $N/10$ HCl + 50 cc alcohol + 49 cc water	2.3–3.3	low	not	good	not	moderate
32	0.01% aqueous	1.9–3.3	low	not	fair	good	good
35	0.01% aqueous	2.6–4.0	low	not	fair	good	good
37	0.01 g 0.1 cc $N/10$ HCl + 80 cc alcohol + 20 cc water	2.9–4.0	low	not	good	not	moderate
44	0.01% aqueous	3.1–4.4*	low	not	fair	good	good
53	0.01 g in 0.4 cc $N/10$ HCl + 30 cc alcohol + 70 cc water	3.7–5.0	low	not	good	not	moderate
50	0.01 g in 60 cc alcohol + 40 cc water	3.5–5.7	low	not	good	good	good
59	0.02 g in 60 cc alcohol + 40 cc water	4.2–6.3*	low	S.C.	good	good	moderate
12	0.04 g in 6 cc alcohol + 94 cc water	5.0–7.0*	moderate	good	good	good	good
158	0.01 g in 50 cc alcohol + 50 cc water	6.8–8.0*	low	S.C.	good	S.C.	good
103	0.04 g in 40 cc alcohol + 60 cc water	6.9–8.0	low	fair	good	fair	good
72	0.01% aqueous	7.6–8.9	low	good	good	good	good
116	0.1 g in 150 cc alcohol + 100 cc water	7.3–8.7	moderate	S.C.	good	good	fair
120	0.05 g in 50 cc alcohol + 50 cc water	8.3–10.0*	moderate	S.C.	good	good	good—fades in strong alkali
122	0.04 g in 50 cc alcohol + 50 cc water	9.3–10.5	moderate	S.C.	good	good	fades in moderate alkali
75	0.01% aqueous	10.1–12.1			good		good
78	0.01% aqueous	11.1–12.7			fair		good

S.C. = useful in special cases.

* Apparent pK values referred to standard buffers: Methyl orange (44) 3.7 (34 *cf.* 60). Methyl red (59) see Table 3A (59, 60). Paranitrophenol (12) see Table 3C. Neutral red (158) 6.85 (34). Phenolphthalein see Table 3C.

Representative average corrections of colorimetric readings with indicators of Table 3B to bring readings to electrometric pH (see also Table 2).

Index No. of indicator	Corrections (after Sørensen (53)): In 2% peptone 0.01–0.3N salt	In 2% egg-white 0.07–0.3N salt	Corrections in solutions containing salts
97	−0.02	−0.19	
155	−0.04	−0.19	
22	−0.06	>−0.90	
25	−0.27	>−1.40	
23	−0.30	>−1.40	
34	+0.01	>−0.80	
32	−0.22	>−0.80	
35	−0.41		
37	−0.08	−0.53	
44	−0.18		0.1N KCl, −0.08; 1.0N KCl, +0.23 Kolthoff
53	−0.02		
50	−0.03	+0.15	0.5N NaCl, + 0.10 Sørensen
12	−0.06	−0.04	0.5N NaCl, − 0.15 Sørensen (−0.05 Kolthoff)
158	+0.13	+0.68	0.5N NaCl, + 0.09 Sørensen
103	+0.08	+0.44	0.5N NaCl, − 0.06 Sørensen
72	−0.12	+0.10	0.5N NaCl, − 0.12 Sørensen
120	−0.01	+0.18	0.5N NaCl, − 0.12 Sørensen (−0.17 Kolthoff)
122	+0.01	+0.40	
75		+0.29	
78		−0.30	0.1N KCl, + 0.38; 1.0N KCl, + 0.62 Kolthoff

C. Michaelis' Selection of One-color Indicators

Index No.	Useful range pH	Conc. % in H_2O	pK (Michaelis and coworkers (38, 39)): In low salt content	In 0.15M salt	In 0.5M salt	pK (Kolthoff (31) at 15° and 0.05M salt)
1	0.03–1.3		[0.26]			
2	2.0–4.0	sat.	3.71 + 0.006 (15 − $t°$)	3.59	3.41	3.58

C. Michaelis' Selection of One-color Indicators.—(*Continued*)

Index No.	Useful range pH	Conc. % in H_2O	pK (Michaelis and coworkers (38, 39)) In low salt content	In 0.15*M* salt	In 0.5*M* salt	pK(Kolthoff (31) at 15° and 0.05*M* salt)
4	2.6–4.4	0.05	$4.08 + 0.006 (15 - t°)$	3.98	3.88	3.95
7			4.87	4.76	4.71	
8	4.0–5.8	0.025	$5.16 + 0.005 (15 - t°)$	5.08	5.01	5.15
10			5.35	5.30	5.25	
12	5.6–7.6	0.10	$7.22 + 0.011 (15 - t°)$	7.22	7.17	7.03
15	6.8–8.6	0.30	$8.35 + 0.008 (15 - t°)$	8.24	8.19	8.30
120	8.0–10.0	0.04	$[9.76] + 0.011 (18 - t°)$	9.6	9.5	
74	10.0–12.0		$[11.2] + 0.013 (20 - t°)$			

TABLE 4

Relation between Percentage, a, of Available Color and pH (after Michaelis and Gyemant (38))

Phenolphthalein......	18°	a	1.0	1.4	3.0	4.7	6.9	9.0
		pH	8.45	8.5	8.6	8.7	8.8	8.9
Phenolphthalein......	18°	a	12.0	16.0	21.0	27.0	34.0	40.0
		pH	9.0	9.1	9.2	9.3	9.4	9.5
Phenolphthalein......	18°	a	45.0	50.0	55.0	60.0	65.0	
		pH	9.6	9.7	9.8	9.9	10.0	
Phenolphthalein......	18°	a	70.0	75.0	80.0	84.5	87.3	
		pH	10.1	10.2	10.3	10.4	10.5	
Alizarine yellow GG..	20°	a	13	16	22	29	36	46
		pH	10.0	10.2	10.4	10.6	10.8	11.0
Alizarine yellow GG..	20°	a	56	66	75	83	88	
		pH	11.2	11.4	11.6	11.8	12.0	

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(For a key to the periodicals see end of volume)

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HIGH VACUUM TECHNIQUE

Saul Dushman

Selected Formulae

1. *Amount of Gas Striking* 1 *Cm² per Sec*—

$$m = \frac{1}{4}\rho\Omega = p\sqrt{\frac{M}{2\pi RT}},$$

where ρ = density and Ω = average velocity

$= 43.74 \times 10^{-6} \times p\sqrt{M/T}$ g cm^{-2} sec^{-1} (p in baryes)

$= 58.32 \times 10^{-3} \times p\sqrt{M/T}$ g cm^{-2} sec^{-1} (p in mm of Hg)

n = number of molecules

$= 6.062 \times 10^{23}\frac{m}{M} = 2.653 \times 10^{19}\frac{p}{\sqrt{MT}}$ cm^{-2} sec^{-1} (p in baryes)

$= 3.535 \times 10^{22}\, p/\sqrt{MT}$ cm^{-2} sec^{-1} (p in mm of Hg)

2. *Laws of Molecular Flow (Flow of Gases at Very Low Pressures)*.—Q = amount of gas flowing through any tube or opening in cm³ per sec

$$= \frac{p_2 - p_1}{W\sqrt{\rho_1}},$$

where $p_2 - p_1$ = difference of pressure

ρ_1 = density at 1 barye pressure

$$= \frac{M}{83.15 \times 10^6 T}.$$

W = "resistance" of tube or opening

For a circular opening (diam., d cm) in a thin plate

$$W = \frac{3.184}{d^2}$$

For a tube of diameter d and length l

$$W = \frac{2.394l}{d^3} + \frac{3.184}{d^2}$$

3. *Speed of Exhaust* (S) *of Given Volume* (v).—

$$S = \frac{v}{t}\log_e\frac{p_2}{p_1}$$

For $p_2/p_1 = 10$, t in sec and v in cm³

$$S = \frac{2.303v}{t}\ \text{cm}^3\,\text{sec}^{-1}$$

For pump exhausting through resistance

$$\frac{1}{S_o} = \frac{1}{S_p} + \frac{1}{F}$$

where S_o = observed speed of exhaust,

S_p = speed of pump through negligible resistance, and

F = rate of flow through resistance (cm³/sec)

$$S = \frac{Q}{p_2 - p_1} = \frac{1}{W\sqrt{\rho_1}}$$

Table of Molecular Data

	H_2	He	N_2	O_2	A	Hg	CO	CO_2	H_2O
Mean Free path (cm) at 25°C and 1 barye....	19.2	29.6	10.0	10.7	10.6	[3.24]*	9.92	6.68	[6.03]*
$(1/d^2) \times 10^{-15}$ (Number of molecules per cm^2)	1.74	2.74	1.01	1.11	1.19	1.11	0.98	0.92	1.19
Micrograms (10^{-6} g) of gas striking 1 cm^2 per sec at 25°C and 1 barye..................	3.597	5.062	13.42	14.33	16.01	35.89	13.42	16.81	10.76
Number of molecules striking 1 cm^2 per sec at 25°C and 1 barye. Unit = 10^{15}...........	1082	769.3	283.7	271.7	243.3	10.85	283.7	231.7	362.0

* Values in square brackets refer to 0°C. Note: 1 barye = 0.75×10^{-3} mm mercury. Values of mean free path calculated from viscosity coefficients.

Rate of Flow of Air and Hydrogen at Low Pressures and 20°C

l	d	W	F (air)	F (H_2)
1 cm	1 cm	5.58	5 204	197 10
10	1	27.12	1 070	40 53
1	0.1	2 712.4	10.70	40.53
10	0.1	24 258	1.196	3.60

(Note.—These relations are valid only for pressures so low that the mean free path is equal to or greater than d.)

Data on Various Types of Pumps

	S_p cm^3 sec^{-1}	Fore pump pressure	Min. pressure attainable
Gaede rotary mercury....	100 (max.)	*ca.* 1 cm	10^{-4} mm
Gaede molecular.........	1 400	0.01 mm	$<10^{-6}$ mm
Gaede diffusion..........	80	0.01 mm	$<10^{-6}$ mm
Langmuir condensation (metal)...............	4 000	0.01 mm	$<10^{-6}$ mm
Gaede two stage metal...	60 000	20 mm	$<10^{-6}$ mm

Evolution of Gas from Glass.—For rate at which gas is evolved at different temperatures, *v.* R. G. Sherwood (*1*, **40**:1645; 18) and J. E. Shrader (*2*, **13**:434; 19).

Chemical Clean-up Reagents for Producing Low Pressures.—1. Charcoal in liquid air. 2. Ca or Mg volatilized in sealed-off device, cleans up all gases except those of group 0. 3. P_2O_5, efficient for water vapor. 4. Palladium black at low temperatures, very good for hydrogen.

Some Vapor Pressures at Low Temperatures

Substance	t°C	p, mm	p, baryes
Hg....................	− 78	3×10^{-9}	4×10^{-6}
H_2O....................	−111	0.75×10^{-6}	1×10^{-3}
CO_2....................	−182	0.75×10^{-5}	1×10^{-2}
CO_2....................	−193	0.75×10^{-6}	1×10^{-3}
CO....................	−190	863	
CH_4....................	−185.8	79.8	
C_2H_4....................	−188	0.076	
C_2H_6....................	−180	0.076	
Vaseline (Stopcock grease)..............	−190 (fresh liquid air)		$<10^{-6}$

PSYCHOLOGICAL DATA PERTAINING TO ERRORS OF OBSERVATION

R. S. Woodworth

(Additional data pertaining to sight and hearing are given in other sections of International Critical Tables treating of the mechanical equivalent of light, colorimetry, and the physical aspects of audition. Consult index. Editor.)

SIGHT

Much of the available data pertaining to the sensitivity of the eye have been obtained under such conditions that the exact value of the stimulus cannot satisfactorily be determined. Some are expressed in terms of the illumination, others in terms of the brightness, of a screen; the latter procedure is to be preferred. If the illuminated screen were a perfect diffuser of the light, and also a perfect reflector, if illuminated from the front, or a perfect transmitter, if illuminated from the rear, then its brightness (B) expressed in millilamberts would be numerically equal to 0.1 of its illumination (I) expressed in meter-candles. In the following data, this relation has been used to reduce to the basis of B, data which have been given in terms of I. Although in many cases the screens surely did not possess the properties thus assumed, it seems probable that the error so introduced is of less importance than those arising from other sources. Data for reaction times will be found near the end of this report.

Spectral range (41) for daylight vision is λ = 397mμ to 760 mμ; for twilight vision (illumination too low for color perception), λ = 440 mμ to 670 mμ.

Threshold value = minimum stimulus which can be visually perceived as light; the perception of form is not involved. For white light and a thoroughly light-adapted eye, luminous area subtending an angle of 10°, it is that corresponding to a brightness of 0.1 millilambert (37). For white light and a dark-adapted eye, it varies with the area of the luminous area and with the duration of stimulus as shown in Table 1.

Table 1.—Threshold of Vision for Dark-adapted Eye (45)

D = distance; θ = visual angle subtended by shortest dimension of area; B = brightness required for perception; P = power entering eye; t = duration of exposure. Diameter of pupil = 8.3 mm.

Unit of: Area = 1 cm^2; D = 1 cm; B = 1 microlambert; P = 1 milliwatt = 10^{-10} erg sec^{-1}; t = 1 sec.

Form	Area	D	θ	B	P	t	B‡
Star*...	0.00785	300	1.2′	7.20	17.1	0.002	0.362
Star*...	0.00785	150	2.30	2.60	24.8	0.006	0.098
Star*...	0.00785	35	9.8	0.24	42.1	0.011	0.0446
Square..	0.04	35	19.6	0.028 3	25.3	0.020	0.0239
Square..	0.25	35	50	0.006 62	37	0.034	0.0123
Square..	1.00	35	1° 30′	0.002 41	54	0.160	0.0071
Square..	4.00	35	3 16	0.001 02	91	0.250	0.0051
Square..	9.00	35	4 54	0.000 45	91	0.500	0.003 54
Square..	36.0	35	9 44	0.000 258	208	1.000	0.002 62
Square..	144.0	35	18 56	0.000 175	564	2.000†	0.000 77

* Circle, Diameter = 1 mm.
† If $t = \infty$, B = 0.000 45; t = 4, B = 0.000 63.
‡ For square, area = 9 cm^2, D = 35 cm, θ = 4.9°.

Table 2.—Change in Threshold during Adaptation

Threshold = brightness (B) of a surface which can just be seen. Sensitivity (S) = $1/B$. In light adaptation, I = illumination to which dark adapted eye was subjected for the time t; S was measured 10 sec after this exposure. Unit of: t = 1 min; B = 1 microlambert; S = 0.1 millilambert^{-1}; I = meter-candle.

*Dark adaptation (38)			†Light adaptation (34, 39)				
t	B	S	I \ t	5	25	60	Day‡
				S	S	S	S
0	100.	1	⅓	23 000	9950	5800	435
0.5	5.0	20	½	17 500	7440	3700	230
4	1.33	75	1	10 400	5200	3250	200
9	0.054	1850	2	8130	3360	2600	115
14	0.0096	10 400	3	5200	2740	2038	87
19	0.0038	26 000	6	3470	2040	1600	48
23	0.001 43	69 500	10	3000	1450	1130	40
26	0.001 56	94 700	15		1000	312	
31	0.000 57	174 000	60		95	36	
39	0.000 51	195 000	80		54	28	
51	0.000 48	208 000	110		54	24	
61	0.000 46	215 000					

* Following nearly complete light adaptation. Luminous surface was 10 cm in diameter and 57 cm from eye ($\theta = 10°$).

† Following nearly complete dark adaptation. Luminous surface was 1 m square and 1 m from eye ($\theta = 45°$); initial S, just before exposure to I, was 10 000 millilambert^{-1}.

‡ Moderate diffused day-light.

The rates of adaptation to darkness and to light are indicated in Table 2 in which are given the threshold values at various intervals (1) after removal from daylight, and (2) immediately (10 seconds) after removal from a specified exposure, the eye before exposure having been kept in darkness for 45 min. The visibility of monochromatic light varies with the wave-length, and the *relative visibility* of lights of different wave-lengths depends upon their intensities. (Figs. 1, 2.) For a large surface with a brightness of

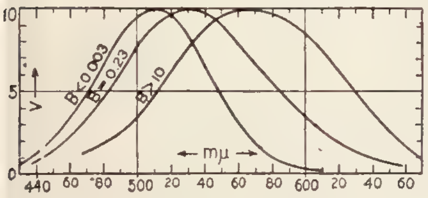

Fig. 1.—Relative visibility (V) [28, 40].
B = brightness, unit = 1 millilambert; abscissae = wave-lengths.

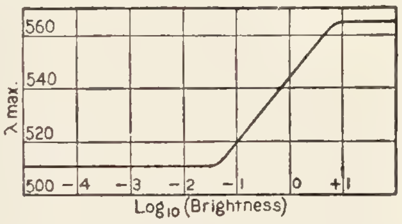

Fig. 2.—Position ($\lambda_{max.}$) of maximum visibility [28, 40].
Unit of brightness = 1 millilambert.

5 to 80 millilamberts, the maximum visibility for the average observer, is near [9] $\lambda = 557.6$ mμ, but even normal subjects exhibit individual differences; out of 125 subjects, the percentage finding the maximum at each of the several wave-lengths was as follows [9]:

λ	%	λ	%	λ	%	λ	%	λ	%	λ	%
549	2	553	4	557	12	561	2	565	2	569	0
550	2	554	7	558	13	562	3	566	2	570	2
551	5	555	9	559	12	563	2	567	0		
552	3	556	8	560	7	564	1	568	2		

All of the preceding refer to direct vision. The sensitivity of other portions of the retina is greater.

Complementary colors are those pairs of colors which, when superposed upon the retina in suitable proportions, produce the sensation of white. Grunberg states that if their wave-lengths are λmμ, λ'mμ, then $(\lambda - 559)(498 - \lambda') = 424$, $\lambda > 559$, $\lambda' < 498$ [47]; there are no complementaries to the colors in the range 498mμ to 559mμ.

Stable, or invariable, colors are those which do not change in hue, except to become gray, as they are moved from the fovea to the periphery of the retina. They are: yellow of λ = 570mμ; bluish green of λ = 490mμ; blue of λ = 460mμ; and a non-spectral bluish red [21].

Discrimination of Brightnesses.—For large adjacent fields, differences of 1 % or even of 0.8 % in the brightness can be detected [31] if the brightness is of the order of 100 millilamberts. Under such conditions the color of the light has no effect upon the discrimination. At lower brightnesses, the sensitiveness to change in brightness depends upon both the color and the brightness (Fig. 4).

Resolving power of the eye is the smallest angular separation at which two points, under the best illumination, can be seen as distinct. For different observers, it varies from 50″ to 93″ [20]; the generally accepted normal value is 1′. It varies with the color of the light. In day-light and on a bright background, a dark line a few minutes long can be seen if it is 1.2″ wide; but, on a dark background, a bright line is not visible unless it is at least 3.5″ wide [48].

Aligning power, the ability to detect a lack of alignment of two similar, adjacent lines of the same width, as in setting a vernier, exceeds the resolving power. The average error [48] of skilled observers under best conditions corresponds to a visual error of not over 3″; in coincidence range-finders, the images can be aligned with an error not greater than 12″ and sometimes as small as 2″.

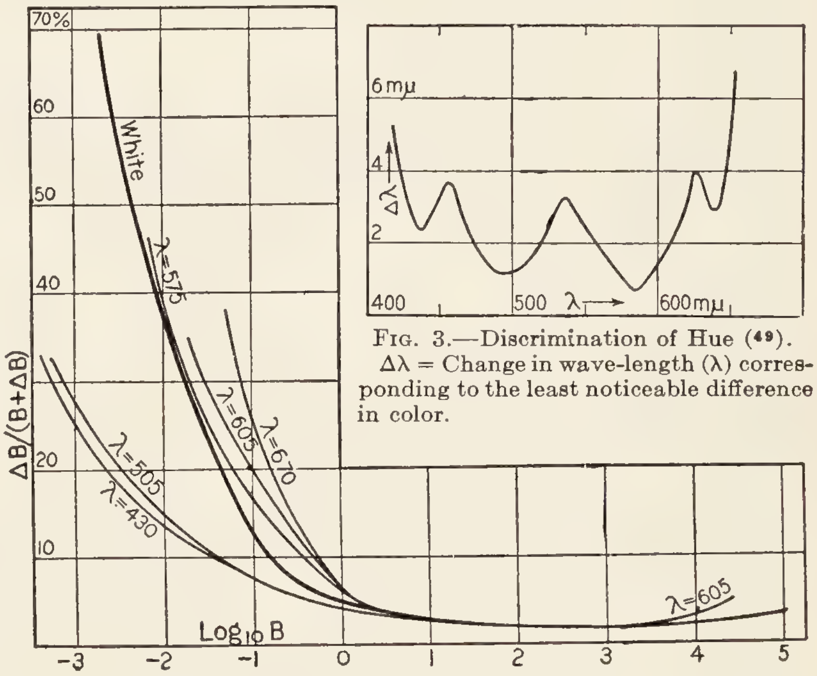

Fig. 3.—Discrimination of Hue [49].
Δλ = Change in wave-length (λ) corresponding to the least noticeable difference in color.

Fig. 4.—Discrimination of brightnesses [29, 40].
ΔB = least noticeable increase in the brightness (B). Unit of B is 1 millilambert; of wave-length (Δ) is 1mμ.

Acuity, or discrimination of form, is closely related to the resolving power, but differs from that in dealing, in general, with extended, interpenetrating, bright and dark areas, and frequently with low brightnesses. The *absolute acuity* (A) is the reciprocal of the smallest visual angle for which neighboring contrasted portions of the field can be seen as separated. Its variation with the brightness (B) of the brighter portions of the field is given by the equation [25] $A = c + k \log B$; the values of the constants c and k are determined by the units, the character of the field, and the eye; some values are given in Table 3. The unit commonly employed for A is 1 reciprocal minute.

Table 3.—Absolute Acuity (A) and Brightness (B)

$A = c + k \log_{10} B$ (*cf.* Fig. 5)
Unit of: A = 1 minute^{-1}; B = 1 millilambert

Limits of B	c	k	Field	Lit.
0.01 to 43.5	1.05	0.415	Snellen and similar charts	(27)
40 to 1000	1.69	0.000	Snellen and similar charts	(27)
0.1 to 18	1.44	0.573	Snellen and similar charts	(12)
0.02 to 21	1.23	0.282	Crossed gratings	(8)
0.06 to 26	1.33	0.262	Crossed gratings	(7)

When the test field is a Snellen test chart, the acuity is commonly expressed as the ratio of the maximum distance (d_m), at which the characters can be distinguished, to the standard distance (d_s). This ratio (d_m/d_s) may be called the *Snellen acuity;* it is numerically equal to the reciprocal of the visual angle (in minutes) subtended by the sides of the elementary squares of the chart. As expressed in these units, the acuity of the average good eye exceeds 1.00; for the *E*-hooks, the mean of 100 subjects was 1.74, ranging from 1.00 to 2.45 ([54]).

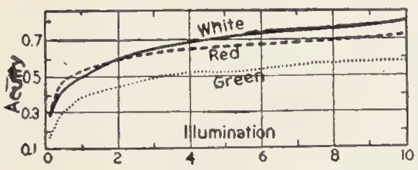

FIG. 5.—Acuity in white and in chromatic illumination ([46]). Unit of acuity = 1 Snellen unit; of illumination = 1 meter-candle.

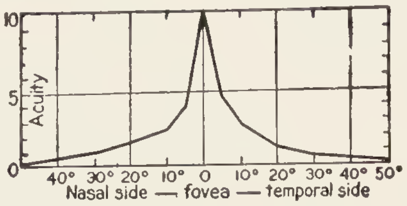

FIG. 6.—Relative acuity in indirect vision ([30]). Abscissa indicates angular position of image upon the retina.

The effect of dark adaptation upon acuity may be obtained by determining, at various intervals (t) after the light adapted eye had been placed in darkness, the minimum illumination (I) in which it can distinguish Snellen test characters placed at a known distance. For a distance corresponding to a Snellen acuity of $\frac{4}{20}$ (= 0.2), the median[1] values of I for 6 observers having in daylight a Snellen acuity of $\frac{6}{4}$ (= 1.5) were found to be as follows ([13]):

t	0	5	10	15	25	35	45 minutes
I	1.09	0.79	0.56	0.40	0.34	0.42	0.42 meter-candles

The acuity depends also upon the color of the light, and upon the position of the image upon the retina. See Figs. 5, 6.

Detection of Differences in Length.—About 1% of the length is the least noticeable difference for simultaneously presented parallel lines which are relatively displaced (result of several old investigations). More recent work shows that a variable line, 1 to 5 cm long, can, by eye, be set to equality with a standard line with a probable error, for a single setting, of only 0.4%; for shorter lines the error is greater, attaining 0.5% for lines 1 mm long ([36]). When the time allowed for observation and judgment is short, the differences which can be detected with certainty are considerably greater. If the sign of the difference is to be judged correctly in 75% of the trials, then, for a 10 cm line, the difference must be 3.5 mm if the time is 4 seconds, and over 5 mm if the time is only 0.5 second ([18]).

Decimal Subdivision of a Small Distance.—When a fine line is set on a millimeter scale to successive positions in random order, and the subject is required to estimate its position to the nearest 0.1 mm, the average actual setting, for each tenth as estimated by 10 subjects (total of 6000 readings), for horizontal and for vertical scales was as follows ([3, 52]):

Estimate	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
Horizontal	0.126	0.234	0.336	0.423	0.509	0.591	0.676	0.773	0.886	1.001
Vertical	0.106	0.202	0.308	0.395	0.486	0.576	0.652	0.757	0.875	0.992

The lines of the scale were presumably of the same width as the "fine line" of variable position. Settings were distributed over a length of 30 mm, the illumination was good, and the distance was that for best reading.

SENSES OTHER THAN SIGHT

Range of audible tones is from 18 to 18 600 double vibrations per second ([44, 53]); at high intensities the lower limit may be reduced to 12. At the upper limit, individuals varied from 15 000 to 22 000 d.v. per sec. As the age increases, the upper limit becomes lower (Fig. 7).

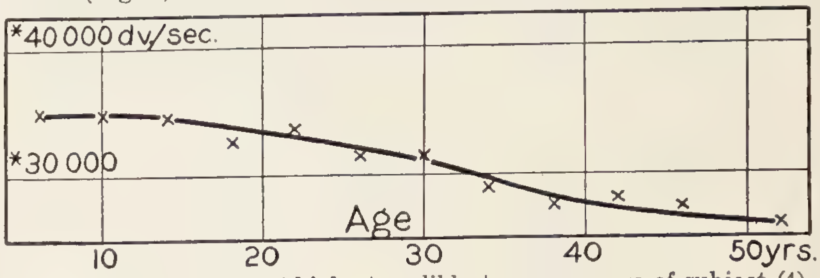

FIG. 7.—Dependence of highest audible tone upon age of subject ([4]).

* It is probable that these frequencies should be divided by two.

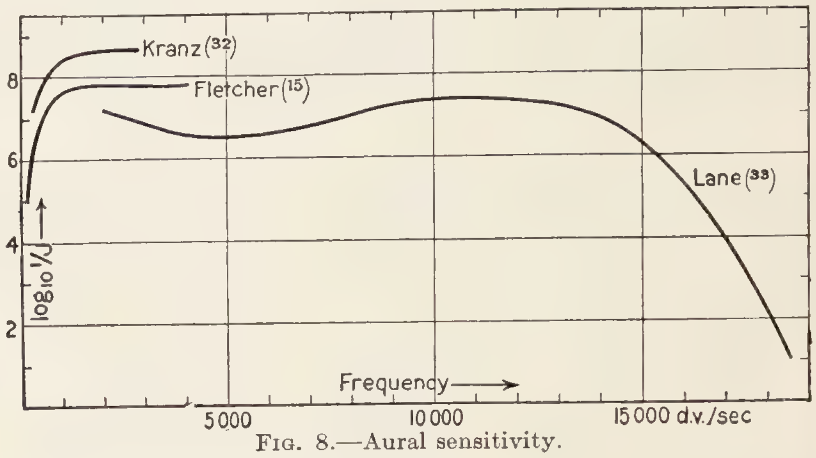

FIG. 8.—Aural sensitivity.

J = minimum audible power, unit = 1 erg cm^{-2} sec^{-1}. Data in terms of effective, or r.m.s., pressure (P) in dynes cm^{-2} have been reduced to erg cm^{-2} sec^{-1} (E) by means of the relation $P = \sqrt{dvE} = 6.5\sqrt{E}$; d = density of air, v = velocity of sound in air, both in cgs units.

REACTION TIMES

The *simple reaction time*, or, briefly, the *reaction time*, is the interval which elapses between the application of a definite, expected stimulus and the performance of a prescribed movement (usually a finger movement) indicating that it has been perceived.

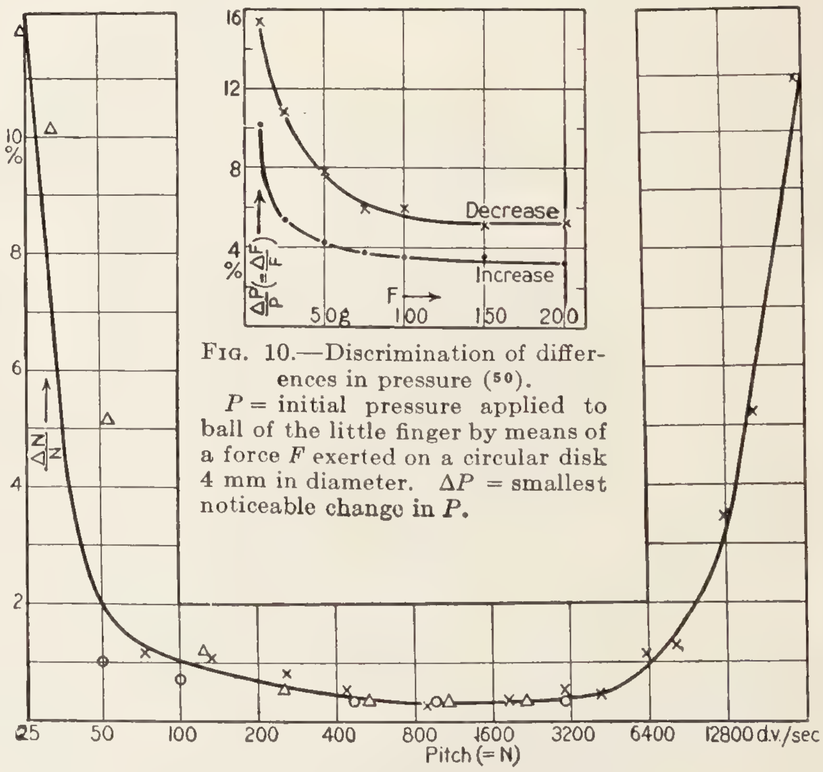

FIG. 10.—Discrimination of differences in pressure ([50]).

P = initial pressure applied to ball of the little finger by means of a force F exerted on a circular disk 4 mm in diameter. ΔP = smallest noticeable change in P.

FIG. 9.—Discrimination of pitch.

N = number of double vibrations per sec; ΔN = smallest noticeable change in N. o = Knudsen ([26]), x = Stücker ([51]), Δ = Vance & Schaefer ([53]).

[1] For each value of t, the 6 observed values of I are arranged in order of magnitude; the mean of the third and the fourth of the values is by definition the *median* of the set.

Light.—For foveal stimulation of medium intensity, reaction time is 0.190 (±0.008) sec; individuals range from 0.150 to 0.225 sec. It is the same for withdrawal as for initiation of stimulus ([22]). For faint stimulation, near threshold, interval is increased by 0.04 to 0.05 sec ([16]); reaction to withdrawal is 0.005 to 0.025 sec quicker than to initiation of stimulus ([22]). For photometrically equal stimuli of different colors, reaction time is independent of the color ([22]). Reaction time for eye to turn towards a stimulus in indirect vision is 0.151 sec (or 1.181 sec) if stimulus lies 1° (or 5°) from fixation point ([10]). For medium intensity, reaction time to monocular stimulation is about 0.015 sec greater than for binocular ([43]).

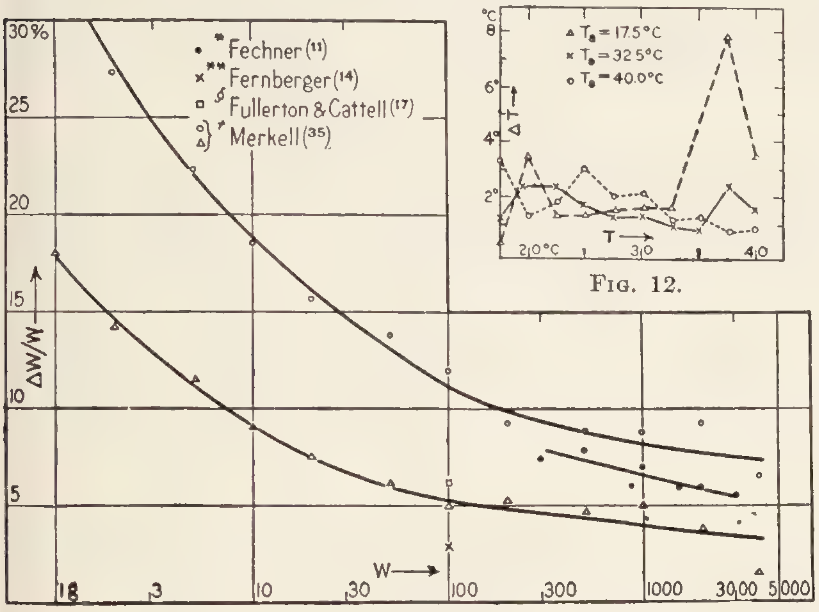

FIG. 12.

FIG. 11.—Discrimination of differences in lifted weights. ΔW = smallest noticeable change in the weight W.

* Weights had horizontal handles, were lifted successively with same hand.

** Cylindrical boxes lifted successively with same hand; ΔW is change for which 50 % of the estimates were of proper sign.

§ Cylindrical boxes lifted successively with same hand; ΔW is change for which 75 % of the estimates were of proper sign.

† Weights lifted by downward pressure of finger on a lever; several series of observations; curves represent the extremes.

FIG. 12.—Discrimination of differences in temperature ([1]).

Both hands were adapted by immersion in water of temperature T_a; they were then separately placed simultaneously in water at temperatures T and T_1; ΔT = least value of $(T_1 - T)$ which could be detected.

TABLE 4.—DISCRIMINATION REACTION TIME

Unit of: T = 0.001 sec; L_1, L_2 = 1 cm; λ = 1mμ = 10Å

Position of squares* or circles†						Lengths‡ ([21])		
Contrast ([21])	λ	T	Contrast ([21])	λ	T	L_1	L_2	T
Black and White		205	Red (640) and Orange red	627	270	1	1.3	312
Red	640	222	Orange	614	257	1	1.25	313
Orange	614	218	Yellow	585	237	1	1.2	318
Yellow	585	211	Green	521	222	1	1.15	326
Green	521	218	Blue	452	231	1	1.1	335
Blue	453	226	Yellow and Green	521	232	1	1.05	351
†Circles ([24])		296	Blue	452	222			

* Two colored squares each 3 by 3 cm, placed side by side; observer was to react with corresponding hand to indicate on which side the previously specified square was placed. This type of discrimination reaction is the quickest. The same procedure was used in the discrimination of lengths.

† On a background of approximately 2.6 millilamberts and at a visual angle of 45′ to each side of fixation point was a circle of angular diameter = 24′, brightness = 3.5% greater than that of background. Either circle could be made to disappear, and the subject, by a reaction with the corresponding hand, indicated which disappeared.

Sound.—For finger reaction to sound of medium intensity, reaction time = 0.136 (±0.002) sec; individuals range from 0.082 to 0.195 sec. For very faint sound, the interval is increased by 0.06 to 0.07 sec ([16]).

Touch.—For finger reaction to tactile stimulus of medium intensity, reaction time is 0.148 sec ([23]).

The *discrimination reaction time* is the interval which elapses between the application of one of two possible, definite, expected stimuli and the performance of the prescribed movement indicating which of the two stimuli has been applied. For printed letters, 10-point type, average for the alphabet, the reaction time for Roman capitals is 0.327 sec, Roman lower case 0.325, for short words 0.353, for long words 0.355, for small (1 cm square) pictures of familiar objects 0.336 sec ([6]). For other data, see Table 4.

Number Limitation and *Span of Apprehension.*—For college students, the greatest number of digits which an individual can repeat correctly immediately after a single auditory presentation averages 7.6 ([5, 19]), individuals range from 5 to 11 ([5]); for visual presentation the average is 8.0 ([19]).

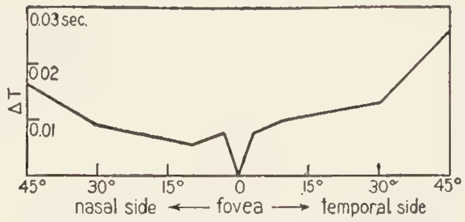

FIG. 13.—Reaction time for nonfoveal stimulation ([43]).

ΔT = excess of reaction time over that required for foveal excitation. Abscissa indicates angular position of image upon the retina. Finger reaction.

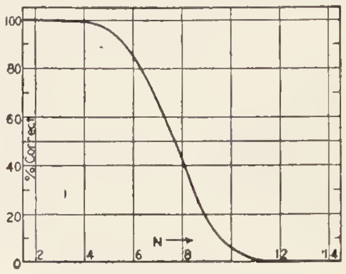

FIG. 14.—Span of apprehension ([41]).

N = number of dots exposed; ordinates = % of judgments which were correct.

When a number of black dots irregularly arranged upon a well illuminated white background were exposed to view for a very short interval (0.038 sec) and the subject was required to determine the number of dots presented, the average number of correct judgments made after considerable, but not extreme, practice was as shown in Fig. 14. The visual angle subtended by the dots was well above the threshold value.

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(For a key to the periodicals see end of volume)

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([40]) Nutting, *31A*, **5**: 261; 08–09. ([41]) Oberly, *335*, **35**: 336–338; 24. ([42]) Parsons, *B70*, 28, 54, 59; 15. ([43]) Poffenberger, *331*, **23**: 48; 12. ([44]) Pratt, *335*, **31**: 404; 20. ([45]) Reeves, *21*, **47**; 143, 145; 18. ([46]) Rice, *331*, **20**: 30; 12. ([47]) Southall, *B69*, **2**: 128 (footnote); 24. ([48]) Southall, *B69*, **2**: 33 (footnote); 24. ([49]) Steindler, *75*, **115**: 115; 06.

([50]) Stratton, *332*, **12**: 538; 96. ([51]) Stücker, *75*, **96**: 367; 07. ([52]) Urban, *Arch. ges. Psychol.*, **31**: 1; 14. ([53]) Vance and Schaefer, *330*, **69**: 114, 115; 14. ([54]) Woodworth and Bruner, *O.*

ARRANGEMENT OF CHEMICAL SUB-

ARRANGEMENT OF CHEMICAL SUBSTANCES

Throughout I. C. T., except when otherwise indicated, the tabular arrangement of all chemical substances and of all systems capable of representation by formula is in accordance with a system called the "Standard Arrangement," which will now be explained and which should be learned by every user of I. C. T.

Elementary Substances

All tables containing *only* elementary substances (𝔄-Tables) are arranged in alphabetical order of the symbols of the elements. In tables containing both elements and compounds (𝔄𝔅-Tables) the elements follow the "standard arrangement," *v. infra.*

Chemical Compounds and Other Systems Represented by Formula

The arrangement is based upon the following table of "Key-numbers" of the elements:

ARRANGEMENT DES SUBSTANCES CHIMIQUES

L'arrangement tabulaire de toutes les substances chimiques et de tous les systèmes susceptibles d'une représentation par formule est, dans les T. C. I., excepté lorsqu'il y a une autre indication, en accord avec un système appelé "arrangement type," (standard arrangement) expliqué ci-dessous, qui devra être appris par chaque personne qui veut utiliser les T. C. I.

Substances Élémentaires

Toutes les tables ne contenant que les substances élémentaires (Tables 𝔄) sont arrangées dans l'ordre alphabétique des symboles des éléments. Dans les tables contenant les éléments et les corps composés (Tables 𝔄𝔅) les éléments se trouvent suivant l' "arrangement type" voir *infra.*

Composés Chimiques et Autres Systèmes Représentés Par Formule

L'arrangement est basé sur la table suivante des "nombres clés" des éléments:

Key-numbers of the Elements — Nombres clés des éléments

−6	−5	−4	−3	−2	−1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
(He	Ne	A	Kr	Xe	Rn)	O	H	F	Cl	Br	I	(85)	S	Se	Te	N	P	As	Sb	Bi	C	Po	Si	Ti	Ge
						46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65
						Cr	Mo	W	U	V	Cb(Nb)	Ta	Pa	B	Al	Sc	Y	La	Ce	Pr	Nd	(61)	Sa	Eu	Gd
Ac	Ag	Al	As	Au		B	Ba	Be	Bi	Br	C	Ca	Cb	Cd	Ce	Cl	Co	Cr	Cs	Cu	Dy	Er	Eu	F	Fe
74	32	55	13	33		54	79	75	15	5	16	77	51	29	59	4	44	46	85	31	67	69	64	3	43
						Os	P	Pa	Pb	Pd	Po	Pr	Pt	Ra	Rb	Re	Rh	Ru	S	Sa	Sb	Sc	Se	Si	Sn
						35	12	53	23	41	17	60	37	80	84	34	40	39	8	63	14	56	9	18	22

To locate a given compound, first write its "key-formula," neglecting water of crystallization, thus:

Afin de situer un composé donné, il faut d'abord écrire sa "formule-clé," en négligeant l'eau de cristallisation, ainsi:

Compound	Composé	Na_2SO_4	$HClO_4.3H_2O$	$Hg(C_{18}H_{33}O_2)_2$	$2Fe_2O_3.P_2O_5.12H_2O$	$Ni_3Pr_2(NO_3)_{12}.24H_2O$	$I_2C_6H_3SO_3H$	$(NH_4)_2CO_3$
Key formula	Formule-clé	82–8–1	4–2–1	30–16–2–1	43–12–1	60–45–11–1	16–8–6–2–1	16–11–2–1

In writing a key-formula the key-numbers must be written *in descending order.*

All chemical compounds (𝔅-Tables) are arranged in the inverse numerical order of their key-formulae. *Example:* to find the compound $Hg(C_{18}H_{33}O_2)_2 = 30 - 16 - 2 - 1$; First, turn to section 30 of the table. Then follow down the column of chemical formulae until element 16 (C) is first encountered. From this point continue until element 2 (H) is found, and then on until element 1 (O) is reached. At this point will be found all the compounds composed of the four elements Hg, C, H, and O and these compounds are arranged in an obvious manner according to the subscripts in the chemical formula. To facilitate the use of the tables, key-numbers are inserted at frequent intervals either along the top of the page or down the left hand column or both.

In looking for a chemical compound *always consult the 𝔅-Table,* the scope of which provides for *all* chemical compounds except those of the radioactive elements, of which only compounds of U, Th and Ra are given in the 𝔅-Table. For the others see p. 364. In certain of the 𝔅-Tables, at the point where key-formulae beginning with 16 occur, there will be found frequently only a few of the simpler compounds, and the reader will be referred to a

Lorsqu' on écrit une formule-clé, les nombres clés doivent être écrits *dans l'ordre des valeurs décroissantes.*

Tous les composés chimiques dans toutes les tables (Tables 𝔅.) sont arrangés d'après l'ordre numérique inverse de leurs formules-clés. *Exemple:* pour trouver le composé Hg $(C_{18}H_{33}O_2)_2$ = 30–16–2–1; il s'agit premièrement de chercher la section 30 de la table; ensuite de suivre en descendant la colonne des formules chimiques jusqu'à ce qu'on trouve l'élément 16 (C). De ce point, on continue jusqu'à ce qu'on rencontre l'élément 2 (H), et ensuite jusqu'à ce que l'élément 1 (O) soit atteint. On trouvera alors à ce point tous les composés renfermant les quatre éléments Hg, C, H et O et ces composés sont arrangés d'une manière apparante en relation avec les indices de leurs formules chimiques. Afin de faciliter l'usage des tables, les nombres-clés sont inscrits, à de fréquents intervalles, ou au haut de la page ou le long de la colonne gauche, ou aux deux places.

Pour la recherche d'un composé chimique, il s'agit de *consulter toujours la Table 𝔅* dont le but est de renseigner sur *tous* les composés chimiques, à l'exception des éléments radio-actifs, dont seuls ceux de U, Th et Ra sont donnés dans la Table 𝔅. Pour les autres, voir p. 364. Dans certaines des Tables 𝔅, au point où les

STANCES AND SYSTEMS IN I. C. T.

DIE ANORDNUNG DER CHEMISCHEN VERBINDUNGEN

Durch die ganzen I. C. T., ausgenommen es ist etwas anderes angegeben, ist die tabellarische Anordnung aller chemischen Verbindungen und aller durch chemische Zeichen oder Formeln darstellbarer Systeme, nach der "Normal-Anordnung" (standard arrangement), durchgeführt. Sie ist im folgenden dargelegt und soll von jedem Leser der I. C. T. erlernt werden.

Elementare Stoffe

Alle Tafeln, welche *nur* elementare Stoffe (𝔄-Tabellen) enthalten, sind in alphabetischer Reihenfolge nach den Symbolen der Elemente angeordnet. In den Tafeln, welche beides, Elemente und Verbindungen (𝔄𝔅-Tabellen), enthalten, folgen die Elemente der "Normal-Anordnung." Siehe weiter unten.

Die chemischen Verbindungen und andere durch Formeln darstellbare Systeme

Die Anordnung ist auf der folgenden Tafel begründet, welche die "Schlüsselnummern" der Elemente enthält:

ORDINE DI ELENCAZIONE DELLE SOSTANZE

In tutti i volumi delle T. C. I. l'ordine in cui le sostanze ed i sistemi rappresentabili con formule sono disposti nelle tabelle è (tranne che non sia diversamente indicato) quello "standard" illustrato più avanti. Chiunque voglia servirsi delle T. C. I. deve anzitutto apprendere in che consiste questo sistema "standard."

Sostanze Elementari

Tutte le Tabelle contenenti soltanto sostanze elementari (tabelle 𝔄) sono disposte secondo l'ordine alfabetico dei simboli degli elementi. Nelle tabelle che comprendono elementi e composti (tabelle 𝔄-𝔅) gli elementi sono ordinati secondo la disposizione "Standard." *v. infra.*

Composti Chimici ed Altri Sistemi Rappresentati da Formule

La disposizione è basata sul quadro seguente di "numeri chiave" degli elementi.

Schlüsselnummern der Elemente — Numeri chiave degli elementi

21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40		41	42	43	44	45
Zr	Sn	Pb	Th	Ga	In	Tl	Zn	Cd	Hg	Cu	Ag	Au	Re	Os	Ir	Pt	Ma	Ru	Rh		Pd	Mn	Fe	Co	Ni
66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86					
Tb	Dy	Ho	Er	Tm	Yb	Lu	Hf	Ac	Be(Gl)	Mg	Ca	Sr	Ba	Ra	Li	Na	K	Rb	Cs	(87)					
Ga	Gd	Ge	Gl	H	Hf	Hg	Ho	I	In	Ir	K	La	Li	Lu	Ma	Mg	Mn	Mo	N		Na	Nb	Nd	Ni	O
25	65	20	75	2	73	30	68	6	26	36	83	58	81	72	38	76	42	47	11		82	51	61	45	1
Sr	Ta	Tb	Te	Th	Ti	Tl	Tm	U	V	W	Y	Yb	Zn	Zr	(61)	(75)	(85)	(87)							
78	52	66	10	24	19	27	70	49	50	48	57	71	28	21	62	34	7	86							

Um eine gegebene Verbindung aufzufinden, hat man zuerst seine Schlüsselformel aufzuschreiben, wobei man das Kristallwasser auslässt. z.B.:

Per trovare il posto di un dato composto bisogna prima scrivere la formula chiave trascurando l'acqua di cristallizzazione, p. es.:

Verbindungen	Composto	Na_2SO_4	$HClO_4.3H_2O$	$Hg(C_{18}H_{33}O_2)_2$	$2Fe_2O_3.P_2O_5.12H_2O$	$Ni_3Pr_2(NO_3)_{12}.24H_2O$	$I_2C_6H_3SO_3H$	$(NH_4)_2CO_3$
Schlüsselformel	Formula chiave	82–8–1	4–2–1	30–16–2–1	43–12–1	60–45–11–1	16–8–6–2–1	16–11–2–1

In die Schlüssselformel müssen die Schlüsselnummern in *absteigender* Reihenfolge geschrieben werden.

Alle chemischen Verbindungen (𝔅-Tabellen) sind in der umgekehrten Reihenfolge der Schlüsselformeln angeordnet. Z. B.: Um die Verbindung $Hg(C_{18}H_{33}O_2)_2$ = 30–16–2–1 zu finden, hat man zuerst den Abschnitt 30 aufzusuchen. Dann hat man den Kolonnen der chemischen Verbindungen abwärts zu folgen, bis man zuerst das Element 16 (C) antrifft, von da an setzt man weiter fort, bis das Element 2 (H) gefunden ist und dann weiter, bis das Element 1 (O) erreicht ist. Bei dieser Stelle werden alle Verbindungen gefunden werden, welche sich aus den 4 Elementen Hg, C, H, und O zusammensetzen. Diese Verbindungen sind in deutlicher Art, entsprechend der Bezeichnungsweise chemischer Formeln, angeordnet. Um den Gebrauch der Tafeln möglichst zu erleichtern, sind die Schlüsselnummern häufig an verschiedenen Stellen eingefügt. Sie befinden sich entweder am Kopf der Seiten, oder auf der linken Seite unten, oder an beiden Stellen.

Um eine chemische Verbindung zu suchen, *benütze man immer die 𝔅-Tabellen:* die *alle* chemischen Verbindungen enthalten, ausgenommen jene der radioaktiven Elemente. Von diesen sind

Nella formula chiave, i numeri chiave devono essere scritti *in ordine decrescente.*

Tutti i composti in tutte le tabelle (Tabelle 𝔅) sono disposti nell'ordine numerico inverso delle loro formule chiavi.

Supponiamo ad es. di voler trovare il composto Hg $(C_{18}H_{32}O_2)_2$ = 30–16–2–1. Prima si cerca la sezione 30 della Tabella, poi si scorre la colonna delle formule fino ad incontrare l'elments 16 (C). Da questo punto si continua finchè si trova l'elemento 2 (H), e quindi fino a raggiungere l'elemento 1 (O). Qui si trovano tutti i composti risultanti dai quattro elementi Hg, C, H e O ordinati secondo gli indici delle formule. Per facilitare l'uso delle tabelle i numeri chiave sono inseriti ad intervalli frequenti nella testata o lungo il margine sinistro della pagina, o nell'una e nell'altro.

Per cercare un composto bisogna *sempre consultare la tabella* 𝔅 che contiene *tutti* i composti tranne quelli degli elementi radioattivi; di questi sono riportati nella tabella 𝔅 soltanto i composti di U, Th, Ra. Per gli altri vedi p. 364. In alcune tabelle 𝔅, laddove si trovano formule chiave che cominciano con 16, si troveranno spesso soltanto pochi composti fra i più semplici e il lettore

𝕮-Table where the remainder of such compounds will be found listed under a different arrangement known as

The 𝕮-Arrangement

In this arrangement the compounds are arranged according to their empirical formulae (*including* water of crystallization), in the order C, H, with the remaining symbols alphabetical, *e.g.*, $C_6H_4I_2O_3S$. The 𝕮-Tables, however, will not contain any carbon compound whose key-formula contains a number greater than 16.

SYSTEMS OF MORE THAN ONE COMPONENT

The components of each system are first arranged according to the standard arrangement, giving the order A, B, C, etc. The systems are then arranged, according to the standard arrangement, in the order of their A-components. All systems having the same A-component will be found (under that component) in the order of their B-components, etc.

In certain tables, the above plan will be based upon the 𝕮-arrangement instead of the standard arrangement. Such cases will always be so indicated.

Name Indices

The chemical formulae of nearly all of the organic compounds and minerals whose properties are given in I. C. T. can be found with the aid of the extensive indices of names given on p. 174 and 280. If the name is not found there, other works of reference must be consulted for the formula. It should be noted, however, that the exact formula is not required. The compound can be readily located if only the elements composing it are known (in the case of inorganic compounds) or if only the number of carbon atoms are known (in the case of organic compounds) provided only that the user can recognize either name or formula when he sees it.

formules-clés commençant par 16 se présentent, on ne trouvera fréquemment qu'un petit nombre de composés plus simples, et le lecteur sera alors renvoyé à une Table 𝕮, où le reste de ces composés se trouvera disposé d'une façon différente nommé

L'Arrangement 𝕮

Dans cet arrangement, les composés sont disposés en relation avec leurs formules empiriques (l'eau de cristallisation inclusivement) dans l'ordre C, H, les symboles restants venant ensuite dans l'ordre alphabétique; par ex: $C_6H_4I_2O_3S$. Cependant les Tables 𝕮 ne contiendront aucun composé dont la formule-clé renferme un nombre supérieur à 16.

SYSTÈMES DE PLUS D'UN COMPOSANT

Les *composants* de chaque système sont premièrement disposés d'après l'arrangement type suivant l'ordre A, B, C, etc. Les *systèmes* sont alors arrangés, en accord avec l'arrangement type, dans l'ordre de leurs composants A. Tous les systèmes ayant le même composant A seront trouvés sous ce composant dans l'ordre de leurs composants B, etc.

Dans certaines tables, le plan sera basé sur l'arrangement 𝕮 au lieu de l'arrangement type. De tels cas seront toujours mentionnés.

Noms Indices (Anglais)

Les formules chimiques de presque tous les composés organiques et les minéraux dont les propriétés sont données dans les T. C. I. peuvent être trouvées au moyen des indices extensifs des noms donnés aux p. 174 et 280.

Si l'on ne trouve pas le nom à cette place, il faudra consulter d'autres ouvrages de références pour la formule. Il faut noter, cependant, que la formule exacte n'est pas nécessaire. Le composé peut être immédiatement situé si l'on ne connait que les éléments qui le composent (dans le cas des composés inorganiques), ou que les nombres des atomes de C (dans le cas des composés organiques); à la seule condition que le lecteur puisse reconnaître ou le nom ou la formule lorsqu'il la voit.

PHYSICAL PROPERTIES OF CHEMICAL SUBSTANCES

INTRODUCTION

The following tables (p. 96 to 314) are intended to serve as a source of ready reference for the *approximate* values of certain properties of chemical substances, displayed in such a manner as to be of the greatest utility. The values given may be uncertain by one or more units in the last significant figure. Non-significant figures are given in small type. Thus, 23oo indicates that the correct value lies between 1800 and 2800, with 2300 as most probable value.

More accurate values for these properties, if known, will be found in subsequent sections of I. C. T., together with their literature references.

𝕬. ELEMENTARY SUBSTANCES AND ATMOSPHERIC AIR

𝕬-Tables, p. 102. Values in parentheses are estimated, usually with the aid of the Periodic Law.

𝕭. CHEMICAL COMPOUNDS. STANDARD ARRANGEMENT (*v.* p. 96)

𝕭-Tables, p. 106

1. Formula or formula and name.
2. Gram-formula-weight. (I. C. T. atomic weights, *v.* p. 43.)
3. Crystal system.
   𝕭-Table.
   Special tables.

PROPRIÈTÈS PHYSIQUES DES SUBSTANCES CHIMIQUES

INTRODUCTION

Les tables suivantes (p. 96 à 314) ont été établies dans le but de servir de source de référence rapide pour les valeurs *approximatives* de certaines propriétés des substances chimiques, et sont disposées de manière à être de la plus grande utilité possible. Les valeurs données puivent être incertaines par une ou plusieurs unités de leur dernier chiffre significatif. Les chiffres non signicatifs sont donnés en petits caractères. Ainsi, 23oo indique que la valeur correcte se trouve entre 1800 et 2800, avec 2300 comme valeur la plus probable. Si l'on connait des valeurs plus précises pour ces propriétés, on les trouvera dans les sections suivantes des T. C. I., accompagnées de leurs références bibliographiques.

𝕬. SUBSTANCES ÉLÉMENTAIRES ET AIR ATMOSPHÉRIQUE

Tables 𝕬, p. 102. Les valeurs entre parenthèses sont estimées ordinairement à l'aide de la Loi périodique.

𝕭. COMPOSES CHIMIQUES. ARRANGEMENT TYPE (*v.* p. 96)

Tables 𝕭, (p. 106)

1. Formule ou formule et nom.
2. Poids moléculaire en grammes (Poids atomiques des T. C. I., *v.* p. 43.)

in den 𝔅-Tabellen nur die Verbindungen des U, Th und Ra enthalten. Für die anderen siehe Seite 364. In einigen 𝔅-Tabellen, dort wo die Schlüsselnummern mit 16 beginnen, findet man häufig nur einige wenige einfache Verbindungen. Der Leser wird dann auf die ℭ-Tabellen verwiesen, wo die restlichen derartigen Verbindungen gefunden werden können. Diese Tabellen sind nach anderen Gesichtspunkten zusammengestellt. Es ist das die

ℭ-Anordnung (ℭ-Arrangement)

Bei dieser Anordnung sind die Verbindungen nach ihrer empirischen Formel gegeben (einschliesslich Kristallwasser) und zwar in der Ordnung C, H, die restlichen Zeichen dann in alphabetischer Ordnung, z.B. $C_6H_4I_2O_3S$. Die ℭ-Tabellen enthalten jedoch keine Kohlenstoffverbindung, in deren Schlüsselformel eine Zahl grösser als 16 vorkommt.

SYSTEME MIT MEHR ALS EINER KOMPONENTE

Die Komponenten jedes einzeln Systemes sind zuerst in der Reihenfolge A, B, C, u. s. w., entsprechend des "Standard-Arrangement" anzuordnen. Die Systeme sind dann, entsprechend des "Standard-Arrangement," in der Reihenfolge ihrer A-Komponenten angegeben. Alle Systeme, welche dieselbe A-Komponente haben, werden unter dieser Komponente in der Reihenfolge ihrer B-Komponenten gefunden.

In gewissen Tabellen wird dieser Plan entsprechend der ℭ-Anordnung, an Stelle des "Standard Arrangement," gewahlt. Solche Fälle werden immer entsprechend bemerkt.

Namenverzeichnis (Englisch)

Die chemischen Formeln von so ziemlich allen organischen Verbindungen und Mineralien, deren Eigenschaften in den I. C. T. enthalten sind, können mit Hilfe des ausgedehnten Namenverzeichnisses auf Seite 174 und 280 gefunden werden. Ist der Name hier nicht auffindbar, so müssten andere Quellen für die Formel nachgesehen werden. Es soll aber bemerkt werden, dass eine genaue Formel nicht nötig ist. Die Verbindung kann bei anorganischen Verbindungen leicht aufgefunden werden, wenn nur die Elemente, die sie zusammensetzen, bekannt sind, bei organischen Verbindungen, wenn nur die Zahl der Kohlenstoffatome bekannt ist. Nötig ist es, dass der Leser entweder den Namen oder die Formel beim Ansehen erkennt.

DIE PHYSIKALISCHEN EIGENSCHAFTEN CHEMISCHER STOFFE

EINFÜHRUNG

Die folgenden Tafeln (s. 96 bis 314) sollen zur raschen Orientierung über angenäherte Werte gewisser Eigenschaften chemischer Verbindungen dienen. Sie sind in einer solchen Art angeordnet, um vom grösstmöglichem Nutzen zu sein. Die angegebenen Werte können auf einer und mehreren Stellen der letzten grossgeschriebenen Ziffer unsicher sein. Z.B. sagt die Zahl 2300 aus, dass der zwischen 1800 und 2800 liegende Wert am wahrscheinlichsten 2300 sein wird.

Genauere Werte für diese Eigenschaften können, wenn sie bekannt sind, in den weiter unten vorhandenen Abschnitten der I. C. T. zusammen mit der Literatur gefunden werden.

𝔄. ELEMENTARE STOFFE UND DIE ATMOSPHÄRISCHE LUFT

𝔄-Tabellen, Seite 102. Werte, die in den Klammern sich befinden, sind geschätzt gewöhnlich nach dem periodischem System der Elemente.

𝔅. CHEMISCHE VERBINDUNGEN. NORMAL-ANORDNUNG [STANDARD-ARRANGEMENT] (siehe S. 97)

𝔅-Tabellen, Seite 106

1. Formel oder Formel und Name.
2. Gramm-Formel-Gewicht (Atomgewichte der I. C. T. siehe S. 43)

sarà rimandato a una tabella ℭ dove si troveranno gli altri disposti con criterio differente che viene chiamato

La Disposizione ℭ

Secondo questa i composti sono disposti in base alle formule empiriche (*compresa* l'acqua di cristallizzazione) nell'ordine C, H e con i rimanenti simboli ordinati alfabeticamente P. es. $C_6H_4I_2O_3S$. Le tabelle ℭ non comprendono però composti del carbonio che hanno un numero chiave piu grande di 16.

SISTEMI DI PIU' D'UN COMPONENTE

I *componenti* di ciascun sistema sono dapprima disposti secondo la disposizione tipo, nell'ordine A, B, C, etc. I *sistemi* sono quindi disposti, secondo la disposizione tipo, nell'ordine dei loro componenti A. Tutti i sistemi aventi lo stesso componente A verranno trovati, sotto questo componente, nell'ordine dei loro componenti B, etc.

In alcune tavole il piano sara' basato sulla disposizione ℭ in luogo della disposizione tipo. Di cio' verra' sempre fatta menzione.

Indici Per Nome (Inglese)

Le formule chimiche di quasi tutti i composti organici e minerali di cui sono riportate le proprietà nelle T. C. I. si possono trovare con l'aiuto di estesi indici di nomi dati a p. 174, e 280. Se negli indici non si trova il nome bisogna consultare altre opere per trovare la formula. Deve tuttavia notarsi che non è necessaria la formula esatta. Il composto può essere facilmente ritrovato se si conoscono solo gli elementi componenti (nel caso di composti inorganici) o se si conosce solo il numero di atomi di carbonio (nel caso di composti organici) purchè il lettore sia in grado di riconoscerne il nome o la formula quando li vede.

PROPRIETA' FISICHE DELLE SOSTANZE

INTRODUZIONE

Le tabelle seguenti (p. 96 a 314) hanno lo scopo di fornire per una serie di sostanze valori *approssimati* di certe proprietà disposti in modo da essere della più grande utilità. I valori riportati pòs sono essere incerti per una o più unità nelle ultime cifre significative. Le cifre non significative sono indicate in caratteri piccolli. Così 2300 indica che il valore esatto si trova fra 1800 e 2800, e che 2300 è il valore più probabile.

Valori più precisi di queste proprietà quando sono conosciuti, sono riportati nelle sezioni successive delle T. C. I. insieme con le relative indicazioni bibliografiche.

𝔄. SOSTANZE ELEMENTARI ED ARIA ATMOSFERICA

Tabelle 𝔄, p. 102. I valori fra parentesi sono calcolati generalmente con l'aiuto della legge periodica.

𝔅. COMPOSTI, DISPOSIZIONE STANDARD (*v.* p. 97)

Tabelle 𝔅, p. 106

1. Formula oppure formula e nome.
2. Peso della formula in grammi. (T. C. I. pesi atomici *v.* p. 43.)
3. Sistema cristallino.
   Tabella 𝔅.
   Tabelle speciali.
4. Punto di fusione. (Alla pressione di una atmosfera, tranne che non sia diversamente indicato dalla soprascritta; così $125^{17 atm.}$ = fonde a 125° alla pressione di 17 atmosfere.)
   Tabella 𝔅

4. Melting point. (Under 1 atm. unless otherwise indicated by superscript, thus $125^{17\,\text{atm.}}$ melts at 125° under 17 atm.)
 𝔅-Table.

5. Boiling point. (Under 760 mm Hg unless otherwise indicated by superscript, thus 321^{125} = boils at 321° under 125 mm Hg.)
 𝔅-Table.

6. Density, g cm^{-3}. (At 20° unless otherwise indicated by superscript, thus 1.853^{40} = 1.853 g cm^{-3} at 40°C.)
 𝔅-Table.

7. Refractive index and dispersion, (n_D and $H_\beta - H_\alpha$) for 20° unless otherwise indicated.

ABBREVIATIONS AND CONVENTIONS

at. or atm.	atmosphere
C.	cubic or regular
d.	decomposes, *e.g.*, d. 335 = decomposes at *ca.* 335°; 335 d. = melts (resp. boils) at 335° with decomposition
diss.	a dissociation temperature
exp.	explodes
l.	liquid
H.	hexagonal
M.	monoclinic
P.	under pressure
s.	sublimation
s. d.	slight decomposition
R.	rhombic or orthorhombic
Tet.	tetragonal
Tr.	transition temperature
Tri.	triclinic
Trig.	trigonal
vac.	*in vacuo*
var.	variable

THE PROPERTY-SUBSTANCE TABLES

Following the General Tables will be found (p. 306) the Property-substance Tables, in each of which the substances, identified by Index Number, are arranged in ascending order of the values of the property, the intervals on the scale of values of the property being given in black-face type.

To Identify a Substance by Means of Its Properties.—*Example:* A liquid is found to have the following properties: B. P. = 81.1° at 745 mm, $d = 0.783$, $n_D = 1.347$. What is the substance ? With the aid of Craft's rule, first correct the boiling point to 760 mm. If the general nature of the substance is unknown, put $c = 10^{-4}$ in the Craft's equation, $\Delta t = cT_B(760 - P)$. Thus in the present instance, we should have $\Delta t = 10^{-4} \times (81.1 + 273)\ (760 - 745) = 0.3°$, and $t_B = 81.1 + 0.3° = 81.4°$. Next turn to the special B. P. (p. 310), d (p. 313), and n (p. 276) tables and read off from these tables the index numbers of substances having values of the above properties in the neighborhood of those for the unknown substance. Thus, for the present example, the following index numbers will be obtained: For B. P., 130, 758, 727, 1612, 168, 277, 1535, 506, 792; for d, 208, 168, 395, 506, 3320, 1049, 262, 792, 5156; for n_D, 141, 168, 213. The only index number common to each of these properties is 168; and on turning to this index number in the General ℭ-Table, we can readily identify our substance as acetonitrile. The identification can then be further checked by appropriate chemical tests, if desired.

3. Système cristallin.
 Table 𝔅.
 Tables spéciales.

4. Point de fusion. (Sous 1 atm. à moins d'une indication par exposant, ainsi $125^{17\,\text{atm.}}$ = fond à 125° sous 17 atm.)
 Table 𝔅.

5. Point d'ebullition. (Sous 760 mm Hg à moins d'une indication par exposant, ainsi 321^{125} = boût à 321° sous 125 mm Hg.)
 Table 𝔅.

6. Densité, g cm^{-3}. (A 20° à moins d'une indication par exposant, ainsi $1{,}853^{40}$ = g cm^{-3} à 40°C.)
 Table 𝔅.

7. Indice de réfraction, et dispersion (n_D et $H_\beta - H_\alpha$) à 20° à moins d'une indication.

ABRÉVIATIONS ET CONVENTIONS

at. ou atm.	atmosphère
C.	cubique ou régulier
d.	Se décompose, par ex., d. 335 = se décompose à *environ* 335°; 335 d. = fond (resp. bout) à 335° avec décomposition
diss.	une température de dissociation
exp.	exploser
l.	liquide
H.	hexagonal
M.	monoclinique
P.	sous pression
s.	sublimation
s.d.	légère décomposition
R.	rhombique ou orthorhombique
Tet.	tétragonal ou quadratique
Tr.	température de transition
Tri.	triclinique
Trig.	trigonal
vac.	dans le vide
var.	variable

TABLES DES PROPRIÉTÉS DES SUBSTANCES

On trouvera (p. 306) à la suite des Tables générales, les Tables des Propriétés des Substances, dans chacune desquelles, les substances identifiées par leur Nombre-Index, sont arrangées dans l'ordre ascendant des valeurs de la propriété; les intervalles de l'échelle des valeurs de la propriété sont donnés en caractères gras.

Pour identifier une substance au moyen de ses propriétés.—*Exemple*: On a trouvé qu'un liquide a les propriétés suivantes: P.E. = 81.1° à 745 mm, $d = 0.783$, $n_D = 1{,}344$. Quelle est la substance? Au moyen de la règle de Craft, on corrige premièrement le point d'ébullition à 760 mm. Si la nature générale de la substance est inconnue, on pose $c = 10^{-4}$ dans l'équation de Craft, $\Delta t = cT_E\ (760 - P)$. Ainsi dans le cas présent, nous aurions $\Delta t = 10^{-4} \times (81.1 + 273)(760 - 745) = 0.3°$, et $t_E = 81.1° + 0.3° = 81.4°$. Ensuite on cherche dans les tables spéciales des P.E. (p. 310), des d (p. 313) et des n (p. 276) et on note les nombres-index des substances ayant les valeurs des propriétés ci-dessus dans le voisinage de celles de la substance inconnue. Ainsi, pour l'exemple présent, les nombres-index suivants seront obtenus; Pour le P.E., 130, 758, 727, 1612, 168, 277, 1535, 506, 792; pour d, 208, 168, 395, 506, 3320, 1049, 262, 792, 5156; pour n_D, 141, 168, 213. Le seul nombre-index commun à chacune de ces propriétés est 168; en revenant à ce nombre-index dans la Table générale ℭ, et en notant les autres propriétés, on peut rapidement identifier notre substance comme étant acétonitrile. L'identification peut être alors poussée plus loin au moyen d'essais chimiques appropriés, si on le désire.

3. Kristall-System
𝔅-Tabellen.
Besondere Tabellen.

4. Schmelzpunkt. (Bei 1 Atmosphäre: wird dem Werte eine Zahl rechts hinaufgesetzt, so bedeutet diese den Druck unter welchem der Schmelzpunkt angegeben ist. Es bedeutet $125^{17 atm.}$: der Schmelzpunkt ist bei einem Druck von 17 Atm. bei 125°.)
𝔅-Tabellen.

5. Siedepunkt. (Unter 760 mm Quecksilber: wird dem Werte eine Zahl rechts hinaufgesetzt, so bedeutet diese Zahl den Druck, unter welchem der Siedepunkt angegeben ist. Es bedeutet 321^{125}; der Siedepunkt liegt bei einem Druck von 125 mm Hg bei 321°.)
𝔅-Tabellen.

6. Dichte, g cm^{-3}. (Bei 20°C: wird dem Wert eine Zahl rechts hinaufgesetzt, so bedeutet diese Zahl die Temperatur, für welche die Dichte angegeben ist. Es bedeutet 1.853^{40}: die Dichte bei 40° beträgt 1.853).
𝔅-Tabellen.

7. Brechungs-Index und Dispersion, (n_D und $H_\beta - H_\alpha$) für 20°, wenn nichts anderes angegeben ist.

ABKÜRZUNGEN UND ZEICHEN

at. oder atm.	Atmosphäre
C.	kubisch oder regulär
d.	zersetzt sich, z. B. d335 bedeutet, zersetzt sich bei *ungefähr* 335°; 335d bedeutet, schmilzt (oder siedet) bei *ungefähr* 335° unter Zersetzung
diss.	Dissoziations Temperatur
exp.	explodiert
l.	flüssig
H.	hexagonal
M.	monoklin
P.	unter Druck
s.	Sublimation
s.d.	schwache Zersetzung
R.	rhombisch oder orthorhombisch
Tet.	tetragonal
Tr.	Umwandlungstemperatur
Tri.	triklin
vac.	im Vacuum
var.	variabel

STOFF-EIGENSCHAFTS TAFELN

Den Haupttabellen folgend, findet man Seite 306 Stoff-Eigenschafts Tafeln. In jeder dieser Tafeln, in welcher die Stoffe durch ihre Indexzahlen bezeichnet sind, werden die Stoffe in aufsteigender Ordnung der Werte dieser Eigenschaften dargestellt. Die Intervalle an der Scala der Eigenschaftswerte sind in fettgedruckten Ziffern angegeben.

Die Erkennung eines Stoffes mit Hilfe seiner Eigenschaften.—*Beispiel:* Es ist eine Flüssigkeit gefunden, welche folgende Eigenschaften hat: Siede-Punkt 81.1° bei 745 mm, $d = 0.783$, $n_D = 1.344$. Welcher Stoff ist das? Mit Hilfe der Regel von Craft corrigiere man zuerst den Siede-Punkt auf 760 mm. Ist die allgemeine Natur des Stoffes nicht bekannt, setze man $c = 10^{-4}$ in die Gleichung von Craft ein: $\Delta t = cT_B(760 - P)$. Im gegenwärtigen Falle ist also $\Delta t = 10^{-4} \times (81.1 + 275)(760 - 745) = 0.3°$, wonach dann der Siede-Punkt $t_B = 81.1° + 0.3° = 81.4°$ sich ergibt. Dann verwende man die Sd.P. Tabellen (Seite 310), die *d*-Tabellen (Seite 313) und die *n*-Tabellen (Seite 276), suche in diesen die Indexzahlen jener Stoffe heraus, deren oben genannte Eigenschaften solche Werte haben, die in der Nähe der Eigenschafts Zahlen des unbekannten Stoffes liegen. So erhält man für das gewählte Beispiel, folgende Indexnummern: für Sd. P. 130, 758, 727, 1612, 168, 277, 1535, 506, 792, für *d*, 208, 168, 395, 506, 3320, 1049, 262, 792, 5156; für n_D 141, 168, 213. Die einzige Index-Nummer, die alle drei Eigenschaften vereinigt, ist 168. Diese Index-Nummer wird in der Haupt ℭ-Tabelle aufgesucht; mit Beachtung noch anderer Eigenschaften kann man leicht die Flüssigkeit als Azetonitril erkennen. Die Identifizierung kann dann noch weiter durch eine chemische Untersuchung, wenn nötig, bestätigt werden.

5. Punto di ebollizione. (Alla pressione di 760 mm Hg tranne che non sia altrimenti indicato dalla soprascritta; così 321^{125} = bolle a 321° alla pressione di 125 mm Hg.)
Tabella 𝔅.

6. Densità, g cm^{-3}. (A 20°, tranne che non sia altrimenti indicato dalla soprascritta; così 1.853^{40} = 1.853 g cm^{-3} a 40°C.)
Tabella 𝔅.

7. Indice di rifrazione e dispersione (n_D e $H_\beta - H_\alpha$) per 20° tranne che non sia altrimenti indicato.

ABBREVIAZIONI E CONVENZIONI

at. oppure atm.	atmosfera
C.	cubico o regolare
d.	si decompone; per es. d335 = si decompone a *ca.* 335°; 355d = fonde (o bolle) a 335° con decomposizione
diss.	una temperatura di dissociazione
exp.	esplode
l.	liquido
H.	esagonale
M.	monoclino
P.	sotto pressione
s.	sublimazione
s.d.	leggera decomposizione
R.	rombico od ortorombico
Tet.	tetragonale
Tr.	temperatura di trasformazione
Tri.	triclino
Trig.	trigonale
vac.	nel vuoto
var.	variable

LE TABELLE DELLE PROPRIETA' DELLE SOSTANZE

Seguendo le tabelle generali si troveranno (p. 306) le tabelle delle proprietà in ciascuna delle quali le sostanze, indicate col numero indice, sono disposte secondo l'ordine ascendente dei valori della proprietà. Gli intervalli nella scala dei valori della proprietà sono indicati in grassetto.

Identificazione di una sostanza a mezzo delle sue proprietà.—*Esempio:* si supponga che un liquido abbia le seguenti proprietà: B.P. = 81.1° a 745 mm, $d = 0.783$, $n_D = 1.344$. Che sostanza è?

Con l'aiuto della regola di Craft, bisogna anzitutto ridurre il punto di ebollizione a 760 mm. Se non si conosce la natura della sostanza bisogna mettere, nella equazione di Craft, $c = 10^{-4}$, $t = cT_B(760 - P)$. Così, nel caso nostro, si avrebbe $t = 10^{-4} \times (81.1 + 273)\ (760 - 745) = 0.3°$, e $t_B = 81.1° + 0.3° = 81.4°$. Dopo bisogna guardare alle tabelle speciali per il B. P. (p. 310), per *d* (p. 313) e per *n* (p. 276), e ricavare da queste tabelle i numeri indici delle sostanze aventi valori delle suddette proprietà vicini a quelli della sostanza sconosciuta. Così, per il nostro esempio, si otterranno i seguenti numeri indici: per B.P., 130, 758, 727, 1612, 168, 277, 1535, 506, 792; per *d*, 208, 168, 395, 506, 3320, 1049, 262, 792, 5156; per n_D 141, 168, 213. L'unico numero indice comune a ciascuna di queste proprietà è 168; tornando a questo numero indice nella Tabella Generale ℭ, e osservando le altre proprietà, si può prontamente identificare la sostanza nel acetonitrile.

La identificazione può quindi essere ulteriormente comprovata da appropriati saggi chimici, se si desidera.

ELEMENTARY SUBSTANCES AND ATMOSPHERIC AIR. A-TABLE

THE GASEOUS STATE

Chem. symb.	Standard density 0°, 1A$_n$ g l^{-1}	Density of the saturated vapor at the normal boiling point g l^{-1}	Critical constants			Specific heat joules per gram atom at 15°	Viscosity $\eta = A \times 10^{-6}$ poises	
	d_g	d_v	t_c °C	p_c atm.	d_c g cm^{-3}	C_p	A	t
A	1.7824	5.89	−122.4	48.0	0.531	20.2	221	20
As			>1400.					
Br			302.		1.18		155	20
Cl	3.214		144.	76.	0.573	17.2	132	20
F	1.695							
H	0.08987	1.33	−239.9	12.8	0.0310	14.55	88.7	20
He	0.1785	(11.2)	−267.9	2.26	0.069	20.9	197	20
Hg		0.020 at 320°	1650	3500	5.		494	273
I			553.				184	124
Kr	3.708	(8.3)	− 62.6	54.2			248	20
N	1.2506	4.61	−147.1	33.5	0.311	14.56	176.5	23
Ne	0.9002	9.46	−228.7	26.9	0.484		312	20
O	1.4290	4.74	−118.8	49.7	0.430	14.60	203.9	23
O_3	3.03 at −80°		− 5.0	(67.)	0.54			
P			721.	100.				
Rn	9.73	(12.6)	104.4	62.4			229	20
S			1040.					
Tl		14.8						
Xe	5.851	(9.7)	16.6	58.2	1.15		225	20
Air	1.2930						284.2	20

THE LIQUID STATE

Chem. symb.	Density g cm^{-3}		Thermal expansion $\frac{1}{v}\frac{dv}{dt} = A \times 10^{-6}$		Normal boiling point (s = "solid")	Latent heat of vaporization at t_B. Kilo-joules per gram atom (s = "solid")
	d	t	A	at t^0	t_B	L_V
A	1.402	−185.7	4500.	−183	−185.7	6.3
Ac					(>1700.)	
Ag	9.4	960.	110.	960–1200	1950.	249.
Al	2.40	658.	113.	658–1100	1800.	225.
As					615.s	139.s
Au	17.	1063.			2600.	368.
B					(2550.)	
Ba					1140.	361.
Be					(1500.)	
Bi	10.1	270.	122.	270–630	1450.	193.
Br	3.119	20.	1100.	0–30	58.78	15.0
C					4200.	600.
Ca					1170.	399.
Cb					(>3300.)	
Cd	8.0	320.	150.	320–540	767.	107.
Ce					1400.	
Cl	1.557	− 33.6	1500.	−34	−34.6	10.0
Co					2900.	380.
Cr					2200.	320.
Cs	1.84	26.	370.	27–123	670.	73.
Cu	8.3	1083.	190.	1083–1295	2300.	467.

THE LIQUID STATE.—*(Continued)*

Chem. symb.	d	t	A	at t^0	t_B	L_V
F	1.11	−187.	3000.	−200	−187.	(6.)
Fe	6.9	1530.			3000.	380.
Ga	6.095	29.7			>1600.	
Ge					(2700.)	(500.)
H	0.0709	−252.7	13000.	−255	−252.7	0.450
He	0.126	−268.9				
	0.147 d_{max}	−270.8			−268.9	0.10
Hf					(>3200.)	
Hg	13.546	20.	182.	20	356.90	59.3
I	4.00	107.	800.	107–150	184.35	22.0
In					>1450.	
Ir					(>4800.)	
K	0.83	62.	290.	62–150	760.	84.
Kr	2.6	146.			−151.8	(9.4)
La					1800.	
Li			180.	186–230	>1200.	(170.)
Mg	1.57	650.	380.	650–800	1110.	262.
Mn					1900.	240.
Mo					3700.	710.
N	0.808	−195.8	6000.	−195	−195.8	2.80
Na	0.93	97.5	280.	100–200	880.	105.
Ne	1.204	−245.9			−245.9	1.74
Ni					2900.	380.
O	1.14	−183.	4100.	−195	−183.00	3.415
O_3	1.71	−183.	2000.	−183	−112.	4.88
Os					(>5300.)	
P	1.745	44.5	520.	50–60	280.	
Pa					(6200.)	
Pb	10.3	327.	120.	327–825	1620.	193.
Pd	11.	1550.			2200.	
Pt	19.	1755.			4300.	520.
Ra					(1140.)	
Rb	1.475	38.5	340.	40–140	700.	74.
Rh					(>2500.)	
Rn	4.4	−62.			−61.8	(18.1)
Ru					(>2700.)	
S	1.808	115.	430.	115	444.6	8.98
Sb	6.55	631.	100.	630–1050	1380.	190.
Sc					(2400.)	
Se					688.	31.
Si					2600.	170?
Sn	6.98	232.	100.	232–1600	2260.	325.
Sr					1150.	383.
Ta					(>4100.)	
Te					1390.	85.
Th					(>3000.)	
Ti					(>3000.)	
Tl	11.0	300.	140.	300–350	1650.	120? 256?
V					(3000.)	
W					5900.	910.
Xe	3.06	−109.1			−109.1	(13.4)
Yt					(2500.)	
Zn	6.7	463.	150.	419–543	907.	99.2
Zr					(>2900.)	
87					(620.)	(69.6)
85					(520.)	(83.7)

Air

Mole % O_2 in liquid	d	t	A at $t°$		t_B	L_V
10	0.831	−195.0			−195.0	
20	.856	−194.3			−194.3	
20.94	.861	−194.2			−194.2	0.185 (per gram)
30	.893	−193.5			−193.5	
40	.932	−192.6			−192.6	
50	.974	−191.5			−191.5	

Chem. symb.	Specific heat joules per gram atom C_p	t	Electrical resistivity ohm-cm $R = A \times 10^n$ A	n	t
A	22.4	−100.			
Ag	33.8	907–1100	17.0	− 6	1000.
Al	28.	660	20.1	− 6	657.
Au	27.	1100	30.8	− 6	1063.
Bi	31.	400	127.		269.
Br	36.	13–45	7.8	12	17.
Cd	36.	321	34.	− 6	400.
Cl	33.5	0–24	>10.	15	−70.
Cs	32.	50	36.6	− 6	28.
Cu	27.	1084	21.3	− 6	1083.
Ga	23.	119	27.	− 6	30.
H	0.975	−252			
Hg	27.9	20	95.8	− 6	20.
I	8.01	114–185	78.	6	110.5
In			29.	− 6	155.
K	30.	63	13.	− 6	62.
Li			45.	− 6	230.
N	27.8	−200			
Na	32.	100	9.7	− 6	100.
Ni	33.	1452	109.		1500.
O	26.4	−200			
P			2.3	6	25.
Pb			98.	− 6	400.
Rb	32.	50	23.5	− 6	50.
S	30.4	100	95.	10	115.
Sb	28	630	12.	− 6	860.
Se			76.6	− 9	390.
Sn	31.	232	49.	− 6	300.
Tl			74.	− 6	300.
Zn			43.	− 6	440.
Air	1.91*	−200.			

* Per gram, for liquid containing 20.94 mole % O_2.

Surface Tension

Chem. symb.	γ dyne cm^{-1}	t	Chem. symb.	γ dyne cm^{-1}	t
A	12.5	−185.8	N	8.85	−195.8
Al	520.	750.	O	13.2	−183.
Bi	376.	300.	Pb	442.	350.
Br	36.	58.6	S	60.	120.
Cd	628.	350.	Se	72.	217.
Cl	27.	− 34.5			
Ga	358.	30(CO_2)	Air, with 50 mole % O_2	11.6	−190.3
H	1.91	−252.7			
Hg	476.	20.			

Refractive Index

Chem. symb.	n_D	t	Chem. symb.	n_D	t
B	2.5*		N	1.2053	−190.
Br	1.661	15.	Na	0.0045	
Cd	0.82*		O	1.221	−181.
Cl	1.385	20.	Pb	2.6*	
H	1.097*	−252.8	S	1.929	110.
Hg	1.6–1.9	20.	Se	2.9	220.
N	1.1975*	−195.8	Sn	2.1	

* These values are for the Hg line 5790 Å.

THE CRYSTALLINE STATE

Chem. symb. (At. wt. *v.* p. 43)	Crystal system or form	Density, g cm^{-3} d	t	Thermal expansion $\frac{1}{l}\frac{dl}{dt} = A \times 10^{-6}$ A	at $t°$	Melting point °C t_F	Specific heat joules per gram atom 1 joule = 4.185 cal. C_p	at $t°$	Latent heat of fusion at t_F Kilo-joules per gram atom L_F	Electrical resistivity ohm–cm $R = A \times 10^{-6}$ A	t
A	C.	1.65	−233			−189.2	25.9	−223	1.12		
Ac						(1800.)					
Ag	C.	10.5	20	18.9	20	960.5	25.2	20	11.	1.62	20
Al	C.	2.702	20	23.03	20	660.0	24.2	20	8.0	2.62	20
As	Met.H.	5.7		4.7	20	814^{36atm}	25.8	0–100		35	0
	Black	4.7	20				27.0	0–100			
	Yel. C.	2.0	20								
Au	C.	19.3	20	14.2	20	1063.0	25.7	18	13.3	2.4	20
B		2.		2		2300.	14.	0–100		1.8×10^{12}	0
Ba		3.5	20			850.					
Be	H.	1.8	20			1350.	16.1	0−100	12.	18.5	20
Bi	H.	9.80	20	13.3	20	271.	25.6	20	10.9	115	20
Br	R.	(3.4)				−7.2	23.5	−192 to −108	5.4	$>10^{14}$	
C	Dia. C.	3.51	20	0.9	20		6.1	20		5×10^{20}	15
Graphite	C	2.255	20	3	20	3500.	8.5	20		1400.	20
Graphite	Single crystal									39–60	20

THE CRYSTALLINE STATE.—(*Continued*)

Chem. symb.	Crystal system	d	t	A at $t°$		t_F	C_p at $t°$		L_F	A	t
Ca	C.	1.55	20	25.	0–21	810.	26.0	20		4.6	20
Cb		8.4	20			1950.					
Cd	H.	8.6	20	29.8	20	320.9	28	20	6.2	7.5	20
Ce	C.	6.90	20			640.	24.8	0–100		78	20
	H.	(6.7)									
Cl	R.	(1.9)				−101.6	28.	−113	3.40		
Co	C.	8.9	20	12.3	20	1480.	24.8	20	14.4	9.7	20
Cr	C.	7.1		8.2	20	1615.	23.	20	6.9	2.6	0
Cs		1.90	20	97.	0–26	26.	29.	20	2.1	20.	20
Cu	C.	8.92	20	16.6	20	1083.	24.5	20	11.5	1.69	20
F		(1.3)				−223.			(0.8)		
Fe	C.	7.86	20	11.7	20	1535.	24.9	20	11.2	10.0	20
Ga	Tet.	5.91	20	18	0–30	29.75	23	12–23	5.55	53	0
Ge	C.	5.36	20			958.5	22.3	0–100		89×10^3	0
H	C.	0.0808	−262			−259.14	2.4	−260.6	0.059		
He						<-272.2					
Hf						(1700)					
Hg	H.?	14.19	−38.9	90	−190 to −40	−38.87	28.0	−40	2.33	21.3	−50
I	R.	4.93	20	93	20–100	113.5	27.8	20	8.38	1.3×10^{15}	20
In	Tet.	7.3	20	33	20	155	27.3	0–100		9	20
Ir	C.	22.4	20	6.5	20	2350.	26.1	0–100		6.	20
K	C.	0.86	20	83.	20	62.3	29	14	2.38	7.0	20
Kr		(2)				−169			(1.5)		
La		6.15	20			826	26	0–100		59	18
Li	C.	0.53	20	56.	20	186	23	0	(3.5)	9.3	20
Ma						(2300)					
Mg	H.	1.74	20	25.6	20	651	25	20	7.13	4.46	20
Mn		7.2	20	23.	20	1260	24.6	0	8.4	5	
Mo	C.	10.2		4	20	2620 ± 10	26	20–100		4.77	20
N	C.	1.026	−252.5			−209.86	23	−212	0.356		
Na	C.	0.97	20	71	20	97.5	28.4	20	2.65	4.6	20
Nd		6.9	20			840	27	0–100		79.	20
Ne		(1.0)				−248.67			(0.24)		
Ni	C.	8.90	20	12.8	20	1452	25.8	20	18.17	6.9	20
O	H.	1.426	−252.5			−218.4	22.5	−221.8	0.22		
O_3	Ozone					−251.					
Os	H.	22.48	20	6.1	20	2700.	25	20–100		9	20
P	Yel. H.	1.82	20	125.	0–40	44.1	23	9	0.654	10^{17}	11
	Red, C.	2.20	20			$590^{43 atm}$	24	−21 to +7			
	Black									710×10^3	0
Pb	C.	11.34	20	29.1	20	327.5	26.5	20	4.70	21.9	20
Pd	C.	12.0	20	11.8	20	1555.	26.2	18	16	10.8	20
Po						(1800.)					
Pr		6.5	20			940.	27	0–100		88	18
Pt	C.	21.45	20	8.9	20	1755.	26.5	20	22	10.5	20
Ra		(5.)				(960.)					
Rb		1.53	20	90.	20	38.5	28.7	0	2.18	12.5	20
Re						(3000)					
Rh	C.	12.5	20	8.4	20	1955.	25	0–100		5.1	20
Rn		(4.)				−71.			(3.25)		
Ru	H.	12.2	20	9.1	20	2450.	26	0–100		10.	20
S	R.	2.07	20	64.	40	112.8	23	0–30		2×10^{23}	20
	M.	1.96	20			119.0	24	0–30	1.18		
Sa		7.7				>1300.					
Sb	H.	6.684	25	11.4	20	630.5	25	20	19.5	39.	20
Sc		(2.5)				1200.					
Se	Gray, Trig.	4.80	25	37	40	220.	28	0–41	(2.2)	1.2	20
	Red, H.?	4.50	25								
Si	C.	2.4	20	2.8–7.3	20	1420.	20.7	20		85×10^3	20
Sn	White, Tet.	7.31	20	20.	20	231.85	26.9	18	(7.)	11.4	20
	Gray, C.?	5.750	20	5.	−163 to −18		25.6	20			

THE CRYSTALLINE STATE.—(*Continued*)

Chem. symb.	Crystal system	d	t	A at $t°$		t_F	C_p at $t°$		L_F	A	t
Sr		2.6				800.				23.	20
Ta	C.	16.6		7	20	2850.	27	20		15	20
Te	α Met. H.?	6.24	20	16.8	40	452.	25	20	3.9	[5.8 − 33 × 10^3]	
	β H.?	6.00	20								
Th	C.	11.2				1845.	26.8	0–100		18.	20
Ti	C.	4.5	20			1800.	29	0–100		3	20
Tl	Tet.	11.85	20	28	20	303.5	26.6	20	6.15	18.1	20
U		18.7				<1850.	28	0–100		60.	20
V	C.	5.96				1710.	24.6	0–100			
W	C.	19.3		4	20	3370.	26	20–100		5.48	20
Xe		(2.7)				−140.			(2.05)		
Yt		5.51				1490.					
Zn	H.	7.140	20	33	20	419.43	25.3	20	7.1	6	20
Zr	C.	6.4	20			1700.	25.2	0–100		170.	0
85						(470.)					
87						(23.)					

CHEMICAL COMPOUNDS

𝔅-TABLE

Compiled with the cooperation of Raleigh Gilchrist, F. W. Smithers and Edward Wichers, Bureau of Standards, Washington D. C.; J. A. Almquist, J. M. Braham and E. W. Guernsey, Fixed Nitrogen Laboratory, Washington, D. C.; H. E. Merwin, H. S. Roberts, R. B. Sosman and E. G. Zies, Geophysical Laboratory, Washington, D. C.; John C. W. Frazer, F. O. Rice and H. C. Urey, Johns Hopkins Univ., Baltimore, Md.; Robert D. Coghill, Florence Fenwick, Donald M. Hetler, Norman W. Krase and Hugh M. Spencer, Yale Univ., New Haven, Conn. The list of minerals was supplied by E. T. Wherry, Bureau of Chemistry, Washington, D. C.

General index number	Formula	Molecular weight (I. C. T. atomic weights, *v.* p. 43)	Crystal system	Normal melting point, °C	Specific gravity 20°/4° (or at other indicated temperature)	Refractive index finding number, *v.* p. 165
1	H_2O	18.0154		0	0.917°	203
					l. 0.9982	8
2	H_2O_2	34.0154		− 1.7	$1.643_4^{-4.45}$	
					l. 1.442	16
3	$H_2O_2.2H_2O$	70.0462		− 51		
4	HF	20.0077		− 83	l. $0.988^{13.6}$	
5	$Cl_2.8H_2O$	215.039	R.	d. 9.6	1.23	
6	ClO_2	67.4580		− 76		
7	Cl_2O	86.9160		− 20?		
7.1	Cl_2O_6	166.916		− 1	1.65	
8	Cl_2O_7	182.916				
9	HCl	36.4657		−111	l. $1.194^{-85.8}$	3
10	$HCl.H_2O$	54.4811		− 15.35	1.48	
11	$HCl.2H_2O$	72.4965		− 17.7	l. $1.46_4^{18.3}$	
12	$HCl.3H_2O$	92.6119		− 24.4		
13	$HClO_4$	100.466		−112	l. 1.768	
14	$HClO_4.H_2O$	118.481		50	1.88	
					l. 1.776_4^{50}	
15	$HClO_4.2H_2O$	136.497		− 17.8		
16	$HClO_4.3H_2O$	154.512		− 43.2 (α)		
				− 37 (β)		
17	HBr	80.9237		− 86	l. 2.16^{-68}	5
18	$HBr.2H_2O$	116.955		− 11	2.11^{-15}	
19	$HBr.3H_2O$	134.970		− 47.5		
20	$HBr.4H_2O$	152.985		− 55.8		
21	HBrO	96.9237				
22	$HBrO_3$	128.924		d. 100		
23	BrF_3	136.916		5		
24	IO_2	158.932		d. 130	4.2_{10}^{10}	
25	I_2O_5	333.864		d. 300	4.799_4^{26}	
26	HI	127.940		− 50.8	l. $2.847^{-4.7}$	27
27	$HI.2H_2O$	145.955		− 43		
28	$HI.3H_2O$	163.970		− 48		
29	$HI.4H_2O$	181.985		− 36.5		
30	HIO_3	175.940	R.	110	4.629^{0}	
31	HIO_4	191.940				
32	$HIO_4.2H_2O$	227.971	M. ?	d. 110		
33	$I_2O_5.HIO_3$	509.804		Tr. 170		
34	IF_5	221.932		8	l. 3.5	
35	ICl (α)	162.390		27.2	l. 3.24_{34}^{34}	
					3.182_4^{0}	
35.1	ICl (β)	162.390	R.	13.9	l. 3.24_{34}^{34}	
					l. 3.182_4^{0}	
36	ICl_3	233.306	R.	*ca.* 33	3.11^{15}	
37	IBr	206.848		*ca.* 42	4.414^{10}	

Index No.	Formula	Mol. wt.	Crystal system	M. P.	d_4^{20}	Ref. ind. finding No.
38	SO_2	64.0650		− 72.7		15
39	SO_3	80.0650		16.83	l. 1.923	
40	S_2O_7	176.130		0		
41	H_2S	34.0804		− 82.9	l. 0.96^{-60}	10
42	H_2S_2	66.1454		− 88	l. 1.376	65
43	H_2S_3	98.2104		− 53	l. 1.496^{15}	
44	H_2S_5	162.340			l. 1.71^{15}	
45	H_2SO_4	98.0804		10.49	l. 1.834	18
46	$H_2SO_4.H_2O$	116.095		8.62	l. 1.842_4^{15}	
47	$H_2SO_4.2H_2O$	134.019		− 38.9	l. 1.650_4^{0}	
48	$H_2SO_4.4H_2O$	170.142		− 25		
49	H_2SO_5	114.080		45		
50	$H_2S_2O_7$	178.145		35	l. 1.9^{20}	
51	$H_2S_2O_8$	194.145		<60		
52	SF_6	146.065		− 55		
53	SOF_2	86.0650		−110		
54	SO_2F_2	102.065		-120^{65mm}		
55	SCl_2	102.981		− 78	l. 1.621_{15}^{15}	56
56	SCl_4	173.897		− 30		
57	S_2Cl_2	135.046		− 80	l. 1.678	61
58	$SOCl_2$	118.981			l. 1.638	52
59	SO_2Cl_2	134.981		− 54.1	l. 1.667	22
60	$SO_3.SO_2Cl_2$	215.046		− 37.5	l. 1.837	
61	$S_2O_3Cl_4$	253.962	R.	57 d.		
62	SO_2OHCl	116.531		− 80	l. 1.753	20
63	S_2Br_2	223.962		− 46	l. 2.635	64
64	$SOBr_2$	207.897		− 50	l. 2.68^{18}	
65	$SOClBr$	163.439			l. 2.31^{0}	
66	SeO_2	111.200		340	3.953_{15}^{15}	
67	HSe	80.2077				
68	H_2Se	81.2154		− 64	l. 2.12^{-42}	
69	H_2SeO_3	129.215	H.	d.	3.004_4^{15}	
70	H_2SeO_4	145.215	H.	58	2.950_4^{15}	
					l. 2.608_4^{15}	
71	$H_2SeO_4.H_2O$	161.230		25	2.627_4^{15}	
					l. 2.356_4^{15}	
72	SeF_4	155.200		− 80		
73	SeF_6	193.200				
74	$SeCl_4$	221.032				
75	Se_2Cl_2	229.316			l. $2.906_4^{17.5}$	
76	$SeOCl_2$	166.116		8.5	l. 2.44	
77	Se_2Br_2	318.232			l. 3.604^{15}	
78	$SeOBr_2$	255.032		41.7	l. 3.38^{50}	
79	$H_2SeO_4.SO_3$	225.280		6.6		
80	$H_2SeO_4.2SO_3$	305.345		20		
81	$SO_3.SeCl_4$	301.097		165		
82	TeO_2—Tellurite	159.500	Tet. P.		Tet. 5.66^{0}	
					R. 5.89^{0}	1056
83	TeO_3	175.500		d.	$5.08^{10.5}$	
84	H_2Te	129.515		− 48	l. 2.57_4^{-20}	
85	H_2TeO_4	193.515		d. 160	$3.44^{19.2}$	
86	$Te(OH)_6$ (α)	229.546	C.		3.053	
86.1	$Te(OH)_6$ (β)	229.546	M.		3.071	
87	TeF_6	241.500				
88	$TeCl_2$	198.416		175		
89	$TeCl_4$	269.332		214		
90	$TeCl_4.HCl.5H_2O$	395.875		− 20		
91	$TeBr_2$	287.332		*ca.* 280		
92	$TeBr_4$	447.164		*ca.* 380	4.31_4^{15}	
93	TeI_4	635.228		259	8.403_4^{15}	
94	$2TeO_2.SO_3$	399.065	R.	d. 500	4.7	
95	NO	30.0080		−161	l. $1.269_4^{-150.2}$	7
96	NO_2	46.0080		− 9.3	l. 1.448	

Index No.	Formula	Mol. wt.	Crystal system	M. P.	d_4^{20}	Ref. ind. finding No.
97	N_2O	44.0160		−102.4	l. 1.226^{-89}	2
98	N_2O_3	76.0160		−102	l. 1.447^{2}	
99	N_2O_5	108.016	R.	30		
100	$2N_2O_5.H_2O$	234.047		5	l. 1.682^{18}	
101	N_4O_6	152.032				
102	NH_3	17.0311		− 77.7	0.817^{-79}	
					l. 0.607	6
103	$H_2N.NH_2$	32.0468		1.4	l. 1.011_4^{15}	28
104	$N_2H_4.H_2O$	50.0622		<− 40	l. 1.03^{21}	
105	N_3H	43.0317		− 80		
106	$NH_3.HN_3$	60.0628		110		
107	$2NH_3.H_2O$	52.0776		− 78		
108	$N_2H_4.HN_3$	75.0785		65		
109	HNO_3	63.0157		− 42	l. 1.502	12
110	$HNO_3.H_2O$	81.0311		− 38		
110.1	$HNO_3.3H_2O$	117.0619		− 18.5		
111	NH_2OH	33.0311		34	1.35	
					l. $1.204_4^{23.5}$	21
112	H_3NO_4	81.0311	R.	− 34		
113	NH_4OH	35.0465		− 77		
114	H_5NO_5	99.0465		− 35		
115	$(OH)_4NON(OH)_4$	180.078		− 39		
116	NH_2NO_2	62.0314		72 d.		
117	NH_4NO_2	64.0468		d.		
118	NH_4NO_3	80.0468	R.	169.6	α 1.66_4^{25}	
					β 1.725_4^{25}	
119	NH_4ONNOH	79.0625		65		
120	$N_2H_4.HNO_3$	95.0625		70.7		
				62.1		
121	$NH_4NO_3.HNO_3$	143.063		12		
122	$N_2H_4.2HNO_3$	158.078		104		
123	$NH_4NO_3.2HNO_3$	206.078		30		
124	$NH_4NO_3.3NH_3$	131.140		*ca.* − 40		
125	NOF	49.0080		−134		
126	NO_2F	65.0080		−139		
127	$NH_4F.HF$	57.0465	R.		l. 1.211_{12}^{12}	
128	$N_2H_4(HF)_2$	72.0622	C.	105		
129	NCl_3	120.382			l. 1.653	
130	NOCl	65.4660		− 64.5	l. 1.417^{-12}	
131	NO_2Cl	81.4660		<− 30	l. 1.32^{14}	
132	NH_4Cl—Salammoniac	53.4968	C.		1.536	145
133	$N_2H_4.HCl$	68.5125		89		
134	$N_2H_4.2HCl$	104.978	C.	198	1.42	
135	$NH_4Cl.3NH_3$	104.590		10.7		
136	$NH_4Cl.6NH_3$	155.683		− 18		
137	$NH_2OH.HCl$	69.4968	M.	151	1.67^{17}	
138	NH_4ClO_4	117.497	R.	d.	1.95	489
139	$N_2H_4.HClO_3$	116.513		exp. 80		
140	$N_2H_4.HClO_4.2H_2O$	168.543		132		
141	NOBr	109.924		− 55.5		
142	$NOBr_3$	269.756		− 40	l. 2.637	
143	NH_4Br	97.9548	C.		2.548	
144	$N_2H_4.HBr$	112.971		80		
145	$HBr.2NH_3$	114.986				
146	$NH_4Br.3NH_3$	149.048	R.	13.7		
147	$NH_4Br.6NH_3$	200.141		− 20		
148	NH_4I	144.971	C.		2.563	153
149	NH_3I_2	270.895		− 2	l. 2.46^{15}	
150	NH_4I_3	398.835	R.		3.749	
151	$NH_4I.NH_3$	162.002				
152	$N_2H_4.HI$	159.987		exp. 127		
153	$N_2H_4.2HI$	287.926		220		
154	$NI_3.NH_3$	411.835		d.>20	3.5	

Index No.	Formula	Mol. wt.	Crystal system	M. P.	d_4^{20}	Ref. ind. finding No.
155	$NH_4I.3NH_3$	196.064		− 8		
156	$NH_4I.4NH_3$	213.095		− 5.1		
157	$3N_2H_4.2HI$	352.020		90		
158	$NH_4I.6NH_3$	247.157		28		
159	NH_4IO_3	192.971	R.	d. 150	3.309_4^{21}	
160	NH_4IO_4	208.971	Tet.	exp.	3.056_4^{18}	
161	$2NH_4IO_3.H_2O$	403.957	Tri.	exp. 150		
162	$3NH_2OH.HI$	227.033		104		
163	N_2S_5	188.341		11	l. 1.901_4^{18}	
164	N_4S_4	184.292	R.	178	2.22^{15}	
165	$N_2O_3.2SO_3$	236.146		230	2.14	
166	NH_4SH	51.1115				
167	$(NH_4)_2S$	68.1426		d.		
168	NO_2SO_3H	127.081	R.	73 d.		
169	NH_2SO_3H	97.0961	R.	205 d.	2.03_4^{12}	
170	NH_4HSO_4	115.112		146.9	1.78	
171	$SO_2(NH_2)_2$	96.112	R.	92		
172	$NH_2SO_3NH_4$	114.127		125		
173	$N_2H_4.H_2SO_4$	130.127	R.	254	1.37	
174	$(NH_4)_2SO_4$—Mascagnite	132.143	R.	513 d.	1.769	602
175	$(NH_2OH)_2.H_2SO_4$	164.143	M.	170		
176	$(NH_4)_2S_2O_3$	148.208	M.	d. 150		
177	$(NH_4)_2S_2O_5$	180.208	R.	d.		
178	$(NH_4)_2S_2O_6$	196.208	M.	d. 130		
179	$(NH_4)_2S_2O_8$	228.208	M.	d. 120	1.982	543
181	$NH(SO_2NH_4)_2$	179.223				
182	$NH(SO_3NH_4)_2$	211.223	M.	357	1.965	
183	$(N_2H_4)_2.H_2SO_4$	162.174		117		
184	NH_4SO_3F	117.104		245		
185	NSe	93.2080		exp. 200		
186	$SeO_2(NO_2)_2$	203.216		− 13		
187	NH_4HSeO_4	162.247	R.	d.	2.162	
188	$(NH_4)_2SeO_4$	179.278	M.	d.	2.194	686
189	$(NH_4)_2SeBr_6$	594.774	C.		3.326	
190	$(NH_4)_2TeO_4$	227.578			3.01^{25}	
191	P_2O_3	110.048	M.	22.5	2.135_4^{21}	
192	P_2O_4	126.048	R.?	> 100	$2.537_4^{22.6}$	
193	P_2O_5	142.048		563 var.	2.387	
194	P_4O	140.096			1.912_4^{26}	
195	PH_3	34.0471		−132.5	l. 0.746^{-90}	4
196	P_2H	63.0557			1.83^{19}	
197	P_2H_4	66.0788			l. 1.012	
198	P_9H_2	281.231			1.95^{16}	
199	$P_{12}H_6$	378.334			1.83^{19}	
200	H_2PO_3	81.0394		35		
201	H_3PO_2	66.0471			$1.493^{18.8}$	
202	H_3PO_3	82.0471		73.6	$1.651^{21.2}$	
203	H_3PO_4	98.0471		42.35	$1.834^{18.2}$	
204	PF_3	88.0240		−160		
205	PF_5	126.024		− 83		
206	POF_3	104.024		− 68		
207	PCl_3	137.398		−111.8	l. $1.574_4^{20.8}$	47
208	PCl_5	208.314	Tet.	148 P.		
209	P_2Cl_4	203.880		− 28		
210	$POCl_3$	153.398		1.25	l. 1.675	25
211	$P_2O_3Cl_4$	251.880		<− 50	l. 1.58^7	
212	PH_4Cl	70.5128		$28^{46\ atm.}$		
213	PF_3Cl_2	158.940				
214	PBr_3	270.772		− 40	l. 2.852_4^{15}	62
215	PBr_5	430.604	R.			
216	$POBr_3$	286.772		56	2.822	
217	PH_4Br	114.971				
218	$POCl_2Br$	197.856		13	l. 2.104	

Index No.	Formula	Mol. wt.	Crystal system	M. P.	d_4^{20}	Ref. ind. finding No.
219	$POClBr_2$	242.314		30	l. 2.45^{50}	
220	PI_3	411.820	H.	61		
221	P_2I_4	569.776	Tri.	110		
222	PH_4I	161.987				
223	P_2S_3	158.243		290		
224	P_2S_5	222.373		276	2.03	
225	P_3S_6	285.462		298		
226	P_4S_3	220.291		172.5	2.03^{17}	
227	P_4S_7	348.551		310	2.19^{17}	
228	P_4S_{10}	444.746		290		
229	$P_2O_2S_3$	190.243		300		
230	$P_4O_6S_4$	348.356		102		
231	PSF_3	120.089		$3.8^{7.6at.}$		
232	$PSCl_3$	169.463		− 35	l. 1.635	193
233	PS_2Cl_5	272.444		<− 17		
234	$PSBr_3$	302.837		38	2.85^{17}	
235	P_2SBr_6	573.609		− 5		
236	$P_2S_3Br_4$	477.907			l. 2.262^{17}	
237	$PSCl_2Br$	213.921		− 30	l. 2.12^{0}	
238	$PSClBr_2$	258.379		− 60	l. 2.48^{0}	
239	P_2SI_2	347.977		75		
240	P_3N_5	163.112			2.51^{18}	
241	$NH_4H_2PO_2$	83.0782		100		
242	$NH_4H_2PO_3$	99.0782		*ca.* 123		
243	$NH_4H_2PO_4$	115.078	Tet.		1.803	250
244	$N_2H_4.H_3PO_3$	114.094		36		
245	$N_2H_4.H_3PO_4$	130.094		82		
246	$(NH_4)_2HPO_4$	118.091			1.619	
247	$(N_2H_4)H_4P_2O_6$	194.126		152		
248	$(NH_4)_2H_2P_2O_6$	196.141		170		
249	$N_2H_4(H_3PO_3)_2$	196.141		82		
250	$P_3N_3Cl_6$	347.844	R.	114	1.98	
251	$P_4N_4Cl_8$	463.792		123.5	2.18^{24}_{24}	
252	$P_5N_5Cl_{10}$	579.740		41		
253	$P_6N_6Cl_{12}$	695.688		91		
254	$P_6N_7Cl_9$	603.322		237.5		
255	$P_7N_7Cl_{14}$	811.636		<− 18		
256	$PNBr_2$	204.864	R.	190		
257	PS_3NH_4	145.258			l. $1.78^{16.5}$	
258	As_2O_3	197.920		275	3.71	
259	As_2O_3—Arsenite	197.920	C.		3.865^{25}_{4}	
260	As_2O_3—Arsenolite	197.920	C.		3.86	160
261	As_2O_3—Claudetite	197.920	M.	315	4.15	986
262	As_2O_5	229.920			4.086	
263	AsH_3	77.9831		−113.5		
264	AsF_3	131.960			l. 2.666^{0}_{4}	
265	AsF_5	169.960		− 80		
266	$AsCl_3$	181.334		− 18	l. 2.163	191
267	$AsCl_5$	252.250		*ca.* − 40		
268	$AsBr_3$	314.708		32.8	l. 3.540^{25}_{4}	
269	AsI_3	455.756		146	4.39^{13}_{4}	
270	AsI_5	709.620		76	3.93	
271	As_2S_2—Realgar	214.050	M.	307 (β) Tr. 267	α 3.506^{19} β 3.254^{19}	1067
272	As_2S_3—Orpiment	246.115	M.	300 Tr. 170	3.43	1071
273	As_4S_3	396.035			3.60^{19}	
274	$2AsSCl.As_2S_3$	531.081		120		
275	$2AsI_3.SI_6$	1705.17		72		
276	$NH_4H_2AsO_4$	159.014	Tet.		$2.311^{9.1}$	283
277	$(NH_4)_2HAsO_4$	176.045	M.		1.989	
278	SbO_2—Cervantite	153.770	C.		4.07	174
279	Sb_2O_3—Valentinite	291.540	R.	656	5.67	1024

Index No.	Formula	Mol. wt.	Crystal system	M. P.	d_4^{20}	Ref. ind. finding No.
280	Sb_2O_3—Senarmontite	291.540	C.		5.2	178
281	Sb_2O_5	323.540			3.78	
282	SbH_3	124.793		− 88	l. 2.26^{-25}	
283	SbF_3	178.770	R. ?	292	$4.379^{20.9}$	
284	SbF_5	216.770		7	l. $2.990^{22.8}$	
285	$SbF_5.2SbF_3$	574.310		390	4.188^{21}	
286	$SbCl_3$	228.144		73.4	3.140_4^{25}	
287	$SbCl_5$	299.060		2.8	l. 2.336	58
288	SbOCl	173.228		170 d.		
289	$Sb_4O_5Cl_2$	637.996	M.		5.014	
290	SbF_2Cl_3	266.144		55		
291	$SbBr_3$	361.518		96.6	4.148^{23} l. $3.845_4^{99.5}$	
292	SbI_3	502.566	Trig. M. R.	167 Tr. 114 (R. to Trig.) Tr. 125 (M. to Trig.)	M. 4.768^{22} Trig. 4.848^{26}	
293	SbI_5	756.430		79		
294	SbF_5I	343.702		*ca.* 80		
295	$(SbF_5)_2I$	560.472		*ca.* 115		
296	Sb_2S_3—Stibnite	339.735	R.	550	4.64 red 4.120^0 gray 4.284^0 black 4.652^0	1032
297	$Sb_2(SO_4)_3$	531.735			3.625_4^4	
298	$Sb_2O_3.2Sb_2S_3$—Kermesite	971.010	M.		4.6	1073
299	SbF_5S	248.835		230		
300	SbSe	200.970		542		
301	Sb_2Se_3	481.140		611		
302	SbS_3e_4	682.110		605		
303	Sb_4Se_5	883.080		590		
304	Sb_2Te_3	626.040		629		
305	BiO	225.000			7.5	
306	BiO_2	241.000			5.6	
306.1	$BiO_2.2H_2O$	277.031		d. 110	5.6	
307	Bi_2O_3 (I)	466.000	R.	820	8.9	
308	Bi_2O_3 (II)	466.000		Tr. 704	8.20	
309	Bi_2O_3 (III)	466.000	R.	860	8.5	
310	$Bi_2O_3.3H_2O$—Bismite	520.046	R.	d. 415	4.36	393
311	Bi_2O_5	498.000			5.10	
312	$HBiO_3$	258.008		d. 120	5.75	
313	BiF_3	266.000			5.32	
314	BiOF	244.000			7.5	
315	BiCl	244.458		320		
316	$BiCl_3$	315.374		230	4.7	
317	$BiCl_4$	350.832		225		
318	BiOCl	260.458			7.72	
319	BiBr	288.916		287		
320	$BiBr_3$	448.748		218	5.7	
321	BiOBr	304.916			8.08	
322	BiI_3	589.796	H.	439	5.7	
323	BiOI	351.932	R.		7.92	
324	BiS	241.065		685	7.7	
325	Bi_2S_3—Bismuthinite	514.195	R.		7.39	
326	BiSe	288.200		625		
327	Bi_2Se_3—Guanajuatite	655.600	R.	710	6.82	
328	Bi_2Te_3	800.500		573	7.7	
329	$Bi_2TeO_6.2H_2O$—Montanite	677.531			3.79	1002
330	Bi_2Te_2S—Tetradymite	705.065	R.		7.5	
331	$Bi(NO_3)_3.5H_2O$	485.101	Tri.	d. 30	2.83	
332	$Bi(NO_3)_3.6H_2O$	503.116			2.76	
333	$BiPO_4$	304.024	M.		3.23	

Index No.	Formula	Mol. wt.	Crystal system	M. P.	d_4^{20}	Ref. ind. finding No.
334	$BiAsO_4$	347.960	M.		7.14	
335	$Bi_3AsH_2O_8$—Atelestite	831.975	M.		6.4	1009
336	$5Bi_2O_3.2As_2O_3.9H_2O$?—Rhagite	2887.98			6.82	
337	CO	28.0000		−207	l. 0.8138_4^{-195}	
338	CO_2	44.0000		− $56.6^{5.2at.}$	1.53^{-79}	
					l. 1.101^{-37}	
339	C_3O_2	68.0000		−107	1.114^0	23
Compounds of C with elements of key numbers 2 to 15 in ℭ-Table, p. 176						
340	SiO_2—Cristobalite	60.0600	C. Tet. ?	1710	2.32	228
341	SiO_2—Lechatelierite	60.0600			2.20	24
342	SiO_2—Quartz	60.0600	Trig.	<1470 m.	2.651	267
343	SiO_2—Tridymite	60.0600	R.	1670	2.26	463
344	$SiO_2.H_2O$—Opal	60.0600			2.1 to 2.3	69, 82
345	SiH_4	32.0908		−185	l. 0.68^{-185}	
346	Si_2H_6	62.1662		−132.5	l. 0.69^{-25}	
347	Si_3H_8	92.2416		−117	l. 0.725^0	
348	Si_4H_{10}	122.317		− 93.5	l. 0.79^0	
349	Si_2H_6O	78.1662		−144	l. 0.881^{-80}	
350	SiF_4	104.060		− 77		
351	$SiHF_3$	86.0677		*ca.* −110		
352	$SiCl_4$	169.892		− 70	l. 1.483	192
353	Si_2Cl_6	268.868		− 1	l. 1.58^0	
354	Si_3Cl_8	367.844		− 67		
357	Si_4Cl_{10}	466.820				
358	Si_5Cl_{12}	565.796				
359	Si_6Cl_{14}	664.772		170 s. d.		
360	Si_2OCl_6	284.868		− 33		
361	$Si_4O_4Cl_8$	459.904				
362	$Si_4O_3Cl_{10}$	514.820				
363	$Si_8O_{10}Cl_{12}$	809.976				
364	SiH_3Cl	66.5411		−118	l. 1.145_4^{-113}	
365	SiH_2Cl_2	100.991		−122	l. 1.42_4^{-122}	
366	$SiHCl_3$	135.442		−134	l. 1.34	
367	$SiBr_4$	347.724		5	2.812_4^0	190
368	Si_2Br_6	535.616		95		
369	Si_3Br_8	723.508		133		
370	Si_4Br_{10}	911.400		185 d.		
371	SiH_3Br	110.999		− 94	l. 1.533^0	
372	SiH_2Br_2	189.907		− 77	l. 2.17^0	
373	$SiHBr_3$	268.816		<− 60	l. 2.7^{17}	
374	Si_2H_5Br	141.075		−100		
375	Si_2HBr_5	456.708		89		
376	$SiCl_3Br$	214.350		<− 60		
377	$SiCl_2Br_2$	258.808		<− 60		
378	$SiClBr_3$	303.266		− 39	l. 2.432	
379	SiI_4	535.788		120.5		
380	Si_2I_6	817.712		250		
381	$SiHI_3$	409.864		8	l. 3.314	
382	$SiCl_3I$	261.366		<− 60		
383	$SiCl_2I_2$	352.840		<− 60		
384	$SiClI_3$	444.314		2		
385	$SiBr_3I$	394.740		14		
386	$SiBr_2I_2$	441.756		38		
387	$SiBrI_3$	488.772		*ca.* 53		
388	SiS	60.1250			1.853_4^{15}	
389	$SiSCl_2$	131.041		75		
390	$SiCl_3.SH$	167.507				
391	$SiSBr_2$	219.957		93		
392	SiN	42.0680			3.17	
393	Si_2N_3	98.1440			3.64	
394	Si_3N_4	140.212			3.44	
395	Si_2N_3H	99.1517			2.015^{17}	

Index No.	Formula	Mol. wt.	Crystal system	M. P.	d_4^{20}	Ref. ind. finding No.
396	Si_3H_9N	107.257			l. 0.895^{-106}	
397	$N_2H_4.H_2SiF_6$	176.122		186 d.		
398	$(NH_4)_2SiF_6$—Cryptohalite	178.138	C.		2.01	68
399	$SiBr_4.6NH_3$	449.911			2.307^{17}	
400	$SiO_2.P_2O_5$	202.108			3.1	
401	$3SiO_2.2Bi_2O_3$—Agricolite	1112.18	M.		6	994
402	$3SiO_2.2Bi_2O_3$—Eulytite	1112.18	C.		6.11	175
403	SiC—Carborundum	40.0600	H.	>2700	3.17	410
404	$Si(CH_3)H_3$	46.1062		−156.4	l. 0.62_4^{-57}	
405	$Si(CH_3)_2H_2$	60.1216		−149.9	l. 0.68_4^{-80}	
406	$Si(CH_3)_4$	88.1524			l. $0.645_4^{21.9}$	
407	$Si(CH_3)_3C_2H_5$	102.168			l. 0.684	
408	$Si(C_2H_5)_3H$	116.183			l. 0.751^0	
409	$Si(CH_3)_2[(C_2H_5)_2]$	116.183			l. 0.7168	
410	$Si(CH_3)_3C_3H_7$	116.183			l. 0.701_4^{21}	
411	$Si(CH_3)_2[(CH_2)_5]$	128.183			l. 0.804	439
412	$Si(CH_3)_2(C_2H_5)(C_3H_7)$	130.199			l. $0.732_4^{17.6}$	
413	$Si(CH_3)_3(C_4H_9)$	130.199			l. 0.721_4^{17}	
414	$Si(CH_3)_3(iso\text{-}C_4H_9)$	130.199			l. 0.717_4^{18}	
415	$Si(CH_3)_2(C_3H_7)_2$	144.214			l. $0.741_4^{17.6}$	
416	$Si(CH_3)_2(C_2H_5)(iso\text{-}C_4H_9)$	144.214			l. 0.743	
417	$Si(CH_3)_3(iso\text{-}C_5H_{11})$	144.214			l. 0.731_4^{16}	
418	$Si(C_2H_5)_4$	144.214			l. $0.766_4^{19.6}$	1036
419	$Si(C_3H_7)_3H$	158.229			l. 0.762_4^{15}	
420	$Si(C_2H_5)_3(C_3H_7)$	158.229			l. 0.774_4^{17}	
421	$Si(C_2H_5)_3(C_4H_9)$	172.245			l. 0.779_4^{18}	
422	$Si(C_2H_5)_3(iso\text{-}C_4H_9)$	172.245			l. $0.781_4^{18.6}$	
423	$Si(C_2H_5)_3(iso\text{-}C_5H_{11})$	186.260			l. 0.782_4^{19}	
424	$Si(C_6H_5)_4$	336.214		233		
425	$Si_2(CH_3)_6$	146.259			l. $0.725_4^{22.5}$	
426	$Si(OCH_3)_4$	152.152			l. 1.028_4^{22}	9
427	$Si(C_2H_5)_3OH$	132.183			l. 0.871^0	
428	$Si(C_2H_5)_3OC_2H_5$	160.214			l. 0.840^0	
429	$Si(OC_3H_7)_4$	264.276			l. 0.915	1034
430	$Si(C_6H_5)_3OH$	276.183			1.178	
431	$Si(C_6H_5CH_2)_3OH$	318.229		106	1.177	
432	$Si_2O(OC_3H_7)_6$	426.443			l. $0.977_4^{22.6}$	1035
433	$Si(CH_3)H_2Cl$	80.5565		−134.1	l. 0.935_4^{-80}	
434	$Si(CH_3)HCl_2$	115.007		− 93	l. 0.93_4^0	
435	$Si(C_2H_5)Cl_3$	163.473			l. $1.239_4^{20.4}$	
436	$Si(C_3H_7)Cl_3$	177.488			l. 1.210_4^{10}	1
437	$Si(C_2H_5)_2Cl_2$	157.053			l. 1.106_4^{15}	
438	$Si(C_4H_9)Cl_3$	191.503			l. $1.162_4^{18.8}$	
439	$Si(iso\text{-}C_4H_9)Cl_3$	191.503			l. 1.154	
440	$Si(C_2H_5)(C_4H_9)Cl_2$	185.084			l. 1.042	
441	$Si(C_6H_5)Cl_3$	211.473			l. $1.326_4^{18.8}$	
442	$Si(C_6H_5CH_2)Cl_3$	225.488			l. $1.289_4^{19.3}$	
443	$Si(C_2H_5)(C_6H_5)Cl_2$	205.053			l. 1.159_4^{15}	
444	$Si(SCN)_4$	260.352		143.8		
445	TiO_2—Anatase	79.9000	Tet.		3.84	407
446	TiO_2—Brookite	79.9000	R.		4.17	1028
447	TiO_2—Rutile	79.9000	Tet.	1640 d.	4.26	409
448	Ti_2O_3	143.800	Trig.		4.6	
449	TiF_4	123.900			$2.798^{20.5}$	
450	$TiCl_4$	189.732		− 30	l. 1.726	59
451	$TiBr_4$	367.564		39		
452	$TiBrCl_3$	234.190				
453	TiI_2	301.764			4.30	
454	TiI_4	555.628		150		
455	$TiCl_4.SCl_4$	363.629		64		
456	Ti_2N_2	123.816		2930	5.18^{18}	
457	TiP	78.9240			3.95_4^{25}	
458	$TiCl_4.PCl_3$	327.130		85.5		

Index No.	Formula	Mol. wt.	Crystal system	M. P.	d_4^{20}	Ref. ind. finding No.
459	$TiCl_4.POCl_3$	343.130		110		
460	$TiCl_4.2POCl_3$	496.528		107		
461	TiC	59.9000		3180	4.25	
462	$Ti_{10}C_2N_8$	615.064			5.29	
463	Ti_2Si	123.860			4.02	
464	GeO_2	104.380	R.		4.703	
465	GeH_4	76.4108		−165	l. 1.523^{-142}	
466	Ge_2H_6	150.806		−109	l. 1.98^{-109}	
467	Ge_3H_8	225.202		−105.6	l. 2.20^{-105}	
468	$GeCl_4$	214.212		− 49.5	l. 1.874_{25}^{25}	
469	$GeHCl_3$	179.762				
470	$GeBr_4$	392.044		26.1	l. 3.132_{29}^{29}	
471	GeI_4	580.108		144	4.322_{26}^{26}	
472	$Ge(C_2H_5)_4$	188.534		− 90	$0.991_{24.5}^{24.5}$	13

All Zr salts probably contaminated with 1–5% Hf

Index No.	Formula	Mol. wt.	Crystal system	M. P.	d_4^{20}	Ref. ind. finding No.
473	ZrO_2—Baddeleyite	123.000	M.	2700	5.49	1012
473.1	ZrO_2 (free from Hf)	123.000			5.73	
474	ZrF_4	167.000			4.43	
475	$ZrCl_4$	232.832				
475.5	$ZrOCl_2.8H_2O$	322.039				274.5
476	ZrOS	139.065			4.87	
477	$4ZrO_2.3SO_3$	732.195			4.1	
478	$4ZrO_2.3SO_3.15H_2O$	1002.43	M.		2.5	
478.5	$(NH_4)_3ZrF_7$	278.034	C.			70.2
479	ZrP_2	153.048			4.77_4^{25}	
480	$2ZrCl_4.PCl_5$	673.978		164.5		
481	ZrC_2	115.000				
482	$ZrSi_2$	147.120			4.88^{22}	
483	$ZrO_2.SiO_2$—Zircon	183.060	Tet.	2500	4.5	382, 387
484	SnO	134.700	C.		6.95	
485	SnO_2—Cassiterite	150.700	Tet. H. R.		7.0	391
486	SnF_4	194.700			4.78	
487	$SnCl_2$	189.616		246.8		
488	$SnCl_4$	260.532		− 30.2	l. 2.226	
489	$H_2SnCl_6.6H_2O$	441.556			1.925^{27}	
490	$SnBr_2$	278.532		215.5	5.12^{17}	
491	$SnBr_4$	438.364		31.0	l. 3.34^{35}	
492	$SnCl_3Br$	304.990		− 31	l. 2.5^{13}	
493	$SnCl_2Br_2$	349.448		− 20	l. 2.8^{13}	
494	$SnClBr_3$	393.906		1	l. 3.1^{13}	
495	SnI_2	372.564		320		
496	SnI_4	626.428		143.5	4.46	
497	$SnCl_2I_2$	443.480			l. 3.29	
498	$SnBr_2I_2$	532.396		50 d.	3.6	
499	SnS	150.765		880	5.080^0	
500	SnS_2	182.830			4.5	
501	SnSe	197.900		861	6.18^0	
502	$SnSe_2$	277.100			5.0	
503	SnTe	246.200		780	6.48	
504	$SnCl_4.2NOCl$	391.464		180	2.6	
505	$2NH_4Cl.SnCl_4$	367.526			2.4	
506	$(NH_4)_2SnBr_6$	634.274			3.50	
507	Sn_4P_3	567.872			5.18	
508	$SnCl_4.POCl_3$	413.930		58		
509	Sn_2As_3	462.280			6.56	
510	SnC_2O_4	206.700			3.56^{18}	
512	$Sn(C_2H_5)_2$	176.777			l. 1.654	
513	$Sn(CH_3)_4$	178.792			l. 1.314^0	50
514	$Sn(CH_3)_2(C_2H_5)_2$	206.823			l. 1.232	
515	$Sn(C_2H_5)_4$	234.854			l. 1.187^{23}	44
516	$Sn(C_6H_5)_2$	272.777		225.7		

Index No.	Formula	Mol. wt.	Crystal system	M. P.	d_4^{20}	Ref. ind. finding No.
517	$Sn(C_6H_5)_4$	426.854		226		
518	$Sn_2(C_2H_5)_6$	411.631			l. 1.412^{0}	
519	$Sn(C_2H_3O_2)_2$	236.746		182		
520	$SnCl(C_2H_5)_3$	241.274			l. 1.428^{8}	
521	$SnBr(C_2H_5)_3$	285.732			l. 1.630	
522	$SnI(CH_3)_3$	290.701			l. 2.109^{18}	
523	$SnI(C_2H_5)_3$	332.748			l. 1.833^{22}	
524	PbO—Litharge	223.200	Tet.	888	9.53	423
525	PbO—Massicotite	223.200	R.		8.0	1068
526	PbO_2—Plattnerite	239.200	Tet.		9.375	417
527	Pb_3O_4—Minium	685.600			9.1	
528	PbF_2	245.200		855	8.24	
529	$PbCl_2$—Cotunnite	278.116	R.	501	5.85	1016
530	$PbCl_4$	349.032		− 15	l. 3.18_4^0	
531	$Pb(ClO_2)_2$	342.116		exp. 126		
532	$Pb(ClO_3)_2$	374.116			3.89	
533	$Pb(ClO_3)_2.H_2O$	392.131	M.	d. 110		
534	$Pb(ClO_4)_2.3H_2O$	460.162	R.	d. 100	2.6	
535	$PbO.PbCl_2$—Matlockite	501.316	Tet.	524 d.	7.21	1008
536	$2PbO.PbCl_2$—Mendipite	724.516	R.	693	7.08	1022
537	$PbO.2PbCl_2$—Penfieldite	779.432	H.			398
538	$6PbO.PbCl_2$—Lorettoite	1617.32	Tet.		7.6	418
539	$PbCl_2.PbO.H_2O$—Laurionite	519.331	R.	d. 142	6.24	1006
540	$PbCl_2.PbO.H_2O$—Paralaurionite	519.331	M.	d. 150	6.05	
541	$2PbCl_2.PbO.H_2O$—Fiedlerite	797.447	M.	d. 150	5.88	1005
542	PbFCl	261.658	Tet.	601		
543	$PbBr_2$	367.032	R.	373	6.66	
544	$Pb(BrO_3)_2.H_2O$	481.047	M.	d. 180	5.53	
545	$PbO.PbBr_2.H_2O$	608.248	R.		6.72	
546	PbClBr	322.574			5.74	
547	PbI	334.132		d. 300		
548	PbI_2	461.064	H.	402	6.16	
549	$Pb(IO_3)_2$	557.064		d. 300		
550	$PbO.PbI_2$	684.264		300 d.		
551	$PbI_2.PbO.H_2O$	702.280	R.	d. <100	6.83	
552	PbS—Galena	239.265	C.	1114	7.5	189
553	$PbSO_4$—Anglesite	303.265	R. M.	1170 Tr. 864	6.2	981
554	PbS_2O_3	319.330			5.18	
556	$PbS_2O_6.4H_2O$	439.392			3.22	311
557	$Pb_2O(SO_4)$—Lanarkite	526.465	M.	977	6.92	995
558	PbSe—Clausthalite	286.400	C.	1065	8.10	
559	$PbSeO_4$	350.400	R.	d.	6.37	
560	PbTe—Attaite	334.700	C.	917	8.16	
561	PbN_6	291.248		exp. 350		
562	$Pb(NO_3)_2$	331.216	C. M.	470	4.53	162
563	$2PbO.N_2O_5.1.5H_2O$	581.439	M.	d. 100		
564	$4PbO.N_2O_3.N_2O_5.2H_2O$	1112.86	R.	d. 100		
565	$2PbO.N_2O_5.H_2O$	572.431	R.	d. 180	5.93	
566	$(NH_4)_2PbCl_6$	456.026	C.	d. 120		
567	$Pb(PO_3)_2$	365.248		800		
568	$Pb_2P_2O_7$	588.448	R.	824	5.8	
569	$3PbO.P_2O_5$	811.648		1014 Tr. 782		389
570	$4PbO.P_2O_5$	1034.85		982		
571	$5PbO.2P_2O_5$	1400.10		946		
572	$8PbO.P_2O_5$	1927.65		860		
573	$PbCl_2.3Pb_3(PO_4)_2$—Pyromorphite	2713.06	H.	1156	6.8	1000
574	$Pb(AsO_2)_2$	421.120			5.85	
575	$Pb(AsO_3)_2$	453.120	H.		6.42	
576	$Pb_2As_2O_7$	676.320		802	6.85	998
577	$Pb_3(AsO_4)_2$	899.520		1042	7.30	
578	$Pb_3(AsO_4)_2.0.5H_2O$	908.528			7.00	

Index No.	Formula	Mol. wt.	Crystal system	M. P.	d_4^{20}	Ref. ind. finding No.
579	$5PbO.Pb_3(AsO_4)_2$	2015.52		862		
580	$5PbO.Pb_3(AsO_4)_2.0.5H_2O$	2024.53	R.		8.04	
581	$10PbO.3As_2O_5.3H_2O$	2975.81	H.		6.86	179
582	$PbHAsO_4$	347.168	M.	d. >200	5.79	1054
583	$Pb(H_2AsO_4)_2$	489.151	Tri.	d. 140	4.46	963
584	$Pb_5(PbOH)_2(AsO_4)_4$	2040.26			7.08	
585	$2Pb_3(AsO_4)_2.2Pb(OH)_2.10H_2O$	2461.62			7.1	
586	$65PbO.21As_2O_5.12H_2O$	19552.5		d. >200	7.10	
587	$9PbO.3As_2O_5.PbCl_2$—Mimetite	2976.68	H.	1140		
				Tr. 395	7.13	399
588	$4PbO.As_2O_3.2PbCl_2$—Ecdemite	1646.15	R.		7.0	
589	$3PbCl_2.3PbO.As_2O_5$—Georgiadesite	1733.87	R.	d.	7.1	
590	$5PbO.2PbCl_2.As_2O_3$	1870.15	Tet.		7.14	
591	$PbS.As_2S_3$—Sartorite	485.380	R.	<700 d.	4.6	
592	$2PbS.As_2S_3$—Dufrenoysite	724.645	R.		5.50	
593	$3PbS.2As_2S_3$—Rathite	1210.03	R.		5.41	
594	$4PbS.As_2S_3$—Jordanite	1203.18	M.		6.10	
595	$4PbS.3As_2S_3$—Baumhauerite	1695.41	M.		5.33	
596	$7PbS.2As_2S_3$—Lengenbachite	2167.09	Tri.		5.8	
597	$10PbS.3As_2S_3$—Guitermanite	3131.00			5.94	
598	$3PbO.Sb_2O_5$—Monimolite	1236.68	C.		6.58	
599	$PbO.PbCl_2.Sb_2O_3$—Nadorite	792.856	R.		7.02	1059
600	$PbS.Sb_2S_3$—Zinkenite	579.000	R.		5.3	
601	$2PbS.Sb_2S_3$—Plumosite	818.265	M.		5.62	
602	$3PbS.Sb_2S_3$—Dürfeldtite	1057.53			5.9	
603	$3PbS.2Sb_2S_3$—Domingite	1397.27			5.62	
604	$4PbS.Sb_2S_3$—Meneghinite	1296.80	R.		6.30	
605	$5PbS.Sb_2S_3$—Geocronite	1536.06	R.		6.4	
606	$5PbS.2Sb_2S_3$—Boulangerite	1875.80	R.		6.18	
607	$5PbS.2Sb_2S_3$—Mullanite	1875.80	R.		6.3	
608	$5PbS.4Sb_2S_3$—Plagionite	2555.27	M.		5.47	
609	$6PbS.Sb_2S_3$—Kilbrickenite	1775.33			6.5	
610	$PbS.Bi_2S_3$—Galenobismutite	753.460			6.9	
611	$2PbS.Bi_2S_3$—Cosalite, Bjelkite	992.725	R.		6.6	
612	$2PbS.3Bi_2S_3$—Chiviatite	2021.12			6.92	
613	$3PbS.Bi_2S_3$—Lillianite	1231.99	R.		7.0	
614	$4PbS.5Bi_2S_3$—Rezbanyite	3528.04			6.2	
615	$6PbS.Bi_2S_3$—Beegerite	1949.79	C.		7.27	
616	$2BiSCl.PbS.Bi_2S_3$	1306.51		500 d.	6.42	
617	$PbCO_3$—Cerussite	267.200	R.	d. 315	6.6	1001
618	PbC_2O_4	295.200			5.28	
619	$Pb(CH_3)_4$	267.292		− 27.5	l. 1.995	42
621	$Pb(CH_3)_3(C_2H_5)$	281.308			l. 1.889	43
622	$Pb(CH_3)_2(C_2H_5)_2$	295.323			l. 1.790	48
623	$Pb(CH_3)_3(C_3H_7)$	295.323			l. 1.760_4^{23}	37
624	$Pb(C_2H_5)_3(CH_3)$	309.339			l. 1.712_4^{23}	46
625	$Pb(CH_3)_3(C_4H_9)$	309.339			l. 1.674_4^{24}	34
626	$Pb(CH_3)_3(iso\text{-}C_4H_9)$	309.339			l. $1.668_4^{23.5}$	32
627	$Pb(CH_3)_2(C_3H_7)_2$	323.354			l. $1.623_4^{24.4}$	35
628	$Pb(C_2H_5)_4$	323.354			l. 1.659_4^{18}	51
629	$Pb(CH_3)_3(iso\text{-}C_5H_{11})$	323.354			l. $1.524_4^{21.4}$	30
630	$Pb(C_2H_5)_3(C_3H_7)$	337.369			l. $1.595_4^{22.5}$	49
631	$Pb(C_2H_5)_2(C_3H_7)_2$	351.385			l. $1.529_4^{25.4}$	41
632	$Pb(CH_3)_2(iso\text{-}C_4H_9)_2$	351.385			l. $1.504_4^{20.6}$	33
633	$Pb(C_2H_5)_3(iso\text{-}C_4H_9)$	351.385			l. $1.530_4^{22.6}$	40
634	$Pb(CH_3)_2(iso\text{-}C_5H_{11})_2$	379.416			l. 1.430	31
635	$Pb(C_2H_5)_2(iso\text{-}C_4H_9)_2$	379.416			l. 1.456_4^{22}	36
636	$Pb(C_2H_5)_3(C_5H_{11})$	365.400			l. 1.482	38
637	$Pb(C_2H_5)_3(iso\text{-}C_5H_{11})$	365.400			l. $1.506_4^{21.8}$	39
638	$Pb(C_6H_5)_4$	515.354		227.7		
639	$Pb(CHO_2)_2$	297.215	R.	d. 190	4.63	973
640	$Pb(dl\text{-}C_4H_4O_6)$	355.231			2.530^{19}	
641	$Pb(d\text{-}C_4H_4O_6)$	355.231	R.		3.871^{19}	

Index No.	Formula	Mol. wt.	Crystal system	M. P.	d_4^{20}	Ref. ind. finding No.
642	$Pb(C_2H_3O_2)_2$	325.246		280	3.251	
643	$Pb(C_2H_3O_2)_2.3H_2O$	379.292	M.	75	2.55	710
644	$Pb(C_2H_3O_2)_2.10H_2O$	505.400	R.	22	1.689	
645	$Pb(C_2H_3O_2)_4$	459.292		180	2.23_4^{18}	
646	$Pb(C_3H_5O_2)_4$	515.354		132		
647	$Pb(C_6H_{11}O_2)_2$	437.369		74		
648	$Pb(C_7H_{13}O_2)_2$	465.400		91.5		
649	$Pb(C_8H_{15}O_2)_2$	493.431		84.5		
650	$Pb(C_9H_{17}O_2)_2$	521.416		95		
651	$Pb(C_{10}H_{19}O_2)_2$	549.493		100		
652	$Pb(C_{12}H_{23}O_2)_2$	605.554		104		
653	$Pb(C_{14}H_{27}O_2)_2$	661.616		107		
654	$Pb(C_{16}H_{31}O_2)_2$	717.677		112		
655	$Pb(C_{18}H_{33}O_2)_2$	769.708		*ca.* 80		
656	$Pb(C_{18}H_{35}O_2)_2$	773.739		125		
657	$3PbO.2CO_2.H_2O$—Hydrocerusite	775.615	H.	d. 400	6.14	395
658	$PbCl_2.PbCO_3$—Phosgenite	545.316	Tet.		6.13	396
659	$PbBr_2.PbCO_3$	634.232	Tet.	d.	6.55	
660	$Pb(OH)_2.PbSO_4.2PbCO_3$—Leadhillite	1078.88	M.		6.5	996
661	$Pb(OH)_2.PbSO_4.2PbCO_3$—Maxite	1078.88	R.		6.9	
662	$Pb(SCN)_2$	323.346	M.		3.82	
663	$PbSiO_3$—Alamosite	283.260	M.	766	6.49	992
664	$2PbO.SiO_2$	506.460		746		
665	$3PbO.SiO_2$?	729.660		717		
666	$3PbO.2SiO_2$—Barysilite	789.720	Trig.		6.72	394
667	$SnPbS_2$—Teallite	390.030	R.		6.4	
668	ThO_2—Thorianite	264.150	C.	>2800	9.69	182
669	$ThCl_4$	373.982	R.	820	4.59	
670	$ThBr_4$	551.814			5.67	
671	ThS_2	296.280		d.	6.8	
672	ThOS	280.215		d.	6.44	
673	$Th(SO_4)_2.9H_2O$	602.419	M.	d.	2.77	
674	$Th(PO_3)_4$	548.246	R.		4.08	
675	ThC_2	256.150			8.96	
676	$ThSi_2$	288.270			7.96^{16}	
677	$ThO_2.SiO_2$—Thorite	324.210	Tet.		5.3	
678	$GaCl_2$	140.636		175		
679	$GaCl_3$	176.094		75.5	l. 2.36_{80}^{80}	
680	$(NH_4)_2Ga_2(SO_4)_2.24H_2O$	992.147			1.77	89
681	In_2O_3	277.600	Trig.		7.179	
682	$InCl_3$	221.174			4.0	
683	$In(ClO_4)_3.8H_2O$	557.297		80		
684	InI	241.732		351		
685	InI_2	368.664		212		
686	InI_3	495.596		199		
687	$In_2(SO_4)_3$	517.795			3.438	
688	$(NH_4)_2InCl_5.H_2O$	346.183	R.		2.281	
689	$(NH_4)_2InBr_5.H_2O$	568.473	R.		3.167	
690	$(NH_4)_2In(SO_4)_2.12H_2O$	541.154			2.011	88
691	Tl_2O	424.800		300		
692	Tl_2O_3	456.800		759	brown 9.65_4^{21} black 10.19_4^{22}	
693	TlOH	221.408				
694	$Tl(OH)_3$	255.423		>340		
695	TlF	223.400				
696	TlCl	239.858		430	7.00	
697	$TlCl_3.4H_2O$	382.836		37		
698	$TlClO_3$	287.858			5.0479	
699	$TlClO_4$	303.858		501	4.89	
700	TlBr	284.316		460	$7.557_4^{17.3}$	
701	$TlBr_3.4H_2O$	516.210		40		
702	$TlBr_2Cl.4H_2O$	471.752		40 d.		
703	TlI	331.332		440	$7.09_4^{14.7}$	

Index No.	Formula	Mol. wt.	Crystal system	M. P.	d_4^{20}	Ref. ind. finding No.
704	Tl_2S	440.865		448	8.0	
705	Tl_2S_5	569.125		125		
706	Tl_8S_7	185.966		127		
707	Tl_2SO_4	504.865	R.	632		975
708	$Tl_2S_2O_6$	568.930	M.		5.57	
709	$TlHSO_4$	301.473		120 d.		
710	Tl_2Se	488.000		340		
711	$Tl_2Se.Tl_2Se_3$	1134.40		338		
712	Tl_2SeO_4	552.000	R.		6.875	991
713	Tl_2Te	536.300		412		
714	Tl_2TeO_4	600.300			5.712	
715	TlN_3	246.424		334		
716	$TlNO_3$	266.408	γ R.	206	$5.556_4^{21.4}$	1053
			β Trig.	Tr. 75 (γ to β)		
			α C.	Tr. 145 (β to α)		
717	$(NH_4)_3TlCl_6.2H_2O$	507.295			2.389	
718	Tl_3PO_4	708.224			6.89	
719	$Tl_4P_2O_7$	991.648	M.	>120	6.786	
720	TlH_2PO_2	269.439	M.	190		
721	TlH_2PO_4	301.439	M.	190	4.723	
722	$Tl_2H_2P_2O_7$	584.863		270		
723	$Tl_2S.As_2S_3$—Lorandite	686.980	M.		5.53	1072
724	$TlSbAs_2S_5$—Vrbaite	636.415	R.		5.30	
725	Tl_2CO_3	468.800			7.11	
726	$Tl(C_2H_3O_2)$	263.423		110	3.68	
					l. 3.9	
727	$Tl(CHO_2)_3$	339.423	M.	95		
728	$Tl(C_3H_5O_2)$	277.439		140	2.8	
729	$Tl(d\text{-}C_4H_5O_6)$	353.439	R.		3.496	
730	$Tl(dl\text{-}C_4H_5O_6)$	353.439	Tri.		3.494	
731	$Tl(meso\text{-}C_4H_5O_6).0.5H_2O$	362.446	Tri.		3.518	
732	$TlH(C_2H_3O_2)_2$	323.454		64		
733	$Tl_2(d\text{-}C_4H_4O_6)$	556.831	Trig.		4.80	558
734	$Tl_2(meso\text{-}C_4H_4O_6)$	556.831	Tri.		5.110	899
735	$Tl_2(dl\text{-}C_4H_4O_6)$	556.831	M.	165	4.66	957
736	$Tl_2(d\text{-}C_4H_4O_6).0.5H_2O$	565.838	M.		4.60	
738	$TlH(Cl_3CCO_2)_2$	530.156	Tet.		2.822_4^{18}	
739	$TlH(CBr_3CO_2)_2$	796.904	M.		3.923^{18}	
740	$TlOC_6H_2(NO_2)_3$—Picrate	432.440	M. (red)		3.164_4^{17}	
			Tri. (yellow)		2.993_4^{25}	
741	$Tl(SbO)(d\text{-}C_4H_4O_6).H_2O$	508.216	R.		3.990	
742	$TlCl.2PbCl_2$	796.090	C.	435		
743	$TlGa(SO_4)_2.12H_2O$	682.435			2.477	110
744	ZnO—Zincite	81.3800	H.	>1800	5.606	392
745	ZnO	81.3800			5.47	
746	$Zn(OH)_2$	99.3954	R.	d. 125	3.053	
747	ZnF_2	103.380	M. Tri. ?	872	4.84_4^{15}	
748	$ZnF_2.4H_2O$	175.442	R.	Tr. 100	2.535_4^{12}	
749	$ZnCl_2$	136.296	C.	365	2.91_4^{25}	
750	$Zn(ClO_3)_2.4H_2O$	304.357			2.15	
751	$Zn(ClO_4)_2.6H_2O$	372.388			2.15	
752	$ZnBr_2$	225.212	R.	394	4.219	
753	ZnI_2	319.244	C.	446	$4.666_4^{14.2}$	
754	$Zn(IO_3)_2$	415.244		d.	4.98	
755	$ZnS(\alpha)$—Würzite	97.4450	H.	$1850^{150 at.}$	4.087	404
756	$ZnS(\beta)$—Sphalerite	97.4450	C.	Tr. 1020	4.102_4^{25}	187
757	$ZnSO_4$—Zinkosite	161.445	R.	d. 740	3.74_4^{15}	860
758	$ZnSO_4.H_2O$	179.460		d. 238	3.28_4^{15}	
759	$ZnSO_4.6H_2O$	269.537	M.	Tr. 70.0	2.072_4^{15}	
760	$ZnSO_4.7H_2O$—Goslarite	287.553	R.	Tr. 39.0	1.97	490
761	$ZnS_2O_6.6H_2O$	333.602	Tri.		1.915	
762	$ZnSe$	144.580	H.		5.42_4^{15}	188.1

Index No.	Formula	Mol. wt.	Crystal system	M. P.	d_4^{20}	Ref. ind. finding No.
763	$ZnSeO_4.5H_2O$	298.657	Tri.	d. >50	2.591	
764	$ZnSeO_4.6H_2O$	316.672	Tet.	d.	2.325	252
765	ZnTe	192.880	C.	1238.5	5.54_4^{18}	188.2
766	$Zn(NO_3)_2$	189.396		44.07		
767	$Zn(NO_3)_2.3H_2O$	243.442		45.5		
768	$Zn(NO_3)_2.6H_2O$	297.488	Tet.	36.4	2.065_4^{14}	
769	$ZnCl_2.NH_3$	153.377				
770	$ZnCl_2.2NH_3$	170.358	R.	210.8		
771	$ZnCl_2.2NH_4Cl$	243.290	R.		1.82	
772	$Zn(ClO_3)_2.4NH_3$	300.420		exp. 205	1.84	
773	$ZnBr_2.2NH_4Br$	421.122			2.625	
774	$Zn(BrO_3)_2.4NH_3$	389.336		exp. 169	2.27	
775	$Zn(IO_3)_2.4NH_3$	483.368		exp. 215	2.82	
776	$ZnSO_4.(NH_4)_2SO_4$	293.588			2.25	
777	$ZnSO_4.(NH_4)_2SO_4.6H_2O$	401.680	M.	d.	1.931	516
778	$Zn(SeO_4).(NH_4)_2SO_4.6H_2O$	495.950	M.		2.20	620
779	Zn_3P_2	258.188	C.	>420	4.55_4^{18}	
780	$Zn_3(PO_4)_2$	386.188	R.	900	3.998_4^{15}	
781	$Zn_3(PO_4)_2.4H_2O$—α Hopeite	458.250	R.	Tr. >105	3.04	734
782	$Zn_3(PO_4)_2.4H_2O$—β Hopeite	458.250	R.	Tr. >140	3.03	720
783	$Zn_3(PO_4)_2.4H_2O$—Parahopeite	458.250	Tri.	Tr. >163		793
784	$ZnH_4(PO_4)_2.2H_2O$	295.490	Tri.	100 d.		
785	$Zn_2(OH)PO_4$—Tarbuttite	242.792	Tri.		4.13	898
786	$Zn_3(PO_4)_2.Zn(OH)_2.3H_2O$—Spencerite	539.630	M.	d. 100	3.14	755
787	$Zn_2P_2S_6$	385.198	H.		2.2	
788	$ZnAs_2$	215.300		771		
789	Zn_3As_2	346.060	C.	1015		
790	$Zn_2As_2O_7$	392.680			4.701_4^{21}	
791	$Zn_3As_2O_8$	474.060	R.		4.913_4^{15}	
792	$Zn_3(AsO_4)_2.8H_2O$—Koettigite	618.183	M.	d. 100	3.309^{15}	881
793	$4ZnO.As_2O_5.H_2O$—Adamite	573.455	R.	d. >100	4.345	918
794	$ZnCO_3$—Smithsonite	125.380	Trig.	d. 300	4.44	369
795	ZnC_2O_4	153.380			$2.58_4^{17.5}$	
796	$ZnC_2O_4.2H_2O$	189.411		d. 100	2.562	
797	$Zn(CH_3)_2$	95.4262		− 40	l. 1.386^{10}	
798	$Zn(C_2H_5)_2$	123.457		− 28	l. 1.182^{18}	
799	$Zn(C_3H_7)_2$	151.488				
800	$Zn(iso\text{-}C_5H_{11})_2$	207.549			l. 1.022^0	
801	$Zn(CHO_2)_2$	155.395			2.36	
802	$Zn(CHO_2)_2.2H_2O$	191.426	M.		2.205	
803	$Zn(C_2H_3O_2)_2$	183.426		142	1.840	
804	$Zn(C_2H_3O_2)_2.2H_2O$	219.457	M.	237	1.735	518
805	$Zn(l\text{-}C_4H_5O_5)_2.2H_2O$—*l*-Malate	367.488	Tet.		1.701^{20}	
806	$Zn(C_3H_7CO_2)_2$	239.488	M.			535
807	$5ZnO.2CO_2.3H_2O$—Hydrozincite	548.947	M. ?		3.7	920
808	$Zn(CH_2SO_3)_2.3H_2O$—Ethane disulfonate	307.587	Tri.		2.043	
809	$ZnC_{10}H_6O_6S_2.6H_2O$—1, 5-Naphthalene disulfonate	459.649	M.		1.793	791
810	$Zn(CN)_2$	117.396	R.	d. 800		
811	$ZnO.SiO_2$	141.440		1437	3.52	
					l. 3.86 gls	
812	$2ZnO.SiO_2$—Willemite	222.820	Trig.	1509	3.9	341
813	$2ZnO.SiO_2.H_2O$—Calamine	240.835	R.		3.45	780
814	$ZnSiF_6.6H_2O$	315.532	H.		2.104	209
815	ZnSiS	125.505			3.41	
816	$ZnO.TiO_2$	161.280			3.17	
817	$ZnO.3TiO_2$	321.080			4.92_4^{15}	
818	$3ZnO.2TiO_2$	403.940			3.83	
819	$4ZnO.5TiO_2$	725.020			3.68_4^{19}	
820	$Tl_2Zn(SO_4)_2.6H_2O$	774.402	M.	d. 120	3.720	771
821	CdO	128.410	C.		8.15	
822	Cd_2O	240.820		d.	8.192_4^{18}	
823	$Cd(OH)_2$	146.425	Trig.	d. 300	4.79_4^{15}	

Index No.	Formula	Mol. wt.	Crystal system	M. P.	d_4^{20}	Ref. ind. finding No.
824	CdF_2	150.410	C.	1100	6.64	
825	$CdCl_2$	183.326	C.	568	4.047_4^{25}	
826	$CdCl_2.2.5H_2O$	228.364	M.	Tr. 34	3.327	829
827	$Cd(ClO_3)_2.2H_2O$	315.357		80		
828	$CdCl_2.CdO.H_2O$	329.751	H.	d. 280	4.56_4^{15}	
829	$CdBr_2$	272.242		583	5.192_4^{25}	
830	$Cd(BrO_3)_2.2H_2O$	404.273	R.		3.758	
831	$CdO.CdBr_2.H_2O$	418.667			4.87_4^{15}	
832	$CdI_2(\alpha)$	366.274	H.	388	5.670_4^{30}	
832.1	$CdI_2(\beta)$	366.274			5.305_4^{30}	
833	$Cd(IO_3)_2$	462.274			6.48	
834	$Cd(IO_3)_2.H_2O$	480.289		Tr. 160	6.43	
835	CdS—Greenockite	144.475	H.	$1750^{100\ at.}$	4.820	406
836	$CdSO_4$	208.475	R.	1000	4.691_4^{24}	
837	$CdSO_4.H_2O$	226.490	M.	Tr. 108	3.786	
838	$CdSO_4.2.66H_2O$	256.583	M.	Tr. 41.5	3.090	688
839	$CdSO_4.7H_2O$	334.583	M.	Tr. 4	2.48	
840	$CdS_2O_6.6H_2O$	380.632	Tri.	d.	2.272	
841	CdSe	191.610	H.		5.81_4^{15}	
842	$CdSeO_4.2H_2O$	291.641	R.	d. 100	3.632	
843	CdTe	239.910	C.	1041	6.20^{15}	
844	$Cd(NO_3)_2$	236.426		350		
845	$Cd(NO_3)_2.4H_2O$	308.488		59.4	2.455_4^{17}	
846	$CdCl_2.NH_4Cl$	236.823	R.		2.93	
847	$CdCl_2.4NH_4Cl$	397.313	Trig.	Tr. − 20	2.01	296
848	$CdCl_2.2NH_2OH$	249.388		d. 130	2.72_{18}^{18}	
849	$Cd(ClO_3)_2.6NH_3$	381.513		exp. 184	1.78	
850	$Cd(BrO_3)_2.4NH_3$	436.366		exp. 192	2.53	
852	$Cd(IO_3)_2.4NH_3$	530.398		exp.	3.23	
853	$CdSO_4.(NH_4)_2SO_4$	340.618		d.	3.11	
854	$CdSO_4.(NH_4)_2SO_4.6H_2O$	448.710	M.	d. 100	2.067	500
855	$CdSeO_4.(NH_4)_2SeO_4.2H_2O$	470.918	Tri.		3.376	
856	$CdSeO_4.(NH_4)_2SeO_4.6H_2O$	542.980	M.	d. 20	2.307	
857	$Cd_2P_2O_7.2H_2O$	434.899		900	4.965_4^{15}	
858	$Cd_3(PO_4)_2$	527.278		1500		
859	$5CdO.2P_2O_5.5H_2O$	1016.22	M.	d. 550	4.13_4^{15}	
860	$Cd(H_2PO_4)_2.2H_2O$	342.520	Tri.	d. 100	2.742_4^{15}	
861	$Cd_3(PO_4)_2.2CdHPO_4.4H_2O$	1016.22	M.	d. 600	4.06	
862	$3Cd_3(PO_4)_2.CdCl_2$	1765.16			5.46_4^{15}	
863	Cd_3As_2	487.150	C.		6.211	
864	$Cd_2As_2O_7$	486.740			5.974	
865	$CdHAsO_4.H_2O$	270.393		d. >120	4.164_4^{15}	
866	$Cd(H_2AsO_4)_2.2H_2O$	430.392	Tri.	d. 75	3.241_4^{15}	
867	CdSb	234.180		455		
868	$CdCO_3$	172.410	Trig.	d. <500	4.258	
869	CdC_2O_4	200.410		d. 340	3.32^{18}	
870	$Cd(CH_3)_2$	142.456				
871	$Cd(CHO_2)_2.2H_2O$	238.456	M.		2.44	
872	$Cd(C_2H_3O_2)$	171.433		256	2.341	
873	$Cd(C_2H_3O_2).2H_2O$	207.464	M.		2.01	
874	$Cd(CH_2SO_3)_2.2H_2O$	336.602	Tri.		2.570	
875	$Cd(CN)_2$	164.426		d. >200		
876	$CdO.SiO_2$	188.470		1242	4.93	
877	$2CdO.SiO_2$	316.880		1243		
878	HgO—Montroydite	216.610	R.	d. 100	11.14	1027
879	Hg_2O	417.220		d. 100	9.8	
880	HgF	219.610	C. ?	570	8.73	
881	HgF_2	238.610	C.	645 d.	8.95	
882	HgCl—Calomel	236.068	Tet.	302	7.150	390
883	$HgCl_2$—Corrosive sublimate	271.526	R.	277	5.44 l. 4.44^{280}	
884	$HgClO_3$	284.068	R.	d. 250		

Index No.	Formula	Mol. wt.	Crystal system	M. P.	d_4^{20}	Ref. ind. finding No.
885	$HgClO_4.6H_2O$	408.160		d. 150	4.28	
886	$Hg(ClO_4)_2.7H_2O$	525.634		34 d.	2.78	
887	Hg_2ClO—Terlinguaite	452.678	M.	d.	8.725	1070
888	$HgCl_2.2HgO$	704.746	H.	d.	red 8.3	
			M.	d.	black 8.5	
889	$HgO.2HgCl_2$	759.662			6.42	
890	$Hg_2O.2HgCl$—Eglestonite	889.356	C.		8.33	195
891	$HgCl_2.3HgO$—Kleinite	921.356	H.	d. 260	7.93	
892	$HgCl_2.4HgO$	1137.97	H.		9.10	
893	$HgBr$	280.526			7.307	
894	$HgBr_2$	360.442	R.	237	6.053	
					l. 5.12^{240}	
895	$HgBr_2.4HgO$	1226.88	R.	d. 230	8.73	
896	HgI	327.542	Tet.	290 d.	7.70	
897	HgI_2 (red)	454.474	Tet.	Tr. 127	6.283	
898	HgI_2 (yellow)	454.474	R.	259	6.271	
					l. 5.24^{255}	
899	$Hg_2Cl_2I_2$	726.000	R.	153		
900	HgS—Metacinnabarite	232.675	C.		7.50	
901	HgS (α)—Cinnabarite	232.675	H.		8.10	411
902	HgS (β)	232.675	H.		7.73	
903	$HgSO_4$	296.675	R.	d.	6.47	
904	Hg_2SO_4	497.285	M.	d.	7.56	
904.1	$Hg_2SO_4Cl_2$	568.201		270		
904.2	$Hg_2SO_4Br_4$	816.949		d. 125		
904.3	$Hg_2SO_4I_2$	751.149		248		
905	$HgSO_4.3HgS$	994.700		d. 120	6.416	
906	Hg_2SeO_3	528.420		180 d.		
907	$HgNO_2$	246.618		d. 140	5.925	
908	$HgNO_3.H_2O$	280.633	M.	70	$4.785^{3.9}$	
909	$Hg(NO_3)_2.0.5H_2O$	333.634		79	4.3	
910	$Hg_2(NO)_2$	461.236		d. 100	7.33	
911	$(HgOH)_2.NH_2OH$	468.267			4.083	
912	$HgCl_2.N_2H_4.HCl$	340.039		157		
913	$HgCl_2.2NH_4Cl.H_2O$	396.535	R.		2.84	
914	$HgCl_2.12NH_3$	475.899		− 9 P.		
914.1	$Hg_2(NO_3)_2Cl_4$	667.068		d. 100		
915	$HgBr_2.2N_2H_4.HBr.H_2O$	603.475		73		
916	$NHg_2Br.3NH_4Br$	789.008	R.	180 d.		
916.1	$Hg_2(NO_3)_2I_4$	1032.96		250		
917	$HgS.2Sb_2S_3$—Livingstonite	912.145	R.		4.81	1029
918	$Hg(CH_3)_2$	230.656			l. 3.069	53
919	$Hg(C_2H_5)_2$	258.687			l. 2.444	54
920	$Hg(C_3H_7)_2$	286.718			l. 2.124^{16}	
921	$Hg(iso\text{-}C_4H_9)_2$	314.748			l. 1.835^{15}	
922	$Hg(C_6H_5)_2$	354.687		121.8	2.318	
923	$Hg(C_{10}H_7)_2$—Mercury α-naphthyl	454.718		188	1.929	
924	$Hg(C_2H_3O_2)_2$	318.656		d.	3.270	
925	$Hg(C_3H_5O_2)_2$	346.687		110		
926	$Hg(C_7H_5O_2)_2$	442.687		165		
927	$Hg(C_{18}H_{33}O_2)_2$—Oleate	763.118		103		
928	$Hg_2(C_3H_5O_2)_2$	547.297		225 d.		
929	$HgCH_3Cl$	251.091		170	4.063	
930	HgC_2H_5Cl	265.107		193	3.482	
931	$HgCH_3I$	342.565		143		
932	$Hg(C_2H_5S)_2$	322.817		77		
933	$Hg(CN)_2$	252.626	Tet.		4.00	
934	CuO—Paramelaconite	79.5700			6.4	
935	CuO—Tenorite	79.5700	C.	d. $1026^{153\ mm\ O_2}$	6.40	1078
936	Cu_2O—Cuprite	143.140	C.	$1235^{0.6\ mm\ O_2}$	6.0	188
937	CuF	82.5700		908		
938	$CuF_2.5HF.6H_2O$	309.701	M.	d.	2.405	
939	$CuCl$—Nantokite	99.0280	C.	422	3.53	173

Index No.	Formula	Mol. wt.	Crystal system	M. P.	d_4^{20}	Ref. ind. finding No.
940	$CuCl_2$	134.486		498	3.054	
941	$CuCl_2.2H_2O$	170.517	R	110 d.	$2.390^{22.4}$	883
942	$Cu(ClO_3)_2.6H_2O$	338.578	C. ?	65		
943	$Cu(ClO_4)_2.7H_2O$	388.594			1.955	
944	$3CuO.CuCl_2.3H_2O$—Atacamite	427.242	R.	d. 200	3.94	1033
945	$3CuO.CuCl_2.3H_2O$—Paratacamite	427.242	Trig.	d. 200	3.74	172
946	$4CuO.Cl_2O_5.3H_2O$	523.242	R. M. ?	d.	3.55	
947	CuBr	143.486	C.	504	4.72	
948	$CuBr_2$	223.402	M.	498		
949	$CuBr_2.4H_2O$	295.464	R.	Tr. 30		
950	$Cu(BrO_3)_2.6H_2O$	427.494	C.	d. 180	2.583	
951	CuI—Marshite	190.502	C. Tet.	605	5.62	186
952	$Cu(IO_3)_2$	413.434	M.	d.	5.241^{15}	
953	$Cu(IO_3)_2.H_2O$	431.449	Tri.	d. 240	4.876^{15}	
954	$Cu(IO_3)OH$	255.510	R.	d. 290	4.878^{15}	
955	CuS—Covellite	95.6350	H. M. ?	Tr. 103	4.6	
956	Cu_2S—Chalcocite	159.205	R.	1100	5.6	
957	Cu_2S	159.205	C.	1130	5.783	
958	$CuSO_4$—Hydrocyanite	159.635	R.	200	3.6	
959	$CuSO_4.H_2O$	177.650		d. 221	3.17	
960	$CuSO_4.3H_2O$	213.681	M.		2.663	
961	$CuSO_4.5H_2O$—Chalcanthite	249.712	Tri.	d. 20	$2.286_4^{15.6}$	641
962	$CuSO_4.7H_2O$—Boothite	285.743	M.		1.944^{21}	
963	$Cu_2SO_3.H_2O$	225.220	H.		3.83^{15}	
964	$3CuO.SO_3.2H_2O$—Antlerite	354.806	R.		3.9	921
965	$Cu_2SO_3.CuSO_3.2H_2O$	386.871		d. 150	3.57	
966	$4CuO.SO_3.3H_2O$—Brochantite	452.391	R.		3.907	944
967	$4CuO.SO_3.4H_2O$—Langite	470.407	R.		3.49	939
968	$7CuO.2SO_3.5H_2O$	807.197	R.		3.85	
969	$20CuO.SO_3.2CuCl_2.20H_2O$—Connellite	2300.75	H.		3.4	350
970	Cu_2Se	206.340	C.	1113	6.749_4^{30}	
971	Cu_3Se_2—Umangite	349.110			5.620	
972	$CuO.SeO_2.2H_2O$—Chalcomenite	226.801	M. R. ?		3.76	916
973	$CuSeO_4.5H_2O$	296.847	Tri.		2.559	
974	$Cu(NO_3)_2.3H_2O$	241.631		114.49	2.047	
975	$Cu(NO_3)_2.6H_2O$	295.678		26.4 d.		
976	$4CuO.N_2O_5.3H_2O$—Gerhardite	480.342	R.		3.43	903
977	$CuCl_2.2NH_4Cl$	241.480			$1.905_{12}^{11.6}$	
978	$CuCl_2.2NH_4Cl.2H_2O$	277.510	Tet.	d. 110	1.98	354
979	$CuCl.3NH_3$	150.121		123		
980	$2CuCl.NH_3$	215.087		162		
981	$2CuCl.3NH_3$	249.149		144		
982	$3CuCl_2.10NH_3$	573.769		270		
983	$Cu(ClO_3)_2.4NH_3$	298.610		d. 90	1.81	
984	$CuBr_2.2NH_3$	257.464		d. 200		
985	$CuBr.3NH_3$	194.579		115		
986	$2CuBr.3NH_3$	338.065		135		
987	$Cu(BrO_3)_2.4NH_3$	387.526		exp. 140	2.31	
988	$CuI.3NH_3$	241.595		105		
989	$2CuI.3NH_3$	432.097		117		
990	$Cu(IO_3)_2.5NH_3$	498.590		exp. 215	2.72	
991	$(NH_4)_2SO_4.CuSO_4$	291.778			2.348	
992	$(NH_4)_2SO_4.CuSO_4.6H_2O$	399.870	M.	d. 120	1.87	538
993	$(NH_4)_2SeO_4.CuSeO_4.6H_2O$	494.140	M.		2.22	639
994	CuP	94.5940			5.14	
995	Cu_2P	158.164		d.	6.4	
996	Cu_3P_2	252.758		d.	6.67	
997	$4CuO.P_2O_5.H_2O$—Libethenite	478.343	R.		3.7	932
998	$4CuO.P_2O_5.2H_2O$—Pseudolibethenite	496.359			4.0	
999	$4CuO.P_2O_5.3H_2O$—Tagilite	514.374			4.08	968
1000	$5CuO.P_2O_5.2H_2O$—Dihydrite	575.929	M. Tri.		4.2	940
1001	$6CuO.P_2O_5.3H_2O$—Phosphochalite	673.514			4.4	
1002	$Cu(H_2PO_2)_2$	193.649		exp. 90		

Index No.	Formula	Mol. wt.	Crystal system	M. P.	d_4^{20}	Ref. ind. finding No.
1003	$CuPO_4.CuOH$	239.172	R.			931
1004	Cu_3As—Domeykite	265.670	H.	830	8.00	
1005	$3CuO.As_2O_5.5H_2O$—Trichalcite	558.707	R.			885
1006	$4CuO.As_2O_5.H_2O$—Olivenite	566.215	R.		4.3	951
1007	$4CuO.As_2O_5.3H_2O$—Leucochalcite	602.246	R.			960
1008	$4CuO.As_2O_5.7H_2O$—Euchroite	674.308	R.		3.40	891
1009	$5CuO.As_2O_5.H_2O$—Erinite	645.785			4.04	964
1010	$6CuO.As_2O_5.3H_2O$—Clinoclasite	761.386	M.		4.37	976
1011	$7CuO.As_2O_5.14H_2O$—Chalcophyllite	1039.12	Trig.		2.66	306
1012	$5CuO.As_2O_5.9H_2O$—Tyrolite	789.909	R.		3.05	912
1013	$2Cu_2S.As_2S_3$	564.525			4.289	
1014	$3Cu_2S.As_2S_5$—Enargite	787.860	C.		4.40	
1015	$3Cu_2S.2As_2S_3$—Binnite	969.845	C.		4.48	
1016	$Cu_3(AsO_4)_2.3NH_3.4H_2O$	591.785	Tri.		3.05	
1017	Cu_3Sb (β)	312.480		687	8.51 (β)	
				Tr. 407 (β to α)	8.48 (α)	
1018	Cu_5Sb_2	561.390		830		
1019	$Cu_2S.Sb_2S_3$—Chalcostibite	498.940	R.		4.932	
1020	$Cu_2S.2Sb_2S_3$—Guejarite	838.675	R.		4.814	
1021	$3Cu_2S.Sb_2S_3$—Stylotypite	817.350			5.147	
1022	$Cu_2S.Bi_2S_3$—Emplectite	673.400	R.		6.10^{15}	
1023	$5Cu_2S.2Bi_2S_3$—Wittichenite	1824.42			5.9^{15}	
1024	$2Cu_2S.Bi_2S_3.2BiSCl$	1385.7			6.78	
1025	$2Cu_2S.Bi_2S_3.2BiSBr$	1474.6			6.41	
1025.1	$20CuO.Bi_2O_3.5As_2O_5.22H_2O$—Mixite	3603.34			3.79	352
1026	$2CuO.CO_2$—Mysorine	203.140			4.398	
1027	$2CuO.CO_2.H_2O$—Malachite	221.155	M.		4.0	977
1028	$3CuO.2CO_2.H_2O$—Azurite	344.725	M.	d. 220	3.88	938
1029	$Cu(CHO_2)_2$	153.585			1.831	
1030	$Cu(CHO_2)_2.4H_2O$	225.647	M		1.795	652
1031	$Cu(C_2H_3O_2)_2$	181.616			1.930	
1032	$Cu(C_2H_3O_2)_2.H_2O$	199.632		115	1.882	667
1033	$Cu(C_2H_3O_2)_2.2H_2O$	217.647		d. 240	1.9	
1034	$Cu(CH_2SO_3)_2.4H_2O$—Ethane disulfonate	323.790	Tri.		2.061	
1035	$CuC_{10}H_6O_6S_2.6H_2O$—1, 5-Naphthalene disulfonate	457.839	M.		1.783	792
1036	$CuCN$	89.5780	M.	474.5		
1037	$CuC_2O_4.2NH_3$	185.632			2.305_4^{25} (α)	
					2.225_4^{25} (β)	
1038	$CuSCN$	121.643			2.846_{15}^{5}	
1039	$Cu_2(NH_3)_2(SCN)_2$	277.348	R.	d. 20	1.021^{25}	
1040	Cu_2Si	155.200			6.9^{18}	
1041	Cu_4Si	282.340		850	7.53	
1042	Cu_5Si_2	373.970		775		
1043	$CuO.SiO_2.H_2O$—Bisbeeite	157.645	R.			783
1044	$CuO.SiO_2.H_2O$—Dioptase	157.645	Trig.		3.05	319
1045	$2CuO.2SiO_2.H_2O$—Shattuckite	297.275	M.			948
1046	$6CuO.5SiO_2.2H_2O$—Plancheite	813.751	M.		3.36	320
1047	$CuSiF_6.6H_2O$	313.722	R.		2.158^{19}	211
1048	$CuCl_2.PbO.H_2O$—Percylite	375.701	C.		$4.67^{18.7}$	176
1049	$2CuO.5PbO.3SO_3.CO_2.3H_2O$—Linarite	1613.38	M.		5.4	967
1050	$CuO.4PbO.P_2O_5$—Tsumebite	1114.42	R.		6	987
1051	$Cu_2S.2PbS.Bi_2S_3$—Aikinite	1151.93	R.		6.45	
1053	$5Cu_2S.2ZnS.2As_2S_3$—Tennantite	1483.14	C.		4.4	198
1054	Cu_2HgI_4	835.478			6.096_4^0	
1055	$CuCl.HgS$	331.703			6.29	
1056	Ag_2O	231.760	C.	d. 300	$7.143^{16.6}$	
1057	Ag_2O_2	247.760		d. >100	7.44	
1058	AgF	126.880	C.	435	$5.852^{15.5}$	
1059	$AgCl$—Cerargyrite	143.338		455	5.56	177
1060	$AgClO_3$	191.338	Tet.	230	4.430	
1061	$AgClO_4$	207.338		d. 486		
1062	$AgBr$—Bromyrite	187.796	C.	434	6.474	185

Index No.	Formula	Mol. wt.	Crystal system	M. P.	d_4^{20}	Ref. ind. finding No.
1063	$AgBrO_3$	235.796	Tet.	d.	5.206	372
1064	AgI—Iodyrite	234.812	H.	d. 552	5.67	400
1065	$AgIO_3$	282.812	R.	>200	5.525	
1066	Ag_2S—Acanthite	247.825	R.	825 Tr. 175	7.326	
1067	Ag_2S—Argentite	247.825	C.	Tr. 175	7.317	
1068	Ag_2SO_4	311.825	R.	652	$5.45_4^{29.2}$	
1069	$Ag_2S_2O_6.2H_2O$	411.921	R.		3.61	844
1070	Ag_2Se—Naumannite	294.960		880	8.0	
1071	Ag_2SeO_3	342.960			5.929	
1072	Ag_2Te—Hessite	343.260	C.	955	8.5	
1073	AgN_3	149.904		exp. 251.5		
1074	$AgNO_2$	153.888	R.	d. 140	4.453^{26}	
1075	$AgNO_3$	169.888	R.	212	4.352_4^{19}	1050
1076	$Ag_2(NO)_2$	275.776		d. 110	5.75_4^{30}	
1077	$AgNO_2.NH_3$	170.919	Tet.	70 d.		
1078	$NH_4NO_3.AgNO_3$	249.935	R.	109.6		
1079	$Ag(NH_3)_2NO_3$	203.950	R.	170 d.		
1080	$AgCl.AgNO_3$	313.226		160		
1081	$2AgCl.3NH_3$	337.769	R.	68 d.		
1082	$AgI.AgNO_3$	404.700	R.	94		
1083	$AgI.2AgNO_3$	574.588	R.	119.1		
1084	$AgBr.NH_4Br.4(NH_4)_2S_2O_3$	878.580	Tet.			336
1085	Ag_2P_3	308.832		d.	4.63	
1086	$AgPO_3$	186.904		482	6.370	
1087	Ag_3PO_4	418.664	C.	849	6.370_4^{25}	
1088	$Ag_4P_2O_7$	605.568		585	$5.306^{7.5}$	
1089	Ag_2HPO_4	311.792	Trig.	d. 110		366
1090	Ag_3AsO_3	446.600		150 d.		
1091	Ag_3AsO_4	462.600	C.		6.657_4^{25}	
1092	Ag_3AsBr_3	638.348		d.	5.55_4^{25}	
1093	$Ag_2S.As_2S_3$—Smithite	493.940	M.		4.700	1066
1094	$Ag_2S.As_2S_3$—Trechmannite	493.940	Trig.		4.700	422
1095	$3Ag_2S.As_2S_3$—Proustite	989.590	Trig.		5.49	412
1096	$3Ag_2S.As_2S_5$—Xanthoconite	1053.72	R.		5.2	1030
1097	$Ag_2S.Sb_2S_3$—Miargyrite	587.560	M.		5.36_{17}^{17}	
1098	$3Ag_2S.Sb_2S_3$—Pyrargyrite	1083.21	Trig.		5.76	425
1099	$3Ag_2S.Sb_2S_3$—Pyrostilpnite	1083.21	M. Tri.		5.790_{17}^{17}	
1100	$5Ag_2S.Sb_2S_3$—Stephanite	1578.86	R.		6.3	
1101	$8Ag_2S.Sb_2S_3$—Polybasite	2322.34	R.		6.1	1031
1102	$12Ag_2S.Sb_2S_3$—Polyargyrite	3313.64	R.		6.50	
1103	$Ag_2S.Bi_2S_3$—Matildite	762.020	R.		6.9	
1104	$AgNO_2.Bi(NO_2)_3.2NH_4NO_2$	629.006			3.055_4^{15}	
1105	Ag_2CO_3	275.760		218 d.	6.077	
1106	$Ag_2C_2O_4$	303.760		exp. 140	5.029^4	
1107	$AgC_2H_3O_2$	166.903		d.	3.259^{15}	
1108	$AgC_3H_5O_3.0.5H_2O$—Lactate	205.995		100		
1109	$Ag_2(d\text{-}C_4H_4O_6)$	363.791		d.	3.432^{15}	
1110	$Ag_2(dl\text{-}C_4H_4O_6)$	363.791			3.775^{15}	
1111	AgCN	133.888		320 d.	3.95	
1112	AgCNO	149.888		d.	4.00	
1113	$AgCN.NH_3$	150.919	M.	102 d.		
1114	$Ag(SbO)(d\text{-}C_4H_4O_6).H_2O$	364.886	R.		$3.481^{18.2}$	
1115	$4Ag_2S.GeS_2$—Argyrodite	1127.81	C.		6.085^{15}	
1116	$4Ag_2S.SnS_2$—Canfieldite	1174.13	C.		6.28	
1117	$Ag_2S.2As_2S_3.6PbS$—Lengenbachite	2175.65	Tri.		5.8	
1118	$3Ag_2S.4PbS.3Sb_2S_3$—Diaphorite	2719.74	R.		5.9	
1119	$3Ag_2S.4PbS.3Sb_2S_3$—Freieslebenite	2719.74	M.		6.3	
1120	$AgNO_2.2TlNO_2.Bi(NO_2)_3$	1001.73			4.87_4^{15}	
1121	AgCl.HgCl	379.406			6.495	
1122	$2AgI.HgI_2$	924.098		Tr. 45	5.998_4^0	
1123	4AgI.CuI—Miersite	1129.75			5.64	183
1124	$Ag_2S.Cu_2S$—Stromeyerite	407.030	R.		6.2	

Index No.	Formula	Mol. wt.	Crystal system	M. P.	d_4^{20}	Ref. ind. finding No.
1125	Au_2O	410.400		d. 205		
1126	Au_2O_2	426.400		d. 180		
1127	Au_2O_3	442.400		d. 160		
1128	$AuCl$	232.658		d. 289.5	7.4	
1129	$AuCl_3$	303.574		254 d.	3.9	
1130	Au_2Cl_4	536.232		d. 250	5.1	
1131	$AuBr$	277.116		d. 115		
1132	$AuBr_3$	436.948		160 d.		
1133	Au_2Br_4	714.064		d. 115		
1134	$AuHBr_4.5H_2O$	607.949		27		
1135	AuI	324.132		d. 120		
1136	Au_2S_2	458.530		d. 140		
1137	Au_2S_3	490.595		d. 197	8.754	
1138	Au_2Se_3	632.000			4.65^{22}	
1139	AuTe—Calaverite	324.700	Tri.		9.04	
1140	Au_2Te_4	904.400		472		
1141	$HAu(NO_3)_4.3H_2O$	500.286		72 d.	2.84	
1142	$Au_2O_3.4NH_3$	510.524		exp. 143		
1143	Au_2P_3	487.472			6.67	
1144	$Au(CN)_3.3H_2O$	329.270		d. 50		
1145	$4AuCl_3.3AgCl.8NH_4Cl$	2072.28	R.			159
1146	OsO_2	222.800			7.91	
1147	OsO_4 (yellow)	254.800	M.	41	4.91	
					l. $4.44^{40.1}$	57
1147.5	OsO_4 (white)	254.800		39.5		
1148	OsF_6	304.800				
1149	OsF_8	342.800		34.5		
1150	$(NH_4)_2OsCl_6$	439.626	C.		2.93	
1151	$(NH_4)_2OsBr_6$	706.374			4.09	
1152	$IrCl$	228.558		d. 798	10.18	
1153	$IrCl_2$	264.016		d. 773		
1154	$IrCl_3$	299.474		d. 763	5.30	
1155	$(NH_4)_2IrCl_6$	441.926	C.		2.856	
1156	$IrCl.4NH_3.H_2O$	314.698	Trig.			327
1157	$[Ir(NH_3)_5Cl]Cl_2$	384.630	R.		2.675	
1158	$[Ir(NH_3)_5Br]Br_2$	518.004	R.		$3.245^{16.5}$	
1159	$[Ir(NH_3)_5Cl]Br_2$	473.546	R.		3.01	
1160	$[Ir(NH_3)_5I]I_2$	659.052	R.		$3.586^{15.5}$	
1161	$[Ir(NH_3)_5Cl]I_2$	567.578	R.		3.12	
1162	$Ir_2(SO_4)_3.(NH_4)_2SO_4.24H_2O$	1238.91	C.	106		
1163	$PtCl_2$	266.146		d. 581	5.87	
1164	$PtCl_4.8H_2O$	481.185			2.43	
1165	$H_2PtCl_6.6H_2O$	518.086		60	2.431	
1166	$PtBr_4$	514.894		d. 180		
1167	$H_2PtBr_6.9H_2O$	838.880	M.	<100 d.		
1168	PtI_4	702.958		d. 100		
1169	PtS	227.295			8.897	
1170	$PtSe_2$	353.630			7.65	
1171	$PtSe_3$	432.830			7.15	
1172	$Pt(NH_3)_4(OH)_2$	297.370		110 d.		
1173	$Pt(NH_3)_2Cl_2$	300.208	R.	d. 270		
1174	$(NH_4)_2PtCl_6$	444.056	C.		3.065	
1175	$[Pt(NH_3)_4]Cl_2.H_2O$	352.286	Tet.	d. 110	2.737	
1176	$(NH_4)_2PtBr_6$	710.804	C.		4.265	
1177	$(NH_4)_2PtI_6$	992.900	C.		4.61	
1178	PtP_2O_7	369.278		d. >600	4.856	
1179	$PtAs_2$—Sperrylite	345.150	C.	>800	10.60	
1180	$[Pt(CO)Cl_2]_2$	588.292		195		
1181	$2PtCl_2.3CO$	616.292	M.	130		
1182	$[Pt(CO)Br_2]_2$	766.124	M.	182		
1183	$[Pt(CO)I_2]_2$	954.188		*ca.* 150 d.		
1184	$[CH_3(C_2H_5)_2SCl]_2PtCl_4$	618.308	M.	210		888
1185	$[(C_2H_5)_3SCl]_2PtCl_4$	646.339	M.			811

Index No.	Formula	Mol. wt.	Crystal system	M. P.	d_4^{20}	Ref. ind. finding No.
1186	$[C_2H_5NH_2]_2H_2PtCl_6$	500.117		218 d.	2.275^{18}	
1187	$[(CH_3)_3N]_2H_2PtCl_6$	528.148		245 d.	2.015	139
1188	$[CH_3(C_2H_5)NH]_2H_2PtCl_6$	528.148		208	2.115^{15}	
1189	$[C_3H_7NH_2)_2H_2PtCl_6$	528.148		214	2.218	
1190	$[(iso\text{-}C_3H_7)NH_2]_2H_2PtCl_6$	528.148		228	2.229	
1191	$[(CH_3)_4N]_2PtCl_6$	556.179	C.	278 d.	1.811^{16}	
1192	$[CH_3(C_3H_7)NH]_2H_2PtCl_6$	556.179		200 d.	1.968^{15}	
1193	$[(CH_3)_3C_2H_5N]_2PtCl_6$	584.210	C.	266 d.	1.762^{17}	
1194	$[(C_2H_5)C_3H_7NH]_2H_2PtCl_6$	584.210		199	1.89	
1195	$[C_2H_5(iso\text{-}C_3H_7)NH]_2H_2PtCl_6$	584.210		180	1.885	
1196	$[C_2H_5(iso\text{-}C_4H_9)NH]_2H_2PtCl_6$	612.240		201 d.	1.804	
1197	$[(C_2H_5)_3N]_2H_2PtCl_6$	612.240		100	1.903	
1198	$[(C_3H_7)_2NH]_2H_2PtCl_6$	612.240		175 d.	1.704^{15}	
1199	$[(CH_3)_3C_3H_7N]_2PtCl_6$	612.240	C.	252 d.	1.821	
1200	$[(CH_3)_3(iso\text{-}C_3H_7)N]_2PtCl_6$	612.240	C.	237	1.871^{16}	
1201	$[(C_3H_7)(iso\text{-}C_4H_9)NH]_2H_2PtCl_6$	640.271		188	1.702^{15}	
1202	$[(CH_3)(C_2H_5)_3N]_2PtCl_6$	640.271	C.	250 d.	1.731	
1203	$[(CH_3)_2(C_2H_5)(C_3H_7)N]_2PtCl_6$	640.271	C.	256 d.	1.812	
1204	$[(CH_3)_3(C_4H_9)N]_2PtCl_6$	640.271	C.	259 d.	1.795	
1205	$[(CH_3)_3(iso\text{-}C_4H_9)N]_2PtCl_6$	640.271	C.	220	1.751^{17}	
1206	$[(CH_3)(C_3H_7)_2N]_2H_2PtCl_6$	640.271		>200	1.737	
1207	$[(C_2H_5)_4N]_2PtCl_6$	668.302	C.	250 d.	1.776	
1208	$[(iso\text{-}C_4H_9)_2NH]_2H_2PtCl_6$	668.302		213	1.62^{15}	
1209	$[(C_2H_5)(C_3H_7)_2N]_2H_2PtCl_6$	668.302		175	1.726	
1210	$[(CH_3)_2(C_3H_7)_2N]_2PtCl_6$	668.302	Tet.	250	1.745	
1211	$[(C_2H_5)_3(C_3H_7)N]_2PtCl_6$	696.333	C.	235 d.	1.710	
1212	$[(CH_3)(C_2H_5)(C_3H_7)_2N]_2PtCl_6$	696.333	C.	228 d.	1.712	
1213	$[(C_2H_5)_2(C_3H_7)_2N]_2PtCl_6$	724.364	C.	220 d.	1.677	
1214	$[(CH_3)(C_2H_5)(C_3H_7)(iso\text{-}C_4H_9)N]_2PtCl_6$	724.364		236 d.	1.637	
1215	$[(C_2H_5)_3(C_4H_9)N]_2PtCl_6$	724.364	C.	220	1.629^{15}	
1216	$[(C_2H_5)_3(iso\text{-}C_4H_9)N]_2PtCl_6$	724.364	M.	215	1.602	
1217	$[(C_2H_5)(C_3H_7)_3N]_2PtCl_6$	752.394	Tri.	212	1.571^{17}	
1218	$[(C_3H_7)_4N]_2PtCl_6$	780.424	Tri.	199	1.515	
1219	$[(CH_3)(iso\text{-}C_4H_9)_3N]_2PtCl_6$	808.456	R. ?	174	1.696	
1220	$[(C_2H_5)(iso\text{-}C_4H_9)_3N]_2PtCl_6$	836.487	Tet.	170	1.562^{17}	
1221	$[(C_3H_7)(iso\text{-}C_4H_9)_3N]_2PtCl_6$	864.518	C.	168	1.509	
1222	$Pt_x(NO_2)_y(C_aH_bS_c)_z$	Tschugaeff and Chlopin, *93*, **82**: 402; 12.				
1223	PtSi	223.290		1100	11.63^{15}	
1224	Pt_2Si	418.520			13.8^{18}	
1225	Pt_3Si_2	641.810			14.1	
1226	$PtPbCl_6.4H_2O$	687.240	C.		3.681	
1227	$PtPbBr_6$	881.926		d. >120	6.025	
1228	$PtZnCl_6.6H_2O$	581.450	Trig.		2.717	
1229	$PtZnBr_6.12H_2O$	956.291	Trig.		2.877	
1230	$PtZnI_6.9H_2O$	1184.34	Trig.		3.689	
1231	$PtCdCl_6.6H_2O$	628.480	Trig.		2.882	
1232	$PtCuCl_6.6H_2O$	579.964	Trig.		2.734	
1233	RuO_2	133.700	Tet.		7.2	
1234	RuO_4	165.700		25.5	5.77^{100}	
1235	Ru_2S_3—Laurite	299.595	C.		6.99	
1236	RuSi	129.760			5.4	
1237	$[Rh_2(NH_3)_{10}Cl_2]Cl_4$	588.879	R.	d. 200	2.079^{18}	
1238	$[Rh(NH_3)_5Br]Br_2$	427.814	R.		2.65	
1239	$[Rh(NH_3)_5I]I_2$	568.862	R.		3.12^{16}	
1240	$NH_4Rh(SO_4)_2.12H_2O$	529.264	C.	103		115
1241	$TlRh(SO_4)_2.12H_2O$	715.625	C.			130
1242	$RbRh(SO_4)_2.12H_2O$	596.665	C.	109		
1243	PdO	122.700		d. 877		
1244	$PdCl_2$	177.616		500		
1245	PdI_2	360 564		d. 350		
1246	PdS	138.765		950		
1247	Pd_2S	245.465		800 d.	7.3	
1248	PdSe	185.900		<960		

Index No.	Formula	Mol. wt.	Crystal system	M. P.	d_4^{20}	Ref. ind. finding No.
1249	$Pd(NH_3)_2Cl_2$	211.678	Tet.		2.5	
1250	$(NH_4)_2PdCl_4$	284.610	Tet.		2.17	
1251	$(NH_4)_2PdCl_6$	355.526	C.		2.418	
1252	$(NH_4)_3PdSO_3Cl_3.H_2O$	365.268	Trig.			316
1253	$Pd(CO)Cl_2$	205.616		197		
1254	$Pd(CO)_2Cl_2$	233.616		142		
1255	$2PdCl_2.3CO$	439.232		132		
1256	PdSi	134.760			7.31^{15}	
1257	$ZnPdCl_6.6H_2O$	492.920	H.		2.359	
1258	MnO—Manganosite	70.9300	C.	1650	5.18	180
1259	$MnO.H_2O$—Pyrochroite	88.9454	Trig.		3.258^{13}	349
1260	MnO_2—Polianite, Pyrolusite	86.9300	R.		5.026	
1261	$MnO_2.H_2O$	104.945	C.			171
1262	Mn_2O_3	157.860	C.		4.50	
1263	$Mn_2O_3.H_2O$—Manganite	175.875	R.		3.258	1058
1264	Mn_3O_4—Hausmannite	228.790	Tet.		4.700	421
1265	MnF_2	92.9300		856	3.98	
1266	MnF_3	111.930			3.54	
1267	$MnF_2.5HF.6H_2O$	301.061			1.921	
1268	$MnCl_2$—Scacchite	125.846	C.	650	2.977^{25}_{4}	
1269	$MnCl_2.4H_2O$	197.908	M.	58.01	2.01	
1270	$Mn(ClO_4)_2.8H_2O$	397.969			1.99	
1270.1	$MnCl_2.3MnO_2.3H_2O$—Kempite	440.682	R.		2.94	889
1271	$MnBr_2$	214.762			4.385^{25}_{4} fused	
1272	$MnBr_2.4H_2O$	285.820	M.	64.3d		
1273	MnS—Alabandite	86.9950	C.	d.	3.99	197
1274	MnS_2—Hauerite	119.060	C.		3.463	196
1275	$MnSO_4$	150.995		700	3.25	
1276	$MnSO_4.H_2O$—Szmikite	169.010	M. ?		2.954	742
1277	$MnSO_4.2H_2O$	187.026			2.526	
1278	$MnSO_4.3H_2O$	205.041			2.356	
1279	$MnSO_4.4H_2O$	223.057	M. R.		2.107	
1280	$MnSO_4.5H_2O$	241.072	Tri.		2.103	
1281	$MnS_2O_6.6H_2O$	323.152	Tri.		1.757	
1282	MnSe	134.130	C.		5.59^{15}	
1283	$MnSeO_4.2H_2O$	234.161	R.		2.949	
1284	$MnSeO_4.5H_2O$	288.207	Tri.		2.334	
1285	Mn_5N_2	302.666			6.63	
1286	$Mn(NO_3)_2.3H_2O$	232.992		34.81		
1287	$Mn(NO_3)_2.6H_2O$	287.038		25.8	1.82	
1288	NH_4MnO_4	136.969	R.		$2.208^{10.3}$	
1289	$(NH_4)_2SO_4.MnSO_4.6H_2O$	391.229	M.		1.831	484
1290	$(NH_4)_2SO_4.2MnSO_4$	434.133	C.		2.56^{14}	
1291	$(NH_4)_2SO_4.Mn_2(SO_4)_3$	530.196			2.40^{11}	
1292	$(NH_4)_2SeO_4.MnSeO_4.6H_2O$	485.500	M.		2.093	
1293	Mn_6P_2	391.628			4.94	
1294	$Mn_2P_2O_7$	283.908	M.		3.707^{25}_{4}	897
1295	$3MnO.P_2O_5.3H_2O$—Reddingite	408.884	R.		3.1	842
1296	$3MnO.P_2O_5.4H_2O$?—Stewartite	426.898	Tri.		2.94	846
1297	$5MnO.2P_2O_5.4H_2O$—Palaite	710.808	M.		3.17	843
1298	$5MnO.2P_2O_5.5H_2O$—Hureaulite	728.823	M.		3.18	835
1299	$3MnO.As_2O_5$—Armangite	442.710	H. R.		4.23	
1300	$4MnO.As_2O_5.H_2O$—Sarkinite, Polyarsenite	531.655	M.		4.15	954
1301	$Mn_2O_3.4MnO.As_2O_5.4H_2O$—Flinkite	743.562	R.		3.87	959
1302	$6MnO.As_2O_5.5H_2O$—Hemafibrite	745.577	R.		3.6	980
1303	$7MnO.As_2O_5.4H_2O$—Allactite	798.492	M.		3.84	945
1304	MnSb	176.700			5.6^{17}	
1305	$10MnO.Sb_2O_5$—Manganostibite	1032.84	M.			989
1306	Mn_3C	176.790			6.89^{17}	
1307	$MnCO_3$—Rhodochrosite	114.930	Trig.		3.125	368
1308	MnC_2O_4	142.930			$2.43^{21.7}$	
1309	$Mn(CHO_2)_2$	144.945			2.205	

Index No.	Formula	Mol. wt.	Crystal system	M. P.	d_4^{20}	Ref. ind. finding No.
1310	$Mn(CHO_2)_2.2H_2O$	180.976	R.		1.953	
1311	$Mn(C_2H_3O_2)_2$	172.976			1.74	
1312	$Mn(C_2H_3O_2)_2.4H_2O$	245.038	M.		1.589	
1313	$MnCl_2.2C_5H_5N.HCl$	320.405		175		
1314	$MnSi$	82.9900		1280	5.90^{15}	
1315	$MnSi_2$	111.050			5.24^{15}	
1316	Mn_2Si	137.920		1316	6.20^{15}	
1317	$MnO.SiO_2$	130.990		1273	3.48_4^{25}	63
1318	$MnO.SiO_2$—Rhodonite	130.990	Tri.	1323	3.72_4^{25}	929
1319	$2MnO.SiO_2$—Tephroite	201.920	R.	1300	4.043_4^{25}	949
1320	$3Mn_2O_3.MnO.SiO_2$—Braunite	604.570	Tet.		4.78	
1321	$8MnO.7SiO_2.5H_2O$—Bementite	1077.94	R.		2.90	803
1322	$12MnO.8SiO_2.7H_2O$—Ectropite	1457.75	M. ?		2.46	1044
1323	$MnSiF_6.6H_2O$	305.082	Trig.	d.	$1.904^{17.5}$	206
1324	$5MnO.SiO_2.As_2O_3.H_2O$—Dixenite	630.645	H.		4.2	385
1324.1	$12MnO.9SiO_2.As_2O_5.7H_2O$—Schallerite	1747.73			3.368	344
1325	$MnO.TiO$—Pyrophanite	150.830	Trig.	1404	4.54	405
1326	$2MnO.6PbO.3As_2O_5.H_2O$—Trigonite	2188.84	M.		8.28	1004
1327	$2Mn_2O_3.3PbO.3SiO_2$—Kentrolite	1165.44	R.		6.19	1014
1328	$2Mn_2O_3.3CuO$—Crednerite	554.430			5.0	
1329	$MnPtCl_6.6H_2O$	571.000	Trig.	d.	2.692	
1330	$MnPtCl_6.12H_2O$	679.093	Trig.		2.112	
1331	$MnPtBr_6.12H_2O$	945.841	Trig.		2.759	
1332	$MnPtI_6.9H_2O$	1173.89	Trig.	d.	3.604	
1333	FeO	71.8400		1420		
1334	Fe_2O_3—Hematite	159.680	Trig.	1560 d.	5.12	424
1335	$Fe_2O_3.H_2O$—Goethite	177.695	R.		4.28	1026
1336	$Fe_2O_3.H_2O$—Lepidocrocite	177.695	R.		4.09	1013
1337	Fe_3O_4—Magnetite	231.520	C.	1538 d.	5.2	
1338	FeF_2	93.8400			4.09	
1339	FeF_3	112.840			3.18	
1340	$FeCl_2$—Lawrencite	126.756	H.		2.7	280
1341	$FeCl_2.4H_2O$	198.818			1.93	
1342	$FeCl_3$—Molysite	162.214	H.	282	2.8	
1343	$2FeCl_3.2HCl.4H_2O$	469.421		45.7		
1344	$FeBr_2$	215.672			4.636_4^{25}	
1345	$FeBr_3.6H_2O$	403.680		27		
1346	FeI_2	309.704		177		
1347	$FeI_2.4H_2O$	381.764			2.87	
1348	FeS—Troilite	87.9050	H.	1193	4.8	
1349	FeS_2—Marcasite	119.970	R.	Tr. 450	4.87	
1350	FeS_2—Pyrite	119.970	C.		5.0	
1351	Fe_2S_3	207.875			4.3	
1352	Fe_3S_4	295.780			4.55	
1353	Fe_7S_8—Pyrrhotite	647.400	H.	d. >700	4.6	
1354	$FeSO_4.H_2O$—Szomolnokite	169.920	M.		3.08	
1355	$FeSO_4.5H_2O$—Siderotilate	241.982	Tri.		2.2	642
1356	$FeSO_4.7H_2O$—Melanterite	278.012	M.		1.89	471
1357	$Fe_2O_3.2SO_3.7H_2O$—Amarantite	445.918	Tri.		2.11	762
1358	$Fe_2O_3.2SO_3.10H_2O$—Fibroferrite	499.964	R.		1.86	255
1359	$Fe_2O_3.3SO_3.9H_2O$—Coquimbite	562.014	Trig.		2.1	270
1360	$Fe_2O_3.4SO_3.9H_2O$—Rhomboclasite	642.079	R.			675
1361	$FeO.Fe_2O_3.4SO_3.24H_2O$—Bilinite	984.150			1.87	530
1362	$2Fe_2O_3.SO_3.6H_2O$—Glockerite	507.517				958
1363	$2Fe_2O_3.5SO_3.18H_2O$—Copiapite	1043.96	R.		2.1	654
1364	$3Fe_2O_3.4SO_3.10H_2O$—Carphosiderite	979.454	Trig.		2.6	371
1365	$Fe_2O_3.3TeO.4H_2O$—Durdenite	662.242	R.			990
1366	Fe_2N	125.688		d.	6.35	
1367	$Fe(NO_3)_3.6H_2O$	349.956		35		
1368	$(NH_4)_2SO_4.FeSO_4.6H_2O$	392.140	M.		1.864	513
1369	$(NH_4)_2SO_4.Fe_2(SO_4)_3.24H_2O$	964.387	C.		1.71	102
1370	$(NH_4)_2SeO_4.FeSeO_4.6H_2O$	486.410	M.		2.160	612
1371	FeP	86.8640			5.2	

Index No.	Formula	Mol. wt.	Crystal system	M. P.	d_4^{20}	Ref. ind. finding No.
1372	Fe_2P	142.704		1290	5.7	
1373	Fe_2P_3	204.752			4.5	
1374	Fe_3P	198.544		1110	6.74	
1375	Fe_3P_4	291.616			5.04	
1376	$Fe(PO_3)_3$	292.912			3.02	
1377	$Fe_2O_3.P_2O_5.4H_2O$—Strengite	373.790	R.		2.87	917
1378	$3FeO.P_2O_5.8H_2O$—Vivianite	501.691	M.		2.58	757
1379	$2Fe_2O_3.P_2O_5.12H_2O$—Cacoxenite	677.593	H.		3.38	285
1380	$3Fe_2O_3.2P_2O_5.8H_2O$—Beraunite	907.259	M.		2.9	950
1381	$7FeO.2P_2O_5.9H_2O$—Ludlamite	949.115	M.		3.72	873
1382	$2Fe_2O_3.P_2O_5.2SO_3.2H_2O$—Destinezite	657.569	Tri.		2.1	794
1383	$2Fe_2O_3.P_2O_5.2SO_3.2H_2O$—Diadochite	657.569			2.0	142
1384	$FeAs$	130.800		1020	7.83	
1385	$FeAs_2$—Arsenoferrite	205.760	C.	990	7.4	
1386	$FeAs_2$—Löllingite	205.760	R.		7	
1387	$FeAsO_4.4H_2O$—Scorodite	266.862	R.		3.2	941
1388	$3FeO.As_2O_5.8H_2O$—Symplesite	589.563	M.		2.96	857
1389	$3Fe_2O_3.2As_2O_3.13H_2O$—Pharmacosiderite	1109.08	M. ?, C.		3	874
1390	$FeS_2.FeAs_2$—Arsenopyrite	325.730	R.		6.2	
1391	$2FeO.Sb_2O_5$—Tripuhyite	467.220			5.82	1015
1392	$FeS.Sb_2S_3$—Berthierite	427.640	R.		4.0	
1393	Fe_3C	179.520		1837	7.4	
1394	$FeCO_3.H_2O$—Siderite	133.855	Trig.		3.8	377
1395	$FeC_2O_4.2H_2O$	179.871	R.	d. 160	2.28	
1396	$Fe(CO)_4$	167.840		d. 140	1.996^{18}	
1397	$Fe(CO)_5$	195.840		− 21	l. 1.457	
1398	$Fe_2(CO)_9$	363.680		d. 100	2.085^{18}	
1399	$FeC_{20}H_{14}O_6S_2.6H_2O$—Naphthalene-β-sulfonate	578.170				1039
1400	$(NH_4)_4Fe(CN)_6.2NH_4Cl.3H_2O$	445.083	Trig.		1.490	301
1401	$Fe_4(NO)_7S_3N(C_2H_5)_4$	659.773			1.883_{19}^{19}	
1402	$FeSi$	83.9000			6.1	
1403	$FeSi_2$	111.960			5.4	
1404	Fe_2Si	139.740			7.0	
1405	Fe_3Si_2	223.640			6.7	
1406	$FeO.SiO_2$—Gruenerite	131.900	M.	1550	3.5	890
1407	$2FeO.SiO_2$—Fayalite	203.740	R.	1255		978
1408	$2Fe_2O_3.2SiO_2.3H_2O$—Iddingsite	493.526	R.		2.8	928
1409	$FeSiF_6.6H_2O$	305.992	Trig.			207
1410	$FeO.TiO_2$—Ilmenite	151.740	Trig.		4.75	
1411	$Fe_2O_3.3TiO_2$—Arizonite	399.380	M. ?		4.25	1069
1412	$2Fe_2O_3.3TiO_2$—Pseudobrookite	559.060	R.		4.7	1061
1413	$6FeO.Sb_2O_3.5TiO_2$—Derbylite	1122.08	R.		4.53	420
1414	$2Fe_2O_3.PbO.3SO_3.4H_2O$—Vegasite	854.817	H.			555
1415	$3Fe_2O_3.PbO.4SO_3.6H_2O$—Plumbojarosite	1130.59	Trig.		3.63	378
1416	$3Fe_2O_3.2PbO.P_2O_5.2SO_3.6H_2O$—Corkite	1335.71	Trig.		4.2	383
1417	$5Fe_2O_3.3PbO.6As_2O_5$—Carminite	2847.52			4.1	
1418	$FeS.3Sb_2S_3.4PbS$—Jamesonite	1967.98	M.		5.7	
1419	$3Fe_2O_3.2PbO.As_2O_5.2SO_3.6H_2O$—Beudantite	1423.58	Trig.		4.1	386
1420	$9Fe_2O_3.4PbO.6As_2O_5.4SO_3.33H_2O$—Lossenite	4622.21	R.			952
1421	$2Fe_2O_3.3PbO.3SiO_2$—Melanotekite	1169.14	R.		5.73	1010
1422	$TlFe(SO_4)_2.12H_2O$	668.555	C.		2.38	124
1423	$Zn(FeO_2)_2$	241.060			5.33	
1424	$Fe_2O_3.CuO$	239.250		1458		
1425	$FeS.CuS$—Chalcopyrite	183.540	Tet.		4.2	
1426	$FeS.2Cu_2S.CuS$—Bornite	501.950	C.		5.0	
1427	$2FeS.CuS$—Cubanite	271.445	R.		4.0	
1428	$4FeS.Cu_2S.2CuS$	702.095			5.0	
1429	$4FeS.3Cu_2S.3CuS$	1116.14			4.85	
1430	$3Fe_2O_3.CuO.2P_2O_5.8H_2O$—Chalcosiderite	986.829	Tri.		3.1	969
1431	$Fe_2O_3.2CuO.As_2O_5.2H_2O$—Chenevixite	584.771			3.93	379

Index No.	Formula	Mol. wt.	Crystal system	M. P.	d_4^{20}	Ref. ind. finding No.
1432	$FeS.Cu_2S.SnS_2$—Stannite	429.940	Tet.		4.4	
1433	$Fe_2O_3.CuO.PbO.2SO_3.4H_2O$—Beaverite	694.642	H.		4.36	373
1434	$2Ag_3Fe(CN)_6.3NH_3$	1122.15			2.45	
1435	$FePtCl_6.6H_2O$	571.910			2.7	
1436	$FePtI_6.9H_2O$	1174.80			3.45	
1437	$FeO.MnO_2$—Bixbyite	158.770	C.		4.95	
1438	$Fe_2O_3.MnO$—Jacobsite	230.610	C.		4.75	
1439	$Fe_2O_3.9MnO.4P_2O_5.14H_2O$—Salmonsite	1618.46	R.		2.88	848
1439.1	$9(MnFe)O.8SiO_2.MnCl_2.7H_2O$—Friedelite		Trig.		3.1	329
1440	CoO	74.9700	C.	d. 800	5.68	
1441	Co_2O_3	165.940			5.18	
1442	Co_3O_4	240.970			6.073	
1443	$Co(OH)_2$	92.9854		d.	3.597^{15}	
1444	CoF_2	96.9700	M.		4.43	
1445	$CoF_2.3H_2O$	151.016			2.583^{25}_{25}	
1446	$CoF_2.5HF.6H_2O$	305.101	Trig.		2.045	
1447	$CoCl_2$	129.886			3.356	
1448	$CoCl_2.2H_2O$	165.917			2.477^{25}_{25}	
1449	$CoCl_2.6H_2O$	237.978	M.	86	1.924^{25}_{25}	
1450	$Co(ClO_3)_2.6H_2O$	333.978		61	1.92	
1451	$Co(ClO_4)_2.6H_2O$	365.978	H.	143		131
1452	$Co(ClO_4)_2.7H_2O$	383.994			2.075	
1453	$CoBr_2$	218.802			4.909^{25}_4	
1454	$CoBr_2.6H_2O$	326.894		100 d.		
1455	CoI_2	312.834			5.68	
1456	$Co(IO_3)_2.6H_2O$	516.926			3.689^{21}	
1457	CoS—Syepoorite	91.0350		>1100	5.45	
1458	Co_3S_4—Linnaeite	305.170	C.		4.9	
1459	$CoSO_4$	155.035			3.710^{25}_{25}	
1460	$CoSO_4.H_2O$	173.050		d.	1.92	
1461	$CoSO_4.4H_2O$	227.096			2.368^{25}_{25}	
1462	$CoSO_4.6H_2O$	263.127	M.		2.029^{25}_{25}	
1463	$CoSO_4.7H_2O$—Bieberite	281.143	M. ?		1.948^{25}_{25}	481
1464	$CoSe$	138.170			7.65	
1465	$CoSeO_4.5H_2O$	292.247	Tri.	d.	2.512	
1466	$CoSeO_4.6H_2O$	310.262	M.		2.32	599
1467	$CoSeO_4.7H_2O$	328.278	M.		2.135	
1468	$Co(NO_3)_2.3H_2O$	237.032		91		
1469	$Co(NO_3)_2.6H_2O$	291.078	M.	<100	1.883^{25}_{25}	
1470	$Co(NO_2)_3.3NH_3$	248.087			2.001^{32}_4	
1471	$[Co(NH_3)_4(NO_2)_2]NO_3$	281.118	R.		1.922^{17}	
1472	$Co(NO_3)_2.6NH_3$	285.173			1.473^{25}_{25}	
1473	$CoF_2.6NH_3$	199.157			1.744^{25}_{25}	
1474	$CoCl_2.NH_3$	146.917		*ca.* 321		
1475	$CoCl_2.2NH_3$ (α)	163.948		273	2.097^{25}_{25}	
1476	$CoCl_2.2NH_3$ (β)	163.948			2.073^{25}_{25}	
1477	$CoCl_2.4NH_3$	198.010		d.	1.593^{25}_{25}	
1478	$CoCl_2.5NH_3$	215.042			1.580^{25}_{25}	
1479	$[Co(NH_3)_5Cl]Cl_2$	250.500	R.		1.819^{25}_{25}	
1480	$CoCl_2.6NH_3$	232.073		d.	1.497^{25}_{25}	
1481	$CoCl_3.6NH_3$	267.531	M.		1.744^{25}_{25}	
1482	$CoCl_2.10NH_3$	300.197			1.71^{25}_{25}	
1483	$[Co(NH_3)_4(OH_2)Cl]Cl_2$	251.484	R.		1.847	
1484	$[Co(NH_3)_5(NO_2)]Cl_2$	261.050	M.		1.698^{18}	
1485	$[Co(NH_3)_5(NO_2)](NO_3)Cl$	287.500	R.		1.800	
1486	$CoBr_2.2NH_3$	252.864		260		
1487	$[Co(NH_3)_5Br]Br_2$	383.874		d.	$2.483^{17.8}_4$	
1488	$CoBr_2.6NH_3$	320.989			1.955	
1489	$[Co(NH_3)_5Br]Cl_2$	294.958			$2.095^{16.8}$	
1490	$CoI_2.2NH_3$	346.896		222		
1491	$(NH_4)_2SO_4.CoSO_4.6H_2O$	395.270	M.		1.901	521
1492	$Co(SO_4)_2.4NH_3.2H_2O$	355.255			1.804^{25}_{25}	
1493	$Co(SO_4)_2.5NH_3$	336.256			1.703^{25}_{25}	

Index No.	Formula	Mol. wt.	Crystal system	M. P.	d_4^{20}	Ref. ind. finding No.
1494	$[Co(NH_3)_5(SO_4)]SO_4H.2H_2O$	373.294	R.		1.828^{18}	
1495	$[Co(NH_3)_5(OH_2)]_2(SO_4)_3.3H_2O$	666.523	Tet.		1.854	
1496	$[Co(NH_3)_6]Cl(SO_4).3H_2O$	346.726	R.		1.765	
1497	$(NH_4)_2SeO_4.CoSeO_4.6H_2O$	489.540	M.	d.	2.212	623
1498	$Co(NH_3)_6Cl(SeO_4).3H_2O$	393.861	R.		1.937	
1499	$Co(H_2PO_2)_2.6H_2O$	297.141			$1.809_4^{18.5}$	
1500	$CoAs_2$—Safflorite	208.890		d.	6.97^0	
1501	$CoAs_2$—Smaltite	208.890		d.	6.5	
1502	$CoAs_3$—Skutterudite	283.850			6.79	
1503	Co_2As_3	342.820		d.	7.35^0	
1504	Co_3As_2	326.830		d.	7.82^0	
1505	$Co_3(AsO_4)_2.8H_2O$—Erythrite	598.953	M.		2.9	850
1506	CoAsS—Cobaltite	165.995	C.	d.	6.2	
1507	$CoCO_3$—Spherocobaltite	118.970	Trig.		2.818_{25}^{25}	375
1508	CoC_2O_4	146.970			2.325_4^{19}	
1509	$Co(CO)_4$	170.970		51	1.73^{18}	
1510	$Co(CHO_2)_2.2H_2O$	185.016			2.129^{22}	
1511	$CoC_3H_2O_4.2H_2O$—Malonate	197.016			2.279	
1512	$Co(C_2H_3O_2)_2.4H_2O$	249.078	M.		$1.7^{18.7}$	651
1513	$Co(C_5H_7O_2)_3$—Acetylacetonate	356.132				
1514	$CoC_{10}H_6O_6S_2.6H_2O$—1, 5-Naphthalene-disulfonate	453.239	M.		1.77	799
1515	$Co(CO)_3NO$	172.978		−1.05	l. 1.513^{14}	
1516	$[Co(NH_3)_5(C_2O_4)]NO_3.HNO_3$	357.149			1.264^{15}	
1517	CoSi	87.0300		1393	6.30	
1518	$CoSi_2$	115.090		1277	5.3^0	
1519	$CoSi_3$	143.150		1307		
1520	Co_2Si	146.000		1327	7.1^{17}	
1521	Co_2SiO_4	210.000			4.63	
1522	$CoSiF_6.6H_2O$	309.122	Trig.		2.087	413
1523	$CoSnCl_6.6H_2O$	498.510	R. Trig.		2.699	
1524	$CoPtCl_6.6H_2O$	575.040	Trig.	d.	2.699	
1525	$CoPtBr_6.12H_2O$	949.881	Trig.		2.762	
1526	$CoPtI_6.9H_2O$	1177.93	Trig.		3.618	
1527	$CoPtI_6.12H_2O$	1231.98	Trig.		3.048	
1528	NiO—Bunsenite	74.6900	C.		7.45	201
1529	Ni_2O_3	165.380			4.83	
1530	$Ni_3O_4.2H_2O$	258.085			3.412^{32}	
1531	NiF_2	96.6900			4.63	
1532	$NiF_2.3H_2O$	150.736			2.014^{19}	
1533	$NiF_2.5HF.6H_2O$	304.821	Trig.		2.132	
1534	$NiCl_2$	129.606			3.544	
1535	$Ni(ClO_3)_2.6H_2O$	333.698		80 d.	2.07	
1536	$Ni(ClO_4)_2.6H_2O$	365.698	H.	149		132
1537	$Ni(ClO_4)_2.7H_2O$	383.714			2.15	
1538	$NiBr_2$	218.522			4.64_4^{28}	
1539	$Ni(IO_3)_2$	408.554			5.07	
1540	$Ni(IO_3)_2.4H_2O$	480.616	H.	d. *ca.* 100		
1541	NiS—Millerite	90.7550	Trig.	797	4.60	
1542	Ni_2S	149.445			5.52	
1543	Ni_3S_2	240.200		794 Tr. 545		
1544	Ni_3S_4—Polydymite	304.330	C.		4.7	
1545	$NiSO_4$	154.755			3.68	
1546	$NiSO_4.H_2O$	172.770			1.98	
1547	$NiSO_4.6H_2O$	262.847	Tet. M.	Tr. 53.3	2.07	246
1548	$NiSO_4.7H_2O$—Morenosite	280.863	R.		1.948	501
1549	$NiS_2O_6.6H_2O$	326.912	Tri.	d.	1.908	
1550	NiSe	137.890			8.46	
1551	$NiSeO_4.6H_2O$	309.982	Tet.		2.31	262
1552	$Ni(NO_3)_2.6H_2O$	290.798	M.	56.7	2.05	
1553	$NH_4Cl.NiCl_2.6H_2O$	291.195	M.		1.645	
1554	$Ni(ClO_3)_2.6NH_3$	327.793		180	1.52	

Index No.	Formula	Mol. wt.	Crystal system	M. P.	d_4^{20}	Ref. ind. finding No.
1555	$Ni(BrO_3)_2.6NH_3$	416.709		exp. 195	1.99	
1556	$Ni(IO_3)_2.5NH_3$	493.710			2.97	
1557	$(NH_4)_2Ni(SO_4)_2.6H_2O$	394.990	M.		1.923	539
1558	$(NH_4)_2Ni(SeO_4)_2.6H_2O$	489.260	M.	d.	2.22	643
1559	NiP_2	120.738			4.62^{18}	
1560	NiP_3	151.762			4.19^{18}	
1561	Ni_2P	148.404		1112	6.3^{15}	
1562	Ni_3P_2	238.118			5.99	
1563	$Ni(H_2PO_2)_2.6H_2O$	296.861		d.	1.824	
1564	NiAs—Nicollite	133.650	H.	968	7.57^{0}	
1565	$NiAs_2$—Rammelsbergite	208.610	R.		7.1	
1566	Ni_3As_2—Maucherite	325.990	Tet.		7.86^{0}	
1567	Ni_5As_2	443.370		998 Tr. 970		
1568	$Ni_3(AsO_4)_2$	453.990			4.982	
1569	$3NiO.As_2O_5.8H_2O$—Annabergite	598.113	M.		3.0	845
1570	NiAsS—Gersdorffite	165.715			6.3	
1571	NiSb—Breithauptite	180.460	H.	1158	7.70^{0}	
1572	Ni_5Sb_2	536.990		1170		
1573	NiSbS—Ullmannite	212.525	C.		6.6	
1574	NiC_2O_4	146.690			2.235	
1575	$Ni(CO)_4$	170.690		−25	l. 1.310	
1576	$3NiO.CO_2.H_2O$—Zaratite	286.085			2.6	136, 143
1577	$Ni(CHO_2)_2.2H_2O$	184.736			2.154	
1578	$Ni(C_2H_3O_2)_2$	176.736			1.798	
1579	$Ni(C_2H_3O_2)_2.4H_2O$	248.798			$1.744^{15.7}$	
1580	$NiC_{10}H_6O_6S_2.6H_2O$—1, 5-Naphthalene disulfonate	452.959	M.		1.79	808
1581	Ni_2Si	145.440		1309	7.2^{17}	
1582	$2NiO_2.3SiO_2.2H_2O$—Connarite	397.590	H.		2.5	292
1583	$NiSiF_6.6H_2O$	308.842	Trig.	d.	2.134	210
1584	$NiPdCl_6.6H_2O$	486.230	H.		2.353	
1585	$3NiO.6CuO.2As_2O_5.SO_3.7H_2O$—Lindackerite	1367.50	M. ?		2.25	851
1586	$NiPtCl_6.6H_2O$	574.760	Trig.		2.798	
1587	$NiPtBr_6.6H_2O$	841.508	Trig.		3.715	
1589	CrO_3	100.010	R.	190 d.	2.7	
1590	Cr_2O_3	152.020	H.	1900	5.21	
1591	$Cr_4O_3.3H_2O$	310.086			2.90	
1592	Cr_5O_9	404.050			4	
1593	CrF_2	90.0100		1100	4.11	
1594	CrF_3	109.010	R.	>1000	3.8	
1595	$CrCl_2$	122.926			2.75	
1596	$CrCl_3$	158.384			2.7	
1597	CrO_2Cl_2	154.926		− 96.5	l. 1.836	
1598	$(CrO_2)_5Cl_6$	632.798			2.5	
1599	CrS	84.0750			4.1	
1600	Cr_2S_3	200.215			3.7	
1601	$Cr_2(SO_3)_3$	344.215			2.2	
1602	$Cr_2(SO_4)_3$	392.215			3.0	
1603	$Cr_2(SO_4)_3.17H_2O$	698.476			1.7	
1604	H_2CrSO_7	198.090		190 d.		
1605	H_2CrSeO_7	245.225		200		
1606	$(NH_4)_2CrO_4$	152.088	M.		1.8	
1607	$CrO_4.3NH_3$	167.103	R.		1.96	
1608	$(NH_4)_2Cr_2O_7$	252.098	M.		2.15	
1609	$(NH_4)_2Cr_3O_{10}$	352.108	R.		2.33	
1610	$(NH_4)_2Cr_4O_{13}$	452.117		170	2.34	
1611	$NH_4IO_3.CrO_3$	292.981	R.		3.5	
1612	$(NH_4)_2CrSO_7$	232.153		160		
1613	$Cr_2(SO_4)_3.(NH_4)_2SO_4.24H_2O$	956.727	C.	100 d.	1.72	101
1614	CrP	83.0340			5.7	
1615	$Cr(PO_3)_3$	289.082			2.97	

Index No.	Formula	Mol. wt.	Crystal system	M. P.	d_4^{20}	Ref. ind. finding No.
1616	$Cr_4(P_2O_7)_3$	730.184	M.		3.2	
1617	Cr_2As_3	328.900			6.2	
1618	$4CrO_3.As_2O_5.2(NH_4)_2O.H_2O$	752.131		d. 175	1.83	
1619	Cr_3C_2	180.030		1890	6.68	
1620	Cr_4C	220.040			6.75	
1621	Cr_5C_2	284.050		1665	6.92	
1622	$CrC_2O_4.H_2O$	158.025			2.46	
1623	$Cr(d\text{-}C_4H_4O_6)$	200.041			2.33^{15}	
1624	$Cr[CH(COCH_3)_2]_3$—Acetylacetonate	349.172		214		
1625	$[Cr(CON_2H_4)_6]Cl_3.3H_2O$	572.711		150		
1626	$[Cr(CON_2H_4)_6](CN)_3.5.5H_2O$	589.400		75		
1627	$[Cr(CON_2H_4)_6](SCN)_3$	586.510		90 d.		
1628	$CrSi_2$	108.130			4.4	
1629	Cr_3Si	184.090			6.52	
1630	Cr_3Si_2	212.150			5.5	
1631	$PbCrO_4$—Crocoitite	323.210	M.	844	6.3	1060
1632	$3PbO.2CrO_3$—Phoenicochroite	869.620			5.75	
1633	$TlCr(SO_4)_2.12H_2O$	664.725	C.		2.38	122
1634	$ZnCr_2O_4$	233.400			5.3	
1635	$(NH_4)_2Cr_2O_7.HgCl_2$	523.624	M.		3.11	
1636	Ag_2CrO_4	331.770			5.625	
1637	$Ag_2Cr_2O_7$	431.780			4.770	
1638	$MnO.Cr_2O_3$	222.950			4.87	
1639	$FeCr_2O_4$—Chromite	223.860	C.		4.5	181
1640	$NiCr_2O_6Cl_2.9H_2O$	491.765		47		
1641	MoO_2	128.000	Tet.		$4.516^{19.5}$	
1642	MoO_3	144.000	R.	795	$4.50^{19.5}$	
1643	$Mo_5O_{14}.6H_2O$	812.092			3.6^{18}	
1644	H_2MoO_4	162.015	H.	d. 115		
1645	H_4MoO_5	180.031	M. Tri. ?		3.124^{15}	
1646	MoF_6	210.000		17		
1647	MoO_2F_2	166.000			3.494	
1648	$MoOF_4$	188.000		98	3.001	
1649	$MoCl_5$	273.290		194		
1650	MoI_2	349.864			4.3	
1651	MoS_2—Molybdenite	160.130	H.	1185	4.8	
1652	Mo_2S_3	288.195			5.9^{15}	
1653	$(NH_4)_2MoO_4$	196.078	M.		2.270	
1654	$18MoO_3.14NH_3.3H_2O_2.18H_2O$	3256.76	M.		2.975	
1655	Mo_2P_2	254.048			6.17	
1656	$Mo(PO_3)_3$	333.072			3.28^{0}	
1658	$MoCl_5.POCl_3$	426.688		127		
1659	$18MoO_3.As_2O_5.28H_2O$	3326.35	Tri.		3.088	
1660	$18MoO_3.As_2O_5.38H_2O$	3506.51	Tri.	d.	2.822	
1661	$Bi_2O_3.MoO_3$—Koechlinite	610.000	R.			1065
1662	MoC	108.000		2570	8.40	
1663	Mo_2C	204.000		2380	8.9	
1664	$Mo(CO)_6$	264.000			1.95	
1665	$3C_2H_4(NH_2)_2.HSCN.Mo(OH)(SCN)_3$	462.447		128 d.		
1666	$MoSi_2$	152.120			6.1	
1667	$TiO_2.12MoO_3.22H_2O$	2204.24	Tet.	60		
1668	$PbMoO_4$—Wulfenite	367.200	Tet.	1068	6.7	419
1669	$2PbO.MoO_3$	590.400		951		
1670	$Fe_2O_3.3MoO_3.7.5H_2O$—Molybdite	774.796	R.		4.5	919, 936, 953
1671	$WO_3.H_2O$—Tungstite	250.015	R.	1473	5.5 ?	1018
1672	WF_6	298.000		2.5		
1673	WOF_4	276.000		110		
1674	WCl_5	361.290		248		
1675	WCl_6	396.748		275		
1676	WO_2Cl_2	286.916				
1677	$WOCl_4$	341.832		211		
1678	WBr_5	583.580		276		

Index No.	Formula	Mol. wt.	Crystal system	M. P.	d_4^{20}	Ref. ind. finding No.
1679	$WOBr_4$	519.664		277		
1680	$WCl_6.3WBr_6$	2387.24		232		
1681	WI_2	437.864			6.9^{18}	
1682	WI_4	691.728			5.2^{18}	
1683	WS_2	248.130			7.5^{10}	
1684	WP	215.024			8.5	
1685	WP_2	246.048			5.8	
1686	W_4P_2	798.048			5.21	
1687	$24WO_3.P_2O_5.45H_2O$	6520.74	C.		4.68	
1688	WAs_2	333.920			6.9^{18}	
1689	WC	196.000		2777	15.7^{18}	
1690	W_2C	380.000		2877	16.06^{18}	
1691	W_3C	564.000		>2700		
1692	WSi_2	240.120			9.3^{0}	
1693	W_2Si_3	452.180			10.9	
1694	$PbO.WO_3$—Raspite	455.200	M.	1123		1023
1695	$PbO.WO_3$—Stolzite	455.200	Tet.		8.23	401
1696	$CuO.WO_3$—Cuprotungstite	311.570	Tet.			1007
1697	$MnO.WO_3$—Hübnerite	302.930	M.		7.2	1017
1698	$FeO.WO_3$—Ferberite	303.845	Tet.		6.64	1062
1699	$Fe_2O_3.WO_3.6H_2O$—Ferritungstite	499.772	H.			364
1700	$NiO.WO_3$	306.690	R.		$6.88^{20.5}$	
1701	$3Cr_3C_2.W_2C$	920.090			8.4^{22}	
1702	UO_2—Uraninite	270.170	R.		10.5	
1703	UO_3	286.170			5.92	
1704	$UO_4.2H_2O$	338.201		d. 115		
1705	U_3O_8—Pitchblende	842.510			7.31	
1706	UF_6	352.170	M.		4.68	
1707	$(UO_2)(ClO_4)_2.4H_2O$	541.148		110 d.		
1708	$(UO_2)(ClO_4)_2.6H_2O$	577.178		90		
1709	UBr_4	557.834			4.84	
1710	UI_4	745.898		500	5.6	
1711	$UO_2(IO_3)_2$	620.034	R.	d. 250	5.2	
1712	$UO_2(IO_3)_2.H_2O$	638.049			5.05	
1713	$UO_2SO_4.3H_2O$	420.281		d. 100	3.28	
1714	$UO_2NO_3.6H_2O$	440.270	R.	59	2.742	
1715	$UO_2(NO_3)_2.3H_2O$	448.232		120		
1716	$UO_2(NO_3)_2.6H_2O$	502.278	R.	d. 100	2.81	525
1717	$(NH_4)_2(UO_2)(NO_3)_4.2H_2O$	590.310			2.78	
1718	$(NH_4)_2(UO_2)(SO_4)_2.2H_2O$	534.408			3.01	
1719	$UO_2.2P_2O_5$	554.266	R.		3.9	
1720	$3UO_2.P_2O_5.6H_2O$—Phosphuranylite	1060.65	C.			906
1721	$3UO_3.As_2O_5.12H_2O$—Troegerite	1304.61	M.		3.3	802
1722	$Bi_2O_3.2UO_2.3H_2O$—Uranospherite	1060.39	R.		6.36	993
1723	$5Bi_2O_3.3UO_2.2As_2O_5.12H_2O$—Walpurgite	3816.53	Tri.		5.76	997
1724	UC_2	262.170		2260	11.3^{18}	
1725	U_2C_3	512.340		2400	11.28	
1726	$UO_3.CO_2$—Rutherfordine	330.170	Tet.		5.6	935
1727	$UO_2C_2O_4$	358.170			2.98	
1728	$UO_2(CHO_2)_2.H_2O$	378.201		d. 110	3.69^{19}	
1729	$UO_2(C_2H_3O_2)_2.2H_2O$	424.247	R.	d. 275	2.89^{15}	
1730	$(NH_4)_4(UO_2)(CO_3)_3.2H_2O$	558.356			2.77	
1731	$UO_2(C_2H_3O_2)_2.NH_4C_2H_3O_2$	465.278	Tet.			223
1732	USi_2	294.290			8.0	
1733	$12U_2O_3.5SiO_2.14H_2O$—Soddite	6844.60	R.		4.627	
1734	$U_5Pb_2O_{17}.4H_2O$—Curite	1949.31			7.19	
1735	$8UO_3.4PbO.3P_2O_5.12H_2O$—Dewindtite	3824.49			4.8	
1736	$UPbSiO_6.1.33H_2O$—Kasolite	593.450	M.		5.96	
1737	$Cu(UO_2)_2P_2O_8.8H_2O$—Metatorbernite I	938.081	Tet.		3.5	303
1738	$CuO.2UO_3.P_2O_5.8H_2O$—Torbernite	938.081	Tet.		3.5	737
1739	$CuO.2UO_2.As_2O_5.8H_2O$—Zeunerite	993.953	Tet.		3.2	317
1740	VO	66.9600			5.758^{14}	
1741	VO_2	82.9600		>1755	4.399	

Index No.	Formula	Mol. wt.	Crystal system	M. P.	d_4^{20}	Ref. ind. finding No.
1742	V_2O_2	133.920			3.64	
1743	V_2O_3	149.920		1970	4.87^{18}_{4}	
1744	V_2O_5	181.920		800	3.357	
1745	VF_3	107.960	R.		3.363^{19}	
1746	VF_4	126.960		d. 325	2.975^{23}	
1747	VF_5	145.960			2.177^{19}	
1748	VOF_2	104.960		d.	3.396^{19}	
1749	VOF_3	123.960		300	2.459	
1750	VCl_2	121.876	H.		3.23^{18}	
1751	VCl_3	157.334			3.00^{18}	
1752	VCl_4	192.792		−109	l. 1.816^{30}	
1753	$VOCl$	102.418			2.824	
1754	$VOCl_2$	137.876			2.88^{13}	
1755	$VOCl_3$	173.334		< −15	l. 1.829	
1756	V_2O_2Cl	201.378			3.64	
1757	$VOBr$	146.876		d. 480	4.00^{18}	
1758	$VOBr_3$	306.708			$2.933^{14.5}$	
1759	V_2S_2	166.050			4.200	
1760	V_2S_3	198.115			4.7^{21}	
1761	V_2S_5	262.245			3.000	
1762	$V_2O_4.3SO_3.16H_2O$—Minasragrite	694.361	M. Tri.			619
1763	VN	64.9680		2050	5.630	
1764	$(NH_4)_3VS_4$	233.336			1.620	
1765	$(NH_4)_4V_2S_6O$	382.465			1.716	
1766	$Bi_2O_3.V_2O_5$—Pucherite	647.920	R.		$6.25^{24.5}$	1064
1767	VC	62.9600		2830	5.4	
1768	V_4C_3	239.840		2750^{5mm}		
1769	$(NH_4)_2VO(CNS)_4.5H_2O$	425.407	R.	58		
1770	VSi_2	107.080			4.42	
1771	V_2Si	129.980			5.48^{17}	
1772	$PbO.V_2O_5$	405.120		849		
1773	$2PbO.V_2O_5$	628.320		722		
1774	$3PbO.V_2O_5$	851.520		952		
1775	$8PbO.V_2O_5$	1967.52		794		
1776	$9PbO.3V_2O_5.PbCl_2$—Vanadinite	2832.68	H.		6.863	403
1777	$TlVO_3$	303.360		424		
1778	Tl_3VO_4	728.160		566		
1779	$Tl_4V_2O_7$	315.200		454		
1780	$Tl_6V_4O_{13}$	1638.24			$8.59^{17.5}$	
1781	$4(PbZn)O.V_2O_5.H_2O$—Descloizite		R.		6.0	1021
1782	$Cd_{10}V_6Cl_2O_{24}$	1884.78	H.		5.264^{15}	
1783	$Cd_{10}V_6Br_2O_{24}$	1973.69	H.		5.456^{15}	
1784	$2PbO.2CuO.V_2O_5.H_2O$—Cuprodescloizite	805.475	R.		6.1	1020
1785	$Ag_4V_2O_7$	645.440		383		
1786	$5(NH_4)_2O.P_2O_5.3V_2O_5.15MoO_3.39H_2O$	3810.80			2.410	
1787	$6(NH_4)_2O.P_2O_5.6V_2O_5.12MoO_3.41H_2O$	4012.67			2.411	
1788	$3(NH_4)_2O.SiO_2.V_2O_5.9MoO_3.20H_2O$	2054.52			2.802^{18}	
1789	$3(NH_4)_2O.SiO_2.V_2O_5.10MoO_3.21H_2O$	2216.54			2.804^{18}	
1790	$3(NH_4)_2O.SiO_2.V_2O_5.11MoO_3.27H_2O$	2468.63	M. ?		2.807	
1791	$3(NH_4)_2O.SiO_2.V_2O_5.15MoO_3.24H_2O$	2990.58			2.816	
1792	$3(NH_4)_2O.SiO_2.V_2O_5.9WO_3.24H_2O$	2918.58			3.40	
1793	$3(NH_4)_2O.SiO_2.V_2O_5.10WO_3.21H_2O$	3096.53			3.43	
1794	$2UO_3.3V_2O_5.15H_2O$—Uvanite	1388.33	R.			979
1795	Cb_2O_5	266.200		1520	$4.60^{61.2}_{4}$	
1796	CbF_5	188.100		75.5	3.29	
1797	$CbCl_5$	270.390		194	2.75	
1798	$CbOCl_3$	215.474				
1799	CbC	105.100				
1800	Cb_2FeO_6—Ferroniobite	338.040	R.		6.26	1063
1801	Ta_2O_5	443.000	R.	1470 d.	$8.735^{61.2}_{4}$	
1802	TaF_5	276.500		96.8	4.74	
1803	$TaCl_5$	358.790		221	3.68^{27}	
1804	$TaBr_5$	581.080		240		

Index No.	Formula	Mol. wt.	Crystal system	M. P.	d_4^{20}	Ref. ind. finding No.
1805	TaC	193.500				
1806	$TaSi_2$	237.620			8.83^{0}	
1807	$Ta_2O_5.MnO$—Manganotantalate	513.930	R.		7.03	1019
1808	B_2O_3	69.6400			l. 1.85 glass	26
1809	$B_2O_3.3H_2O$—Sassolite	123.686	Tri.	d.	1.49	448
1810	B_2H_6	27.6862		−169		
1811	B_4H_{10}	53.3570		−112		
1812	$B_{10}H_{14}$	122.308		99.5	0.94	
1813	BF_3	67.8200		−127		
1814	BCl_3	117.194		−107	l. 1.434^{0}_{4}	
1815	BBr_3	250.568		− 45	l. 2.60	
1816	B_2HBr	102.564		−104		
1817	BI_3	391.616		43	l. 3.3^{50}	
1818	B_2S_3	117.835		310	1.55	
1819	BN_2	38.8360				
1820	NH_4BF_4	104.859			1.851^{17}	
1821	CB_6	76.9200		2350	2.6	
1822	$B(CH_3)_3$	55.8893		56		
1823	$B(C_2H_5)_3$	97.9355			l. 0.696^{23}	
1824	$B(OCH_3)_3$	103.889			l. 0.915	
1825	$B(OC_2H_5)_3$	145.936			l. $0.864^{26.5}$	11
1826	$B(OC_3H_7)_3$	187.982			l. 0.867^{16}	
1827	$B(OC_4H_9)_3$—Isobutyl	230.028			l. 0.864^{0}	14
1828	$B(OC_5H_{11})_3$—Isoamyl	272.074			l. 0.872^{0}	17
1829	SiB_3	60.5200			2.52	
1830	SiB_6	92.9800			2.47	
1831	Zr_3B_4	316.280			3.7	
1833	ThB_4	275.430			7.5	
1834	ThB_6	297.070			6.4	
1835	$TlBO_2$	247.220		472		
1836	Tl_3BO_3	672.020		370 d.		
1837	$Tl_4B_2O_5$	919.240		434		
1838	$B_2O_3.CdO$	198.050		875		
1839	$B_2O_3.CuO$	149.210		d. 875	3.86	
1840	MnB_2	76.5700			6.9	
1841	$Mn_3B_4O_9$	352.070	Tri.		3.61	923
1842	FeB	66.6600			7.15	
1843	Fe_2B	122.500			7.4	
1844	FeB_2	77.4800			5.0	
1845	Fe_2B_5	165.780		1340		
1846	Fe_5B_2	300.840		1351		
1847	CoB	69.7900			7.25	
1848	Co_2B	112.740			7.9	
1849	NiB	69.5100			7.4	
1850	Ni_2B	128.200		1225	8.0	
1851	Ni_3B_2	197.710		1160		
1852	CrB	62.8300			5.5	
1853	Cr_3B_2	177.670			6.7^{15}	
1854	Mo_3B_4	331.280			7	
1855	WB_2	205.640			10.8	
1857	$B_2O_3.9WO_3.2NiO.18H_2O$	2631.30	M.	80	l. 3.6^{80}	
1858	Al_2O_3—Corundum	101.920	Trig.	2050	4.00	359
1859	$Al_2O_3.H_2O$—Diaspore	119.935	R.	d. 360	3.413	911
1860	$Al_2O_3.3H_2O$—Gibbsite	155.966	M.	d. 200	2.423	692
1861	$Al(OH)_3$	77.9831	M.			632
1862	AlF_3	83.9600	Tri.	1040	3.07	
1863	$AlF_3.H_2O$—Fluellite	101.975	R.		2.17	507
1864	$AlCl_3$	133.334	H.	194	2.44^{25}_{4}	
1865	$AlBr_3$	266.708	Trig.	97.5	l. 1.31^{200}_{4} 3.01^{25}_{4} l. 2.64^{100}_{4}	
1866	$AlBr_3.15H_2O$	536.939		− 7.5 m		
1867	$Al(BrO_3)_3.9H_2O$	572.847		62.3		

Index No.	Formula	Mol. wt.	Crystal system	M. P.	d_4^{20}	Ref. ind. finding No.
1868	$AlBrCl_2$	177.792		143		
1869	AlI_3	407.756		191	3.98 l. 3.20_4^{200}	
1870	Al_2S_3	150.115	H.	1100	2.02	
1871	$Al_2O_3.SO_3.9H_2O$—Aluminite	344.124	M.	d.	1.705^0	453
1872	$Al_2O_3.2SO_3$—Alumian	262.050	Trig.		2.74	286
1873	$Al_2O_3.3SO_3$	342.115		d. 770	2.71	
1874	$Al_2O_3.3SO_3.18H_2O$—Alunogenite	630.361	M.		1.691^{17}	468
1875	$2Al_2O_3.SO_3.10H_2O$—Felsoebanyite	464.059	R.		2.33	587
1876	$2Al_2O_3.SO_3.15H_2O$—Paraluminite	554.136				462
1877	AlN	40.9680	R.	2150		
1878	$Al(NO_3)_3.9H_2O$	375.123	R.	73		
1879	$AlCl_3.NH_4Cl$	186.831		304		
1880	$AlCl_3.3NH_3$	184.427		280 d.		
1881	$Al_2(SO_4)_3.(NH_4)_2SO_4$	474.258			2.039	
1882	$Al_2O_3.(NH_4)_2O.4SO_3.24H_2O$—Tschermigite	906.628	C.	93.5	1.64	81
1883	$AlPO_4$	121.984	H.		2.59	
1884	$Al_2O_3.P_2O_5.4H_2O$—Metavariscite	316.030	R.	>1500	2.54	680
1885	$Al_2O_3.P_2O_5.6H_2O$—Lucinite	352.060	R.		2.566	724
1886	$Al_2O_3.P_2O_5.6H_2O$—Zepharovichite	352.060		>1500	2.37	664
1887	$Al_2O_3.3P_2O_5$	528.064			2.779	
1888	$2Al_2O_3.P_2O_5.3H_2O$—Augelite	399.934	M.	d.	2.77	712
1889	$5Al_2O_3.2P_2O_5.9H_2O$—Spherite	955.835	R.	d.	2.536	711
1890	$Al(AsCl)_3$	358.214			2.85_4^{22}	
1891	Al_4C_3	143.840			2.36	
1892	$Al_2O_3.C_{12}O_9.18H_2O$—Mellite	714.197	Tet.		1.64	260
1893	$Al(CH_3)_3$	72.0293				19
1894	$Al(C_2H_5)_3$	114.076				29
1895	$Al(C_5H_7O_2)_3$—Acetylacetonate	324.122		194		
1896	$Al(OC_6H_5)_3$	306.076		*ca.* 265	1.23	
1897	$NH_3(CH_3)Al(SO_4)_2.12H_2O$	467.329	C.		1.568	75
1898	$Al_2O_3.SiO_2$—Andalusite	161.980	R.	d.	3.2	815
1899	$Al_2O_3.SiO_2$—Cyanite	161.980	Tri.	d.	3.6	907
1900	$Al_2O_3.SiO_2$—Sillimanite	161.980	R.	d. <1550	3.23	819
1901	$Al_2O_3.2SiO_2.2H_2O$—Kaolinite	258.071	M.		2.6	690
1902	$Al_2O_3.2SiO_2.4H_2O$—Newtonite	294.102	Tet.		2.37	274
1903	$Al_2O_3.4SiO_2.H_2O$—Pyrophyllite	360.175	R.		2.85	727
1904	$3Al_2O_3.2SiO_2$—Mullite	425.880	R.	1810 d.	3.156	
1905	$2(AlF)O.SiO_2$—Topaz		R.		3.58	784
1906	Al_3Ti_2	176.680	Tet.		3.348	
1907	$3Al_2O_3.2PbO.2P_2O_5.7H_2O$—Plumbogummite	1162.36	H.	d.	4.014	325
1908	$3Al_2O_3.2PbO.2SO_3.P_2O_5.6H_2O$—Hinsdalite	1162.43	H.		3.65	865
1909	$2Al(OH)_3.Pb(HCO_3)_2$—Dundasite	485.182			3.25	
1910	$Al_2(SO_4)_3.Tl_2SO_4.24H_2O$	1279.35	C.	91	2.320	107
1911	$Al_2O_3.ZnO$—Automolite (Gahnite)	183.300	C.		4.58	161
1912	$3Al_2O_3.6ZnO.2SO_3.18H_2O$—Zincaluminite	1278.45	H.	d.	2.26	256
1913	$Al_2O_3.4CuO.SO_3.8H_2O$—Cyanotrichite	644.388	R.		2.737	779
1914	$(AlCl)O.6CuO.SO_3.9H_2O$—Spangolite		Trig.	d.	3.14	340
1915	$3Al_2O_3.CuO.2P_2O_5.9H_2O$—Turquoise	831.565	Tri.	d. 300	2.67	782
1916	$4Al_2O_3.18CuO.5As_2O_5.55H_2O$—Liroconite	3980.39	M.	d.	2.96	830
1917	$Al_2O_3.MnO$	172.850	C.		4.12	
1918	$Al_2O_3.MnO.4SO_3.24H_2O$—Apjohnite	925.480	M.		1.782	477
1919	$Al_2O_3.2MnO.P_2O_5.4H_2O$—Eosphorite	457.890	R.		3.13	837
1920	$Al_2O_3.MnO.2SiO_2.2H_2O$—Carpholite	329.001	R.		2.94	801
1921	$Al_2O_3.3MnO.3SiO_2$—Spessartite	494.890	C.		4.180	167
1922	$Al_2O_3.7MnO.8SiO_2.6H_2O$—Ganophyllite	1187.00	M.		2.84	914
1923	$Al_2O_3.FeO$—Hercynite	173.760	C.		3.93	165
1924	$Al_2O_3.FeO.4SO_3.24H_2O$—Halotrichite	926.390	M.		2.04	505
1925	$Al_2O_3.FeO.P_2O_5.11H_2O$—Paravauxite	513.977	Tri.	d.	2.3	681
1926	$Al_2O_3.2FeO.P_2O_5.4H_2O$—Childrenite	459.710	R.	d.	3.23	876

Index No.	Formula	Mol. wt.	Crystal system	M. P.	d_4^{20}	Ref. ind. finding No.
1927	$2Al_2O_3.4FeO.3P_2O_5.24H_2O$—Vauxite	1349.71	Tri.		2.45	677
1928	$Al_2O_3.3FeO.3SiO_2$—Almandite	497.620	C.		4.04	166
1929	$Al_2O_3.3FeO.2SiO_2.3H_2O$—Daphnite	491.606	M.			826
1930	$5Al_2O_3.2FeO.4SiO_2.H_2O$—Staurolite	910.528	R.		3.7	930
1931	$Al_2O_3.CoO$	176.890	C.		4.37_4^{18}	
1932	$3Al_2O_3.4CoO$	605.640			4.80	
1933	AlB_{12}	156.800	M.		2.5	
1934	$Al_2O_3.B_2O_3$—Jeremejevite	171.560	H.		3.3	313
1935	$BO_3(AlO)_3$	187.700	R.			758
1936	$C_2B_{12}.3AlB_{12}$	624.240	Tet.		2.615	
1937	$8Al_2O_3.B_2O_3.6SiO_2.H_2O$—Dumortierite	1263.38	R.		3.3	886
1938	Sc_2O_3	138.200			3.864	
1939	$ScCl_3$	151.474		939		
1940	$ScBr_3$	284.848			3.91	
1941	$Sc_2(SO_4)_3$	378.395			2.579	
1942	$Sc(NO_3)_3$	231.124		150		
1943	$Sc(NO_3)_3.4H_2O$	303.186		d. 100		
1944	$Sc_2O_3.2SiO_2$—Thortveitite	258.320	R.		3.57	946
1945	Yt_2O_3	226.000		2410	4.84	
1946	$YtCl_3$	195.374		<686	2.8_4^{18}	
1947	$YtCl_3.H_2O$	213.389		160		
1948	$Yt(BrO_3)_3.9H_2O$	634.887		74		
1949	$Yt_2(SO_4)_3$	466.195			2.612	
1950	$Yt_2(SO_4)_3.8H_2O$	610.318	M.		2.558	661
1951	$Yt_2O_3.P_2O_5$—Xenotime	368.048	Tet.		4.6	348
1952	$Yt_4(P_2O_7)_3$	878.144			3.059	
1953	YtC_2	113.000			4.13	
1954	$Yt(CH_3CO_2)_3.4H_2O$	338.131	Tri.		1.696	
1955	$Yt(C_2H_5SO_4)_6.18H_2O$	1163.90	H.		1.764_4^{25}	238
1956	$2Yt_2O_3.4SiO_2.H_2O$—Thalenite	710.255	M.		4.23	925
1957	$Yt_2Pt_3(CN)_{12}.21H_2O$	1453.90	R.		2.376	
1957.1	$Yt_2(MoO_4)_3$	658.000		1347	4.79^{16}	415
1958	La_2O_3	325.820		>2000	6.51	
1959	$LaCl_3$	245.284		907	3.947_4^{18}	
1960	$LaCl_3.7H_2O$	371.392		d. 91		
1961	$La(BrO_3)_3.2H_2O$	558.689		d. 150		
1962	$La(BrO_3)_3.9H_2O$	684.797		37.5		
1963	LaS_2	203.040		d. 650		
1964	La_2S_3	374.015			4.911^{11}	
1965	$La_2(SO_4)_3$	566.015			3.600	
1966	$La_2(SO_4)_3.9H_2O$	728.154			2.821	
1967	$(NH_4)_2La_2(SO_4)_4.8H_2O$	842.281	M.		2.516	
1968	$La_2O_3.5P_2O_5$	1036.06	M.		3.241	
1969	LaC_2	162.910			5.02	
1970	$La(C_2H_5SO_4)_6.18H_2O$	1213.81	H.		1.845_4^{25}	224
1971	$Tl_2La(NO_3)_5.4H_2O$	929.812		72 d.	3.318_4^{0}	
1972	$Zn_3La_2(NO_3)_{12}.24H_2O$	1650.43		98.0	2.161_4^{0}	
1973	$La_2Pt_3(CN)_{12}.18H_2O$	1499.88	M.		2.626	
1974	$Mn_3La_2(NO_3)_{12}.24H_2O$	1619.08		87.2	2.080_4^{0}	
1975	$Co_3La_2(NO_3)_{12}.24H_2O$	1631.20		101.8	2.131_4^{0}	
1976	$Ni_3La_2(NO_3)_{12}.24H_2O$	1630.36		110.5	2.146_4^{0}	
1976.1	$La_2(MoO_4)_3$	757.820	Tet.	1181	4.77^{16}	
1977	CeO_2	172.250	C.	1950	7.3	
1978	CeF_3—Fluocerite	197.250	H.	1324	5.8	298
1979	$CeCl_3$	246.624		848	3.92_4^{0}	
1980	$Ce(BrO_3)_3.9H_2O$	686.137	H.	49		
1981	Ce_2S_3	376.695			5.020^{11}	
1982	$Ce_2(SO_4)_3$	568.695			3.912	
1983	$Ce_2(SO_4)_3.5H_2O$	658.772	M.		3.17	
1984	$Ce_2(SO_4)_3.8H_2O$	712.818	Tri.	630	2.886^{17}	
1985	$Ce_2(SO_4)_3.9H_2O$	730.834	H.		2.831	
1986	$Ce_2(S_2O_6)_3.15H_2O$	1031.12	Tri.		2.288	560
1987	Ce_2SeO_4	423.700	R.		4.456	748

Index No.	Formula	Mol. wt.	Crystal system	M. P.	d_4^{20}	Ref. ind. finding No.
1988	$(NH_4)_2Ce(NO_3)_5.4H_2O$	558.429	M.	74		
1989	$(NH_4)_2SO_4.Ce_2(SO_4)_3.8H_2O$	844.961	M.		2.52_3	
1990	$CePO_4$	235.274			5.2_2	
1991	$Ce(PO_3)_3$	377.322			3.27	
1992	CeC_2	164.250			5.2_3	
1993	$Ce(C_2H_3O_2)_2$	258.296		308 d.		
1994	$CeOF.CO_2$—Bastnäsite	219.250	H.		$5._0$	346
1995	$Ce(C_2H_5SO_4)_6.18H_2O$	1215.15	H.		1.930_4^{25}	225
1996	$CeSi_2$	196.370			5.67^{17}	
1997	$Tl_2Ce(NO_3)_5.4H_2O$	931.152		64.5 d.	3.326_4^0	
1998	$Zn_3Ce_2(NO_3)_{12}.24H_2O$	1653.11	Trig.	$92._8$	2.188_4^0	
1999	$Ce_2Pt_3(CN)_{12}.18H_2O$	1502.56	M.		2.657	
2000	$Mn_3Ce_2(NO_3)_{12}.24H_2O$	1621.76		$83._7$	2.102_4^0	
2001	$Co_3Ce_2(NO_3)_{12}.24H_2O$	1633.88		$98._5$	2.157_4^0	
2002	$Ni_3Ce_2(NO_3)_{12}.24H_2O$	1633.04		$108._5$	2.173_4^0	
2002.1	$Ce_2(MoO_4)_3$	760.480	R. Tet.	973	4.83	416
2003	$Ce_2(WO_4)_3$	1024.50	Tet.	108_9	$6.77^{16.5}$	
2004	$Ce_2O_3.3Al_2O_3.2P_2O_5.6H_2O$—Florencite	1026.45	Trig.		3.59	337
2005	Pr_2O_3	329.840			6.87	
2006	Pr_4O_7	675.680			6.71_5	
2007	$Pr_{10}O_{18}$	1697.20			6.70_4	
2008	$PrCl_3$	247.294		81_8	4.020_4^{25}	
2009	$Pr(BrO_3)_3$	524.668		d. 150		
2010	$Pr(BrO_3)_3.9H_2O$	686.807	H.	56.5		
2011	Pr_2S_3	378.035			5.04_2^{11}	
2012	$Pr_2(SO_4)_3$	570.035			3.72_0^{16}	
2013	$Pr_2(SO_4)_3.5H_2O$	660.112	M.		3.17_3	
2014	$Pr_2(SO_4)_3.8H_2O$	714.158	M.		2.82	663
2015	$Pr_2(SeO_4)_3$	711.440			4.30^{15}	
2016	$Pr_2(SeO_4)_3.8H_2O$	855.563			$3.094^{13.5}$	
2017	PrC_2	164.920			5.1	
2018	$Pr(C_2H_5SO_4)_6.18H_2O$	1215.82	H		1.876_4^{25}	226
2019	$Zn_3Pr_2(NO_3)_{12}.24H_2O$	1654.45	Trig.	91.5	2.202_4^0	
2020	$Mn_3Pr_2(NO_3)_{12}.24H_2O$	1623.10		$81._0$	2.109_4^0	
2021	$Co_3Pr_2(NO_3)_{12}.24H_2O$	1635.22		$97._0$	2.176_4^0	
2022	$Ni_3Pr_2(NO_3)_{12}.24H_2O$	1634.38		$108._0$	2.195_4^0	
2023	Nd_2O_3	336.540			7.24	
2024	$NdCl_3$	250.644		78_4	4.134_4^{25}	
2025	$NdCl_3.6H_2O$	358.736		124	$2.282_4^{16.5}$	
2026	$Nd(BrO_3)_3.2H_2O$	564.049		d. 15_0		
2027	$Nd(BrO_3)_3.9H_2O$	690.157	H.	$66._7$		
2028	Nd_2S_3	384.735			5.17_9^{11} ?	
2029	$Nd_2(SO_4)_3.8H_2O$	720.858	M.		2.850	668
2030	NdC_2	168.270			5.1_5	
2031	$Nd(C_2H_5SO_4)_6.18H_2O$	1219.17	H.		1.883_4^{25}	227
2032	$Zn_3Nd_2(NO_3)_{12}.24H_2O$	1661.15		88.5	2.215_4^0	
2033	$Mn_3Nd_2(NO_3)_{12}.24H_2O$	1629.80		$77._0$	2.114_4^0	
2034	$Co_3Nd_2(NO_3)_{12}.24H_2O$	1641.92		$95._5$	2.195_4^0	
2035	$Ni_3Nd_2(NO_3)_{12}.24H_2O$	1641.08		$105._6$	2.202_4^0	
2035.1	$Nd_2(MoO_4)_3$	768.540	Tet.	1176	5.14^{18}	414
2036	$(NdPr)_2(SO_4)_3.8H_2O$		M.			658
2037	Sa_2O_3	348.860			7.43	
2038	$SaCl_2$	221.346			3.69^{22}	
2039	$SaCl_3$	256.804		68_6	4.46_4^{18}	
2040	$SaCl_3.6H_2O$	364.896	Tri.		2.383	
2041	$SaOCl$	201.888			7.02	
2042	$SaBr_3.6H_2O$	498.270			2.971	
2043	$Sa(BrO_3)_3.2H_2O$	570.209		d. 15_0		
2044	$Sa(BrO_3)_3.9H_2O$	696.317	H.	75		
2045	Sa_2S_3	397.055			3.7	
2046	$Sa_2(SO_4)_3.8H_2O$	733.178	M.		2.930	670
2047	$Sa(NO_3)_3.6H_2O$	444.546	Tri.		2.375	
2048	$SaPO_4$	245.454			$5.83^{17.5}$	

Index No.	Formula	Mol. wt.	Crystal system	M. P.	d_4^{20}	Ref. ind. finding No
2049	SaC_2	174.430			5.86	
2050	$Sa(CHO_2)_3$	285.453			3.733	
2051	$Sa(C_2H_3O_2)_3.4H_2O$	399.561			1.94	
2052	$Sa(C_3H_5O_2)_3$	369.546			1.894	
2053	$Sa(C_3H_5O_2)_3.3H_2O$	423.592			1.786	
2054	$Sa(C_2H_5SO_4)_6.18H_2O$	1225.33	H.		1.904_4^{25}	234
2055	$Zn_3Sa_2(NO_3)_{12}.24H_2O$	1673.47		76.5	2.283_4^0	
2056	$Mn_3Sa_2(NO_3)_{12}.24H_2O$	1642.12		70.2	2.188_4^0	
2057	$Co_3Sa_2(NO_3)_{12}.24H_2O$	1654.24		83.2	2.237_4^0	
2058	$Ni_3Sa_2(NO_3)_{12}.24H_2O$	1653.40		92.2	2.272_4^0	
2059	$Sa_2O.B_2O_3$	386.500			6.05	
2060	Eu_2O_3	352.000			7.42	
2061	$Eu(C_2H_5SO_4)_6.18H_2O$	1226.90	H.		1.909_4^{25}	239
2062	Gd_2O_3	362.520			7.407	
2063	$GdCl_3$	263.634		628	4.52_4^0	
2064	$GdCl_3.6H_2O$	371.726			2.424_4^0	
2065	$GdBr_3.6H_2O$	505.100			2.844^{15}	
2066	$Gd_2(SO_4)_3$	602.715			$4.139^{14.6}$	
2067	$Gd_2(SO_4)_3.8H_2O$	746.838	M.		$3.010^{14.6}$	
2068	$Gd(NO_3)_3.5H_2O$	433.361		92	2.406^{15}	
2069	$Gd(NO_3)_3.6H_2O$	451.376	Tri.	91	2.332	
2070	$Gd_2(C_2O_4)_3.10H_2O$	758.674		110		
2071	$Gd(C_2H_3O_2)_3.4H_2O$	406.391	Tri.		1.611	
2072	$Gd(C_2H_5SO_4)_6.18H_2O$	1232.16	H.		1.919_4^{25}	235
2073	$Zn_3Gd_2(NO_3)_{12}.24H_2O$	1687.13		56.5	2.351_4^0	
2074	$Gd_2Pt_3(CN)_{12}.21H_2O$	1590.63	R.		2.563	
2075	$Co_3Gd_2(NO_3)_{12}.24H_2O$	1667.90		63.2	2.315_4^0	
2076	$Ni_3Gd_2(NO_3)_{12}.24H_2O$	1667.06		72.5	2.356_4^0	
2077	$TbCl_3$	265.574		588	4.35_4^0	
2078	$Tb(NO_3)_3.6H_2O$	453.316	M.	89.3		
2079	Dy_2O_3	373.040			7.81	
2080	$DyCl_3$	268.894		680	3.67_4^0	
2081	$Dy(C_2H_5SO_4)_6.18H_2O$	1237.42	H.		1.492_4^{25}	240
2082	Er_2O_3	383.400			8.640	
2083	$Er_2(SO_4)_3$	623.595			3.678	
2084	$Er_2(SO_4)_3.8H_2O$	767.718			3.180	
2085	$Er(C_2H_3O_2)_3.4H_2O$	416.831	Tri.		2.114	
2086	$Er(C_2H_5SO_4)_6.18H_2O$	1242.60	H.		1.907_4^{25}	233
2087	Yb_2O_3	395.200			9.17	
2088	$YbCl_3.6H_2O$	388.066			2.575	
2089	$Yb_2(SO_4)_3$	635.395			3.793	
2090	$Yb_2(SO_4)_3.8H_2O$	779.518			3.286	
2091	$Yb_2(SeO_4)_3$	776.800			4.140	
2092	$Yb_2(SeO_4)_3.8H_2O$	920.923			3.30	
2093	$Yb(NO_3)_3.4H_2O$	431.686			2.682	
2094	$Yb_2(CO_3)_3.4H_2O$	599.262			3.67	
2095	$Yb(C_2O_4)_3$	437.600			2.439	
2096	$Yb(C_2O_4)_3.10H_2O$	617.754			2.644	
2097	$Yb(C_2H_3O_2)_3.4H_2O$	422.731			2.09	
2098	$LuCl_3$	281.374		>916	3.98	
2099	HfO_2	211.000		2812	9.68	
2099.5	$HfOCl_2.8H_2O$	410.039				270.5
2099.6	$(NH_4)_3HfF_7$	366.034	C.			70.1
2100	BeO	25.0200	H.	2400	3.025	347
2101	BeF_2	47.0200			l. 2.1^{15}	
2102	$2BeO.5BeF_2$	285.140			2.3	
2103	$BeCl_2$	79.9360		440	1.899_4^{25}	
2104	$BeBr_2$	168.852		490		
2105	BeI_2	262.884		510		
2106	$BeSO_4$	105.085			4.20^{15}	
2107	$BeSO_4.4H_2O$	177.147	Tet.		2.443	219
2108	$BeSeO_4.4H_2O$	224.282	R.		$1.713^{10.5}$	537
2109	Be_3N_2	55.0760		2200	2.03	

Index No.	Formula	Mol. wt.	Crystal system	M. P.	d_4^{20}	Ref. ind. finding No.
2110	$Be(NO_3)_2.3H_2O$	187.082		60		
2111	Be_2C	30.0400			1.9^{15}	
2112	$Be(C_2H_5)_2$	67.0970				
2113	$Be(C_3H_7)_2$	95.1278				
2114	$Be(C_5H_7O_2)_2$—Acetylacetonate	207.128	M.	108	1.168^4	
2115	$BeO.3Be(C_2H_3O_2)_2$	170.126		284	1.36^4	
2116	$BeO.3Be(C_2H_3O_2)(C_3H_5O_2)$	448.265		127		
2117	$BeO.3Be(C_3H_5O_2)_2$	490.311		120		
2118	$BeO.3Be(C_4H_7O_2)_2$	574.403				
2119	$BeO.Be(C_2H_5SO_4)_2.4H_2O$	356.309	Tet.			220
2120	$BeO.SiO_2$	85.0800		>1755		
2121	$2BeO.SiO_2$—Phenacite	110.100	Tri.		3.0	326
2122	$4BeO.2SiO_2.H_2O$—Bertrandite	238.215	R.		2.6	764
2123	$BeOH.BeBO_3$—Hambergite	93.8677	R.		2.35	733
2124	$BeO.Al_2O_3$—Chrysoberyl	126.940	R.		3.76	933
2125	$3BeO.Al_2O_3.6SiO_2$—Beryl	537.340	H.	1410	2.66	284
2126	$2BeO.Al_2O_3.2SiO_2.H_2O$—Euclase	290.095	M.		3.1	839
2127	$2BeO.Yt_2O_3.FeO.2SiO_2$—Gadolinite	468.000	M.		4.3	947
2128	MgO—Periclase	40.3200	C.	2800	3.65	158
2129	$MgO.H_2O$—Brucite	58.3354	Trig.		2.4	272
2130	MgF_2—Sellaite	62.3200	Tet.	1396	3.0	208
2131	$MgCl_2$—Chloromagnesite	95.2360	H.	712	2.325	335
2132	$MgCl_2.6H_2O$—Bischofite	203.328	M.	118 d.	1.56	562
2133	$Mg(ClO_3)_2.6H_2O$	299.328		35	1.80	
2134	$Mg(ClO_4)_2$	223.236		d. 251	2.60_4^{25}	
2135	$Mg(ClO_4)_2.6H_2O$	331.328		147	1.970_4^{25}	
2136	$MgBr_2$	184.152		700	3.72	
2137	$Mg(BrO_3)_2.6H_2O$	388.244	C.			117
2138	MgI_2	278.184			4.25	
2139	$Mg(IO_3)_2.4H_2O$	446.246	M.		$3.3^{13.5}$	
2140	MgS	56.3850			2.80	
2141	$MgSO_4$	120.385		1185	2.66	
2142	$MgO.SO_3.H_2O$—Kieserite	138.400	M.		2.57	637
2143	$MgSO_4.5H_2O$	210.462	Tri.		1.718	511
2144	$MgSO_4.6H_2O$—Hexahydrite	228.477	M.		1.76	
2145	$MgO.SO_3.7H_2O$—Epsomite	246.493	R.		1.68	447
2146	$MgS_2O_6.6H_2O$	292.542	Tri.		1.666	
2147	$MgSeO_4.6H_2O$	275.612	M.		1.928	503
2148	$MgO.N_2O_5.H_2O$—Nitromagnesite	166.351				558
2149	$Mg(NO_3)_2.6H_2O$	256.428		95	1.464	
2150	$(NH_4)_2O.MgO.2SO_3.6H_2O$—Boussingaultite	360.620	M.	>120	1.70	464
2151	$(NH_4)_2O.MgO.2SeO_3.6H_2O$	454.890	M.		2.04	568
2152	$Mg_2P_2O_7$	222.688			2.598^{22}	761
2153	$2MgO.P_2O_5.7H_2O$—Newberyite	348.796	R.		2.10	585
2154	$3MgO.P_2O_5.8H_2O$—Bobierite	407.131	M.		2.41	595
2155	$Mg(H_2PO_2)_2.6H_2O$	262.491	Tet.		1.59^{13}	
2156	$3MgO.P_2O_5.MgF_2$—Wagnerite	325.328	M.		3.12	701
2157	$(NH_4)_2O.2MgO.P_2O_5.12H_2O$—Struvite	490.950	R.		1.72	522
2158	$3MgO.(NH_4)_2O.2P_2O_5.10H_2O$—Hannayite	637.288	Tri.		1.89	703
2159	$3MgO.As_2O_5.8H_2O$—Hoernesite	495.003	M.		2.60	702
2160	$(NH_4)MgAsO_4.6H_2O$	289.411			1.932^{15}	
2161	Mg_3Sb_2	316.500		961		
2162	Mg_3Bi_2	490.960		715		
2163	$MgO.CO_2$—Magnesite	84.3200	Trig.		3.037	342
2164	$MgO.CO_2.3H_2O$—Nesquehonite	138.366	R.		1.850	542
2165	$MgO.CO_2.5H_2O$—Lansfordite	174.397	M.		1.73	459
2166	$2MgO.CO_2.4H_2O$—Artinite	196.702	R.		2.02	630
2167	$4MgO.3CO_2.4H_2O$—Hydromagnesite	365.342	R.		2.16	622
2168	$Mg(d\text{-}C_4H_4O_6).5H_2O$	262.428	M.		1.67	
2169	$Mg(d\text{-}C_4H_5O_6)_2.4H_2O$	394.459	R.		1.72	
2170	$Mg(C_2H_3O_2)_2$	142.366		323	1.42	

Index No.	Formula	Mol. wt.	Crystal system	M. P.	d_4^{20}	Ref. ind. finding No.
2171	$Mg(C_2H_3O_2)_2.4H_2O$	214.428	M.		1.454	512
2172	$Mg(CH_2SO_3)_2.4H_2O$—Ethane disulfonate	284.542	Tri.		1.727	
2173	$MgC_{10}H_6O_6S_2.6H_2O$—1, 5-Naphthalene disulfonate	418.589	M.		1.64	777
2174	Mg_2Si	76.7000		1102		
2175	$MgO.SiO_2$—Clinoenstatite	100.380	M.	1557 d.	3.28	836
2176	$MgO.SiO_2$—Enstatite	100.380	R.	d.	3.19	832
2177	$2MgO.SiO_2$—Forsterite	140.700	R.	189_0	3.2_6	828
2178	$2MgO.3SiO_2.4H_2O$—Parasepiolite	332.882	R.			557
2179	$3MgO.2SiO_2.2H_2O$—Chrysotile	277.111	R.		2.5	647
2180	$3MgO.3SiO_2.2H_2O$—Antigorite	337.171	R.		2.62	545
2181	$3MgO.4SiO_2.H_2O$—Talc	379.215	M.		2.7_5	728
2182	$MgSiF_6.6H_2O$	274.472	Trig.			204
2183	$2MgO.SiO_2.Mg(F,OH)_2$—Prolectite		M.		3.1	861
2184	$4MgO.2SiO_2.Mg(F, OH)_2$—Chondrodite		M.		3.1_5	781
2185	$6MgO.3SiO_2.Mg(F, OH)_2$—Humite		R.		3.1_5	790
2186	$8MgO.4SiO_2.Mg(F, OH)_2$—Clinohumite		M.		3.1	863
2187	$MgO.TiO_2$—Geikielite	120.220	Trig.		3.98	402
2188	$MgSnCl_6.6H_2O$	463.860	Trig.		2.08	289
2189	$2(MgPb)O.SiO_2.H_2O$—Molybdophyllite		H.		4.7_2	367
2190	$MgCl_2.2CdCl_2.12H_2O$	678.073	R.			629
2191	$MgHg_2I_6.7H_2O$	1313.24			3.8^0	
2192	$MgPtCl_6.6H_2O$	540.390	Trig.		2.437	
2193	$MgPtBr_6.12H_2O$	915.231	Trig.		2.802	
2194	$MgPdCl_6.6H_2O$	451.860	H.		2.12	
2195	$Mg_2MnCl_6.12H_2O$	532.503	H.		1.802	
2196	$MgO.Fe_2O_3$—Magnesioferrite	200.000	C.		4.6	194
2197	$MgO.Fe_2O_3.3SO_3.13H_2O$—Quetenite	674.395	M.		2.12	626
2198	$2MgO.Fe_2O_3.4SO_3.15H_2O$—Botryogenite	830.811	M.		2.1	660
2199	$6MgO.Fe_2O_3.CO_2.12H_2O$—Pyroaurite	661.785	H.		2.07	275
2200	$6MgO.Fe_2O_3.CO_2.12H_2O$—Brugnatellite	661.785	H.		2.07	264
2201	$3(Fe, Mg)O.Fe_2O_3.2SiO_2.3H_2O$—Cronstedtite		Trig. ?		3.34	363
2202	$MgO.CoO_2$	131.290			5.06	
2203	$Mg_2Ni_2O_2.3SiO_2.6H_2O$—Genthite	486.292	R. ?		$2._5$	
2204	$MgCrO_4.7H_2O$	266.438	R.		1.695	665
2205	$MgO.Cr_2O_3$	192.340			4.5_0	
2206	$MgCrO_4.(NH_4)_2CrO_4.6H_2O$	400.510	M.		1.84	813
2207	$6MgO.Cr_2O_3.CO_2.12H_2O$—Stichtite	654.125	H.		2.16	265
2208	$MgW_4O_{13}.8H_2O$	1112.44	M.			926
2209	$3MgO.5V_2O_5.28H_2O$	3407.09	Tri.		2.18_0	
2210	$4MgO.Cb_2O_5$	427.480	H.		4.4	
2211	$MgO.B_2O_3.3H_2O$—Pinnoite	164.006	Tet.		2.30	277
2212	$2MgO.B_2O_3.H_2O$—Ascharite	168.295			2.7	666
2213	$2MgO.B_2O_3.H_2O$—Camsellite	168.295	R. ?			1041
2214	$3MgO.B_2O_3$	190.600	R.		2.99	833
2215	$6MgO.8B_2O_3.MgCl_2$—Boracite impure	894.276	R. C.	Tr. 265 R. to C.	2.9	856
2216	$10MgO.4B_2O_3.3H_2O$—Szaibelyite	735.806			3	321
2217	$6MgO.2B_2O_3.2SO_3.9H_2O$—Sulfoborite	703.469	R.		2.4	650
2218	$3MgO.B_2O_3.P_2O_5.8H_2O$—Lueneburgite	476.771	M.		2.1	649
2219	$3MgO.B_2O_3.MnO.Mn_2O_3$—Pinakiolite	419.390	R.		3.9	999
2220	$3MgO.B_2O_3.FeO.Fe_2O_3$—Ludwigite	422.120	R.		4.0	972
2221	$4MgO.B_2O_3.Fe_2O_3$—Magnesioludwigite	390.600	R.		4.0	971
2222	$MgO.Al_2O_3$—Spinel	142.240	C.	213_5	3.6	156
2223	$MgO.Al_2O_3.4SO_3.22H_2O$—Pickeringite	858.839	M.		1.85	473
2224	$6MgO.Al_2O_3.CO_2.12H_2O$—Hydrotalcite	604.025	H.		2.06	247
2225	$3MgO.Al_2O_3.3SiO_2$—Pyrope	403.060	C.		3.5	154
2226	$4MgO.Al_2O_3.2SiO_2.5H_2O$—Colerainite	473.397	H.		2.51	273
2227	$5MgO.Al_2O_3.3SiO_2.4H_2O$—Leuchtenbergite	555.762	M.		2.7	726
2228	$5MgO.Al_2O_3.6SiO_2.4H_2O$—Zebedassite	735.942			2.19	590
2229	$5MgO.6Al_2O_3.2SiO_2$—Sapphirine	933.240	M.		3.45	900
2230	$(FeMg)O.Al_2O_3.P_2O_5.H_2O$—Lazulite		M.		3.1	804

Index No.	Formula	Mol. wt.	Crystal system	M. P.	d_4^{20}	Ref. ind. finding No.
2231	$Mg_3Gd_2(NO_3)_{12}.24H_2O$	1563.95	Trig.	77.5	2.163_4^0	
2232	CaO—Lime	56.0700	C.	257_2	3.40	168
2233	CaH_2	42.0854		d. 675	1.7	
2234	$Ca(OH)_2$	74.0854	R. Trig.		2.343	318
2235	CaF_2—Fluorite	78.0700	C.	1360	3.180	71
2236	$CaCl_2$—Hydrophyllite	110.986	C.	772	2.152_4^{25} fused	120
2237	$CaCl_2.6H_2O$	219.078	Trig.	29.92	1.68^{17}	212
2238	$CaF_2.CaCl_2$	189.056		d. 737	3.07	
2239	$CaBr_2$	199.902		765	3.353_4^{25}	
2240	$CaBr_2.3H_2O$	253.948	R.	$80._5$		
2241	$CaBr_2.6H_2O$	307.994	H.	38.2		
2242	$Ca(BrO_3)_2.H_2O$	313.917	M.	d.	3.329	
2243	$CaF_2.CaBr_2$	277.972			3.15^{18}	
2244	CaI_2	293.934		575	3.956_4^{25}	
2245	$CaI_2.6H_2O$	402.026		42		
2246	$Ca(IO_3)_2$—Lautarite	389.934	Tri.		4.591^{15}	
2247	CaS—Oldhamite	72.1350	C.		2.8^{15}	
2248	$CaSO_4$—Anhydrite	136.135	R. M.	Tr. 1193 (R. to M.) M. 1450	2.9_6	708
2249	$CaSO_4.2H_2O$—Gypsum	172.166	M.		2.32	600
2250	$CaS_2O_6.4H_2O$	272.262	Trig.		2.176	269
2251	$CaSeO_4$	183.270			2.93	
2252	$CaSeO_4.2H_2O$	219.301	M.		2.676	
2253	Ca_3N_2	148.226		900	2.63^{17}	
2254	$Ca(NO)_2$	100.086			2.53_4^{30}	
2255	$Ca(NO_2)_2.H_2O$	150.101	H.		2.23^{34}	
2256	$Ca(NO_2)_2.4H_2O$	204.148			1.674_0^0	
2257	$Ca(NO_3)_2$—Nitrocalcite	164.086	C.	56_1	$2._{36}$	
2258	$Ca(NO_3)_2.3H_2O$	218.132		51.1		
2259	$Ca(NO_3)_2.4H_2O$ (α)	236.148	M.	42.7	1.8_2	526
2260	$Ca(NO_3)_2.4H_2O$ (β)	236.148		39.7		
2261	Ca_3P_2	182.258		>1600	2.51^{15}	
2262	CaP_2O_6	198.118		97_5	2.82	
2263	$Ca_2P_2O_7$	254.188		1230	3.09	
2264	$2CaO.P_2O_5.H_2O$—Monetite	272.204	Tri.	d.	2.75	586
2265	$2CaO.P_2O_5.5H_2O$—Brushite	344.265	M.		2.25	656
2266	$Ca_3(PO_4)_2$	310.258		1670	3.14	
2267	$Ca_4P_2O_9$	366.328	M.	1630	3.06	148
2268	$4CaO.P_2O_5.5H_2O$—Isoclasite	456.405	M.		2.92	698
2269	$5CaO.2P_2O_5.1.5H_2O$—Martinite	591.469	M. ?		2.89	765
2270	$10CaO.3P_2O_5$	986.844		1540	2.89	
2271	$Ca(H_2PO_4)_2$	234.149	Tri.	d.	$2.546_4^{15.5}$	
2272	$Ca(H_2PO_4)_2.H_2O$	252.164	Tri.	d.	2.220_4^{16}	
2273	$CaF_2.3Ca_3P_2O_8$—Fluoroapatite	1008.84	H.	1630	3.18^{25}	309
2274	$Ca_5P_3ClO_{12}$—Chloroapatite	520.880		1530	3.17^{20}	331
2275	$3Ca_3(PO_4)_2.CaFCl$—Apatite	1025.30		127_0	3.14	308
2276	$(NH_4)CaPO_4.7H_2O$	279.241	M.	d.	1.561^{15}	
2277	Ca_3As_2	270.130			2.5^{15}	
2278	$2CaO.As_2O_5.3H_2O$—Haidingerite	396.106	R.		2.967	756
2279	$2CaO.As_2O_5.5H_2O$—Pharmacolite	432.137	M.		2.535	730
2280	$2CaO.As_2O_5.8H_2O$—Wapplerite	486.183	Tri.		2.48	621
2281	$9CaO.3As_2O_5.CaF_2$—Svabite	1272.46	H.		3.8_0	345
2282	$5CaO.3Sb_2S_5$—Romeite	1491.95	C.		5.04	169
2283	CaC_2	64.0700		23_{00}	2.22	
2284	$CaCO_3$—Aragonite	100.070	R.		2.9_3	880
2285	$CaCO_3$—Calcite	100.070	H.	$1339^{779\ 000mm}$	$2.711_4^{25.2}$	328
2286	$CaCO_3.6H_2O$	208.162	M.			633
2287	CaC_2O_4	128.070			2.2^4	
2288	$CaO.C_2O_3.H_2O$—Whewellite	146.085	M.		2.23	674
2289	$Ca(CHO_2)_2$	130.085	R.	d.	2.015	577
2290	$CaC_4H_2O_4.H_2O$—Maleate	172.101	R.			706
2291	$CaC_4H_2O_4.2H_2O$—Fumarate	190.116	R.			754

Index No.	Formula	Mol. wt.	Crystal system	M. P.	d_4^{20}	Ref. ind. finding No
2292	$CaC_4H_4O_3.3H_2O$—Malate	194.147	R.			676
2293	$CaC_4H_4O_4.3H_2O$—Succinate	210.147				648
2294	$Ca(meso\text{-}C_4H_4O_6).3H_2O$	242.147	Tri.			609
2295	$Ca(d\text{-}C_4H_4O_6).4H_2O$?	260.162	R.			638
2296	$Ca(C_2H_3O_2)_2$	158.116				683
2297	$Ca(C_3H_5O_3)_2.3H_2O$—Lactate	218.147		100		
2298	$Ca(C_4H_5O_2)_2$—Crotonate	210.147				695
2299	$CaC_8H_{10}O_{10}.6H_2O$—Acid malate	414.239	R.			561
2300	$Ca(C_6H_5CO_2)_2.3H_2O$	336.193	R.		1.436	
2301	$CaH_2(C_4H_4O_6)_2.2C_4H_6O_6$—*d*-Tetratartrate	638.239	R.		1.851^{19}	
2302	$Ca_3C_{12}H_6O_{12}$—Aconitate	462.256				636
2303	$Ca_3C_{12}H_{10}O_{14}.2H_2O$—Citrate	534.318		130		
2304	$Ca_3C_{12}H_{10}O_{14}.4H_2O$—Citrate	570.349				618
2305	$Ca(C_4H_2O_3NO_2)_2.xH_2O$—Nitrotetronate		M.		1.745	822
2306	$Ca(C_9H_8NO_3)_2.3H_2O$—Hippurate	450.255	R. ?		1.318	
2307	$7CaO.CO_2.2P_2O_5$—Dahllite	720.586	H.		3.08	310
2308	$10CaO.CO_2.3P_2O_5$—Podolite	1030.84	H.		3.077	807
2309	$10CaO.CaF_2.CO_2.3P_2O_5.H_2O$—Francolite	1126.92	H.		3.1	304
2310	$CaSi$	68.1300			2.35^{16}	
2311	$CaSi_2$	96.1900			2.5	
2312	Ca_3Si_2	176.330			1.64	
2313	Ca_6Si_{10}	521.020		1200		
2314	$CaSiO_3$	116.130	H.		2.89	299
2315	$CaO.SiO_2$—Pseudowollastonite	116.130	M.	1540		773
2316	$CaO.SiO_2$—Wollastonite	116.130	M.	Tr. 1200	2.9	800
2317	$CaO.2SiO_2.H_2O$—Okenite	194.205	R.		2.3	578
2318	$2CaO.SiO_2$ (α)	172.200	M. Tri.	2130		908
2319	$2CaO.SiO_2$ (β)	172.200	M. R.	Tr. 1420 β to α		1049
2320	$2CaO.SiO_2$ (γ)	172.200	M.	Tr. 675 γ to β		824
2321	$2CaO.SiO_2.H_2O$—Hillebrandite	190.215	R. ?		2.69	772
2322	$2CaO.2SiO_2.3H_2O$—Riversideite	286.306			2.61	751
2323	$3CaO.2SiO_2$	288.330	R.	1475 d.		1046
2324	$4CaO.4SiO_2.7H_2O$—Crestmorite	590.628			2.22	759
2325	$CaSiF_6.2H_2O$	218.161	Tet.		2.25	
2326	$3CaO.CaF_2.3SiO_2.2H_2O$—Zeophyllite	462.491	Trig.		2.76	276
2327	$3CaO.CaF.2SiO_2.H_2O$—Custerite	365.415	M.		2.96	732
2328	$5CaO.SiO_2.P_2O_5$	482.458		1760	3.01	
2329	$3CaO.SiO_2.CO_2.SO_3.15H_2O$—Thaumasite	622.566	H.		1.87	243
2330	$5CaO.2SiO_2.CO_2$—Spurrite	444.470	M. ?		3.01	867
2331	$CaO.TiO_2$—Perovskite	135.970	R.		4.10	1025
2332	$CaTi(SO_4)_3$	376.165	C.			91
2333	$5CaO.2TiO_2.3Sb_2O_5$—Lewisite	1410.77	C.		4.95	184
2334	$CaO.TiO_2.SiO_2$—Titanite	196.030	M.	1142	3.5	983
2335	$CaO.SnO_2.3SiO_2.2H_2O$—Stokesite	422.981	R.		3.2	776
2336	$Ca_2PbC_{18}H_{30}O_{12}$—Propionate	725.571	Tet.			251
2337	$2CaO.PbO.3SiO_2$	515.520			3.99	955
2338	$4CaO.6PbO.6SiO_2.H_2O$—Ganomalite	1902.86	Tet.		5.74	985
2339	$4CaO.5PbO.PbCl_2.6SiO_2$—Nasonite	1978.76	H.		5.7	380, 384
2340	$CaO.ZnO.SiO_2.H_2O$—Clinohedrite	215.525	M.		3.33	862
2341	$2CaO.ZnO.SiO_2$—Hardystonite	253.580	Tet.		3.4	332
2342	$CaHgI_4$	748.408			3.30^{9}	
2343	$CaHg_5I_{12}.8H_2O$	2710.43			4.69^{0}	
2344	$Ca_3Hg_4I_{14}.24H_2O$	3132.07			3.61^{0}	
2345	$CaSO_4.3Cu(OH)_2.CuSO_4.3H_2O$—Urvolgyite	574.542	R.		3.132	
2346	$2CaO.2CuO.As_2O_5.H_2O$—Higginsite	519.215	R.		4.33	965
2347	$CaCu(C_2H_3O_2)_4.6H_2O$	357.748	Tet.		1.42	213
2348	$CaPt(CN)_4.5H_2O$	429.409	R.			1045
2349	$2CaO.MnO.P_2O_5.2H_2O$—Fairfieldite	361.149	Tri.		3.07	823
2350	$2CaO.MnO.As_2O_5.2H_2O$—Brandtite	449.021	Tri.		3.671	902
2351	$CaO.MnO.SiO_2$—Glaucochroite	187.060	R.		3.41	910

Index No.	Formula	Mol. wt.	Crystal system	M. P.	d_4^{20}	Ref. ind. finding No.
2352	$4CaO.2Mn_2O_3.5SiO_2.4H_2O$—Orientite	912.362	R.		3.1	943
2353	$4CaSiO_3.3MnSiO_3$—Bustamite	857.490	Tri.			868
2354	$CaO.Fe_2O_3$	215.750		1216 d.		408
2355	$2CaO.Fe_2O_3$	271.820		1436 d.		1057
2356	$2CaO.FeO.P_2O_5.4H_2O$—Anapaite	398.090	Tri.		2.82	778
2357	$6CaO.3Fe_2O_3.4P_2O_5.19H_2O$—Calcioferrite	1725.94	M.		2.53	282
2358	$3CaO.2Fe_2O_3.2As_2O_5.6H_2O$—Arseniosiderite	1055.50	R.		3.36	376
2359	$FeCa_2(CN)_6.12H_2O$	508.212	Tri.			718
2360	$CaO.FeO.2SiO_2$—Hedenbergite	248.030	M.	1100	3.7	922
2361	$2CaO.4FeO.Fe_2O_3.4SiO_2.H_2O$—Ilvaite	817.435	R.		4.0	984
2362	$CaO.Cr_2O_3$	208.090			4.8^{18}	
2363	$15CaO.8CrO_3.7I_2O_5$—Dietzeite	397.818	M.		3.70	970
2364	$3CaO.Cr_2O_3.3SiO_2$—Uvarovite	500.410	C.		3.42	170
2365	$CaMoO_4$—Powellite	200.070	Tet.		4.35	388
2366	$CaO.WO_3$—Scheelite	288.070	Tet.		6.06	381
2367	$CaO.8UO_3.2SO_3.25H_2O$—Uranopilite	2505.56	Tri. ?		3.8	788
2368	$CaO.2UO_3.P_2O_5.8H_2O$—Autunite	914.581	R.		3.1	707
2369	$CaO.2UO_3.P_2O_5.8H_2O$—Bassetite	914.581	M.		3.10	705
2370	$CaO.2UO_3.As_2O_5.8H_2O$—Uranospinite	1002.45	R.		3.45	719
2371	$2CaO.UO_2.4CO_2.10H_2O$—Uranothallite	738.464	R.		2.8	547
2372	$CaO.2UO_3.2SiO_2.6H_2O$—Uranophane	856.622	Tri. ?		3.9	855
2373	CaV_4O_{11}	419.910		637		
2374	$CaO.3V_2O_5.9H_2O$—Hewettite	763.969	R.		2.554	1011
2375	$CaO.3V_2O_5.9H_2O$—Metahewettite	763.969	R.		2.51	1003
2376	$2CaO.3V_2O_5.11H_2O$—Pascoite	856.069	M.		2.46	961
2377	$CaCl_2.Ca_3(VO_4)_2$	461.116	R.		4.01	
2378	CaB_6	104.990			2.3	
2379	$CaO.B_2O_3$	125.710	R.	1100		841
2380	$2CaO.B_2O_3$	181.780		1304		
2381	$2CaO.3B_2O_3.5H_2O$—Colemanite	411.137	M.	d.	2.43	739
2382	$2CaO.3B_2O_3.7H_2O$—Meyerhofferite	447.168	Tri.	d.	2.12	635
2383	$2CaO.3B_2O_3.13H_2O$—Inyoite	555.260	M.	d.	1.875	570
2384	$4CaO.5B_2O_3.9H_2O$—Pandermite	734.619	M.	d.	2.43	738
2385	$5CaO.6B_2O_3.9H_2O$—Priceite	860.329	Tri.		2.4	735
2386	$CaO.2SiO_2.B_2O_3$—Danburite	245.830	R.		3.0	806
2387	$2CaO.2SiO_2.B_2O_3.H_2O$—Datolite	319.915			3.0	831
2388	$4CaO.5B_2O_3.2SiO_2.5H_2O$—Howlite	782.677	M.		2.6	746
2389	$8CaO.5B_2O_3.6SiO_2.6H_2O$—Bakerite	1265.21			2.8	721
2390	$CaO.B_2O_3.SnO_2$—Nordenskioeldine	276.410	Trig.		4.2	
2391	$CaO.Al_2O_3$	157.990	M. ?, Tri.	1600		838
2392	$3CaO.Al_2O_3$	270.130	C.	1535 d.		155
2393	$3CaO.5Al_2O_3$	677.810	Tet. ?, R.	1720		300
2394	$5CaO.3Al_2O_3$	586.110	C.	1455		141
2395	$CaF_2.Al(F, OH)_3.H_2O$—Gearksutite		M.		2.77	445
2396	$CaF_2.2Al(F, OH)_3.H_2O$—Prosopite		M. Tri.		2.88	548
2397	$6CaO.Al_2O_3.3SO_3.33H_2O$—Ettringite	1273.04	H.		1.75	231
2398	$CaO.2CaF_2.2Al(F, OH)_3.SO_3.2H_2O$—Creedite		M.		2.73	470
2399	$CaO.2Al_2O_3.P_2O_5.5H_2O$—Crandallite	492.035	R.		3.5	294
2400	$CaO.Al_2O_3.2SiO_2$—Anorthite	278.110	Tri.	1551	2.765	723
2401	$CaO.Al_2O_3.2SiO_2.2H_2O$—Hibschite	314.141	C.		3.05	149
2402	$CaO.Al_2O_3.2SiO_2.2H_2O$—Lawsonite	314.141	R.		3.09	869
2403	$CaO.Al_2O_3.3SiO_2.5H_2O$—Levynite	428.247	Trig.		2.1	241
2404	$CaO.Al_2O_3.4SiO_2.4H_2O$—Gismondite	470.292		1550	2.3	644
2405	$CaO.Al_2O_3.4SiO_2.4H_2O$—Laumontite	470.292	M.		2.3	605
2406	$CaO.Al_2O_3.6SiO_2.5H_2O$—Epistilbite	608.427	M.		2.25	572
2407	$CaO.Al_2O_3.6SiO_2.5H_2O$—Heulandite	608.427	M.		2.2	528
2408	$CaO.Al_2O_3.7SiO_2.7H_2O$—Stellerite	704.518	R.		2.12	509
2409	$CaO.2Al_2O_3.2SiO_2.H_2O$—Margarite	398.045	M.		3.0	820
2410	$2CaO.Al_2O_3.SiO_2$—Velardenite	274.120	Tet.	1590	3.04	333
2411	$2CaO.Al_2O_3.3SiO_2.H_2O$—Prehnite	412.255	R.		2.9	796
2412	$2CaO.Al_2O_3.5SiO_2.6H_2O$—Laubanite	622.452	M. ?		2.2	221

Index No.	Formula	Mol. wt.	Crystal system	M. P.	d_4^{20}	Ref. ind. finding No.
2413	$2CaO.3Al_2O_3.9SiO_2$—Didymolite	958.440	M.		2.71	540
2414	$3CaO.Al_2O_3.SiO_2$	330.190	R.			1048
2415	$3CaO.Al_2O_3.3SiO_2$—Grossularite	450.310	C.		3.530	157
2416	$3CaO.Al_2O_3.6SiO_2.H_2O$—Bavenite	648.505	M.		2.72	717
2417	$4CaO.3Al_2O_3.6SiO_2$—Meionite	890.400	Tet.		2.74	295
2417.1	$4CaO.3Al_2O_3.6SiO_2.H_2O$—Clinozoisite	908.415	M.		3.36	915
2418	$4CaO.3Al_2O_3.6SiO_2.H_2O$—Zoisite	908.415	R.		3.3	896
2419	$3CaO.5Ce_2O_3.6P_2O_5.24H_2O$—Churchite	3095.37	M.		3.14	785
2420	$CaO.2CeOF.3CO_2$—Parisite	538.570	Trig.		4.32	279
2421	$CaPO_4.BeOH$—Hydro-herderite	161.122	R.		3.0₀	774
2422	$CaCl_2.2MgCl_2.12H_2O$—Tachyhydrite	517.643	H.	>168 d.	1.66₅	249
2423	$2CaO.2MgO.As_2O_5.H_2O$—Adelite	440.715	M.		3.76	909
2424	$2CaO.MgO.As_2O_5.MgF$—Tilasite	425.700	M.		3.28	847
2425	$CaO.MgO.2CO_2$—Dolomite	184.390	Trig.		2.872	339
2426	$CaO.MgO.SiO_2$—Monticellite	156.450	R.	d. 1498	3.2	852
2427	$CaO.MgO.2SiO_2$—Diopside	216.510	M.	1391	3.3	864
2428	$CaO.3MgO.2SiO_2$—Merwinite	297.150	M.		3.15	901
2429	$CaO.3MgO.4SiO_2$—Tremolite	417.270	M.		3.0	786
2430	$2CaO.MgO.2SiO_2$—Åkermannite	272.580	Tet.	1458	2.944	307
2431	$5CaO.2MgO.6SiO_2$	721.350		d. 1365		797
2432	$CaO.MgO.3B_2O_3.6H_2O$—Hydroboracite	413.402	M.		2.0	631
2433	$CaO.MgO.Al_2O_3.SiO_2$—Gehlenite	258.370	Tet.		3.04	330
2434	SrO	103.620	R.	243₀	4.7	
2435	$Sr(OH)_2$	121.635			3.625	
2436	$Sr(OH)_2.8H_2O$	265.758	Tet.		1.9₀	242
2437	SrF_2	125.620	C.	1190	2.44	
2438	$SrCl_2$	158.536	C.	873	3.052	140
2439	$SrCl_2.6H_2O$	266.628	Trig.	d. 61	1.93	257
2440	$Sr(ClO_3)_2$	254.536	R.	120 d.	3.152	763
2441	$SrF_2.SrCl_2$	284.156	Tet.	962	4.18	324
2442	$SrBr_2$	247.452		643	4.216_4^{24}	
2443	$SrBr_2.6H_2O$	355.544		d. 20	2.358^{18}	
2444	$Sr(BrO_3)_2.H_2O$	361.467	M.	d.	3.773	
2445	$SrBr_2.SrF_2$	373.072			4.06	
2446	SrI_2	341.484		402	4.549_4^{25}	
2447	$Sr(IO_3)_2$	437.484	Tri.		5.045^{15}	
2448	$SrI_2.SrF_2$	467.104			4.5	
2449	SrS	119.685	C.		3.70^{15}	
2450	$SrS_4.6H_2O$	323.972		25		
2451	$SrO.SO_3$—Celestite	183.685	R.	1580 d.	3.96	789
2452	$SrS_2O_3.5H_2O$	289.827	M.	d.	2.17^{17}	
2453	$SrS_2O_6.4H_2O$	319.812	Trig.		2.373	253
2454	$Sr(NO)_2$	147.636			2.683	
2455	$Sr(NO)_2.5H_2O$	237.713			2.173_4^{30}	
2456	$Sr(NO_2)_2$	179.636			2.867^{27}	
2457	$Sr(NO_2)_2.H_2O$	197.651		d.	2.408_0^0	
2458	$Sr(NO_3)_2$	211.636	C.	570	2.986	135
2459	$Sr(NO_3)_2.4H_2O$	283.698	M.		2.2	
2460	Sr_3P_2	324.908			2.68	
2461	$SrHPO_4$	183.652	R.		3.544	
2462	SrC_2	111.620			3.₂	
2463	$SrO.CO_2$—Strontianite	147.620	R.	1497^{60} at.	3.70	853
2464	$Sr(CHO_2)_2$	177.635	R.	71.9	2.69	704
2465	$Sr(CHO_2)_2.H_2O$	195.651	R.		2.25	
2466	$Sr(CHO_2)_2.2H_2O$	213.666	R.		2.69₅	597
2467	$Sr(C_2H_3O_2)_2$	205.666			2.099	
2468	$Sr(CH_2SO_3)_2.H_2O$—Ethane disulfonate	293.796	M.		2.355 (α) 2.453 (β)	
2469	$Sr(C_2H_5O_4S)_2.2H_2O$—Ethylsulfate	373.858	M.		2.032	554
2470	$Sr(C_4H_2O_3NO_2)_2.xH_2O$—Nitrotetronate		M.		2.043	812
2471	$Sr(SbOC_4H_4O_6)_2$	627.222	H.			426
2472	$SrSiO_3$	163.680		1580	3.65	60
2473	$2SrO.SiO_2$	267.300		>1700	3.84	

Index No.	Formula	Mol. wt.	Crystal system	M. P.	d_4^{20}	Ref. ind. finding No.
2474	$SrSiF_6.2H_2O$	265.711	M.		$2.99^{17.5}$	
2475	$SrCl_2.2CdCl_2.7H_2O$	651.296	M.		2.718^{24}	
2476	$SrHg_5I_{12}.8H_2O$	2757.98			4.66^{0}	
2477	$Sr_2Cu(CHO_2)_4.8H_2O$	562.964	Tri.			593
2479	$SrCrO_4$	203.630	M.		3.895^{15}	
2480	$SrCr_2O_7.3H_2O$	357.686	M.			905
2481	$Sr(OCrO_2Cl)_2.4H_2O$	430.618		72		
2482	$SrMoO_4$	247.620			4.145	
2483	$SrWO_4$	335.620			6.184	
2484	$Sr_2W_{12}SiO_{40}.16H_2O$	3339.55	M.			934
2485	SrB_6	152.540			3.3	
2486	$SrO.B_2O_3$	173.260		1100		
2487	$SrO.2B_2O_3$	242.900		930		
2488	$2SrO.B_2O_3$	276.880		1130		
2489	$2SrO.3Al_2O_3.2P_2O_5.7H_2O$—Goyazite	923.204	Trig.		3.2	305
2490	$2SrO.3Al_2O_3.P_2O_5.2SO_3.6H_2O$—Svanbergite	923.270	Trig.		3.5	314
2491	$SrO.Al_2O_3.2SiO_2$	325.660		>1700		
2492	$3SrO.2Ce_2O_3.7CO_2.5H_2O$—Ancylite	1365.94	R.		3.95	974
2493	$SrCa_2C_{18}H_{30}O_{12}$—Propionate	605.991	Tet.			230
2494	BaO	153.370	C.	1923	5.72	
2495	BaO_2	169.370			4.96	
2496	BaH_2	139.385		d. 675	4.21^{0}	
2497	$Ba(OH)_2$	171.385	M.		4.495	
2498	$Ba(OH)_2.8H_2O$	315.509	M.	77.9	2.18	544
2499	BaF_2	175.370	C.	1280	4.83	
2500	$BaCl_2$	208.286	M. C.	Tr. 925 962	3.856_4^{24}	
2501	$BaCl_2.2H_2O$	244.317	R.		3.097_4^{24}	825
2502	$Ba(ClO)_2$	240.286		d. 235		
2503	$Ba(ClO_3)_2$	304.286		414		
2504	$Ba(ClO_3)_2.H_2O$	322.301	M.	d. 120	3.179	713
2505	$Ba(ClO_4)_2$	336.286		505		
2506	$Ba(ClO_4)_2.3H_2O$	390.332	H.		2.74	
2507	$BaClF$	191.828	Tet.	1008	5.931	315
2508	$BaCl_2.BaF_2$	383.656			4.51^{18}	
2509	$BaBr_2$	297.202		847	4.781_4^{24}	
2510	$BaBr_2.2H_2O$	333.233	M.		3.582_4^{24}	913
2511	$Ba(BrO_3)_2.H_2O$	411.217	M.		3.99^{18}	
2512	$BaBr_2.BaF_2$	472.572			4.96^{18}	
2513	BaI_2	391.234		740 d.	5.151	
2514	$BaI_2.6H_2O$	499.326	H.	25.7		
2515	$BaI_2.7H_2O$	517.342			3.67	
2516	$Ba(IO_3)_2$	487.234	M.		5.23	
2517	$Ba(IO_3)_2.H_2O$	505.249	M.		5.0^{15}	
2518	$BaI_2.BaF_2$	566.604			5.21^{18}	
2519	BaS	169.435	C.		4.25^{15}	
2520	$BaS_4.2H_2O$	301.661	R.	d.	2.988	
2521	$BaO.SO_3$—Barite	233.435	R.	Tr. 1149 to M. ? 1580	4.499^{15}	816
2522	$BaS_2O_3.H_2O$	267.515	R.		3.45^{18}	
2523	$BaS_2O_6.2H_2O$	333.531	R. M.		$4.536^{13.5}$	744
2524	$BaS_2O_6.4H_2O$	369.562	M.		3.142	1076
2525	$BaSeO_4$	280.570	R.	d.	4.75	
2526	$BaTeO_4$	328.870			4.48^{16}	
2527	BaN_6	221.418	R.	d. 219		
2528	$Ba(NO)_2$	197.386			3.891^{23}	
2529	$Ba(NO_2)_2$	229.386		217	3.23^{23}	
2530	$Ba(NO_2)_2.H_2O$	247.401			3.173^{29}	
2531	$Ba(NO_3)_2$—Nitrobarite	261.386	C.	592	3.244^{23}	137
2532	$Ba(NH_2)_2$	169.417		280		
2533	$Ba_2P_2O_7$	448.788	R.		4.1^{16}	
2534	$Ba_3(PO_4)_2$	602.158	C.		4.1^{16}	

Index No.	Formula	Mol. wt.	Crystal system	M. P.	d_4^{20}	Ref. ind. finding No
2535	$BaHPO_4$	233.402	R.		4.165^{15}	
2536	$BaH_4(PO_2)_2.H_2O$	285.464	M.		2.90^{17}	
2537	$BaF_2.3Ba_3P_2O_8$	1981.84	H.	1670		334
2538	$BaCl_2.3Ba_3P_2O_8$	2014.76	H.	1584	5.949	343
2539	Ba_3As_2	562.030			4.1^{15}	
2540	$BaHAsO_4.H_2O$	295.353	R. M.		3.93^{15}	
2541	BaC_2	161.370			3.75	
2542	$BaCO_3$—Witherite	197.370	R.	Tr. 811 to α	4.43	875
2543	$BaCO_3$ (α)	197.370	H.	Tr. 982 to β		
2544	$BaCO_3$ (β)	197.370		$1740^{90 \text{ at.}}$		
2545	BaC_2O_4	225.370			2.658	
2546	$Ba(CHO_2)_2$	227.385	R.		3.21	745
2547	$BaC_3H_2O_4$—Malonate	239.385			2.147_4^{18}	
2548	Ba(*meso*-$C_4H_4O_6$).H_2O	303.416			2.98	
2549	Ba(*dl*-$C_4H_4O_6$).$5H_2O$	375.478	M.			1051
2550	$Ba(C_2H_3O_2)_2$	255.416			2.468	
2551	$Ba(C_2H_3O_2)_2.H_2O$	273.432	Tri.		2.19	582
2552	$Ba(C_2H_3O_2)_2.3H_2O$	309.462	Tri.		2.021	
2553	$Ba(C_2H_5CO_2)_2.H_2O$	301.462	R.			584
2554	$Ba(CH_2SO_3)_2$—Ethane disulfonate	325.531	R.		2.779	
2555	$BaC_6H_4O_7S_2.4H_2O$—Phenol-2, 4-disulfonate	461.592	M.			767
2556	$BaC_{10}H_6O_6S_2.H_2O$—Naphthalene-1, 5-disulfonate	441.562	R.		2.282	904
2557	$BaSiO_3$	213.430		1604	4.399	872
2558	$BaSiO_3.6H_2O$	321.522	R.		2.59	659
2559	$BaO.2SiO_2$	273.490	R.	1420	3.73	775
2560	$2BaO.SiO_2$	366.800		>1755		1052
2561	$2BaO.3SiO_2$	486.920		1450	3.93	795
2562	$BaSiF_6$	279.430			4.279^{15}	
2563	$BaO.TiO_2.3SiO_2$—Benitoite	413.450	H.		3.7	356
2564	$BaCdCl_4.4H_2O$	463.674	Tri.		2.968	827
2565	$BaCdBr_4.4H_2O$	641.506	Tri.		3.687	894
2566	$BaCd(CHO_2)_4.2H_2O$	465.842	M.			627
2567	$BaHg_5I_{12}$	2692.60			4.63^0	
2568	$Ba_3Hg_5I_{16}.16H_2O$	3734.32			4.06	
2569	$BaPtBr_6.10H_2O$	992.250	M.		3.713	
2570	$BaPt(CN)_4.4H_2O$	508.694	M.		3.05	1047
2571	$BaO.MnO_2$	240.300			5.85	
2572	$BaO.FeO.4SiO_2$—Gillespite	465.450	Trig.		3.33	302
2573	$4BaO.FeO.2Fe_2O_3.10SiO_2$—Taramellite	1605.28	R.		3.92	942
2574	$BaNi_2O_5$	334.750			4.8	
2575	$BaCrO_4$	253.380			4.498^{15}	
2576	$Ba_3[Cr(C_2O_4)_3]_2$	1044.13			2.57	
2577	$Ba_3[Cr(C_2O_4)_3]_2.7H_2O$	1170.24			2.896^{28}	
2578	$Ba_3[Cr(C_2O_4)_3]_2.12H_2O$	1260.31			2.372^{27}	
2579	$BaMoO_4$	297.370			4.65	
2580	$BaWO_4$	385.370			6.35	
2581	$BaO.4WO_3.9H_2O$	1243.51	R.		4.30	
2582	$Ba_2W_{12}SiO_{40}.16H_2O$	3439.05	M.			962
2583	$BaO.2UO_3.P_2O_5.8H_2O$—Uranocircite	1011.88	R.		3.53	787
2584	$Ba_2V_2O_7$	488.660		*ca.* 863		
2585	$3BaO.10WO_3.V_2O_5.SiO_2.28H_2O$	3526.52			3.66	
2586	BaB_6	202.290			4.36	
2587	$BaO.B_2O_3$	223.010		1060		
2588	$2BaO.B_2O_3$	376.380		1002		
2589	$3BaO.B_2O_3$	529.750		1315		
2590	$BaCl_2.2AlCl_3$	474.954		290		
2591	$BaO.Al_2O_3.2SiO_2$—Celsian	375.410	M.	>1700	3.37	727
2592	$BaO.Al_2O_3.3SiO_2.3H_2O$—Edingtonite	435.470	R.		2.7	662
2593	$4BaO.Al_2O_3.7SiO_2$—Barylite	1135.82	R.		4.03	884
2594	$BaF_2.Ce_2O_3.3CO_2$—Cordylite	635.870	H.		4.31	357
2595	$BaO.CaO.2CO_2$—Barytocalcite	297.440	M.		3.65	828

Index No.	Formula	Mol. wt.	Crystal system	M. P.	d_4^{20}	Ref. ind. finding No.
2596	$BaCa_2C_{18}H_{30}O_{12}$—Propionate	655.741	C.			73
2597	$BaO.2CaO.3SiO_2$	445.690	H. ?	1320 d.		338
2598	$RaCl_2$	296.866	M.	1000	4.91	
				Tr. 870		
2599	$RaBr_2$	385.782	M.	728	5.79	
2600	Li_2O	29.8780		>1700	$2.013_4^{25.2}$	
2601	LiH	7.94670	C.	680	0.820	
2602	LiOH	23.9467		450	2.54	
2603	$LiOH.H_2O$	41.9621			1.83	
2604	LiF	25.9390	C.	870	$2.295^{21.5}$	
					l. 1.789^{870}	
2605	LiCl	42.3970	C.	613	2.068_4^{25}	
2606	$LiClO_3$	90.3970		129		
2607	$LiClO_3.0.5H_2O$	99.4047		65		
2608	$LiClO_4$	106.397		236	2.429	
2609	$LiClO_4.3H_2O$	160.443	H.	95	1.841	
2610	LiBr	86.8550	C.	547	3.464_4^{25}	
2611	$LiBr.2H_2O$	122.886		44		
2612	$LiBr.3H_2O$	140.901		3.5		
2613	LiI	133.871		446	4.061_4^{25}	
					l. $2.827^{673.4}$	
2614	$LiI.3H_2O$	187.917		73		
2615	Li_2S	45.9430			1.66	
2616	Li_2SO_4	109.943	M.	860	2.221	455
					l. 2.004^{860}	
2617	$Li_2SO_4.H_2O$	127.958	M.		2.06	469
2618	$Li_2S_2O_6.2H_2O$	210.039	R.		2.158	684
2619	$LiHSO_4$	104.012			2.123^{13}	
2620	$LiNO_2.H_2O$	70.9624			1.615^{0}	
2621	$LiNO_3$	68.9470	Trig.	255	l. 1.77_4^{272}	
					2.38	353
2622	$LiNO_3.3H_2O$	122.993		d. 29.6		
2623	$LiNH_2$	22.9624		390	$1.178^{17.5}$	
2624	Li_2NH	28.8937			1.303^{19}	
2625	$LiBr.NH_3$	103.886		97		
2626	$LiNH_4SO_4$	121.043	M. (α)		1.204	
			H. (β)			
			M. (γ ?)			
2627	$LiPO_3$	85.963			2.461	
2628	Li_3PO_4	115.841	R.	837	$2.537^{17.5}$	
2629	$Li_3PO_4.12H_2O$	332.026	Trig.	100	1.645	
2630	LiH_2PO_4	103.978		>100	2.461	
2631	Li_3AsO_4	159.777			3.07	
2632	Li_3Sb	142.587		>950	3.2^{17}	
2633	Li_2C_2	37.8780			1.65^{18}	
2634	Li_2CO_3	73.8780	M.	618	$2.111^{17.5}$	694
					l. 1.765^{900}	
2635	$Li_2C_2O_4$	101.878			$2.121^{17.5}$	
2636	$LiCHO_2.H_2O$	69.9621	R.		1.46	
2637	$LiHC_4H_4O_5.6H_2O$—Malate	248.070	M.			682
2638	$LiC_2H_3O_2.2H_2O$	101.993	R.	70		533
2639	$Li_2(CH_2SO_3)_2.2H_2O$—Ethane disulfonate	238.070	M.		1.817	
2640	$Li_2C_{10}H_6O_6S_2.2H_2O$—Naphthalene 1, 5-disulfonate	336.085	M.		1.664	814
2641	$LiNH_4(dl\text{-}C_4H_4O_6).H_2O$	191.024	M.			614
2642	$LiNH_4(d\text{-}C_4H_4O_6).H_2O$	191.024	R.			693
2643	Li_6Si_2	97.7540			1.12	
2644	$Li_2O.SiO_2$	89.9380	R.	1201	l. 2.33_4^{25}	55
					2.52_4^{25}	322, 1042
2645	$Li_2O.2SiO_2$	149.998		1032 d.	2.454_4^{25}	
2646	$2Li_2O.SiO_2$	119.816		1256	2.28	1043
2647	$Li_2SiF_6.2H_2O$	191.969	M.		2.3	
2648	$TlLi(dl\text{-}C_4H_4O_6).2H_2O$	395.401	Tri.		3.144	

Index No.	Formula	Mol. wt.	Crystal system	M. P.	d_4^{20}	Ref. ind. finding No
2649	$2LiI.HgI_2.6H_2O$	830.308			3.26^0	
2650	$2LiI.HgI_2.8H_2O$	866.339			2.95^0	
2651	$Li_2O.2MnO.P_2O_5$—Lithiophilite	313.786	R.		3.5	878
2652	$Li_2O.2FeO.P_2O_5$—Triphylite	315.606	R.		3.55	895
2653	$Li(UO_2)(C_2H_3O_2)_3.3H_2O$	508.224	M.		2.280^{15}	
2654	$Li_2O.B_2O_3$	99.5180		843		
2655	$Li_2O.B_2O_3.16H_2O$	387.764	Trig.	47	1.38	
2656	$Li_2O.2B_2O_3$	169.158		900		
2657	$Li_2O.Al_2O_3$	131.798		>1625	$2.554_4^{25.1}$	
2658	$2LiF.Al_2O_3.P_2O_5$—Amblygonite	295.846	Tri.		3.05	740
2659	$Li_2O.Al_2O_3.2SiO_2$—Eucryptite	251.918	H.	1388	2.67	268
2660	$Li_2O.Al_2O_3.4SiO_2$—Spodumene	372.038	M.	1400	3.2	854
2661	$Li_2O.Al_2O_3.5SiO_2$	432.098			2.40	
2662	$Li_2O.Al_2O_3.6SiO_2$	492.158			2.41	
2663	$Li_2O.Al_2O_3.8SiO_2$—Petalite	612.278	M.	1370	2.4	573
2664	$2Li_2O.7Al_2O_3.2B_2O_3.6SiO_2.12H_2O$—Manandonite	1489.02	H.		2.89	749
2665	Na_2O	61.9940			2.27	
2666	$Na_2O_2.8H_2O$	222.117	H.	d. 30		
2667	NaH	24.0047			0.92	
2668	NaOH	40.0047		$318._4$	2.130	
2669	$NaOH.3.5H_2O$	103.059		15.5		
2670	NaF—Villiaumite	41.9970	Tet.	980	2.79	66
2671	NaCl—Halite	58.4550	C.	804	2.163	129
2672	$NaOCl.2.5H_2O$	119.494		57.5		
2673	$NaOCl.5H_2O$	164.532		24.5		
2674	$NaClO_3$	106.455	C. Trig.	248	2.490^{15}	119
2675	$NaClO_4$	122.455	R.	482 d.		
2676	$NaClO_4.H_2O$	140.470	H.	d. 130	2.02	
2677	NaBr	102.913	C.	75_5	3.205	
2678	$NaBr.2H_2O$	138.944	M.	50.7	2.176	
2679	$NaBrO_3$	150.913	C.	38_1	$3.339^{17.5}$	138
2680	NaI	149.929	C.	651	3.667	
2681	$NaIO_3$	197.929	R.	d.	4.277	
2682	$NaIO_4$	213.929	Tet.	d. 300	3.865^{16}	
2683	$NaIO_4.3H_2O$	267.975	Trig.		3.219^{18}	
2684	Na_2S	78.0590			1.856	
2685	Na_2S_2	110.124		445		
2686	Na_2S_3	142.189		223.5		
2687	Na_2S_4	174.254	C.	275		
2688	$Na_2S_4.6H_2O$	282.346		25		
2689	Na_2S_5	206.319		251.8		
2690	$Na_2SO_3.7H_2O$	252.167	M.		1.561	
2691	Na_2SO_4 (α)—Thenardite	142.059	R.	Tr. 100	2.69	466
2692	Na_2SO_4	142.059	R.	Tr. 100 to M.	2.698	
			M.	Tr. 500 to H		
			H.	88_4		
2693	$Na_2SO_4.10H_2O$—Glaubers salt	322.213	M.	d. 32.4	1.464	434
2694	$Na_2SO_4.10H_2O$—Mirabilite	322.213	M.		1.48	428
2695	$Na_2S_2O_3$	158.124	M.		1.667	
2696	$Na_2S_2O_3.5H_2O$	248.201	M.	d. 48.0	1.68_5	564
2697	$Na_2S_2O_6.2H_2O$	242.155	R.		2.189	520
2698	$NaHS.3H_2O$	110.116	R.	22		
2699	$NaHSO_4$	120.070	Tri.	>315	2.742	
2700	$2Na_2O.NaCl.NaF.2SO_3$—Sulphohalite	384.570	C.		2.49	76
2701	Na_2Se_4	362.794		−55		
2702	Na_2SeO_4	189.194	R.		3.098	
2703	$Na_2SeO_4.10H_2O$	369.348	M.		1.58	
2704	$NaNO_2$	69.0050	R.	271	2.168^0	
2705	$NaNO_3$—Soda-niter	85.0050	Trig.	308	2.257	288
2706	$Na_2(NO)_2$	106.010		300 d.	2.466^{30}	
2707	$NaNH_2$	39.0204		210		
2708	$3Na_2O.N_2O_5.2SO_3.2H_2O$—Darapskite	490.159	M.		2.2	475

Index No.	Formula	Mol. wt.	Crystal system	M. P.	d_4^{20}	Ref. ind. finding No.
2709	$6NaNO_3.2Na_2SO_4.3H_2O$—Nitroglauberite	848.194	R.			534
2710	$NaNH_4SO_4.2H_2O$—Lecontite	173.132	R.	d.	1.63	443
2711	$NaPO_3$	102.021		616 d.	2.476	
2712	Na_3PO_4	164.015		1340	$2.537^{17.5}$	
2713	$Na_3PO_4.12H_2O$	380.200	Trig.	d. 73.4	1.62	214
2714	$(NaPO_3)_3.2H_2O$	342.094	Tri.	d.	2.476	
2715	$Na_4P_2O_6.10H_2O$	430.190	M.		1.832	480
2716	$Na_4P_2O_7$	266.036		988	2.45	
2717	$Na_4P_2O_7.10H_2O$	446.190	M.	d.	1.82	444
2718	$NaH_2PO_3.2.5H_2O$	149.075	M.	42		432
2719	$NaH_2PO_4.H_2O$	138.052	R.	d. 190	2.040	487
2720	$NaH_2PO_4.2H_2O$	156.067	R.	*ca.* 60	1.91	450
2721	$Na_2HPO_3.5H_2O$	216.103	R.			438
2722	$Na_2HPO_4.2H_2O$	178.057	H.		1.848	
2723	$Na_2HPO_4.7H_2O$	268.134	M.	d.	1.679	437
2724	$Na_2HPO_4.12H_2O$	358.211	R. M.	34.6	1.52	433
2725	$Na_2H_2P_2O_6.6H_2O$	314.150	M.		1.849	504
2726	$Na_2H_2P_2O_7$	222.057	M.	d. 220	1.862	
2727	$Na_2H_2P_2O_7.6H_2O$	330.150	M.		1.848	454
2729	$Na_3HP_2O_6.9H_2O$	390.185	M.	d. 100	1.743	465
2730	$Na_3PO_4.H_3PO_4.15H_2O$	532.293		55		
2731	$Na_3PO_4.NaF.12H_2O$	422.197	C.		2.216	
2732	$2Na_3PO_4.NaF.19H_2O$	712.320	C.		2.217	74
2733	$NH_4NaHPO_4.4H_2O$—Microcosmic salt, Stercorite	209.129	M.	*ca.* 79 d.	1.574	436
2734	Na_3AsO_4	207.951			2.835	
2735	$Na_3AsO_4.12H_2O$	424.136	Trig.	86.3	1.759	216
2736	$NaH_2AsO_4.H_2O$	181.988	R.		2.535	672
2737	$NaH_2AsO_4.2H_2O$	200.003	R.		2.309	546
2738	$Na_2HAsO_4.7H_2O$	312.070	M.		1.871	556
2739	$Na_2HAsO_4.12H_2O$	402.147	M.	28	1.72	441
2740	$2Na_3AsO_4.NaF.19H_2O$	800.192	C.		2.85^{25}	90
2741	$Na_3AsS_4.8H_2O$	416.334	M.	d.		879
2742	$2Na_2O.As_2O_5.2SO_3$	514.038			2.425^{21}	
2743	$(NH_4)NaHAsO_4.4H_2O$	253.065	M.		1.845^{17}	457
2744	$NaSb$	144.767		465		
2745	Na_3Sb	190.761		856		
2746	$NaSbO_2.3H_2O$	230.813	R.	d.	2.864	
2747	$Na_3SbS_4.9H_2O$	481.160	C.		1.839	
2748	Na_3Bi	277.991		775		
2749	Na_2C_2	69.9940			1.575^{15}	
2750	Na_2CO_3	105.994		851	2.533	
2751	$Na_2CO_3.H_2O$—Thermonatrite	124.009	R.		1.55	
2752	$Na_2CO_3.7H_2O$	232.102	R. Trig.	d. 35.1	1.51	
2753	$Na_2CO_3.10H_2O$—Natron	286.148	M.		1.46	431
2754	$NaCHO_2$	68.0047	M.	253	1.92	
2755	$NaHCO_3$	84.0047	M.		2.20	
2756	$NaC_2H_3O_2$	82.0201		324	1.528	
2757	$NaC_2H_3O_2.3H_2O$	136.063	M.	58; 78	1.45	452
2758	$NaHC_3H_2O_4.H_2O$—Acid malonate	144.036	R.			604
2759	$NaH(d\text{-}C_4H_4O_6).H_2O$	190.051	R.			628
2760	$NaC_4H_7O_4$—Diacetate	142.051	C.			79
2761	$NaC_{16}H_{31}O_2$—Palmitate	278.236		*ca.* 270		
2762	$NaC_{18}H_{33}O_2$—Elaidate	304.251		227		
2763	$NaC_{18}H_{33}O_2$—Oleate	304.251		235		
2764	$Na_2(d\text{-}C_4H_4O_6).2H_2O$	230.056	R.		1.818	
2765	$Na_2CO_3.NaHCO_3.2H_2O$—Tronite	226.030	M.		$2.147^{21.7}$	563
2766	$Na_3C_6H_5O_7.5H_2O$—Citrate	348.107	R.		$1.857_4^{23.5}$	
2767	$NaC_{10}H_6S_2O_6.2H_2O$—Naphthalene 1, 5-disulfonate	345.040	M.		1.777	809
2768	$Na_2(CH_2SO_3)_2.2H_2O$—Ethane disulfonate	270.186	M.		1.939 (α) 1.880 (β)	
2769	$NaCN$	49.0050		563.7		

Index No.	Formula	Mol. wt.	Crystal system	M. P.	d_4^{20}	Ref. ind. finding No.
2770	$NaNH_4$(*meso*-$C_4H_4O_6$).H_2O	207.082	M.		1.740	1074
2771	$NaNH_4$(*d*-$C_4H_4O_6$).$4H_2O$	261.128	R.		1.587	527
2772	$NaC_5H_8NO_4$—Glutamate	169.067	M.			574
2773	NaSCN	81.0700	R.	562.3		
2774	$NaC_6H_4(NH_2)SO_3.2H_2O$—Sulfanilate	231.147	R.			696
2775	$NaC_{10}H_8NO_3S.4H_2O$—1, 4-Naphthylamine sulfonate	317.193	M.			747
2776	$Na_2O.SiO_2$	122.054		1088		1040
2777	$Na_2O.2SiO_2$	182.114	R.	874		571
2778	Na_2SiF_6	188.054	H.		2.679	202
2779	$Na_2O.3TiO_2$	301.694	M.		3.5^{18}	
2780	$Na_2O.ZrO_2.6SiO_2.3H_2O$—Elpidite	599.400	R.		2.58	689
2781	$Na_2O.Pb(OH)Cl.SO_3$—Caracolite	401.725	R.		4.5	937
2782	TlNa(*dl*-$C_4H_4O_6$).$2H_2O$	411.459	Tri.		3.289	
2783	TlNa(*meso*-$C_4H_4O_6$).$2.5H_2O$	420.466	Tri.		3.120	
2784	TlNa(*d*-$C_4H_4O_6$).$4H_2O$	447.489	R.		2.580	
2785	$NaTl_3$(*d*-$C_4H_4O_6$)$_2$	932.259	R.		4.145	
2786	$ZnNaPO_4$	183.401	R.		3.3	
2787	$Zn(Na_2PO_4)_2$	347.416	C.		2.8	
2788	$Na_2SO_4.CdSO_4$	350.534		551		
2789	$Na_2SO_4.CuSO_4.2H_2O$—Kroehnkite	337.725	M.		2.06^4	715
2790	$Na_2SO_4.Cu(OH)_2.3CuSO_4.3H_2O$—Natrochalcite	772.596	M.	d. 350	2.33	840
2791	$NaCu(CN)_2$	138.583		d. 100	1.013	
2792	$Na_3IrCl_6.12H_2O$	691.024		50		
2793	$Na_2PtCl_4.4H_2O$	455.118		100 d.		
2794	$Na_2PtCl_6.6H_2O$	562.064	Tri.		2.50	
2795	$Na_2PtBr_6.6H_2O$	828.812	Tri.		3.323	
2796	$Na_2PtI_6.6H_2O$	1110.91	M. ?		3.707	
2798	$Na_2Ru(NO_2)_5.2H_2O$	413.765	M.			741
2799	$Na_2MnP_2O_7$	274.972			2.9	
2800	$Na_2O.2MnO.P_2O_5$—Natrophilite	345.902	R.		3.41	871
2801	$Na_4Mn(PO_4)_2$	336.966			2.7	
2802	$Na_2O.3Fe_2O_3.4SO_3.6H_2O$—Natrojarosite	969.386	R.		3.2	966
2803	$2Na_2O.Fe_2O_3.4SO_3.7H_2O$—Sideronatrite	684.042	R.		2.2	725
2804	$3Na_2SO_4.Fe_2(SO_4)_3.6H_2O$—Ferrinatrite	934.144	Trig.		2.55	271
2805	$Na_6Fe_2(C_2O_4)_6.10H_2O$	957.816	M.		$1.973^{17.5}$	
2806	$Na_2Fe(CN)_5NO.2H_2O$	297.913	R.		1.7_2	
2807	$Na_4Fe(CN)_6.12H_2O$	520.061	M.		1.458	616
2808	$Na_2O.Fe_2O_3.4SiO_2$—Aegirite	461.914	M.		3.5	956
2809	$Na_2O.Fe_2O_3.FeO.5SiO_2$—Riebeckite	593.814	M.		3.44	887
2810	$Na_2O.2FeO.Fe_2O_3.6SiO_2$—Crocidolite	725.714	M.		3.2	893
2811	Na_2CrO_4	162.004	R.	39_2	2.723	
2812	$Na_2CrO_4.4H_2O$	234.066	M.	d. $64._8$		
2813	$Na_2CrO_4.6H_2O$	270.096	Tri.	d. 25.9		
2814	$Na_2CrO_4.10H_2O$	342.158	M.		1.483	
2815	$Na_2Cr_2O_7.2H_2O$	298.045	M.	320	2.52^{13}	892
2816	$Na_2O.2CrO_3.I_2O_5.2H_2O$	631.909			3.21	
2817	$Na_2Cr_2S_4$	278.274	H.	d.	2.55^{15}	
2818	$NH_4NaCrO_4.2H_2O$	193.077	R.	d.	1.842^{15}	
2819	$NaCrP_2O_7$	249.055	R.		3	
2820	Na_2MoO_4	205.994		687	l. 2.590_4^{1026}	
2821	$Na_2Mo_2O_7$	349.994		612		
2822	$3Na_2O.7MoO_3.22H_2O$	1590.32	M.	*ca.* 700		
2823	$3Na_2O.5MoO_3.P_2O_5.14H_2O$	1300.25	R.			818
2824	Na_2WO_4	293.994	R.	698	4.179	
					l. $3.613_4^{996.6}$	
2825	$Na_2WO_4.2H_2O$	330.025	R.		3.245	
2826	$Na_2W_2O_6$	509.994			7.28	
2827	$Na_2W_3O_9$	741.994		d.	6.617	
2828	$Na_2W_4O_{12}$	973.994			7.195^4	
2829	$Na_2O.4WO_3.10H_2O$	1170.15	C.	706.6	3.847^{13}	
2830	$Na_2W_5O_{15}$	1205.99			7.283^{17}	

Index No.	Formula	Mol. wt.	Crystal system	M. P.	d_4^{20}	Ref. ind. finding No.
2831	$4Na_2O.10WO_3.23H_2O$	2982.33	M.	680.8	4.3	
2832	$5Na_2O.12WO_3.28H_2O$	3598.40	Tri.	705.8		
2833	$9Na_2O.22WO_3.51H_2O$	6580.73		683.3		
2834	$Na_2O.3UO_3$	920.504	R. ?		6.912	
2835	$NaU(C_2H_3O_2)_3$	438.236	Tet.		2.56	109.1
2836	$NaVO_3$	121.957	M. ?	562	2.79	
2837	$Na_2O.V_2O_4.5V_2O_5$	1137.51	R. ?	*ca.* 800 d.		
2838	Na_3VO_4	183.951		*ca.* 866		
2839	$Na_3VO_4.10H_2O$	364.105	C. H.			127, 263
2840	$Na_3VO_4.12H_2O$	400.136	Trig.			245
2841	$Na_4V_2O_7$	305.908	H.	654		
2842	$2Na_3VO_4.NaF.19H_2O$	752.192	C.			123
2843	$Na_3VSO_3.10H_2O$	380.170		18	1.773	
2844	$3Na_2O.V_2O_5.10WO_3.SiO_2.29H_2O$	3270.41	C.		3.344	
2845	Na_2CbO_3	187.094			4.19	
2846	$Na_2O.B_2O_3$	131.634		966		
2847	$Na_2O.2B_2O_3$	201.274		741	l. 2.5 glass 2.37	45
2848	$Na_2B_4O_7.10H_2O$—Borax	381.428	M.	75	1.73	460
2849	$Na_2O.4B_2O_3$	340.554		783		
2850	$NaAlO_2$	81.9570		1650		
2851	$2NaF.AlF_3$—Chiolite	167.954	Tet.		3.0	205
2852	$3NaF.AlF_3$—Cryolyte	209.950	M.	1000	2.90 l. 2.10^{1083}	427
2853	$Na_2O.Al_2O_3.4SO_3.12H_2O$—Tamarugite	700.359	M. Tri.		2.03	494
2854	$Na_2O.Al_2O_3.4SO_3.22H_2O$—Mendozite	880.513	M. ?		1.88	449
2855	$Na_2SO_4.Al_2(SO_4)_3.24H_2O$	916.544	C.	61	1.675	72
2856	$Na_2O.3Al_2O_3.4SO_3.6H_2O$—Natroalunite	796.106	Trig. C.		2.6	287
2857	$Na_2O.Al_2O_3.P_2O_5.H_2O$—Fremontite	323.977	M. ?		3.04	760
2858	$Na_2O.2AlOF.As_2O_5$—Durangite	396.834	M.		4.0	866
2859	$Na_2O.Al_2O_3.2CO_2.2H_2O$—Dawsonite	287.944	R.		2.4	653
2860	$Na_2O.Al_2O_3.2SiO_2$—Carnegieite	284.034	Tri. ?	1526	2.57	596
2861	$Na_2O.Al_2O_3.2SiO_2$—Nephelite	284.034	H.	Tr. 1248	2.67	266
2862	$Na_2O.Al_2O_3.3SiO_2.2H_2O$—Natrolite	380.125	R.		2.25	478
2863	$Na_2O.Al_2O_3.4SiO_2$—Jadeite	404.154	M.	1050	3.34	834
2864	$Na_2O.Al_2O_3.4SiO_2.2H_2O$—Analcite	440.185	C.		2.25	229
2865	$Na_2O.Al_2O_3.6SiO_2$—Albite	524.274	Tri.	1100	2.61	615
2866	$Na_2O.Al_2O_3.9SiO_2.2NaF$—Leifite	788.448	H.		2.57	248
2867	$Na_2O.3Al_2O_3.6SiO_2.2H_2O$—Paragonite	764.145	M.		2.8	750
2868	$2Na_2O.Al_2O_3.6SiO_2.H_2O$—Ussingite	604.283	Tri.		2.50	565
2869	$2Na_2O.3Al_2O_3.6SiO_2.7H_2O$—Hydronephelite	916.216	H.		2.3	236
2870	$3Na_2O.3Al_2O_3.6SiO_2.2NaCl$—Sodalite	969.012	C.		2.2	99
2871	$3Na_2O.3Al_2O_3.18SiO_2.2NaCl$—Marialite	1689.73	Tet.		2.56	261
2872	$3Na_2O_3.3Al_2O_3.6SiO_2.2Na_2S$—Lazurite	1008.22	C.		2.4	108
2873	$5Na_2O.3Al_2O_3.6SiO_2.2SO_3$—Noselite	1136.22	C.		2.3	105
2874	$Na_2La(NO_3)_5.H_2O$	512.959	M.		2.63_4^8	
2875	$Na_2Ce(NO_3)_5.H_2O$	514.299			2.65_4^0	
2876	$Na_2O.2BeO.P_2O_5$—Beryllonite	254.082	R.		2.85	679
2877	$Na_2O.2BeO.6SiO_2.H_2O$—Epididymite	490.409	R.		3.55	700
2878	$Na_2O.2BeO.6SiO_2.H_2O$—Eudidymite	490.409	M.		2.55	657
2879	$Na_2SO_4.MgSO_4$	262.444	R.		2.729	
2880	$Na_2O.MgO.2SO_3.2.5H_2O$—Loeweite	307.483	Trig.	Tr. 71	2.37	232
2881	$Na_2O.MgO.2SO_3.4H_2O$—Bloedite	334.506	M.		2.23	498
2882	$3Na_2O.MgO.4SO_3$—Vanthoffite	546.562	M. ?		2.69	497
2883	$NaMgPO_4$	142.341			2.5	
2884	$Na_2MgP_2O_7$	244.362	C. ?		2.2	
2885	$Na_2Mg(CO_3)_2$	190.314	Tet.		2.729^{15}	
2886	$NaCl.Na_2CO_3.MgCO_3$—Northrupite	248.769	C.		2.377^{15}	118
2887	$3Na_2O.2MgO.4CO_2.SO_3$—Tychite	522.687	C.		2.52	113
2889	$Na_2O.CaO.2SO_3$—Glauberite	278.194	M.		2.83	625
2890	$Na_2O.CaO.2SO_3.4H_2O$—Wattevillite	350.257	M.		1.81	446
2891	$3Na_2O.3CaO.2P_2O_5$	638.288	M.		2.1	

Index No.	Formula	Mol. wt.	Crystal system	M. P.	d_4^{20}	Ref. ind. finding No.
2893	$Na_2O.CaO.2CO_2.2H_2O$—Pirssonite	242.095	R.	813	2.35	567
2894	$Na_2O.CaO.2CO_2.5H_2O$—Gaylussite	296.141	M.		1.94	580
2895	$Na_2O.4CaO.6SiO_2.H_2O$—Pectolite	664.650	M.		2.73	766
2896	$Na_2O.2CaO.5B_2O_3.16H_2O$—Ulexite	810.580	M.	d.	1.95	551
2897	$NaF.CaF_2.AlF_3.H_2O$—Pachnolite	222.042	M.		2.98	429
2898	$NaF.CaF_2.AlF_3.H_2O$—Thomsenolite	222.042	M.		2.98	430
2899	$Na_2O.CaO.2Al_2O_3.10SiO_2.20H_2O$—Faujasite	1282.81	C.		1.92	92
2900	$Na_2O.2CaO.3Al_2O_3.9SiO_2.8H_2O$—Mesolite	1164.56	Tri.		2.27	555
2901	$Na_2O.2CaO.3Al_2O_3.9SiO_2.8H_2O$—Pseudomesolite	1164.56	Tri.		2.22	531
2902	$5(Na_2, Ca)O.3Al_2O_3.6SiO_2.2SO_3$—Haüynite		C.		2.4	106
2903	$NaF.CaO.BeO.2SiO_2$—Leucophanite	243.207	R.		2.96	743
2904	$NaF.2CaO.2BeO.3SiO_2$—Meliphanite	384.357	Tet.		3.01	297
2905	$NaCaMgAlSi_4O_{12}$—Tuxtlite	418.587	M.		3.27	870
2906	Na_2SrSO_7	277.679		280		
2907	$Na_2Sr(CO_3)_2$	253.614		750		
2908	$Na_4SrCa(CO_3)_4$	459.678		720		
2909	$Na_2Ba(CO_3)_2$	303.364		740		
2910	$2Na_2O.BaO.2TiO_2.10SiO_2$—Leucosphenite	1037.76	M.		3.1	849
2911	$Na_4BaCa(CO_3)_4$	509.428		660		
2912	$NaLi(dl\text{-}C_4H_4O_6).2H_2O$	213.998	M.			506
2913	$3NaF.3LiF.2AlF_3$—Cryolithionite	371.728	C.		2.78	67
2914	K_2O	94.1900			2.32	
2915	K_2O_4	142.190		>280		
2916	KH	40.1027		d.	0.80	
2917	KOH	56.1027		Tr. 260	2.044	
				380	l. 1.87_4^{330}	
2918	KF	58.0950		880	2.48	
					l. 1.869_4^{913}	
2919	KF.2HF	98.1104		105		
2920	KF.3HF	118.118		100		
2921	KCl—Sylvite	74.5530	C.		1.988	103
2922	$KClO_3$	122.553	M.	368.4	2.32	579
2923	$KClO_4$	138.553	R.	d. 400	2.52	
2924	KBr	119.011		730	2.75	134
2925	$KBrO_3$	167.011	Trig.	370 d.	$3.27^{17.5}$	
2926	KI	166.027	C.	773	3.123	150
2927	KI_3	419.891	M.	45	3.498	
2928	KIO_3	214.027	M.	560	3.89	
2929	KIO_4	230.027	Tet.	582	3.618	
2930	$K_2H_3IO_6.3H_2O$	358.191	Tri.			541
2931	$KICl_2$	236.943	M.	60		
2932	$KIBr_2$	325.859	R.	60		
2933	K_2S	110.255		471	1.805	
				Tr. 146.4		
2934	$K_2S.5H_2O$	200.332		60		
2935	K_2S_3	174.385		252.0		
2936	K_2S_4	206.450		>145		
2937	K_2S_5	238.515		206.0		
2938	K_2SO_4—Arcanite	174.255	R.	Tr. 588	2.662	519
				1067		
2939	$K_2S_2O_3$	190.320	C.	d. 400		
2940	$K_2S_2O_3.0.33H_2O$	196.325	M.		2.23	
2941	$K_2S_2O_6$	238.320	Trig.		2.278	215
2942	$K_2S_2O_7$	254.320		>300	2.277	
2943	$K_2S_2O_8$	270.320	Tri.			458
2944	$K_2S_3O_6$	270.385	R.		2.304	472
2945	$K_2S_4O_6$	302.450	M.		2.296	
2946	$K_2S_5O_6.1.5H_2O$	361.538			2.112	

Index No.	Formula	Mol. wt.	Crystal system	M. P.	d_4^{20}	Ref. ind. finding No.
2947	KSH	72.1677		455		
2948	$KHSO_4$—Misenite	136.168	R. M.	210	2.35	
2949	KHS_2O_7	216.233		168		
2950	$K_2SO_4.KHSO_4$	310.423	M.		2.59^{18}	508
2951	$4K_2SO_4.3H_2SO_4$	991.261		d. <25	2.277^{18}	
2952	KSO_3F	138.160		311		
2953	$KI.4SO_2$	422.287		0.26		
2954	K_2Se	157.390			2.851	
2955	K_2SeO_4	221.390	R.		3.066	646
2956	K_2SeSO_7	301.455		120		
2957	$K_2H_2TeI_2O_{10}.2H_2O$	657.600	Trig.			397
2958	KNO_2	85.1030		297	1.915	
2959	KNO_3—Niter	101.103	R. Trig.	Tr. 129 R. to Trig. 333	$2.11^{10.6}$	556
2960	KNH_2	55.1184		338		
2961	$KNO_3.2HNO_3$	227.134		22		
2962	$KBr.4NH_3$	187.135		45		
2963	$KNO_3.KHSO_4$	237.271			2.38	
2964	$5K_2O.(NH_4)_2O.6SO_3$—Taylorite	1003.42				440
2965	KPO_3	118.119		Tr. 450 810	$2.258^{14.5}$ l. 2.068^{900}	
2966	K_3PO_4	212.309		1340		
2967	$K_4P_2O_7$	330.428		Tr. 278 1090	2.33	
2968	KH_2PO_4	136.134	Tet.	96	2.338	244
2969	$K_2H_2P_2O_6.2H_2O$	274.284	M.	d.		624
2970	$K_2H_2P_2O_6.3H_2O$	292.300	R.	d.		483
2971	KH_2AsO_4	180.070	Tet.	288	2.867	278
2972	$5K_2O.As_2O_5.8SO_3.6H_2O$	1449.48			2.289	
2973	KSb	160.865		605		
2974	K_3Sb	239.055		812		
2975	K_2CO_3	138.190		891	2.29	
2976	$(KCO)_2$	134.190		78		
2977	$K_2C_2O_4.H_2O$	184.205	M.		2.13	486
2978	$K_2O.2CO_2.H_2O$—Kalicinite	200.205	M.	d. <200	2.17	476
2979	$2K_2CO_3.3H_2O$	330.426	M.		2.043	
2980	$KCHO_2$	84.1027		167.5	1.91	
2981	KHC_2O_4	128.103	M.		2.0	655
2982	$KHC_2O_4.H_2O$	146.118			2.044	
2983	$KC_2H_3O_2$	98.1181		292	1.8	
2984	$KC_4H_5O_4$—Acid succinate	156.134	M.	242 d.	1.767	
2985	$KC_4H_5O_4.2H_2O$—Acid succinate	192.164	R.		1.616	617
2986	$KH(d\text{-}C_4H_4O_6)$	188.134	R.		1.956	
2987	$KH(dl\text{-}C_4H_4O_6)$	188.134	M.		1.954	
2988	$KH(C_2H_3O_2)_2$	158.149		142		
2989	$KC_6H_7O_7$—Citrate	230.149	Tri.		1.906	
2990	$KC_2H_3O_2.2C_2H_4O_2$	218.180		112	1.47	
2991	$KHC_8H_4O_4$—Acid phthalate	204.134	R.		1.636	
2992	$KH(C_4H_5O_4)_2$—Disuccinate	274.180	M.	162	1.56	
2993	$KC_9H_7O_4.2H_2O$—Acetylsalicylate	254.180		65		
2994	$KC_{18}H_{35}O_2$—Oleate	320.349				1037
2995	$K_2C_4H_4O_4.3H_2O$—Succinate	248.267	R.		1.564	
2996	$K_2(d, l\text{-}C_4H_4O_6)$	226.221	M.		1.984	
2997	$K_2(d\text{-}C_4H_4O_6).0.5H_2O$	235.229	M.		1.98	610
2998	$2K_2C_2O_4.H_2C_2O_4.2H_2O$—Tetraoxalate	458.426	R.		1.213^{22}	592
2999	$KH(CCl_3CO_2)_2$	364.851	Tet.		2.005_4^{18}	
3000	$KC_2H_5O_4S$—Ethyl sulfate	164.199	M.		1.843	
3001	$KC_6H_5O_4S$—*p*-Phenolsulfonate	212.199	R.	>260	1.87	770
3002	$KC_6H_5O_4S.2H_2O$—*o*-Phenolsulfonate	248.229	R.		1.734	697
3003	$KC_6H_4O_7S_2.H_2O$—2, 4-Phenoldisulfonate	309.271	R.			768
3004	$CH_2(SO_3K)_2$—Methane disulfonate	252.335	M.		2.376	645
3005	$K_2C_{10}H_6O_2S_2.2H_2O$—Naphthalene 1, 5-disulfonate	336.397	M.		1.797	859

Index No.	Formula	Mol. wt.	Crystal system	M. P.	d_4^{20}	Ref. ind. finding No.
3006	KCN	65.1030		634.5	1.52^{16}	
3007	KCNO	81.1030			2.048	
3008	$KNH_4(d\text{-}C_4H_4O_6).0.5H_2O$	214.172			1.700	
3009	$KC_5H_2N_4O_6$—Acid uroxasate	253.142				1038
3010	$KC_6H_2O_7N_3$—Picrate	267.134	R.		1.852	982
3011	KCNS	97.1680		173.2	1.886	
3012	$K(SbO)(d\text{-}C_4H_4O_6).0.5H_2O$—Tartar emetic	333.904	R.		2.607	810
3013	$K_2O.SiO_2$	154.250		976		
3014	$K_2O.2SiO_2$	214.310	R. ?	1041		532
3015	$K_2O.4SiO_2.H_2O$	352.445	R.	d. 400	2.417	634
3016	K_2SiF_6—Hieratite	220.250	C.		2.665	
3017	$K_2Ti_2O_5$	253.990		980		
3017.5	K_2ZrF_6	283.190	M.			1037.2
3017.6	K_3ZrF_7	341.285	C.			68.2
3018	$K_2Sn(OH)_6$	298.936	Trig.		3.197	
3019	K_2SnCl_6	409.638	C.		2.71	147
3020	K_2SnBr_6	676.386			3.783	
3021	$K_2SnS_3.3H_2O$	347.131			1.847_4^{18}	
3022	KPb_2Cl_5	630.785	R.	440		
3023	K_2PbCl_6	498.138	C.	d. 190		
3024	$KC_2H_3O_2.PbI(C_2H_3O_2)$	491.273		208.5		
3025	$KGa(SO_4)_2.12H_2O$	517.130	C.		1.895	86
3026	$K_3InCl_6.2H_2O$	480.864	Tet.		2.483	
3027	$K_3InBr_6.2H_2O$	747.612	Tet.		3.140	
3028	$K_3TlCl_6.2H_2O$	570.464	Tet.		2.859	
3029	$K_2SO_4.ZnSO_4.6H_2O$	443.792	M.	d. 121	2.245	482
3030	$K_2Zn(SeO_4)_2.2H_2O$	466.001	Tri.		3.21	
3031	$K_2Zn(SeO_4)_2.6H_2O$	538.062	M.		2.554	588
3032	$K_2Zn(CN)_4$	247.602	C.	d. 150		70
3033	$4KCl.CdCl_2$	481.538	Trig.		2.5	293
3034	$K_2Cd(NO_2)_4$	374.632	R.			691
3035	$CdKPO_4$	246.529	R.		3.8	
3036	$KCl.2HgCl_2.2H_2O$	653.636	R.		4.11_{15}^{15}	
3037	$2KCl.HgCl_2.H_2O$	438.647	R.		3.58_{15}^{15}	877
3038	$KBr.HgBr_2$	479.453			4.40	
3039	$KBr.HgBr_2.H_2O$	497.468			3.865	
3040	$KI.HgI_2.H_2O$	638.516		104		
3041	$2KCN.Hg(CN)_2$	382.832	Tet.		$2.447^{21.3}$	
3042	$2KCl.CuCl_2.2H_2O$	319.623	Tet.		2.41	312
3043	$K_2O.CuO.2SO_3.6H_2O$—Cyanochroite	441.982	M.		2.22	491
3045	$K_2SeO_4.CuSeO_4.6H_2O$	536.252	M.		2.527	603
3046	$K_2CO_3.CuCO_3$	261.760			1.35^{65}	
3047	$K_3Cu(CN)_4$	284.887	Trig.			121
3048	$KNO_3.AgNO_3$	270.991	M.	125	3.219	
3049	$2KNO_2.AgNO_2.Bi(NO_2)_3$	671.118			3.33	
3050	$KAgCO_3$	206.975		d.	3.769	
3051	$KAuCl_4$	378.127	M.	357		
3052	$K_4Os(CN)_6.3H_2O$	557.274	M.			769
3053	K_2IrCl_6	484.038	C.	d.	3.546	
3054	$K_2SO_4.Ir_2(SO_4)_3.24H_2O$	1281.02	C.	103		
3055	$K_3Ir(C_2O_4)_3.4H_2O$	646.447	Tri.		2.510_{19}^{19}	
3056	$K_3IrCl_2(C_2O_4)_2.H_2O$—Chloroxalate	615.316	M.			736
3057	$K_3IrCl_2(NO_2)_2C_2O_4.2H_2O$—Dichloro dinitro oxalate	597.348	R.			716
3058	K_2PtCl_4	415.252	Tet.		3.30	
3059	K_2PtCl_6	486.168	C.	d. 250	3.499	
3060	K_2PtBr_6	752.916	C.	>400 d.	4.66	
3061	K_2PtI_6	1035.01	C.		5.18	
3062	$K_2S.3PtS.PtS_2$	1051.50		d.	6.44^{15}	
3063	$[Pt(NH_3)Cl_3]K.H_2O$	375.746	R.			709
3064	$K_2Pt(NO_2)_2Br_2.H_2O$	543.283	Tri.			858
3065	$K_2Pt(NO_2)_2I_2.2H_2O$	655.331	Tet.			362

Index No.	Formula	Mol. wt.	Crystal system	M. P.	d_4^{20}	Ref. ind. finding No.
3066	$K_2Pt(C_2O_4)_2.2H_2O$	485.451	M.		3.03	
3067	$K_2Pt(CN)_4$	377.452	R.		2.45	
3068	$K_2Pt(NO_2)_2C_2O_4.H_2O$	471.451	M.			817
3069	$K_2Pt(SCN)_6$	621.858	H.		3.70^{19}	
3070	$K_2Pt(SCN)_6.2H_2O$	657.889	M. R.		2.342^{18}	
3071	$K_2Pt(SeCN)_6$	904.668	R.	d. 80	3.378$^{12.5}$	
3072	$KRuO_4.H_2O$	222.810	Tet.	d. 400$^{vac.}$		
3073	$K_4Ru(CN)_6.3H_2O$	468.174	M.			722
3074	$K_3Rh(CN)_6$	376.243	M.			669
3075	K_2PdCl_4	326.722			2.67	
3076	K_2PdCl_6	397.638	C.		2.738	
3077	$KMnO_4$	158.025	R.	d. <240	2.703	291
3078	$K_2MnCl_4.2H_2O$	310.983	Tri.		2.221	
3079	K_4MnCl_6—Chloromanganokalite	424.058	Trig.		2.31	
3080	$K_2SO_4.MnSeO_4.2H_2O$	408.416	Tri.		3.07	
3081	$K_3Mn(CN)_6$	328.695	M.			1055
3082	$K_2Fe(SO_4)_2$	326.160			2.177	
3083	$K_2Fe(SO_4)_2.6H_2O$	434.252	M.		2.169	479
3084	$K_2Fe_2(SO_4)_4.24H_2O$	1006.50	C.	33	1.831	97
3085	$K_2O.3Fe_2O_3.4SO_3.6H_2O$—Jarosite	1001.58	R.		3.2	370
3086	$K_6Fe_2(CrO_4)_4.6H_2O$	806.342	M.		1.448$^{17.5}$	678
3087	$K_3Fe(CN)_6$	329.173	M.		1.894^{17}	699
3088	$K_4Fe(CN)_6$	368.268			1.898^{17}	
3089	$K_4Fe(CN)_6.3H_2O$	422.314	M.			714
3090	$2KF.CoF_2$	213.160	M.		3.22	
3091	$K_2SO_4.CoSO_4.6H_2O$	437.382	M.		2.218	492
3092	$K_2SeO_4.CoSeO_4.6H_2O$	531.652	M.		2.514	589
3093	$[Co(NH_3)_2(NO_2)_4]K$	316.159	R.		2.076	
3094	$K_2Co(C_3H_2O_4)_2$—Malonate	341.191			2.234	
3095	$K_3Co(CN)_6$	332.303	M.		1.906	
3096	$K_2SO_4.NiSO_4.6H_2O$	437.102	M.	d. <100	2.237	514
3097	$K_2Ni(SeO_4)_2.6H_2O$	531.372	M.	d. <100	2.539	608
3098	$K_2Ni(COS)_4$	377.140	M.		2.132$_4^{18.4}$	125
3099	$2KCN.Ni(CN)_2.H_2O$	258.927	M.		1.871$^{14.5}$	
3100	$K_2O.CrO_3$—Tarapacaite	194.200	R.	975	2.732^{18}	927
3101	$K_2Cr_2O_7$	294.210	Tri.	398	2.69	924
3102	$K_2Cr_3O_{10}$	394.220	M.	250	2.648	
3103	$K_2Cr_4O_{13}$	494.230	M.	215	2.649	
3104	$KCrClO_3$	174.563	M.	d.	2.497^{39}	
3105	$K_2O.2CrO_3.I_2O_5$	628.074			3.66	
3106	K_2CrSO_7	274.265		350		
3107	$K_2SO_4.Cr_2(SO_4)_3.24H_2O$	998.840	C.		1.83	95
3108	K_2CrSeO_7	321.400		120		
3109	$3K_2CrO_4.2(NH_4)_2CrO_4$	886.775			2.403^{15}	
3110	$K_2O.Cr_2O_3.2P_2O_5$	530.306	M.		3.5^{20}	
3111	$K_3Cr(CN)_6$	325.343	M.	150 d.	1.71	607
3112	$K_3Cr(SCN)_6.4H_2O$	589.795	R.		1.711^{16}	
3113	$K_2Cr_2O_7.HgCl_2$	565.736	R.		3.531^{11}	
3114	$K_2Cr_2O_7.Hg(CN)_2.2H_2O$	582.867	R.			1077
3115	K_2MoO_4	238.190		919	l. 2.342$_4^{964}$	
3116	K_2WO_4	326.190	M.	921 Tr. 388	3.120$_4^{991}$	
3117	$K_2W_2O_7$	558.190		555		
3118	$K_2O.8WO_3$	1950.19			6.53	
3119	$K_2SeO_4.Cr_2(SeO_4)_3.24H_2O$	1187.38			2.078$^{17.5}$	
3120	$K_4U(C_2O_4)_4.5H_2O$	772.627	M.		2.563	
3121	$KUO_2(C_2H_3O_2)_3.H_2O$	504.350	Tet.		2.396	
3122	$KV(SO_4)_2.12H_2O$	498.370			1.782	
3123	$K_4V_2S_6O.3H_2O$	520.736			2.144	
3124	$K_2O.2UO_3.V_2O_3.8H_2O$—Carnotite	960.573	H. R.			988
3125	$3K_2O.SiO_2.V_2O_5.10WO_3.22H_2O$	3240.89	C.		3.664	
3126	$7K_2O.2SiO_2.3V_2O_5.18WO_3.42H_2O$	6257.86	M. Tri.		3.537	
3127	$NH_4K_5O_3.SiO_2.V_2O_5.10WO_3.23H_2O$	3237.85			3.74	

Index No.	Formula	Mol. wt.	Crystal system	M. P.	d^{20}_{4}	Ref. ind. finding No.
3128	$2KF.TaF_5$	392.690	R.		4.56	
3129	$K_2O.B_2O_3$	163.830	M.	947		
3130	KBF_4	125.915	C. R.	500 d.	2.50	
3131	$KBO_2.KPO_3$	200.034		872		
3132	$3KF.AlF_3$	258.245		1035 Tr. 300		
3133	$K_2O.Al_2O_3.4SO_3.24H_2O$—Kalinite	948.740	M. C.		1.75	77, 442
3134	$K_2O.3Al_2O_3.4SO_3.6H_2O$—Alunite	828.302	Trig.		2.60	281
3135	$KAl(SeO_4)_2.12H_2O$	568.640	C.		2.001	93
3136	$K_2O.Al_2O_3.2SiO_2$—Kaliophilite	316.230	H.	>1745	2.6	258
3137	$K_2O.Al_2O_3.4SiO_2$—Leucite	436.350		>1800	2.47	114
3138	$K_2O.Al_2O_3.6SiO_2$—Microcline	556.470	Tri.	1150	2.56	613
3139	$K_2O.Al_2O_3.6SiO_2$—Orthoclase	556.470	M.	1170 d.	2.56	606
3140	$K_2O.3Al_2O_3.6SiO_2.2H_2O$—Muscovite	796.341	M.	d.	2.9	731
3141	$2Al_2O_3.3B_2O_3.K_2O$—Rhodizite	506.950	C.		3.4	151
3142	$K_2La(NO_3)_5.1.5H_2O$	554.163	R.	d. 60	2.54^{0}_{4}	
3143	$K_2Ce(NO_3)_5.2H_2O$	564.511	R.	d. 180		
3143.5	K_2HfF_6	371.19	M.			1037.1
3143.6	K_3HfF_7	429.285	C.			68.1
3144	$KMgF_3$	120.415			2.8	
3145	K_2MgF_4	178.510			2.7	
3146	$KCl.MgCl_2.6H_2O$—Carnallite	277.881	R.	167	1.60	467
3147	$KI.MgI_2.6H_2O$	552.303			2.547	
3148	$K_2SO_4.MgSO_4.4H_2O$—Leonite	366.702	M.		2.25	493
3149	$K_2O.MgO.2SO_3.6H_2O$—Picromerite	402.732	M.	d. 72	2.15	451
3150	$K_2SO_4.2MgSO_4$—Langbeinite	415.025	C.		2.83	128
3151	$KCl.MgSO_4.3H_2O$—Kainite	248.984	M.		2.13	553
3152	$K_2Mg(SeO_4)_2.6H_2O$	497.002	M.		2.34	527
3153	$KMgPO_4$	158.439	R.		2.6	
3154	$K_2Mg(P_2O_6)_3$	576.654	M.		2.4	
3155	$KHMg(CO_3)_2.4H_2O$	256.484	Tri.	d. 100	1.98	
3156	$K_2Mg(CrO_4)_2.2H_2O$	370.561	Tri.		2.60^{15}	
3157	$K_2O.4MgO.11B_2O_3.18H_2O$—Heintzeite	1345.79	M.		2.1	611
3158	$KCl.CaCl_2$—Chlorocalcite	185.539	C.	754		591
3159	$K_2O.CaO.2SO_3.H_2O$—Syngenite	289.310	M.		2.60	581
3160	$K_2CaP_2O_7$	292.308	H.		2.7	
3161	$K_2Ca(CO_3)_2$	238.260	R.	790		
3162	$K_2O.8CaO.16SiO_2.16H_2O$—Apophyllite	1791.96	C.		2.35	259
3163	$K_2CrO_4.CaCrO_4.2H_2O$	386.311	Tri.		2.502	
3164	$K_2O.4CaO.2Al_2O_3.24SiO_2.H_2O$—Milarite	1981.77	H.		2.57	254
3165	$K_2O.2CaO.MgO.4SO_3.2H_2O$—Polyhalite	602.941	R.		2.78	685
3166	$K_2SO_4.4CaSO_4.MgSO_4.2H_2O$—Krugite	875.211			2.801	
3167	$KCl.2SrCl_2$	391.625		638		
3168	$2KCl.SrCl_2$	307.642	R.	597		
3169	$K_2SrP_2O_7$	339.858	H.		2.9	
3170	$KSrCr(C_2O_4)_3.6H_2O$	550.817			$2.155^{12.8}$	
3171	$K_2Ba(CO_3)_2$	335.560		800		
3172	$K_4BaCa(CO_3)_4$	573.820		758		
3173	$LiKSO_4$	142.099	H.		2.393	218
3174	$2KNO_2.LiNO_2.Bi(NO_2)_3$	570.177			3.21^{15}_{4}	
3175	$LiKCO_3$	106.034		515		
3176	$LiK(d\text{-}C_4H_4O_6).H_2O$	212.080	R.			601
3177	$KLi(dl\text{-}C_4H_4O_6).H_2O$	212.080	M.		1.610	1075
3178	$KLiPt(CN)_4.3H_2O$	399.342	R.			798
3179	$K_2Li_2Fe(CN)_6.3H_2O$	358.002	M.			753
3180	$KLiMoO_4.H_2O$	224.049	R.		2.696	
3181	$K_3Na(SO_4)_2$—Glaserite	332.412	Trig.	<1000	2.696	237
3182	$KNaHAsO_4.7H_2O$	328.168			1.884	
3183	$KNa(dl\text{-}C_4H_4O_6).3H_2O$	264.169	M.		1.783	
3184	$KNaC_4H_4O_6.4H_2O$—Rochelle salt	282.184	R.		1.790	517
3185	$KCl.11Na_2O.9SO_3.2CO_2$—Hanksite	1565.07	H.		2.56	222
3186	$3KCl.NaCl.FeCl_3$—Rinneite	408.870	Trig.		2.35	290
3187	$K_3Na(CrO_4)_2$	372.302	Trig.		2.767	351

Index No.	Formula	Mol. wt.	Crystal system	M. P	d_4^{20}	Ref. ind. finding No.
3188	$5K_2W_4O_{12}.2Na_4W_5O_{15}$	7534.93			7.117	
3189	$(CaK_2Na_2)O.Al_2O_3.6SiO_2.6H_2O$—Erionite		R.		2.0	435
3190	Rb_2O	186.880		d. 400	3.72	
3191	Rb_2O_2	202.880			3.65	
3192	Rb_2O_3	218.880			3.53	
3193	Rb_2O_4	234.880		280	3.05^{0}	
3194	RbH	86.4477		d. 300	2	
3195	RbOH	102.448		300	3.203^{11}	
3196	RbF	104.440		760	l. 2.88^{820}	
3197	RbCl	120.898		715	2.76 l. 2.088_4^{750}	104
3198	$RbClO_3$	168.898			3.19	
3199	$RbClO_4$	184.898	R.		2.9	
3200	RbBr	165.356	C.	682	3.35 l. 2.795_4^{730}	133
3201	$RbBr_3$	325.188	R.	d. 140		
3202	$RbBrO_3$	213.356		430	3.68	
3203	$RbBrCl_2$	236.272	R.	d. 110		
3204	$RbBr_2Cl$	280.730	R.	76		
3205	RbI	212.372	C.	642	3.55 l. 2.873_4^{825}	146
3206	RbI_3	466.236	R.	190		
3207	$RbIO_3$	260.372	M. ?, C.	d.	$4.33^{19.5}$	
3208	$RbIO_4$	276.372	Tet.		3.918^{16}	
3209	$RbICl_2$	283.288	R.	190		
3210	$RbIBr_2$	372.204	R.	225		
3211	RbIBrCl	327.746	R.	205		
3212	Rb_2S	202.945			2.912	
3213	Rb_2S_3	267.075		213		
3214	Rb_2S_5	331.205		225	2.618^{15}	
3215	Rb_2SO_4	266.945	R.	1060 Tr. 653	3.613 l. 2.529_4^{1100}	576
3216	$Rb_2S_2O_6$	331.010	H.			217
3217	$Rb_2S_2O_8$	363.010	M.			502
3218	$RbHSO_4$	182.513			2.892^{16}	
3219	$RbI.4SO_2$	468.632		13.5		
3220	Rb_2SeO_4	314.080	R.		3.90	673
3221	$RbNO_3$	147.448	H. C. R. Tri.	Tr. 161.4 to C. Tr. 219 to R. 310	3.11 l. 2.395_4^{400}	594
3222	$RbNO_3.HNO_3$	210.464	Tet.	62		
3223	$RbNO_3.2HNO_3$	273.479		45		
3224	Rb_2CO_3	230.880		837		
3225	$RbH_3(C_2O_4)_2.2H_2O$	300.494	Tri.		2.125^{18}	
3226	$Rb(dl\text{-}C_4H_5O_6)$	234.479	Tri.		2.282	
3227	$Rb(meso\text{-}C_4H_5O_6).0.5H_2O$	243.486	Tri.		2.399	
3228	$RbHC_8H_4O_4$—Phthalate	250.479	R.		1.933	
3229	$Rb_2(d\text{-}C_4H_4O_6)$	318.911	Trig.		2.692	
3230	$Rb_2(meso\text{-}C_4H_4O_6).H_2O$	336.926	Tri.		2.584	569
3231	$Rb_2(meso\text{-}C_4H_4O_6).2H_2O$	354.942	M.			496
3232	$Rb_2C_6H_6O_7$—Citrate	360.926		212 d.		
3233	$RbH(CCl_3CO_2)_2$	411.196	M.		2.150^{18}	
3234	RbSCN	143.513		195		
3235	Rb_2SiF_6	312.940			3.332	
3236	$RbTi(SO_4)_2.12H_2O$	541.655	C.			199
3237	$RbPbCl_3$	399.014	R.	440		
3238	$RbPb_2Cl_5$	677.130	R.	423		
3239	$RbGa(SO_4)_2.12H_2O$	563.475	C.		1.962	87
3240	$Rb_2InCl_5.H_2O$	480.985	R.		3.087	
3241	$Rb_2InBr_5.H_2O$	703.275			3.409	
3242	$RbIn(SO_4)_2.12H_2O$	608.555	C.	42	2.065	83
3243	$Rb_2TlCl_5.H_2O$	570.585			3.513	

Index No.	Formula	Mol. wt.	Crystal system	M. P.	d_4^{20}	Ref. ind. finding No.
3244	$Rb_3TlBr_6.2H_2O$	976.247			4.077	
3245	$Rb_2Zn(SO_4)_2.6H_2O$	536.482	M.		2.591	499
3246	$Rb_2Zn(SeO_4)_2.6H_2O$	630.752	M.		2.860	598
3247	$Rb_2Cd(SO_4)_2.6H_2O$	583.512			2.695	485
3248	$2RbCl.CuCl_2.2H_2O$	412.313			2.895	
3249	$Rb_2Cu(SO_4)_2.6H_2O$	534.672	M.		2.57	510
3250	$Rb_2AgBi(NO_2)_6$	763.808			3.67^{15}	
3251	$Rb_2SO_4.Ir_2(SO_4)_3.24H_2O$	1373.71	C.	109		
3253	$RbRh(SO_4)_2.12H_2O$	596.665	C.			109
3254	$RbMnO_4$	204.370			$3.235^{10.4}$	
3255	$Rb_2Mn(SO_4)_2.6H_2O$	526.032	M.		2.46	474
3256	$RbFeCl_3.2H_2O$	283.685			2.711	
3257	$Rb_2FeCl_4.2H_2O$	404.583			2.850	
3258	$Rb_2Fe(SO_4)_2.6H_2O$	526.942	M.		2.518	495
3259	$RbFe(SO_4)_2.12H_2O$	549.595	C.		1.92	98
3260	$Rb_2FeSe_2O_8.6H_2O$	621.212			2.819	
3261	$Rb_2SeO_4.Fe_2(SeO_4)_3.24H_2O$	1287.73	C.	45	2.131^{15}	111
3262	$Rb_2Co(SO_4)_2.6H_2O$	530.072	M.		2.567	515
3263	$Rb_2Co(C_3H_2O_4)_2.4H_2O$—Malonate	505.942			2.131	
3264	$Rb_2SO_4.NiSO_4.6H_2O$	529.792	M.		2.586	523
3265	$Rb_2SO_4.Cr_2(SO_4)_3.24H_2O$	1091.53	C.	107	1.946	96
3266	$RbV(SO_4)_2.12H_2O$	544.715			1.915^{4}	
3267	$3RbF.AlF_3$	397.280		985		
3268	$Rb_2SO_4.Al_2(SO_4)_3.24H_2O$	1041.43	C.		1.867^{0}	78
3269	$Rb_2La(NO_3)_5.4H_2O$	691.892	M.	86	2.497^{0}	
3270	$Rb_2Ce(NO_3)_5.4H_2O$	693.232	M.	70	2.497^{0}	
3271	$Rb_2Pr(NO_3)_5.4H_2O$	693.902		63.5	2.50^{0}	
3272	$Rb_2Nd(NO_3)_5.4H_2O$	697.252		47	2.56^{0}	
3273	$Rb_2Mg(SO_4)_2.6H_2O$	495.422	M.		2.40	461
3274	$Rb_2Mg(SeO_4)_2.6H_2O$	589.692	M.		2.684	549
3275	$Rb_2Mg(CrO_4)_2.6H_2O$	535.312	M.		2.466	805
3276	$RbLi(d\text{-}C_4H_4O_6).H_2O$	258.425	R.		2.281	671
3277	$RbNa(meso\text{-}C_4H_4O_6).2.5H_2O$	301.506	Tri.		2.20	
3278	Cs_2O	281.620			4 36	
3279	Cs_2O_3	313.620		400	4.25^{0}	
3280	Cs_2O_4	329.620		600		
				515 (in O_2)	3.68^{0}	
3281	CsH	133.818			2.7	
3282	CsOH	149.818		Tr. 223		
				272.3	3.675	
3283	CsF	151.810		683	3.586_4^{750}	
					l. 2.549	
3284	CsCl	168.268	C.	646	3.97	144
					l. 2.732_4^{700}	
3285	$CsClO_3$	216.268			$3.57^{19.5}$	
3286	$CsClO_4$	232.268			3.327	
3287	CsBr	212.726	C.	636	4.44	152
					l. 3.038_4^{700}	
3288	$CsBr_3$	372.558	R.	180		
3289	$CsBrO_3$	260.726		420	$4.10^{19.5}$	
3290	$CsBrCl_2$	283.642		205		
3291	$CsBr_2Cl$	328.100		191		
3292	CsI	259.742	C.	621	4.51	163
					l. 3.114_4^{690}	
3293	CsI_3	513.606	R.	207.5		
3294	$CsIO_3$	307.742	M.		4.85	
3295	$CsIO_4$	323.742	R.		4.259	
3296	$CsICl_2$	330.658	R.	230	3.86	
3297	$CsIBr_2$	419.574		248		
3298	CsI_2Br	466.590		195.5		
3299	CsIBrCl	375.116		235		
3300	Cs_2S_2	329.750		460		
3301	Cs_2S_3	361.815		217		

Index No.	Formula	Mol. wt.	Crystal system	M. P.	d_4^{20}	Ref. ind. finding No.
3302	Cs_2S_4	393.880		160		
3303	Cs_2S_5	425.945		210	2.806^{16}	
3304	Cs_2S_6	458.010		186		
3305	Cs_2SO_4	361.685	R.	Tr. 660 to H.	4.243	687
				1010	l. 3.034_4^{1040}	
3306	$CsHSO_4$	229.883	R.	d.	3.352^{16}	
3307	Cs_2SeO_4	408.820	R.			752
3308	$Cs_2(SeO_4)_2$	552.020	R.		4.453	
3309	CsN_3	174.834		315		
3310	$CsNO_3$	194.818	H.	Tr. 161 to C.	3.685	
				414	l. 2.713_4^{500}	
3311	$CsNH_2$	148.833		260		
3312	$CsNO_3.HNO_3$	257.834		100		
3313	$CsNO_3.2HNO_3$	320.849		35		
3314	$CsHC_8H_4O_4$—Phthalate	297.849	R.		2.178	
3315	$CsH(CCl_3CO_2)_2$	458.566	M.		2.143	
3316	Cs_2SiF_6	407.680			3.372^{17}	
3317	$CsGa(SO_4)_2.12H_2O$	610.845	C.		2.113	84
3318	$Cs_2InCl_5.H_2O$	575.725			3.350	
3319	$Cs_2InBr_5.H_2O$	798.015			3.776	
3320	$CsIn(SO_4)_2.12H_2O$	655.925	C.		2.241	85
3321	$Cs_2TlCl_5.H_2O$	665.325			3.879	
3322	$Cs_3Tl_2Cl_9$	1126.35	H.			361
3323	$Cs_2Zn(SO_4)_2.6H_2O$	631.222	M.		2.875	552
3324	$Cs_2Zn(SeO_4)_2.6H_2O$	725.492	M.		3.115	640
3325	$Cs_2Cd(SO_4)_2.6H_2O$	678.252	M.		2.957	536
3326	$CsCd(CNS)_3$	419.439		213		
3327	$CsCl.HgCl_2$	439.794	C. R.			164
3328	Cs_2HgI_4	973.958	M.		4.806	
3329	$Cs_2Hg_3I_8$	1882.91	M.		5.14	
3330	Cs_3HgI_5	1233.70	R.		4.605	
3331	$Cs_2Cu(SO_4)_2.6H_2O$	629.412	M.		2.858	559
3332	$2CsNO_2.AgNO_2.Bi(NO_2)_3$	858.548			3.88^{15}	
3333	$CsSO_4.Ir_2(SO_4)_3.24H_2O$	1335.64	C.	110		
3334	$CsRh(SO_4)_2.12H_2O$	644.035	C.	111		112
3335	$CsMnO_4$	251.740			$3.597^{10.3}$	
3336	$CsMn(SO_4)_2.12H_2O$	596.055	C.			200
3337	$Cs_2Mn(SO_4)_2.6H_2O$	620.772	M.		2.740	524
3338	$CsFeCl_3.2H_2O$	331.055			2.907^{17}	
3339	$Cs_2FeCl_4.2H_2O$	499.323			3.275	
3340	$CsFe(SO_4)_2.12H_2O$	596.965	C.		2.061	100
3341	$Cs_2Fe(SO_4)_2.6H_2O$	621.682	M.		2.796	550
3342	$Cs_2FeSe_2O_8.6H_2O$	715.952	M.		3.694	
3343	$Cs_2SeO_4.Fe_2(SeO_4)_3.24H_2O$	1382.47	C.	60	3.618^{15}	116
3344	$Cs_2Co(SO_4)_2.6H_2O$	624.812	M.		2.844	566
3345	$Cs_2Co(C_3H_2O_4)_2.4H_2O$—Malonate	600.682			2.682	
3346	$Cs_2Ni(SO_4)_2.6H_2O$	624.532	M.		2.872	575
3347	$CsCr(SO_4)_2.12H_2O$	593.135	C.	116	2.043	94
3348	$CsV(SO_4)_2.12H_2O$	592.085			2.033^{4}	
3349	$3CsF.AlF_3$	539.390		823		
3350	$Cs_2SO_4.Al_2(SO_4)_3.24H_2O$	1136.17	C.		1.867^{0}	80
3351	$2Cs_2O.2Al_2O_3.9SiO_2.H_2O$—Pollucite	1325.64	C.		2.9	126
3352	$Cs_2La(NO_3)_5.2H_2O$	750.601	M.		2.827^{0}	
3353	$Cs_2Mg(SO_4)_2.6H_2O$	590.162	M.		2.676	488
3354	$Cs_2Mg(SeO_4)_2.6H_2O$	684.432	M.		2.94	583
3355	$Cs_2Mg(CrO_4)_2.6H_2O$	630.052	M.		2.747	821
3356	$Cs_3Cu_2Sr(SCN)_7$	1019.69	Tet.		2.882	374
3357	$Cs_3Cu_2Ba(SCN)_7$	1069.45	Tet.		2.92	365
3358	$Cs_3BaAg_2(SCN)_7$	1158.07	Tet.		3.026	360
3359	$CsLiCl_2$	210.665		356.5		

BOILING POINTS

General index No.	Boiling point under 1 atm. (or mm of Hg indicated by superscript)	General index No.	Boiling point under 1 atm. (or mm of Hg indicated by superscript)	General index No.	Boiling point under 1 atm. (or mm of Hg indicated by superscript)	General index No.	Boiling point under 1 atm. (or mm of Hg indicated by superscript)
1	100	89	414	204	− 95	294	d. <260
2	152.1	91	339	205	− 75	316	447
4	19.4	92	421	206	− 40	320	453
6	9.9^{731}	95	−151.0	207	73.5	322	500 d.
7	3.8^{766}	96	21.3	208	162	337	−192.0
8	82	97	− 89.5	209	180	338	s. − 78.5
9	− 85.0	98	3.5	210	107.23	339	6.3
13	16^{18}	99	47	211	212	341	2230
17	− 67.0	101	42.5	213	− 8	345	−112.0
21	40^{50}	102	− 33.35	214	172.9	346	− 15
23	135	103	113.5	215	106	347	53
26	$-35.5^{4\text{at.}}$	104	$118.5^{739.5}$	216	193	348	80
31	s. 110	105	37	217	s. 38.8^{794}	349	− 15.2
34	97	109	86	218	137.6	350	-65^{1801}
35	*ca.* 97	111	56.5	219	*ca.* 165	351	− 80.2
36	*ca.* 77 diss.	114	diss. 40^{13}	222	s. 61.8^{708}	352	57.57
	s. $101^{16\text{at.}}$	118	d. 210	223	490	353	139
37	*ca.* 116	120	s. *ca.* 140	224	514	356	213
38	− 10.0	125	− 56	226	407.5	357	150^{15}
39	44.6	126	− 63.5	227	523	358	190^{15}
40	s. 10	128	s. 105	228	515	360	137.0
41	− 59.6	129	<71	230	295	361	200
42	74.5		exp. 93	232	125	362	153
44	60^{40}	130	− 5.5	233	*ca.* 118	363	*ca.* 300
46	290	131	5	235	205 s. d.	364	− 30
47	167	132	s. 520	237	150 d.	365	8
53	− 30	139	d. <100	238	95^{60}	366	33
54	− 52	140	exp. 240	250	127^{13}	367	153
55	59	141	− 2	251	328.5	368	*ca.* 240
57	138	142	*ca.* 32	252	224^{13}	371	2
58	78.8	143	s. 542	253	262^{13}	372	66
59	69.1		235 vac.	254	257^{13}	373	109
60	153^{766}	148	s. 551	255	291^{13}	374	0^{45}
62	151.5^{765}		220 vac.	256	s. 150 vac.	376	80
63	$54^{0.18}$	149	d. 15	263	−55	377	104
64	68^{40}	164	s. 135	264	63^{752}	378	140.5
65	115 d.	165	357.3	265	− 53	379	290
66	s. 317	166	s. 120	266	122	381	220
67	− 41.2	170	490	268	221	382	113.5
68	− 42	172	d. 160	269	408	383	172
72	100	177	s. 140	271	565	384	235
73	s. − 39	181	s. 80 d.	272	707	385	192
74	d. 288	186	d. > − 13	274	*ca.* 300 d.	386	230.5
76	176.4	191	90^{300}	282	− 17	387	255
77	227	192	s. *ca.* 180	284	149.5	388	s. 940^{20}
81	183	193	s. 347 (α)	285	390	389	$92^{18.3}$
82	s. 450		600 (β)	286	220.2	390	96
84	− 1.8	195	− 87.4	287	92^{30}	391	$150^{18.3}$
87	− 35.5	197	57.5^{735}	291	280	403	s. 2210 diss.
88	324	198	s. 280 d.	292	400.6	404	31

No.	B. P.	No.	B. P.	No.	B. P.	No.	B. P.
406	27	488	114.1	716	430	1515	78.6
407	63.5	490	620	749	732	1534	973
408	107	491	202	752	650	1552	136.7
409	96.2	492	50^{30}	753	624	1556	78 d.
410	90	493	65^{30}	755	s. 1185	1575	43^{751}
411	$134^{752.9}$	494	65^{30}	760	d. 280	1593	>1300
412	122	495	720	769	500	1597	176
413	115.5	496	340	770	d. 271	1610	d. 175
414	108	497	191 d.	779	1100	1619	3800
415	142	499	1230	797	46	1624	340
416	139.5	508	180	798	118	1646	35
417	132	513	78	799	160	1647	s. 270
418	153.7	514	146	800	220	1648	180
419	171	515	181	825	970	1649	268
420	172.5	517	>420	829	963	1658	170 d.
421	191	518	270 d.	832	713	1664	35 (in H_2)
422	187	519	240	845	132	1672	19.5
423	205^{756}	520	210	870	105	1673	187
425	114.3^{756}	521	224	881	650	1674	275.6
426	122	522	170	882	383.7	1675	346.7
427	154	523	231	883	304	1676	266
428	153	528	1290	893	s. 345	1677	227.5
429	227	529	950	894	322	1678	333
432	195^{20}	530	exp. 105	896	310 d.	1679	327
435	$100.5^{765.7}$	543	916		s. 140	1689	6000
436	125	548	954	898	354	1690	6000
437	130	600	s. 475	901	s. 580	1706	$69^{2at.}$
438	$149^{754.3}$	619	110	915	d. 150		s. 56
439	141.5	621	130^{751}	918	96	1714	118
440	154.5	622	53^{14}	919	159	1724	4100
441	$201.5^{739.4}$	623	152^{755}	920	191	1747	111.2
442	107^{18}	624	70.5^{16}	921	135^{90}	1749	480
443	230	625	64.5^{14}	922	>306 d.	1752	148.5^{755}
444	314.2	626	166^{769}	939	1366	1753	127
449	284	627	78^{13}	940	993	1755	127.19
450	136.4	628	83^{14}	947	1345	1758	130
451	230	629	70^{13}	951	1290	1767	3900
452	154	630	99.5^{16}	958	d. 400	1796	219
454	>360	631	105^{13}	974	170 d.	1797	240.5
459	140	632	96^{13}	1032	240 d.	1798	s. 400
460	138	633	108.2^{16}	1059	1550	1799	4300
461	4300	634	123^{13}	1075	444 d.	1802	229.5
465	− 90	635	124^{13}	1129	s. 265	1803	242
466	29	636	121^{15}	1147	134	1804	320
467	110.5	637	144.5^{13}	1148	203	1805	5500
468	86.5	670	s. 610	1149	47.3	1810	87.5
469	72		725	1180	s. 240	1811	17
470	185.9	675	5000	1234	100.8^{183}	1812	d. 200
471	375	678	535	1268	1190	1813	−101
472	163.5	679	217	1334	s. 1200 diss.	1814	12.5
480	416	693	139 diss.	1342	315	1815	90.6
481	5100	695	300	1397	102.8^{749}	1817	210
485.5	− 52	696	806	1447	1049	1819	$1230^{9.4}$
486	705	700	815	1509	d. 52	1821	>3500
487	623	703	824	1513	240	1822	110

No.	B. P.	No.	B. P.	No.	B. P.	No.	B. P.
1823	95	2010	d. 100	2500	1560	2921	1416
1824	65	2044	d. 100	2601*		2924	1380
1825	120	2105	590	2604	1670	2926	1330
1826	175	2112	188	2605	1353	2927	d. 225
1827	212	2113	245	2606	d. 270	2931	d. 215
1828	255	2114	270	2608	d. 410	2932	d. 180
1858	2210	2115	331	2610	1265	2936	d. 850
1864	182.7^{752}	2116	330	2613	1190	2958	d. 350
	s. 177.8	2117	341	2625	d. > 170	2959	d. 400
1865	268	2118	239^{19}	2668	1390	3196	1410
1866	d. 7	2131	1412	2670	1700	3197	1390
1869	382	2232	2850	2671	1413	3200	1340
1870	s. 1550 (in N_2)	2234	450 diss.	2677	1390	3205	1300
1879	600 (in H_2)	2236	>1600	2680	1300	3283	1250
1893	130	2244	718	2769	1496	3284	1290
1894	194	2285	s. 898.6	2846	>1400	3287	1300
1895	315	2495	795 diss.	2917	1320	3292	1280
1953	4600	2499	1400	2918	1500		

* Hüttig, *93*, **141**: 133; 24.

REFRACTIVE INDICES

A. LIQUIDS

Serial No.	Gen. index No.	Refractive index n_D	Serial No.	Gen. index No.	Refractive index n_D	Serial No.	Gen. index No.	Refractive index n_D	Serial No.	Gen. index No.	Refractive index n_D
1	436	$1.833_4^{30.3}$	18	45	1.429	34	625	$1.5035^{22.5}$	50	513	1.5201
2	97	1.193^{16}	19	1893	1.432^{12}	35	627	$1.5062^{23.1}$	51	628	1.5218^{18}
3	9	1.256	20	62	1.437^{14}	36	635	1.5081^{22}	52	58	1.527^{10}
4	195	$1.317^{17.5}$	21	111	$1.440^{23.5}$	37	623	1.5082^{21}	53	918	$1.5327^{22.2}$
5	17	1.325^{10}	22	59	1.444	38	636	1.5097	54	919	$1.5399^{23.2}$
6	102	$1.325^{16.5}$	23	339	1.454	39	637	1.5118^{21}	55	2644	1.548^{25}
7	95	1.330^{-90}	24	341	1.46	40	633	$1.5120^{21.5}$	56	55	1.557^{14}
8	1	1.333	25	210	$1.460^{25.1}$	41	631	1.5127^{25}	57	1147	1.56^{45}
9	426	1.368	26	1808	1.464	42	619	1.5128	58	287	1.601^{14}
10	41	1.374	27	26	1.466^{12}	43	621	1.5132^{19}	59	450	$1.61^{10.5}$
11	1825	1.381	28	103	1.470^{22}	44	515	1.5143	60	2472	1.618
12	109	$1.397^{16.4}$	29	1894	$1.480^{6.5}$	45	2847	1.515	61	57	1.666^{14}
13	472	1.400	30	629	1.4926	46	624	$1.5158^{24.3}$	62	214	$1.697^{26.6}$
14	1827	1.408	31	634	1.5005	47	207	1.516^{14}	63	1317	1.700
15	38	1.410	32	626	$1.5021^{21.2}$	48	622	1.5174	64	63	1.736
16	2	1.414^{22}	33	632	1.5023	49	630	$1.5175^{19.7}$	65	42	1.885
17	1828	1.421									

B. SOLIDS

I. Isotropic Group. m. = mean value

Serial No.	Gen. index No.	Refractive index n_D	Serial No.	Gen. index No.	Refractive index n_D	Serial No.	Gen. index No.	Refractive index n_D	Serial No.	Gen. index No.	Refractive index n_D
66	2670	1.336	95	3107	1.4814	127	2839	1.5305	160	260	1.7550
67	2913	1.339	96	3265	1.4815	128	3150	1.5329	161	1911	1.780
68	398	1.370	97	3084	1.4817	129	2671	1.5442	162	562	1.782
68.1	3143.6	1.403	98	3259	1.4823	130	1241	1.548	163	3292	1.7876
68.2	3017.6	1.408	99	2870	1.483	131	1451	1.55 (m.)	164	3327	1.792
69	344	1.41	100	3340	1.4839	132	1536	1.55 (m.)	165	1923	1.800
70	3032	1.4115	101	1613	1.4842	133	3200	1.5530	166	1928	1.801
70.1	2099.6	1.426	102	1369	1.4854	134	2924	1.5590	167	1921	1.811
70.2	478.5	1.433	103	2921	1.4903	135	2458	1.5667	168	2232	1.83
71	2235	1.4339	104	3197	1.493	136	1576	1.57	169	2282	1.83
72	2855	1.4388	105	2873	1.495	137	2531	1.5717	170	2364	1.838
73	2596	1.444	106	2902	1.496	138	2679	1.5943	171	1261	1.862?
74	2732	1.452	107	1910	1.4976	139	1187	1.6000	172	945	1.864 (m.)
75	1897	1.454	108	2872	1.50	140	2438	<1.6	173	939	1.93
76	2700	1.454	109	3253	1.5004	141	2394	1.608	174	278	2.0
77	3133	1.4562	109.5	2835	1.501	142	1383	1.61	175	402	2.05
78	3268	1.4566	110	743	1.5066	143	1576	1.61	176	1048	2.05
79	2760	1.457	111	3261	1.5070^{18}	144	3284	1.6418	177	1059	2.0710
80	3350	1.4587	112	3334	1.5077	145	132	1.642	178	280	2.087
81	1882	1.4594	113	2887	1.508	146	3205	1.6474	179	581	2.09?
82	344	1.46	114	3137	1.509	147	3019	1.6574	180	1258	2.16
83	3242	1.4638	115	1240	1.5103	148	2267	1.660 (m.)	181	1639	2.16
84	3317	1.4649	116	3343	1.5116^{18}	149	2401	1.67	182	668	2.20
85	3320	1.4652	117	2137	1.514	150	2926	1.6770	183	1123	2.20
86	3025	1.4653	118	2886	1.5144	151	3141	1.69	184	2333	2.20
87	3239	1.4658	119	2674	1.5151	152	3287	1.6984	185	1062	2.253
88	690	1.4664	120	2236	1.52	153	148	1.7031	186	951	2.346
89	680	1.4684	121	3047	1.522 (m.)	154	2225	1.705	187	756	2.3682
90	2740	1.4693	122	1633	1.5228	155	2392	1.710	188	936	2.705
91	2332	1.4736	123	2842	1.5230	156	2222	1.723			
92	2899	1.48	124	1422	1.5236	157	2415	1.735	188.1		2.89
93	3135	1.4801	125	3098	1.54 (m.)	158	2128	1.7364	188.2		3.56
94	3347	1.4810	126	3351	5.521	159	1145	1.74 (m.)	189	552	3.912

MISCELLANEOUS

Serial No.	Gen. index No.	Refractive index n	Serial No.	Gen. index No.	Refractive index n	Serial No.	Gen. index No.	Refractive index n	Serial No.	Gen. index No.	Refractive index n
190	367	$1.579^{15.5}$ (F)	193	232	1.563^{11} (C)	196	1274	2.69 (Li)	199	3236	1.46 (red)
191	266	1.621^{14} (F)	194	2196	2.35 (Li)	197	1273	2.70 (Li)	200	3336	1.48 (red)
192	352	1.412 (C)	195	890	2.49 (Li)	198	1053	>2.72 (Li)	201	1528	2.18 (red)

II. Uniaxial Group

Serial No.	Gen. Index No.	Refractive index		Serial No.	Gen. index No.	Refractive index	
		ω	ϵ			ω	ϵ
202	2778	1.300	1.296	247	2224	1.512	1.498
203	1	1.309	1.313	248	2866	1.518	1.522
204	2182	1.3439	1.3602	249	2422	1.522	1.513
205	2851	1.349	1.342	250	243	1.5246	1.4792
206	1323	1.3570	1.3742	251	2336	1.527	1.539
207	1409	1.3638	1.3848	252	764	1.5291	1.5039
208	2130	1.378	1.390	253	2453	1.5296	1.5252
209	814	1.3824	1.3992	254	3164	1.532	1.529
210	1583	1.3910	1.4066	255	1358	1.533	1.575
211	1047	1.4092	1.4080	256	1912	1.534	1.514
212	2237	1.417	1.393	257	2439	1.5364	1.4866
213	2347	1.436	1.478	258	3136	1.537	1.533
214	2713	1.4458	1.4524	259	3162	1.537	1.535
215	2941	1.455	1.515	260	1892	1.539	1.511
216	2735	1.4567	1.4662	261	2871	1.539	1.537
217	3216	1.4574	1.5078	262	1551	1.5393	1.5125
218	3173	1.4715	1.4721	263	2839	1.5398	1.5475
219	2107	1.4720	1.4395	264	2200	1.540	1.510
220	2119	1.473	1.435	265	2207	1.542	1.516
221	2412	1.475	1.486	266	2861	1.542	1.538
222	3185	1.481	1.461	267	342	1.544	1.553
223	1731	1.481	1.493	268	2659	1.545	
224	1970	1.482	1.473	269	2250	1.5496	
225	1995	1.482	1.474	270	1359	1.5519	1.5575
226	2018	1.486	1.479	270.5	2099.5	1.557	1.543
227	2031	1.487	1.479	271	2804	1.558	1.613
228	340	1.487	1.484	272	2129	1.559	1.580
229	2864	1.487	1.486	273	2226	1.56	
230	2493	1.487	1.496	274	1902	1.560	1.580
231	2397	1.49		274.5	475.5	1.563	1.552
232	2880	1.490	1.471	275	2199	1.565	
233	2086	1.490	1.480	276	2326	1.565	1.560
234	2054	1.490	1.481	277	2211	1.565	1.575
235	2072	1.490	1.482	278	2971	1.567	1.518
236	2869	1.490	1.502	279	2420	1.5690	1.6700
237	3181	1.4901	1.4996	280	1340	1.57	
238	1955	1.493	1.480	281	3134	1.572	1.592
239	2061	1.494	1.484	282	2357	1.575	1.57
240	2081	1.495	1.480	283	276	1.5766	1.5217
241	2403	1.496	1.491	284	2125	1.581	1.575
242	2436	1.4991	1.4758	285	1379	1.582	1.645
243	2329	1.507	1.468	286	1872	1.583	1.602
244	2968	1.5095	1.4684	287	2856	1.585	
245	2840	1.5095	1.5232	288	2705	1.5874	1.3361
246	1547	1.5109	1.4873	289	2188	1.5885	1.5970

Serial No.	Gen. index No.	Refractive index	
		ω	ε
290	3186	1.589	1.590
291	3079	1.59	
292	1582	1.59	1.56
293	3033	1.5906	1.5907
294	2399	1.595	1.585
295	2417	1.597	1.560
296	847	1.6038	1.6042
297	2904	1.612	1.593
298	1978	1.613	1.607
299	2314	1.6150	1.6360
300	2393	1.617	1.652
301	1400	1.6198	1.5922
302	2572	1.621	1.619
303	1737	1.623	1.625
304	2309	1.625	
305	2489	1.629	1.639
306	1011	1.632	1.575
307	2430	1.633	1.639
308	2275	1.634	1.631
309	2273	1.634	1.632
310	2307	1.635	1.631
311	556	1.635	1.653
312	3042	1.636	1.615
313	1934	1.640	
314	2490	1.64	
315	2507	1.640	1.633
316	1252	1.6430	
317	1739	1.643	1.623
318	2234	1.644	1.446
319	1044	1.644	1.697
320	1046	1.644	1.702
321	2216	1.65	1.59
322	2644	1.65	1.67
324	2441	1.651	1.627
325	1907	1.654	1.676
326	2121	1.6542	1.6700
327	1156	1.6576	1.6666
328	2285	1.6583	1.4864
329	1439.	1.664	1.629
330	2433	1.666	1.661
331	2274	1.667	1.666
332	2341	1.669	1.657
333	2410	1.669	1.658
334	2537	1.669	1.665
335	2131	1.675	1.59
336	1084	1.6769	1.6294
337	2004	1.680	1.685
338	2597	1.681	1.668
339	2425	1.6817	1.5026
340	1914	1.694	1.641
341	812	1.694	1.723
342	2163	1.700	1.509
343	2538	1.701	1.699
344	1324.1	1.704	1.679
345	2281	1.706	1.698
346	1994	1.717	1.817
347	2100	1.719	1.733
348	1951	1.721	1.816
349	1259	1.723	1.681
350	969	1.724	1.746
351	3187	1.7278	1.7361
352	1025.1	1.730	1.810
353	2621	1.735	1.435
354	978	1.744	1.724
355	1414	1.755	1.82
356	2563	1.757	1.804
357	2594	1.760	1.577
358	733	1.768	1.812
359	1858	1.773	1.773
360	3358	1.7761	1.6788
361	3322	1.784	1.774
362	3065	1.7909	1.6527
363	2201	1.80	
364	1699	1.80	1.72
365	3357	1.8013	1.6882
366	1089	1.8036	1.7983
367	2189	1.815	1.761
368	1307	1.817	1.5973
369	794	1.818	1.618
370	3085	1.820	1.715
371	1364	1.82	1.73
372	1063	1.8466	1.9200
373	1433	1.85	
374	3356	1.8535	1.6982
375	1507	1.855	1.60
376	2358	1.870	1.792
377	1394	1.875	1.633
378	1415	1.875	1.784
379	1431	1.88	
380	2339	1.913	1.923
381	2366	1.918	1.934
382	483	1.923	1.968
383	1416	1.93	
384	2339	1.945	1.971
385	1324	1.96	
386	1419	1.96	
387	483	1.960	2.015
388	2365	1.967	1.978
389	569	1.970	1.936
390	882	1.9733	2.6559
391	485	1.997	2.093
392	744	2.008	2.029
393	310	2.01	1.82
394	666	2.07	2.05
395	657	2.09	1.94
396	658	2.114	2.140
397	2957	2.12	2.00
398	537	2.13	2.21
399	587	2.135	2.118
400	1064	2.21	2.22

Serial No.	Gen. index No.	Refractive index ω	Refractive index ε	Serial No.	Gen. index No.	Refractive index ω	Refractive index ε
401	1695	2.2685	2.182	407	445	2.554	2.493
402	2187	2.31	1.95	408	2354	2.58	2.43
403	1776	2.354	2.299	409	447	2.616	2.903
404	755	2.356	2.378	410	403	2.654	2.697
405	1325	2.481	2.210	411	901	2.854	3.201
406	835	2.506	2.529	412	1095	3.0877	2.7924

Miscellaneous

Serial No.	Gen. index No.	ω	ε	Serial No.	Gen. index No.	ω	ε
413	1522	1.3817 (C)	1.3872 (C)	420	1413	2.45 (Li)	2.51 (Li)
414	2035.1	2.005 (667)	2.004 (667)	421	1264	2.46 (Li)	2.15 (Li)
415	1957.1		2.013 (667)	422	1094	2.6 (Li)	
416	2002.1	2.019 (667)	2.007 (667)	423	524	2.665 (Li)	2.535 (Li)
417	526	2.3 (Li)		424	1334	3.01 (Li)	2.94 (Li)
418	538	2.35 (Li)	2.33 (Li)	425	1098	3.084 (Li)	2.881 (Li)
419	1668	2.402 (Li)	2.304 (Li)	426	2471	1.683 (red)	1.587 (red)

III. Biaxial Group

Serial No.	Gen. index No.	Refractive index α	Refractive index β	Refractive index γ	Serial No.	Gen. index No.	Refractive index α	Refractive index β	Refractive index γ
427	2852		1.364		462	1876	1.462	1.470	1.471
428	2694	1.394	1.396	1.398	463	343	1.469	1.47	1.473
429	2897		1.413		464	2150	1.4716	1.4730	1.4786
430	2898	1.407	1.414	1.415	465	2729	1.4653	1.4738	1.4804
431	2753	1.405	1.425	1.440	466	2691	1.464	1.474	1.485
432	2718	1.4193	1.4309	1.4493	467	3146	1.466	1.475	1.494
433	2724	1.4321	1.4361	1.4373	468	1874	1.474	1.476	1.483
434	2693		1.44		469	2617	1.460	1.477	1.488
435	3189	1.438	1.44	1.452	470	2398	1.461	1.478	1.485
436	2733	1.439	1.441	1.469	471	1356	1.4713	1.4782	1.4856
437	2723	1.4412	1.4424	1.4526	472	2948	1.475	1.480	1.487
438	2721		1.4434		473	2223	1.476	1.480	1.483
439	411	1.4368	1.4458	1.4510	474	3255	1.4767	1.4807	1.4907
440	2964	1.447	1.448	1.459	475	2708	1.391	1.481	1.486
441	2739	1.4453	1.4496	1.4513	476	2978		1.482	
442	3133	1.430	1.452	1.458	477	1918	1.478	1.482	1.482
443	2710	1.440	1.452	1.453	478	2862	1.480	1.482	1.493
444	2717	1.4499	1.4525	1.4604	479	3083	1.4759	1.4821	1.4969
445	2395	1.448	1.454	1.456	480	2715	1.4777	1.4822	1.5036
446	2890	1.435	1.455	1.459	481	1463	1.477	1.483	1.489
447	2145	1.4326	1.4554	1.4609	482	3029	1.4775	1.4833	1.4969
448	1809	1.340	1.456	1.459	483	2970	1.4768	1.4843	1.4870
449	2854	1.432	1.457	1.458	484	1289	1.4801	1.4840	1.4913
450	2720	1.4401	1.4629	1.4815	485	3247	1.4798	1.4848	1.4948
451	3149	1.4607	1.4629	1.4755	486	2977	1.440	1.485	1.550
452	2757		1.464		487	2719	1.4557	1.4852	1.4873
453	1871	1.459	1.464	1.470	488	3353	1.4857	1.4858	1.4916
454	2727	1.4599	1.4645	1.4649	489	138		1.486	
455	2616		1.465		490	760	1.4620	1.4860	1.4897
456	2738	1.4622	1.4658	1.4782	491	3043	1.4836	1.4864	1.5020
457	2743	1.4649	1.4663	1.4791	492	3091	1.4807	1.4865	1.5004
458	2943	1.4609	1.4669	1.5657	493	3148	1.483	1.487	1.490
459	2165	1.456	1.468	1.507	494	2853	1.484	1.487	1.496
460	2848	1.4468	1.4686	1.4715	495	3258	1.4815	1.4874	1.4977
461	3273	1.4672	1.4689	1.4779	496	3231		1.488	

Serial No.	Gen. index No.	Refractive index α	β	γ	Serial No.	Gen. index No.	Refractive index α	β	γ
497	2882	1.485	1.488	1.489	552	3323	1.5022	1.5048	1.5093
498	2881	1.486	1.488	1.489	553	3151	1.494	1.505	1.516
499	3245	1.4833	1.4884	1.4975	554	2469	1.497	1.505	1.509
500	854	1.4847	1.4887	1.4959	555	2900	1.505	1.505	1.506
501	1548	1.4669	1.4888	1.4921	556	2959	1.3346	1.5056	1.5064
502	3217	1.4812	1.4888	1.5719	557	2178		1.506	
503	2147	1.4856	1.4892	1.4911	558	2148	1.344	1.506	1.506
504	2725	1.4855	1.4897	1.5041	559	3331	1.5048	1.5061	1.5153
505	1924		1.49		560	1986		1.507	
506	2912		1.490		561	2299	1.493	1.507	1.545
507	1863	1.473	1.490	1.511	562	2132	1.495	1.507	1.528
508	2950	1.479	1.490	1.526	563	2765		1.5073	
509	2408	1.484	1.49	1.495	564	2696	1.4886	1.5079	1.5360
510	3249	1.4886	1.4906	1.5036	565	2868	1.504	1.508	1.545
511	2143		1.491		566	3344	1.5057	1.5085	1.5132
512	2171		1.491		567	2893	1.5043	1.5093	1.5751
513	1368	1.4870	1.4915	1.4989	568	2151	1.5070	1.5093	1.5169
514	3096	1.4836	1.4916	1.5051	569	3230		1.510	
515	3262	1.4859	1.4916	1.5014	570	2383	1.495	1.51	1.520
516	777	1.4888	1.4930	1.4994	571	2777	1.500	1.510	1.515
517	3184	1.492	1.493	1.496	572	2406	1.502	1.510	1.512
518	804		1.494		573	2663	1.504	1.510	1.516
519	2938	1.4935	1.4947	1.4973	574	2772		1.511	
520	2697	1.4820	1.4953	1.5185	575	3346	1.5087	1.5129	1.5162
521	1491	1.4902	1.4953	1.5032	576	3215	1.5131	1.5133	1.5144
522	2157	1.495	1.496	1.504	577	2289	1.510	1.514	1.578
523	3264	1.4895	1.4961	1.5052	578	2317	1.512	1.514	1.515
524	3337	1.4946	1.4966	1.5025	579	2922	1.440	1.515	1.525
525	1716		1.4967		580	2894	1.4435	1.5156	1.5233
526	2259	1.465	1.498	1.504	581	3159	1.500	1.5170	1.5183
527	2771	1.495	1.498	1.499	582	2551	1.500	1.517	1.525
528	2407	1.498	1.499	1.505	583	3354	1.5178	1.5179	1.5236
529	3152	1.4969	1.4991	1.5139	584	2553		1.518	
530	1361		1.500		585	2153	1.514	1.518	1.533
531	2901		1.5		586	2264	1.515	1.518	1.525
532	3014		1.500		587	1875	1.516	1.518	1.533
533	2638	1.40	1.50		588	3031	1.5121	1.5181	1.5335
534	2709	1.418	1.500	1.543	589	3092	1.5135	1.5195	1.5358
535	806	1.480	1.500	1.530	590	2228		1.52	
536	3325	1.498	1.500	1.506	591	3158		1.52	
537	2108	1.4664	1.5007	1.5027	592	2998	1.48	1.52	1.55
538	992	1.4910	1.5007	1.5054	593	2477	1.500	1.520	1.580
539	1557	1.4949	1.5007	1.5081	594	3221	1.51	1.52	1.524
540	2413		1.501		595	2154	1.510	1.520	1.543
541	2930		1.501		596	2860	1.516	1.52	1.520
542	2164	1.495	1.501	1.526	597	2466	1.484	1.521	1.538
543	179	1.4981	1.5016	1.5866	598	3246	1.5162	1.5222	1.5331
544	2498	1.4710	1.5017	*ca.* β	599	1466		1.5225	1.5227
545	2180	1.490	1.502	1.511	600	2249	1.5205	1.5226	1.5296
546	2737	1.4794	1.5021	1.5265	601	3176		1.523	
547	2371	1.499	1.503	1.538	602	174	1.5209	1.5230	1.5330
548	2396	1.501	1.503	1.510	603	3045	1.5096	1.5235	1.5387
549	3274	1.5011	1.5031	1.5135	604	2758	1.407	1.524	1.541
550	3341	1.5003	1.5035	1.5094	605	2405	1.513	1.524	1.525
551	2896	1.491	1.504	1.520	606	3139	1.518	1.524	1.526

Serial No.	Gen. index No.	Refractive index α	β	γ
607	3111	1.5221	1.5244	1.5373
608	3097	1.5199	1.5248	1.5339
609	2294	1.470	1.525	1.555
610	2997		1.526	
611	3157	1.508	1.526	1.550
612	1370	1.5201	1.5260	1.5356
613	3138	1.522	1.526	1.530
614	2641		1.529	
615	2865	1.525	1.529	1.536
616	2807	1.5193	1.5295	1.5436
617	2985	1.417	1.530	1.533
618	2304	1.515	1.530	1.580
619	1762	1.518	1.530	1.542
620	778	1.5240	1.5300	1.5385
621	2280	1.525	1.53	1.550
622	2167	1.527	1.530	1.540
623	1497	1.5246	1.5311	1.5396
624	2969	1.4893	1.5314	1.5363
625	2889	1.515	1.532	1.536
626	2197	1.527	1.532	1.583
627	2566		1.533	
628	2759		1.533	
629	2190		1.533	1.5769
630	2166	1.489	1.534	1.557
631	2432	1.517	1.534	1.565
632	1861	1.5347	1.5347	1.5577
633	2286	1.460	1.535	1.545
634	3015	1.495	1.535	
635	2382	1.500	1.535	1.560
636	2302	1.515	1.535	1.575
637	2142	1.523	1.535	1.586
638	2295	1.525	1.535 ?	1.550
639	993	1.5213	1.5355	1.5395
640	3324	1.5326	1.5362	1.5412
641	961	1.5140	1.5368	1.5433
642	1355	1.528	1.537	1.543
643	1558	1.5291	1.5372	1.5466
644	2404		1.539	
645	3004		1.539	
646	2955	1.5352	1.5390	1.5446
647	2179		1.54	
648	2293	1.460	1.540	1.610
649	2218	1.520	1.54	1.545
650	2217	1.527	1.540	1.544
651	1512		1.542	
652	1030	1.413	1.542	1.557
653	2859	1.466	1.542	1.596
654	1363	1.530	1.543	1.595
655	2981	1.415	1.545	1.565
656	2265	1.539	1.545	1.551
657	2878	1.545	1.546	1.551
658	2036	1.5392	1.5479	1.5592
659	2558	1.542	1.548	*ca.* 1.548
660	2198	1.544	1.548	1.572
661	1950	1.5433	1.5490	1.5755
662	2592	1.538	1.549	1.554
663	2014	1.5399	1.5494	1.5607
664	1886		1.55	
665	2204	1.5211	1.5500	1.5680
666	2212	1.53	1.55	1.55
667	1032	1.545	1.55	
668	2029	1.5413	1.5505	1.5621
669	3074	1.5498	1.5513	1.5634
670	2046	1.5427	1.5519	1.5629
671	3276		1.552	
672	2736	1.5382	1.5535	1.5607
673	3220	1.5515	1.5537	1.5582
674	2288	1.491	1.555	1.650
675	1360	1.533	1.555	1.635
676	2292	1.545	1.555	1.575
677	1927	1.551	1.555	1.562
678	3086		1.556	
679	2876	1.5520	1.5579	1.5608
680	1884	1.551	1.558	1.582
681	1925	1.554	1.558	1.573
682	2637	1.530	1.560	1.590 ?
683	2296	1.55	1.56	1.57
684	2618	1.5487	1.5602	1.5788
685	3165	1.548	1.562	1.567
686	188	1.5607	1.5630	1.5846
687	3305	1.5598	1.5644	1.5662
688	838		1.565	
689	2780	1.560	1.565	1.574
690	1901	1.561	1.565	1.567
691	3034		1.565	1.608
692	1860	1.566	1.566	1.587
693	2642		1.567	
694	2634	1.428	1.567	1.572
695	2298	1.450	1.567	1.600
696	2774	1.536	1.567	1.649
697	3002	1.527	1.568	1.647
698	2268	1.565	1.568	1.580
699	3087	1.5660	1.5689	1.5831
700	2877	1.565	1.569	1.569
701	2156	1.569	1.570	1.582
702	2159	1.563	1.571	1.596
703	2158	1.555	1.572	1.575
704	2464	1.559	1.574	1.598
705	2369	1.56	1.574	1.580
706	2290	1.495	1.575	1.640
707	2368	1.553	1.575	1.577
708	2248	1.5693	1.5752	1.6130
709	3063	1.5438	1.5754	
710	643		1.576	
711	1889	1.562	1.576	1.588
712	1888	1.574	1.576	1.588
713	2504	1.5622	1.577	1.635
714	3089		1.5772	
715	2789	1.544	1.578	1.601
716	3057	1.569	1.579	1.669

Serial No.	Gen. index No.	Refractive index α	β	γ	Serial No.	Gen. index No.	Refractive index α	β	γ
717	2416	1.578	1.579	1.583	772	2321	1.605	1.61	1.612
718	2359	1.5700	1.5818	1.5961	773	2315	1.610	1.611	1.654
719	2370	1.560	1.582	1.587	774	2421	1.592	1.612	1.621
720	782	1.574	1.582	1.582	775	2559	1.597	1.612	1.621
721	2389		1.583		776	2335	1.609	1.6125	1.619
722	3073		1.5837		777	2173	1.520	1.613	1.639
723	2400	1.576	1.584	1.588	778	2356	1.602	1.613	1.649
724	1885	1.563	1.585	1.592	779	1913	1.588	1.617	1.655
725	2803	1.508	1.586	1.525	780	813	1.614	1.617	1.636
726	2227	1.585	1.586	1.596	781	2184	1.607	1.619	1.639
727	1903	1.552	1.588	1.600	782	1915	1.61	1.62	1.65
728	2181	1.539	1.589	1.589	783	1043	1.61	1.62	1.71
729	2591	1.584	1.589	1.594	784	1905	1.619	1.620	1.627
730	2279	1.5825	1.5891	1.5937	785	2419	1.620	1.620	1.654
731	3140	1.561	1.590	1.594	786	2429	1.609	1.623	1.635
732	2327	1.586	1.59	1.598	787	2583	1.610	1.623	1.623
733	2123	1.5595	1.5908	1.6311	788	2367	1.621	1.623	1.631
734	781	1.572	1.591	1.59	789	2451	1.6220	1.6237	1.6309
735	2385	1.572	1.591	1.594	790	2185	1.617	1.624	1.652
736	3056		1.592		791	809	1.531	1.625	1.659
737	1738	1.582	1.592	1.592	792	1035	1.541	1.625	1.660
738	2384	1.582	1.592	<1.606	793	783	1.614	1.625	1.637
739	2381	1.5863	1.5920	1.6139	794	1382	1.615	1.625	1.665
740	2658	1.579	1.593	1.597	795	2561	1.620	1.625	1.645
741	2798	1.5889	1.5943	1.7163	796	2411	1.616	1.626	1.649
742	1276	1.562	1.595	1.632	797	2431	1.621	1.627	1.635
743	2903	1.571	1.595	1.598	798	3178	1.6237	1.6278	2.2916
744	2523	1.5860	1.5951	1.6072	799	1514	1.532	1.628	1.665
745	2546	1.573	1.597	1.636	800	2316	1.616	1.629	1.631
746	2388	1.586	1.598	1.605	801	1920		1.63	
747	2775	1.573	1.599	1.657	802	1721	1.585	1.630	1.630
748	1987	1.5989	1.5999	1.6003	803	1321	1.602	1.632	1.632
749	2664		1.6		804	2230	1.603	1.632	1.639
750	2867		1.60		805	3275	1.622	1.633	1.644
751	2322	1.595	1.60	1.603	806	2386	1.632	1.634	1.636
752	3307	1.599	1.600	1.600	807	2308		1.635	
753	3179	1.5883	1.6007	1.6316	808	1580	1.541	1.636	1.669
754	2291	1.413	1.602	1.611	809	2767	1.577	1.636	1.639
755	786	1.586	1.602	1.608	810	3012	1.620	1.636	1.638
756	2278	1.590	1.602	1.638	811	1185		1.637	
757	1378	1.579	1.603	1.633	812	2470	1.453	1.637	1.707
758	1935	1.586	1.603	1.623	813	2206	1.636	1.637	1.653
759	2324	1.593	1.603	1.607	814	2640	1.507	1.638	1.698
760	2857	1.594	1.603	1.615	815	1898	1.632	1.638	1.643
761	2152	1.602	1.604	1.615	816	2521	1.6369	1.6381	1.6491
762	1357	1.51	1.605	1.611	817	3068	1.545	1.641	1.760
763	2440	1.567	1.605	1.626	818	2823	1.596	1.641	1.652
764	2122	1.591	1.605	1.614	819	1900	1.638	1.642	1.653
765	2269		1.606		820	2409	1.632	1.643	1.645
766	2895	1.595	1.606	1.634	821	3355	1.637	1.643	1.655
767	2555		1.607		822	2305	1.462	1.643	1.722
768	3003		1.607		823	2349	1.636	1.644	1.654
769	3052		1.6071		824	2320	1.642	1.645	1.654
770	3001	1.571	1.608	1.694	825	2501	1.635	1.646	1.660
771	820	1.617	1.609	1.593	826	1929	1.643	1.649	1.649

Serial No.	Gen. index No.	Refractive index			Serial No.	Gen. index No.	Refractive index		
		α	β	γ			α	β	γ
827	2564		1.651		882	2595	1.525	1.684	1.686
828	2177	1.635	1.651	1.670	883	941		1.685	
829	826		1.6513		884	2593	1.681	1.685	1.695
830	1916	1.612	1.652	1.675	885	1005	1.67	1.686	1.698
831	2387	1.625	1.653	1.669	886	1937	1.678	1.686	1.689
832	2176	1.650	1.653	1.658	887	2809		1.687	
833	2214	1.6527	1.6537	1.6748	888	1184	1.687	1.687	1.704
834	2863		1.654		889	1270.1	1.684	1.695	1.698
835	1298	1.647	1.654	1.660	890	1406	1.672	1.697	1.717
836	2175	1.651	1.654	1.660	891	1008	1.695	1.698	1.733
837	1919	1.633	1.655	1.662	892	2815	1.6610	1.6994	1.7510
838	2391	1.643	1.655	1.663	893	2810		1.70	
839	2126	1.652	1.655	1.671	894	2565		1.702	
840	2790	1.6491	1.6555	1.7143	895	2652		1.702	
841	2379	1.540	1.656	1.682	896	2418	1.700	1.702	1.706
842	1295	1.651	1.656	1.683	897	1294	1.695	1.704	1.710
843	1297	1.652	1.656	1.660	898	785	1.660	1.705	1.713
844	1069	1.6272	1.6573	1.6601	899	734		1.707	
845	1569	1.622	1.658	1.687	900	2229	1.705	1.709	1.711
846	1296	1.63	1.66	1.69	901	2428	1.708	1.711	1.718
847	2424	1.640	1.660	1.675	902	2350	1.709	1.711	1.724
848	1439	1.655	1.66	1.670	903	976	1.703	1.713	1.722
849	2910	1.645	1.661	1.688	904	2556	1.614	1.714	1.729
850	1505	1.6263	1.6614	1.6986	905	2480	1.7146	1.7174	1.812
851	1585	1.629	1.662	1.727	906	1720	1.691	1.720	1.720
852	2426	1.651	1.662	1.668	907	1899	1.712	1.720	1.728
853	2463	1.5155	1.664	1.666	908	2318	1.715	1.720	1.737
854	2660	1.660	1.666	1.676	909	2423	1.712	1.721	1.731
855	2372	1.642	1.667	1.669	910	2351	1.686	1.722	1.735
856	2215	1.662	1.667	1.673	911	1859	1.702	1.722	1.750
857	1388	1.635	1.668	1.702	912	1012	1.694	1.726	1.730
858	3064	1.626	1.6684	1.757	913	2510	1.7129	1.7266	1.7441
859	3005	1.485	1.669	1.697	914	1922	1.705	1.729	1.730
860	757	1.658	1.669	1.670	915	2417.1	1.724	1.729	1.734
861	2183		1.670		916	972	1.710	1.731	1.732
862	2340		1.670		917	1377	1.730	1.732	1.762
863	2186	1.668	1.670	1.690	918	793	1.708	1.733	1.758
864	2427	1.664	1.671	1.694	919	1670	1.720	1.733	1.935
865	1908	1.670	1.671	1.689	920	807	1.640	1.736	1.750
866	2858	1.634	1.673	1.685	921	964	1.730	1.737	1.785
867	2330	1.640	1.674	1.679	922	2360	1.732	1.737	1.751
868	2353	1.662	1.674	1.676	923	1841	1.617	1.738	1.776
869	2402	1.665	1.674	1.684	924	3101	1.7202	1.7380	1.8197
870	2905	1.666	1.674	1.688	925	1956	1.731	1.738	1.744
871	2800	1.671	1.674	1.684	926	2208		1.74	
872	2557	1.673	1.674	1.678	927	3100		1.74	
873	1381	1.653	1.675	1.697	928	1408	1.71	1.74	1.76
874	1389		1.676		929	1318	1.733	1.740	1.744
875	2542	1.529	1.676	1.677	930	1930	1.736	1.741	1.746
876	1926	1.643	1.678	1.684	931	1003		1.743	
877	3037	1.648	1.678	1.699	932	997	1.702	1.745	1.789
878	2651	1.676	1.679	1.687	933	2124	1.747	1.748	1.757
879	2741		1.6802		934	2484		1.749	
880	2284	1.5299	1.6809	1.6854	935	1726	1.72	1.75	1.86
881	792	1.662	1.683	1.717	936	1670	1.74	1.75	1.95

Serial No.	Gen. index No.	Refractive index α	β	γ
937	2781	1.743	1.754	1.764
938	1028	1.730	1.758	1.838
939	967	1.708	1.760	1.798
940	1000	1.719	1.762	1.805
941	1387	1.765	1.774	1.797
942	2573	1.770	1.774	1.783 ?
943	2352	1.758	1.776	1.795
944	966	1.730	1.778	1.803
945	1303	1.760	1.779	1.779
946	1944	1.757	1.78	1.803
947	2127	1.78	1.78	1.785
948	1045	1.752	1.782	1.815
949	1319	1.759	1.786	1.797
950	1380	1.775	1.786	1.815
951	1006	1.747	1.788	1.829
952	1420	1.783	1.788	1.818
953	1670	1.78	1.79	2.04
954	1300	1.780	1.793	1.802
955	2337		1.795	
956	2808	1.763	1.799	1.813
957	735		1.80	
958	1362	1.76	1.8	1.81
959	1301	1.783	1.801	1.834
960	1007	1.79	1.807	1.84
961	2376	1.775	1.815	1.825
962	2582		1.816	
963	583	1.74	1.82	
964	1009	1.820	1.826	1.88
965	2346	1.800	1.831	1.846
966	2802	1.750	1.832	1.832
967	1049	1.8090	1.8380	1.8593
968	999	1.69	1.84	1.85
969	1430	1.773	1.840	1.845
970	2363	1.825	1.842	1.857
971	2221	1.85	1.85	1.99
972	2220	1.85	1.85	2.02
973	639	1.789	1.852	1.877
974	2492		1.865	
975	707	1.8600	1.8671	1.8853
976	1010	1.73	1.870	1.91
977	1027	1.655	1.875	1.909
978	1407	1.835	1.877	1.886
979	1794	1.817	1.879	2.057
980	1302	1.87	1.88	1.93
981	553	1.8771	1.8823	1.8937
982	3010	1.527	1.903	1.952
983	2334	1.900	1.907	2.034
984	2361		1.91	1.91
985	2338	1.910	1.91	1.945
986	261	1.871	1.92	2.01
987	1050	1.885	1.920	1.956
988	3124	1.750	1.925	1.95
989	1305	1.92	1.95	1.96
990	1365	1.702	1.955	1.965
991	712	1.9493	1.9592	1.9640
992	663	1.947	1.961	1.968
993	1722	1.955	1.985	2.05
994	401		1.99	
995	557	1.93	1.99	2.02
996	660	1.87	2.00	2.01
997	1723	1.90	2.00	2.05
998	576		2.03	
999	2219	1.908	2.05	2.065
1000	573	2.042	2.050	2.050
1001	617	1.8037	2.0763	2.0780
1002	329		2.09	
1003	2375	1.70	2.10	2.23
1004	1326	2.08	2.1	2.16
1005	541	1.816	2.102	2.126 ?
1006	539	2.0767	2.1161	2.1580
1007	1696		2.15	
1008	535	2.04	2.15	2.15
1009	335	2.14	2.15	2.18
1010	1421	2.12	2.17	2.31
1011	2374	1.77	2.18	2.35
1012	473	2.13	2.19	2.20
1013	1336	1.94	2.20	2.51
1014	1327	2.10	2.20	2.31
1015	1391	2.19	2.20	2.33
1016	529	2.1992	2.2172	2.2596
1017	1697	2.17	2.22	2.32
1018	1671	2.09	2.24	2.26
1019	1807	2.22	2.25	2.29
1020	1784	2.17	2.26	2.32
1021	1781	2.18	2.27	2.35
1022	536	2.24	2.27	2.31
1023	1694	2.27	2.27	2.30
1024	279	2.18	2.35	2.35
1025	2331		2.38	
1026	1335	2.26	2.39	2.40
1027	878	2.37	2.5	2.65
1028	446	2.583	2.586	2.741
1029	917		3	
1030	1096		3	
1031	1101		3	
1032	296	3.194	4.046	4.303

Miscellaneous

Serial No.	Gen. index No.	α	β	γ
1033	944	1.831	1.861 (green)	1.880
1034	429	1.3996		1.4102
1035	432	1.4057		1.4165
1036	418	1.4248		1.4382
1037	2994	1.452		1.465
1037.1	3143.5	1.461		1.449
1037.2	3017.5	1.466		1.455
1038	3009	1.4676		1.620
1039	1399	1.500		1.660
1040	2776	1.518		1.527

Serial No.	Gen. index No.	Refractive index α	β	γ	Serial No.	Gen. index No.	Refractive index α	β	γ
1041	2213	1.575		1.649	1061	1412	2.38	2.39 (Li)	2.42
1042	2644	1.584		1.604	1062	1698		2.40 (Li)	
1043	2646	1.594		1.614	1063	1800		2.40 (Li)	
1044	1322	1.62		1.63	1064	1766	2.41	2.50 (Li)	2.51
1045	2348	1.6226		1.7643	1065	1661		2.55 (Li)	
1046	2323	1.641		1.650	1066	1093	2.48	2.58 (Li)	2.60
1047	2570	1.6704			1067	271	2.46	2.59 (Li)	2.61
1048	2414	1.675		1.685	1068	525	2.51	2.61 (Li)	2.71
1049	2319	1.717		1.735	1069	1411		2.62 (Li)	
1050	1075	1.729		1.788	1070	887	2.35	2.64 (Li)	2.66
1051	2549			1.789	1071	272		>2.72 (Li)	
1052	2560	1.810		1.830	1072	723	>2.72	>2.72 (Li)	
1053	716	1.817			1073	298	2.74(Li)		>2.72 (Li)
1054	582	1.90		1.97	1074	2770		1.473 (red)	
1055	3081	1.553	1.555 (Li)	1.571	1075	3177		1.5226 (red)	
1056	82	2.00	2.18 (Li)	2.35	1076	2524		1.532 (red)	
1057	2355	2.200	2.200 (Li)	2.290	1077	3114		1.591 (red)	
1058	1263	2.24	2.24 (Li)	2.53	1078	935		2.63 (red)	
1059	599	2.30	2.35 (Li)	2.40					
1060	1631	2.31	2.37 (Li)	2.66					

INDEX OF MINERAL NAMES

ℭ-TABLE

[Compounds of carbon with elements having key-numbers below 16]

Acknowledgement is made to Prof. E. E. Reid for advice in connection with nomenclature and for his reading of the manuscript of this section.

Gen. index No.	Formula	Name. *cf.* Table, p. 280	Molecular weight (I. C. T. atomic weights. *v.* p. 43)	Normal melting point. °C	Boiling point under 1 atm. (or mm of Hg indicated by superscript)	Specific gravity, 20°/4° (or at other indicated temperature)	Refractive index finding No. *v.* Table, p. 276
1	CBi_2O_5	Bismutospherite	510.00	d.		7.35	
1.1	$CBrClO$	Carbonyl bromochloride	143.37		25	1.82^{15}	
2	$CBrCl_3$	Bromotrichloromethane	198.29	−21	172	$1.959_4^{14.5}$	697
3	$CBrN$	Cyanogen bromide	105.92	52	61.6	2.015	
4	CBr_2O	Carbonyl bromide	187.83		64.5	2.44	
5	CBr_3NO_2	Bromopicrin	297.76	10.3	127^{118}	2.799	826
6	CBr_4	Carbon tetrabromide	331.66	α48.4; β90.1	189.5	3.42	
7	$CClN$	Cyanogen chloride	61.466	−6	13.8	1.186	
8	$CCl_2N_2O_4$	Dichlorodinitromethane $Cl_2C(NO_2)_2$	174.93	122.5			
9	CCl_2O	Carbonyl chloride (Phosgene)	98.916	−104	8.3	1.392	
10	CCl_2S	Thiophosgene	114.98		73.5	1.509^{15}	721
11	CCl_3NO_2	Chloropicrin Cl_3CNO_2	164.38	−64	112.4	1.692^{0}	470
12	CCl_4	Carbon tetrachloride	153.83	−23.0	76.8	1.595	476
13	CF_4	Carbon tetrafluoride	88.00	−80	−15		
14	CIN	Cyanogen iodide	152.94	146.5			
15	CIN_3O_6	Iodotrinitromethane $CI(NO_2)_3$	276.96	56			
16	CI_4	Carbon tetraiodide	519.73	d.		4.32	
17	CN_4O_8	Tetranitromethane $C(NO_2)_4$	196.03	13	125.7	1.650_4^{13}	364
17.1	COS	Carbonyl sulfide	64.065	−138	−48	1.24^{-87}	
17.2	$CSSe$	Carbon sulfoselenide	123.265		84.5		
17.3	CS_2	Carbon disulfide	76.130	−111.6	46.3	1.261_{20}^{22}	
17.4	$CHBrCl_2$	Bromodichloromethane	163.84		92	1.925^{15}	
18	$CHBr_3$	Bromoform	252.76	7.7	150.4	2.890	772
19	$CHCl_3$	Chloroform	119.38	−63.5	61.2	1.489	417
20	CHF_3	Fluoroform	70.008		$20^{40 \text{ at.}}$	2.53	
21	CHI_3	Iodoform	393.80	119		4.1	1189
22	CHN	Hydrocyanic acid HCN	27.016	−14	26	0.699	809
23	$CHNO$	Cyanic acid $HCNO$	43.016	d.		1.140^{0}	
24	$CHNS$	Thiocyanic acid $HCNS$	59.081	5	d.		
25	CHN_3O_6	Nitroform $CH(NO_2)_3$	151.032	15	> 100 d.		
26	CH_2Br_2	Methylene bromide	173.85	−52.8	97.8	2.46_{15}^{15}	
27	CH_2ClNO	Carbamyl chloride $ClCONH_2$	79.481	50	62		
28	CH_2Cl_2	Methylene chloride	84.931	−96.7	40.1	1.336	273
29	CH_2I_2	Methylene iodide	267.88	5.2; 5.7	180 d.	3.325	870
30	CH_2N_2	Cyanamide $CN.NH_2$	42.031	44	140^{19} d.	1.083	1073
31	CH_2N_2	Diazomethane $H_2C{:}N_2$	42.031	−145	−23		
32	$CH_2N_2O_3$	Methylnitrolic acid $O_2NCHNOH$	90.031	64			
33	$CH_2N_2O_4$	Dinitromethane $H_2C(NO_2)_2$	106.031	< −15	100 d.		
34	CH_2N_4	Tetrazole	70.047	155			
35	CH_2O	Formaldehyde $HCHO$	30.015	−92	−21	0.815^{-20}	
36	$(CH_2O)_x$	Paraformaldehyde	$(30.015)_x$	160			
37	CH_2O_2	Formic acid HCO_2H	46.015	8.4	100.5	1.220	25
38	CH_3AsCl_2	Methylarsine dichloride	160.90	−59	136	1.838	
39	CH_3AsO	Methylarsinous oxide	105.98	95			
40	CH_3Br	Methyl bromide	94.939	−93	4.6	1.732_0^0	
41	CH_3Cl	Methyl chloride	50.481	−97.6	−23.7	0.920^{18}	
42	CH_3ClO	Methyl hypochlorite CH_3OCl	66.481		13.4		
43	CH_3ClO_2S	Methylsulfone chloride	114.546		160	1.510	
44	CH_3F	Methyl fluoride	34.023		−78.0		
45	CH_3I	Methyl iodide	141.96	−66.1	42.6	2.279	696
46	CH_3NO	Formamide $HCONH_2$	45.031	−5	193	1.139	995
47	CH_3NO	Formaldoxime $H_2C{:}NOH$	45.031		84		
48	CH_3NO_2	Nitromethane CH_3NO_2	61.031	−29.2	101.9	1.139	43
49	CH_3NO_2	Methyl nitrite CH_3ONO	61.031		−12	0.991^{15}	

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
50	CH_3NO_3	Methyl nitrate CH_3ONO_2	77.031		exp. 65	1.217^{15}	
51	CH_3NS	Thioformamide $HCSNH_2$	61.096	29			
52	CH_3N_3	Methyl azide	57.047		21	0.869^{8}_{15}	
53	$CH_3N_3O_3$	Nitrourea $O_2NNHCONH_2$	105.05	150 d.			
54	CH_4	Methane	16.0308	−184	−161.4	0.415^{-164}	
55	CH_4N_2O	Urea H_2NCONH_2	60.047	132.7		1.335	1167
56	$CH_4N_2O_2$	Methylnitramine CH_3NHNO_2	76.047	38		$1.243^{48.6}_{4}$	1077
57	CH_4N_2S	Ammonium thiocyanate	76.112	149.6	d. 160	1.305	
58	CH_4N_2S	Thiourea H_2NCSNH_2	76.112	182		1.405	
59	$CH_4N_4O_2$	Nitroguanidine $H_2NC(:NH)N.HNO_2$	104.063	231			
60	CH_4O	Methyl alcohol CH_3OH	32.031	−97.8	64.5	0.792	2
61	CH_4O_3S	Methylsulfonic acid CH_3SO_3H	96.096		167^{10}	1.481	
62	CH_4O_4S	Methyl sulfuric acid CH_3SO_4H	112.09	< −30			
63	CH_4S	Methylmercaptan CH_3SH	48.096	−121.0	7.6	0.868	
64	CH_5As	Methylarsine CH_3AsH_2	91.999		2		
64.1	CH_5AsO_3	Methyl arsenate $CH_3AsO(OH)_2$	139.999	161			1234
65	CH_5N	Methylamine CH_3NH_2	31.047	−92.5	−6.5	0.699^{-11}	
66	CH_5NO	*N*-Methylhydroxylamine CH_3NHOH	47.047	42	62.5^{15}	1.0003	226
67	CH_5NO_2	Ammonium formate HCO_2NH_4	63.047	116		1.266	
67.1	CH_5NO_3	Ammonium hydrogen carbonate	79.047	d.		1.573	1223
68	CH_5N_3	Diazoaminomethane	59.063	−12	92 s. d.		
69	CH_5N_3O	Semicarbazide $H_2NCONHNH_2$	75.063	96			
70	$CH_5N_3O_4$	Urea nitrate $H_2NCONH_2.HNO_3$	123.06	153 d.		1.664	
71	CH_5N_3S	Thiosemicarbazide $H_2NCSNHNH_2$	91.128	183			
72	CH_5O_2P	Methylphosphinic acid $CH_3PO(OH)_2$	96.063	105			
73	CH_5P	Methylphosphine CH_3PH_2	48.063		−14		
74	CH_6ClN	Methylamine hydrochloride	67.512	226	230^{15}		
75	CH_6ClN_3	Guanidine hydrochloride	95.528				1333
76	CH_6ClN_3O	Semicarbazide hydrochloride	111.53	173 d.			
77	CH_6N_2	Methylhydrazine CH_3NHNH_2	46.062		87.5		
78	CH_6N_4	Methyltetrazine $CH_3NHN:NNH_2$	74.078		130		
79	$CH_6N_4O_2$	Guanidine nitrite $(NH_2)_2C(:NH).HNO_2$	106.08	78.5			
80	$CH_6N_4O_3$	Guanidine nitrate	122.079				1333
81	$CH_6N_4O_4$	Semicarbazide nitrate	138.08	123			
82	CH_7ClNH_4	Aminoguanidine hydrochloride	110.54	163			
83	C_2Br_2	Dibromoacetylene $BrC⋮CBr$	183.83		76	2	
84	$C_2Br_2Cl_2$	1, 2-Dibromo-1, 2-dichloroethylene	254.75	4.4	172	2.304^{15}_{4}	894
84.1	$C_2Br_2Cl_4$	1, 2-Dibromo-1, 1, 2, 2-tetrachloroethane	325.66			2.713	1308
85	$C_2Br_2O_2$	Oxalyl bromide $(COBr)_2$	215.83	−19.5	104.4		
86	C_2Br_4	Tetrabromoethylene $Br_2C⋮CBr_2$	343.66	57.5	227		
87	C_2Br_6	Hexabromoethane Br_3CCBr_3	503.50		210	3.823	1316
88	C_2Cl_2	Dichloroacetylene $ClC⋮CCl$	94.916	−50			
89	$C_2Cl_2O_2$	Oxalyl chloride $(COCl)_2$	126.916	−12	64	$1.488^{13.4}_{4}$	822
90	C_2Cl_4	Tetrachloroethylene $Cl_2C⋮CCl_2$	165.83	−22.4	120.8	1.623	623
91	$C_2Cl_4O_2$	Trichloromethyl chloroformate	197.83	−57	127.5	1.653^{14}	
92	C_2Cl_6	Hexachloroethane Cl_3CCCl_3	236.75	185	185	2.091	
93	C_2I_2	Diiodoacetylene $IC⋮CI$	277.86	82			
94	C_2I_4	Tetraiodoethylene $I_2C⋮CI_2$	531.73	187		2.983	
95	C_2N_2	Cyanogen $CN.CN$	52.016	−34.4	−20.5	$0.866^{17.2}$	
96	C_2N_2S	Cyanogen sulfide $(CN)_2S$	84.081	60			
97	$C_2N_4O_6$	Trinitroacetonitrile	176.03	41.5	exp. 220		
98	$C_2N_6O_{12}$	Hexanitroethane $(O_2N)_3CC(NO_2)_3$	300.05	142 d.			
99	C_2HBr	Bromoacetylene $BrC⋮CH$	104.924		−2		
100	C_2HBrCl_2	1, 2-Dichloro-1-bromoethylene	175.84	−83.5	113.8	1.913^{15}_{4}	867
101	C_2HBr_3	Tribromoethylene $Br_2C⋮CHBr$	264.76		164	2.708	778
102	$C_2HBr_3Cl_2$	1, 2, 2-Tribromo-1, 2-dichloroethane	335.67	6	112^{16}	2.635^{15}_{4}	781
103	C_2HBr_3O	Bromal Br_3CCHO	280.76		174	2.30^{15}	
104	$C_2HBr_3O_2$	Tribromoacetic acid Br_3CCO_2H	296.76	130	245 d.		
105	C_2HBr_5	Pentabromoethane Br_3CCHBr_2	424.59	57	210^{300}	3.312	
106	C_2HCl_3	Trichloroethylene $Cl_2C⋮CHCl$	131.38	−86.4	88	1.477	525
107	C_2HCl_3O	Chloral Cl_3CCHO	147.38	−57.5	98.1	1.512	455
108	C_2HCl_3O	Dichloroacetyl chloride $Cl_2CHCOCl$	147.38		108		
109	$C_2HCl_3O_2$	Trichloroacetic acid Cl_3CCO_2H	163.38	57.5	195.3	1.617^{46}_{15}	

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
110	$C_2HCl_3O_2$	Dichloromethyl chloroformate	163.38		116	1.558^{14}	
111	C_2HCl_5	Pentachloroethane Cl_3CCHCl_2	202.298	−29.0	162	1.709_4^0	614
112	C_2HF_3	Trifluoroethylene	82.008		−51	1.26^{-78}	
112.1	$C_2HF_3O_2$	Trifluoroacetic acid F_3CCO_2H	114.01	−15.6	72.5	1.535^0	
113	C_2HI	Iodoacetylene IC⋮CH	151.94		32		
114	$C_2HI_3O_2$	Triiodoacetic acid I_3CCO_2H	437.80	150 d.			
115	C_2H_2	Acetylene HC⋮CH	26.015	−81.8	−83.6	Liq. 0.613^{-80} Sol. 0.730^{-85}	
116	$C_2H_2AsCl_3$	2-Chlorovinylarsine dichloride	207.35		190	1.888	
117	C_2H_2BrCl	*cis*-1-Bromo-2-chloroethylene	141.39		84.7	1.797_4^{15}	863
118	C_2H_2BrCl	*trans*-1-Bromo-2-chloroethylene	141.39	41	75.4	1.777_4^{15}	864
119	C_2H_2BrClO	Chloroacetyl bromide $ClCH_2COBr$	157.39		135	1.913^0	
120	$C_2H_2BrClO_2$	Bromochloroacetic acid $BrClCHCO_2H$	183.39	23.8	211.7 s. d.	1.985_4^{30}	
121	$C_2H_2BrCl_3$	1-Bromo-1, 2, 2-trichloroethane	212.31	−21	104.1	2.0554^0	
122	$C_2H_2Br_2$	1, 1-Acetylene dibromide $CH_2{:}CBr_2$	185.85		92	2.178	
123	$C_2H_2Br_2$	1, 2-Acetylene dibromide $BrCH{:}CHBr$	185.85		110.2	2.256	719
124	$C_2H_2Br_2O$	Bromoacetyl bromide $BrCH_2COBr$	201.85		150	$2.317_{21.5}^{21.5}$	
125	$C_2H_2Br_2O_2$	Dibromoacetic acid Br_2CHCO_2H	217.85	48	232		
126	$C_2H_2Br_3Cl$	1, 2, 2-Tribromo-1-chloroethane	301.22	20.6	220 d.	2.652_4^{14}	780
127	$C_2H_2Br_4$	1, 1, 1, 2-Tetrabromoethane $BrCH_2CBr_3$	345.68	0.0	$103.5^{13.5}$	2.875	794
128	$C_2H_2Br_4$	1, 1, 2, 2-Tetrabromoethane	345.68	0.1	151^{54}	2.964	796
129	$C_2H_2ClIO_2$	Chloroiodoacetic acid $ClICHCO_2H$	220.41	90			
130	C_2H_2ClNO	Chloromethyl isocyanate $ClCH_2CNO$	91.481		81		
132	$C_2H_2Cl_2$	*cis*-1, 2-Acetylene dichloride	96.931	−50.0	48.4	1.265_4^{15}	855
133	$C_2H_2Cl_2$	*trans*-1, 2-Acetylene dichloride	96.931	−80.5	60.3	1.291_4^{15}	854
134	$C_2H_2Cl_2O$	Dichloroacetaldehyde Cl_2CHCHO	112.931		90.5		
135	$C_2H_2Cl_2O$	Chloroacetyl chloride $ClCH_2COCl$	112.931		105	1.495^0	
136	$C_2H_2Cl_2O_2$	Dichloroacetic acid Cl_2CHCO_2H	128.931	10; −4	193.5	1.563	490
137	$C_2H_2Cl_2O_2$	Chloromethyl chloroformate	128.931		108	1.516	
138	$C_2H_2Cl_3NO$	Trichloroacetamide Cl_3CCONH_2	162.40	141	240		
139	$C_2H_2Cl_4$	1, 1, 1, 2-Tetrachloroethane	167.85		130.5	1.588	528
140	$C_2H_2Cl_4$	1, 1, 2, 2-Tetrachloroethane	167.85	−43.8	146.3	1.600	567
141	$C_2H_2F_2O_2$	Difluoroacetic acid F_2CHCO_2H	96.015	−0.35	134.2^{766}	1.526	4
142	$C_2H_2F_3NO$	Trifluoroacetamide F_3CCONH_2	113.023	74.8	162.5		
143	$C_2H_2I_2O_2$	Diiodoacetic acid I_2CHCO_2H	311.88	110			
144	$C_2H_2N_4$	1, 2, 4, 5-Tetrazine	82.047	99			
145	C_2H_2O	Ketene $CH_2{:}CO$	42.015	−151	−56		
146	$C_2H_2O_2$	Glyoxal CHO.CHO	58.015	15	50.4	1.14	46
147	$C_2H_2O_4$	Oxalic acid HO_2CCO_2H	90.015	189		2	1194
148	C_2H_3Br	Vinyl bromide $CH_2{:}CHBr$	106.939	−137.8	15.8	1.517_4^{14}	415
149	C_2H_3BrO	Acetyl bromide CH_3COBr	122.939	−96.5	76.7	$1.52^{9.5}$	
150	$C_2H_3BrO_2$	Bromoacetic acid CH_2BrCO_2H	138.939	50	208	1.934	
151	$C_2H_3Br_3$	1, 1, 2-Tribromoethane $BrCH_2CHBr_2$	266.77	−26	188.4	2.579	773
152	$C_2H_3Br_3O$	Tribromoethyl alcohol Br_3CCH_2OH	282.77	80	94^{11}		
152.1	$C_2H_3Br_3O_2$	Bromal hydrate	298.77	53			1333
153	C_2H_3Cl	Vinyl chloride $CH_2{:}CHCl$	62.481		−15		
154	C_2H_3ClO	Acetyl chloride CH_3COCl	78.481	−112.0	52	1.104	76
155	$C_2H_3ClO_2$	Methyl chloroformate $ClCO_2CH_3$	94.481		71.4	1.236^{15}	
156	$C_2H_3ClO_2$	Chloroacetic acid CH_2ClCO_2H	94.481	α61.2 β56.3 γ50.1 δ43.8 (?)	189.5	1.370_4^{65}	1099
157	$C_2H_3Cl_2NO$	Dichloroacetamide $Cl_2CHCONH_2$	127.947	98	234.6		
158	$C_2H_3Cl_3$	1, 1, 1-Trichloroethane CH_3CCl_3	133.397		74.1	1.334	350
159	$C_2H_3Cl_3$	1, 1, 2-Trichloroethane $ClCH_2CHCl_2$	133.397	−36.7	113.5	1.443	506
160	$C_2H_3Cl_3O$	Trichloroethyl alcohol Cl_3CCH_2OH	149.397	17.8	152.2	$1.550^{23.3}$	
161	$C_2H_3Cl_3O_2$	Chloral hydrate $Cl_3CCH(OH)_2$	183.41	47.4	98 d.	1.908	1258
162	C_2H_3FO	Acetyl fluoride CH_3COF	62.023	> −60	20.5	0.993^{20}	
163	$C_2H_3FO_2$	Fluoroacetic acid CH_2FCO_2H	78.023	33	165		
164	C_2H_3I	Vinyl iodide $CH_2{:}CHI$	153.96		56	2.08^0	
165	C_2H_3IO	Iodoacetaldehyde CH_2ICHO	169.96		80 d.		
166	C_2H_3IO	Acetyl iodide CH_3COI	169.96		108	1.98^{17}	
167	$C_2H_3IO_2$	Iodoacetic acid ICH_2CO_2H	185.96	82			

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
168	C_2H_3N	Acetonitrile CH_3CN	41.031	−41	82	0.783	6
169	C_2H_3N	Methyl isocyanide CH_3NC	41.031	−45	59.6	0.756^{4}	
170	C_2H_3NO	Glycollic nitrile $HOCH_2CN$	57.031		183	1.104	952
172	C_2H_3NO	Methyl isocyanate $CH_3N{:}CO$	57.031		43		
173	$C_2H_3NO_2$	Nitroethylene $CH_2{:}CHNO_2$	73.031		98.5	$1.073^{13.8}$	
174	$C_2H_3NO_3$	Oxamic acid HO_2CCONH_2	89.031	210 d.			
175	$C_2H_3NO_4$	Nitroacetic acid $O_2NCH_2CO_2H$	105.03	89			
176	C_2H_3NS	Methyl thiocyanate CH_3CNS	73.096	−51	133	1.068	501
177	C_2H_3NS	Methyl isothiocyanate $CH_3N{:}CS$	73.096	35	119	1.069^{37}_{4}	1052
178	$C_2H_3N_3$	1, 2, 4-Triazole	69.047	121	260		
179	$C_2H_3N_3O_6$	1, 1, 1-Trinitroethane $(O_2N)_3CCH_3$	165.05	56			
180	C_2H_4	Ethylene $H_2C{:}CH_2$	28.0308	−169.4	−103.8	0.566^{-102}_{4}	
181	C_2H_4BrCl	1-Bromo-2-chloroethane $ClCH_2CH_2Br$	143.405	−16.6	103.7	1.79^{0}	
182	C_2H_4BrNO	Acetobromoamide $CH_3CONHBr$	137.96	108			
183	$C_2H_4Br_2$	1, 1-Dibromoethane CH_3CHBr_2	187.86		110	2.056	647
184	$C_2H_4Br_2$	Ethylene bromide $BrCH_2CH_2Br$	187.86	10.0	131.7	2.182	710
185	$C_2H_4Br_2O$	Dibromoethyl alcohol Br_2CHCH_2OH	203.86		181	2.35^{0}	
186	$C_2H_4Br_2O$	*sym.*-Dibromomethyl ether $(BrCH_2)_2O$	203.86	−34	155	2.201	
187	C_2H_4ClNO	Acetochloroamide $CH_3CONHCl$	93.497	110			
188	C_2H_4ClNO	Chloroacetamide $ClCH_2CONH_2$	93.497	119.5	225.6		
189	$C_2H_4Cl_2$	1, 1-Dichloroethane CH_3CHCl_2	98.947	−96.7	57.3	1.174	227
190	$C_2H_4Cl_2$	Ethylene chloride $ClCH_2CH_2Cl$	98.947	−35.3	83.7	1.257	400
191	$C_2H_4Cl_2O$	Dichloroethyl alcohol Cl_2CHCH_2OH	114.947		146	1.145^{15}	
192	$C_2H_4Cl_2O$	*sym.*-Dichloromethyl ether $(ClCH_2)_2O$	114.947		106	1.315	349
193	$C_2H_4Cl_2OS$	Di-(chloromethyl) sulfoxide	147.01	40			
194	$C_2H_4Cl_2S$	*sym.*-Dichloromethyl sulfide	131.012		58.5^{18}	1.414^{14}_{4}	
195	$C_2H_4Cl_3NO$	Chloral ammonia $Cl_3CCHO.NH_3$	164.41	74	100 d.		
196	$C_2H_4I_2$	1, 1-Diiodoethane CH_3CHI_2	281.9		179	2.84^{0}	
197	$C_2H_4I_2$	Ethylene iodide ICH_2CH_2I	281.9	82	d.	2.132^{10}	
199	$C_2H_4N_2O_2$	Oxamide $H_2NOCCONH_2$	88.047	419 d.		1.667	
200	$C_2H_4N_2O_2$	Glyoxime $NOH{:}CHCH{:}NOH$	88.047	178			
201	$C_2H_4N_2O_3$	Ethylnitrolic acid $CH_3C(NO_2){:}NOH$	104.047	88	d.		
202	$C_2H_4N_2O_4$	1, 1-Dinitroethane $CH_3CH(NO_2)_2$	120.047		186	1.350^{23}_{23}	
203	$C_2H_4N_2O_4$	Ethylene dinitrite $ONOCH_2CH_2ONO$	120.047	37.5	98	1.216^{0}	
204	$C_2H_4N_2O_5$	Ethylene nitrite nitrate	136.047	d.		1.472	
205	$C_2H_4N_2O_6$	Dinitroglycol $(CH_2ONO_2)_2$	152.047	−20	exp. 116	1.496^{15}	
207	$C_2H_4N_4$	Dicyandiamide $H_2NC({:}NH)NHCN$	84.063	207			
208	C_2H_4O	Acetaldehyde CH_3CHO	44.031	−123.5	20.2	0.781	3
209	C_2H_4O	Ethylene oxide	44.031	−111.3	10.7	0.887^{7}_{4}	803
210	C_2H_4OS	Thioacetic acid CH_3COSH	76.096	<−17	93	1.074^{10}	
211	$C_2H_4O_2$	Glycollic aldehyde $HOCH_2CHO$	60.031	97			
212	$C_2H_4O_2$	Acetic acid CH_3CO_2H	60.031	16.6	118.1	1.049	26
213	$C_2H_4O_2$	Methyl formate HCO_2CH_3	60.031	−99.8	31.8	0.975	5
214	$C_2H_4O_3$	Glycollic acid $HOCH_2CO_2H$	76.031	α63.0; β79			
215	$C_2H_4O_3$	Methyl acid carbonate CH_3HCO_3	76.031	−57			
216	$C_2H_4O_3$	Ethylene ozonide	76.031		18^{16}		
217	$C_2H_4O_5S$	Sulfoacetic acid $HO_3SCH_2CO_2H$	140.10	86			
218	C_2H_4S	Ethylene sulfide	60.096		55	1.034	
219	$C_2H_5AsO_5$	Arsonoacetic acid $(OH)_2AsOCH_2COOH$	184.00	152			
220	C_2H_5Br	Ethyl bromide	108.955	−119.0	38.0	1.430	275
221	C_2H_5BrO	2-Bromoethyl alcohol $BrCH_2CH_2OH$	124.955		150.3	1.685	555
222	C_2H_5BrO	Bromomethyl methyl ether	124.955		87	$1.531^{12.3}$	458
224	C_2H_5Cl	Ethyl chloride	64.497	−138.7	12.2	0.910	
225	$C_2H_5ClO_4S$	Chloromethyl methyl sulfate	160.56		92^{18}	1.473	
226	$C_2H_5Cl_2N$	Ethyl dichloramine $C_2H_5NCl_2$	113.963		89		
227	C_2H_5ClO	2-Chloroethyl alcohol $ClCH_2CH_2OH$	80.497	−69.0	128.8	1.213	
228	C_2H_5ClO	Chloromethyl methyl ether	80.497		59.5	1.063^{10}	107
229	C_2H_5ClO	Ethyl hypochlorite	80.497		36.6		
230	$C_2H_5ClO_2S$	Ethylsulfone chloride $CH_3CH_2SO_2Cl$	128.562		177.5	1.357	
231	$C_2H_5ClO_4$	Ethyl perchlorate	128.497		74		
232	C_2H_5F	Ethyl fluoride	48.039		−32	1.7	
233	C_2H_5FO	2-Fluoroethyl alcohol FCH_2CH_2OH	64.039	−26.5	103.4	1.114	21

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
234	C_2H_5I	Ethyl iodide	155.97	−108.5	72.2	1.933	644
235	C_2H_5IO	2-Iodoethyl alcohol ICH_2CH_2OH	171.97		177 s. d.	2.905	
236	C_2H_5IO	Iodomethyl methyl ether ICH_2OCH_3	171.97		125	2.025^{16}	728
237	C_2H_5N	Vinylamine $H_2C:CHNH_2$	43.047		56	0.832	
238	C_2H_5NO	Acetamide CH_3CONH_2	59.047	81.0 69.4	222	1.159	1107, 1173, 1198
239	C_2H_5NO	Acetaldoxime $CH_3CH:NOH$	59.047	47	115	0.966	1070
240	$C_2H_5NO_2$	Acetohydroxamic acid $CH_3CONHOH$	75.047	88			
241	$C_2H_5NO_2$	Aminoacetic acid $H_2NCH_2CO_2H$	75.047	233 d.		1.161	1274
242	$C_2H_5NO_2$	Nitroethane $CH_3CH_2NO_2$	75.047	< −50	114.8	1.056_{15}^{15}	84
243	$C_2H_5NO_2$	Ethyl nitrite CH_3CH_2ONO	75.047		17	$0.900^{15.5}$	
244	$C_2H_5NO_2$	Methyl carbamate CH_3CONH_2	75.047	52	177		
245	$C_2H_5NO_2$	Glycollicamide $HOCH_2CONH_2$	75.047	120			
246	$C_2H_5NO_3$	Nitroethyl alcohol $O_2NCH_2CH_2OH$	91.047	< −80	193.8	1.270^{15}	
247	$C_2H_5NO_3$	Ethyl nitrate $CH_3CH_2ONO_2$	91.047	−102.0	88.7	1.105	54
248	$C_2H_5NO_4$ (H_2O)	Ammonium hydrogen oxalate	107.047			1.556	
249	$C_2H_5NO_4$	Nitroglycol $HOCH_2CH_2NO_3$	107.047	d.		1.31^{11}	
250	C_2H_5NS	Thioacetamide CH_3CSNH_2	75.112	108.5			
251	$C_2H_5N_3O_2$	Biuret $NH(CONH_2)_2$	103.063	193			
252	C_2H_6	Ethane $CH_3.CH_3$	30.0462	−172.0	−88.3	0.546^{-88}	
253	C_2H_6AsBr	Cacodyl bromide $(CH_3)_2AsBr$	184.92		130		
254	C_2H_6AsCl	Cacodyl chloride $(CH_3)_2AsCl$	140.464		106.5	> 1	
255	$C_2H_6AsCl_3$	Cacodyl trichloride $(CH_3)_2AsCl_3$	211.38	50 d.			
256	C_2H_6AsI	Cacodyl iodide $(CH_3)_2AsI$	231.94		160		
257	C_2H_6NO	Aminoacetamide $H_2NCH_2CONH_2$	74.06	65			
258	$C_2H_6N_2O$	Dimethylnitrosamine $(CH_3)_2N.NO$	74.062		152.5	1.003	356
259	$C_2H_6N_2O$	*N*-Methylurea $CH_3NHCONH_2$	74.062	101		1.204	
260	$C_2H_6N_4O_2$	Oxalyl dihydrazide $(CONHNH_2)_2$	118.08	235 d.			
261	$C_2H_6N_4S$	Guanidine thiocyanate	118.143	118			
262	C_2H_6O	Ethyl alcohol C_2H_5OH	46.046	−117.3	78.5	0.789	17
263	C_2H_6O	Methyl ether CH_3OCH_3	46.046	−138.0	−24.9	1.617	
264	$C_2H_6O_2$	Glycol $HOCH_2CH_2OH$	62.046	−17.4	197.5	1.115	305
265	$C_2H_6O_2S$	Dimethyl sulfone $(CH_3)_2SO_2$	94.111	193	238		
266	$C_2H_6O_3S$	Methyl sulfite $(CH_3)_2SO_3$	110.111		126.5	1.046	
267	$C_2H_6O_4$	Acetyl peroxide $(CH_3CO)_2O_2$	94.046	30	63^{21}		
268	$C_2H_6O_4S$	Ethylsulfuric acid $C_2H_5SO_4H$	126.111		d.	1.316^{17}	
269	$C_2H_6O_4S$	Methyl sulfate $(CH_3)_2SO_4$	126.111	−31.8	188.8	1.333_{15}^{15}	66
270	$C_2H_6O_6$	Oxalic acid dihydrate	126.046	101.5		1.64	1206
271	$C_2H_6O_6S_2$	Ethane-1, 2-disulfonic acid	190.18	104			
272	C_2H_6S	Methyl sulfide $(CH_3)_2S$	62.111	−83.2	36.2	0.849	
273	C_2H_6S	Ethylmercaptan C_2H_5SH	62.111	−121.0	34.7	0.840	323
274	$C_2H_6S_2$	Methyl disulfide CH_3SSCH_3	94.176		118	1.046	
275	$C_2H_6S_2$	Ethylenemercaptan $HSCH_2CH_2SH$	94.176		146	1.123	
276	C_2H_6Se	Ethylhydroselenide C_2H_5SeH	109.246		53.5	1.395	
277	C_2H_6Te	Methyl telluride $(CH_3)_2Te$	157.546		82		
278	C_2H_7As	Dimethylarsine $(CH_3)_2AsH$	106.014		36	1.213^{29}	
279	C_2H_7As	Ethylarsine $C_2H_5AsH_2$	106.014		36	1.217	
280	$C_2H_7AsO_2$	Cacodylic acid $(CH_3)_2AsO.OH$	138.014	200			
281	$C_2H_7AsO_3$	Ethylarsonic acid $C_2H_5AsO(OH)_2$	154.014	95			
282	C_2H_7N	Dimethylamine $(CH_3)_2NH$	45.062	−96.0	7.4	0.680_4^0	
283	C_2H_7N	Ethylamine $C_2H_5NH_2$	45.062	−80.6	16.6	0.689_{15}^{15}	
284	C_2H_7NO	Acetaldehyde ammonia $CH_3CHO.NH_3$	61.062	97	110 s. d.		1333
285	C_2H_7NO	2-Aminoethyl alcohol $H_2NCH_2CH_2OH$	61.062		171	1.022^{20}	446
286	C_2H_7NO	Dimethylhydroxylamine $(CH_3)_2NOH$	61.062		42.4		
287	C_2H_7NO	α-Ethylhydroxylamine $NH_2OC_2H_5$	61.062		68	$0.883^{7.5}$	
288	C_2H_7NO	β-Ethylhydroxylamine C_2H_5NHOH	61.062	59 d.		0.908	1098
289	$C_2H_7NO_2$	Ammonium acetate $CH_3CO_2NH_4$	77.062	114		1.073	
290	$C_2H_7NO_3S$	Taurine $H_2NCH_2CH_2SO_3H$	125.127	88			
290.1	$C_2H_7N_3$	Diazoaminoethane $C_2H_5N.N.NH_2$	73.08	−12	92 s. d.		
291	$C_2H_7N_3O_4$	Methylurea nitrate	137.08	128			
292	$C_2H_7O_2P$	Dimethylphosphinic acid $(CH_3)_2PO.OH$	94.08	76			
293	$C_2H_7O_3P$	Ethylphosphinic acid $C_2H_5PO(OH)_2$	110.08	44			

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
294	C_2H_7P	Dimethylphosphine $(CH_3)_2PH$	62.078		25		
295	C_2H_7P	Ethylphosphine $C_2H_5PH_2$	62.078		25	<1	
296	C_2H_8BrN	Ethylamine hydrobromide	125.986	159.5		1.741	
297	C_2H_8ClN	Dimethylamine hydrochloride	81.528	171			
298	C_2H_8ClN	Ethylamine hydrochloride	81.528	109		1.216	
299	C_2H_8IN	Ethylamine hydroiodide $C_2H_5NH_2.HI$	173.00	188.5		2.100	
300	$C_2H_8N_2$	Ethylenediamine $H_2NCH_2CH_2NH_2$	60.078	8.5	117	$0.892^{26.1}_{4}$	1032
301	$C_2H_8N_2$	*unsym.*-Dimethylhydrazine	60.078		64	0.794	987
302	$C_2H_8N_2$	Ethylhydrazine $C_2H_5NHNH_2$	60.078		101.5		
303	$C_2H_8N_2O_4(H_2O)$	Ammonium oxalate	124.078			1.501	1233
304	$C_2H_8N_4$	Ethyltetrazine	88.094	<-20	140 d.		
305	$C_2H_8N_4O_3$	Methylguanidine nitrate	136.09	150			
306	$C_2H_{10}Cl_2N_2$	Ethylenediamine hydrochloride	133.01				1284
307	$C_2H_{10}N_2O$	Ethylenediamine hydrate	78.093	10	118	0.963	433
308	$C_2H_{14}N_8O_4S$	Aminoguanidine sulfate	246.24	161			
308.1	$C_3Cl_3N_3$	Cyanuric trichloride	184.40	146		1.32	
309	C_3Cl_8	Octachloropropane $Cl_3CCCl_2CCl_3$	319.66	160	269		
310	C_3O_2	Carbon suboxide OC:C:CO	68.00	−107	6.3	1.114^{0}	802
311	$C_3HCl_3O_2$	Trichloroacrylic acid Cl_2C:$CClCO_2H$	175.38	72.9	223		
312	C_3HCl_7	Heptachloropropane $Cl_2CHCCl_2CCl_3$	285.21	30	248	1.805^{34}_{4}	
313	C_3HN	Cyanoacetylene HC⋮CCN	51.016	5	42.5	0.816	911
313.1	$C_3H_2Br_2N_2O$	Dibromocyanoacetamide	245.86	123		2.375	
314	$C_3H_2Cl_2O_2$	Malonyl chloride $H_2C(COCl)_2$	140.93		58^{26}	1.450	1009
315	$C_3H_2Cl_3NO$	2, 2, 2-Trichlorolactic nitrile	174.40	61	220		
316	$C_3H_2N_2$	Malonic nitrile $H_2C(CN)_2$	66.031	32.1	220	$1.049^{34.2}_{4}$	1042
317	$C_3H_2N_2O_3$	Parabanic acid $CO<(NHCO)_2>$	114.031	227 d.			1333
318	C_3H_2O	Propargyl aldehyde HC⋮CCHO	54.015		61		
319	$C_3H_2O_2$	Propiolic acid HC⋮C.CO_2H	70.015	9	144 d.	1.139^{15}_{15}	
320	$C_3H_3BrO_2$	1-Bromoacrylic acid CH_2:$CBrCO_2H$	150.94	70			
321	$C_3H_3BrO_2$	2-Bromoacrylic acid BrCH:$CHCO_2H$	150.94	116			
322	$C_3H_3BrO_4$	Bromomalonic acid $BrCH(CO_2H)_2$	182.94	112 d.			
323	C_3H_3Cl	3-Chloroallylene $ClCH_2C$⋮CH	74.481		65	1.045^{5}	
323.1	C_3H_3ClO	Acryl chloride H_2C:CHCOCl	90.481		76	1.14^{0}	
324	$C_3H_3ClO_2$	1-Chloroacrylic acid CH_2:$CClCO_2H$	106.48	65			
325	$C_3H_3ClO_2$	2-Chloroacrylic acid ClCH:$CHCO_2H$	106.48	85			
326	$C_3H_3ClO_4$	Chloromalonic acid $ClCH(CO_2H)_2$	138.48	133			
327	$C_3H_3Cl_3O$	1, 1, 1-Trichloroacetone CH_3COCCl_3	161.40		149		
328	$C_3H_3Cl_3O$	1, 1, 1′-Trichloroacetone	161.40		172		
329	$C_3H_3Cl_3O_2$	Methyl trichloroacetate $Cl_3CCO_2CH_3$	177.40	−17.5	153.8	$1.489^{19.2}_{19.2}$	
330	$C_3H_3Cl_3O_3$	2, 2, 2-Trichlorolactic acid	193.40	124	170^{45}		
331	$C_3H_3Cl_5$	Pentachloropropane	216.31		198	1.607^{34}_{4}	645
332	C_3H_3N	Acrylic nitrile CH_2:CHCN	53.031	−82.0	79		
332.1	C_3H_3NO	Pyruvic nitrile CH_3COCN	69.04		93		
333	$C_3H_3NO_2$	Cyanoacetic acid $NCCH_2CO_2H$	85.031	66	$108^{0.15}$		
334	C_3H_3NS	Thiazole	85.096		116.8	1.198	
335	$C_3H_3N_3O_3$	Cyanuric acid	129.047	>360			1333
336	$C_3H_3N_3O_3$	Fulminuric acid $(CNOH)_3$	129.05	145 d.			
337	C_3H_4	Allene H_2C:C:CH_2	40.031	−146	−32		
338	C_3H_4	Allylene HC⋮CCH_3	40.031	−104.7	−27.5	$0.660^{-12.9}_{4}$	
339	$C_3H_4Br_2$	*cis*-1, 2-Dibromopropylene	199.86		135.2	2.024	924
340	$C_3H_4Br_2$	*trans*-1, 2-Dibromopropylene	199.86		126	2.024	925
341	$C_3H_4Br_2$	2, 3-Dibromopropylene	199.86		142.3	1.934	
342	$C_3H_4Br_2O_2$	1, 1-Dibromopropionic acid	231.86	61	221		
343	$C_3H_4Br_2O_2$	1, 2-Dibromopropionic acid	231.86	64; 51	160^{20}		
344	$C_3H_4Br_4$	1, 1, 2, 2-Tetrabromopropane	359.69		230 s. d.	2.94^{0}	
345	$C_3H_4Br_4$	1, 2, 2, 3-Tetrabromopropane	359.69	11	230 d.	2.653^{18}_{0}	
346	$C_3H_4Cl_2O$	*sym.*-Dichloroacetone $(ClCH_2)_2CO$	126.947	45	173.4	1.383^{46}_{4}	
347	$C_3H_4Cl_2O$	*unsym.*-Dichloroacetone	126.947		120	1.234^{15}	
348	$C_3H_4Cl_2O_2$	2, 2-Dichloropropionic acid	142.947	56	190		
349	$C_3H_4Cl_3NO_2$	Chloral formamide $Cl_3CCHO.HCONH_2$	192.41	116			
350	$C_3H_4N_2$	Imidazole	68.047	90	256		
351	$C_3H_4N_2$	Pyrazole	68.047	70	188		
352	$C_3H_4N_2O$	Cyanoacetamide $NCCH_2CONH_2$	84.047	120			

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
353	$C_3H_4N_2O$	Pyrazolone —NHCOCH₂CH:N—......	84.047	165			
354	$C_3H_4N_2O_2$	Hydantoin —NHCONHCH₂CO—.....	100.047	220			
355	C_3H_4O	Propargyl alcohol HC:CCH₂OH.......	56.031	−17	115	0.972	324
356	C_3H_4O	Acrolein H₂C:CH.CHO...............	56.031	−87.7	52.5	0.841	119
357	C_3H_4O	Allylene oxide.........................	56.031		63		
358	$C_3H_4O_2$	Acrylic acid H₂CCHCO₂H............	72.031	12.3	141.9	1.051	264
359	$C_3H_4O_3$	Pyruvic acid CH₃COCO₂H............	88.031	13.6	165	1.267	873
360	$C_3H_4O_4$	Malonic acid CH₂(CO₂H)₂............	104.031	135.6			
361	$C_3H_4O_4$	Methyl hydrogen oxalate...............	104.031	54	163.3	1.422^{54}	1191
362	$C_3H_4O_5$	Tartronic acid HOCH(CO₂H)₂.........	120.031	158 d.			1333
363	$C_3H_4O_6$	Mesoxalic acid (HO)₂C(CO₂H)₂........	136.03	121			
364	C_3H_5Br	1-Bromopropylene CH₃CH:CHBr......	120.955	−116.6	60.2	$1.428^{19.5}$	452
365	C_3H_5Br	2-Bromopropylene CH₃CBr:CH₂.......	120.955	−124.8	48.4	1.362^{20}	
366	C_3H_5Br	3-Bromopropylene BrCH₂CH:CH₂.....	120.955	−119.4	71.3	1.398	489
367	C_3H_5BrO	Bromoacetone CH₃COCH₂Br..........	136.955	−54	127	1.603	
368	$C_3H_5BrO_2$	*dl*-1-Bromopropionic acid...............	152.955	25.7	203.5	1.700	522
369	$C_3H_5BrO_2$	2-Bromopropionic acid..................	152.96	61			
370	$C_3H_5Br_3$	1, 1, 2-Tribromopropane...............	280.79		201	2.356	
371	$C_3H_5Br_3$	1, 2, 2-Tribromopropane...............	280.79		191	2.33^{12}	
372	$C_3H_5Br_3$	1, 2, 3-Tribromopropane...............	280.79	17	222	2.436^{23}	767
373	C_3H_5Cl	1-Chloropropylene CH₃CH:CHCl......	76.497		36		
374	C_3H_5Cl	2-Chloropropylene CH₃CCl:CH₂.......	76.497	−137.4	22.7	0.931^{0}	
375	C_3H_5Cl	3-Chloropropylene ClCH₂CH:CH₂.....	76.497	−136.4	44.6	0.938	222
376	$C_3H_5ClN_2O_6$	Chlorodinitrohydrin...................	200.51	6.8	123^{15}	1.54^{15}	
377	C_3H_5ClO	Chloroacetone CH₃COCH₂Cl..........	92.497	−44.5	121	1.162^{16}	
378	C_3H_5ClO	Propionyl chloride C₂H₅COCl.........	92.497	−94.0	80	1.065	152
379	C_3H_5ClO	α-Epichlorohydrin.....................	92.497	−25.6	117	1.184	895
380	$C_3H_5ClO_2$	Chloroacetyl carbinol..................	108.497	74 d.			
381	$C_3H_5ClO_2$	1-Chloropropionic acid.................	108.497		186	1.306^{9}	
382	$C_3H_5ClO_2$	2-Chloropropionic acid.................	108.497	61	204		
383	$C_3H_5ClO_2$	Ethyl chloroformate ClCO₂C₂H₅.......	108.497	−80.6	95	$1.139^{18.2}_{15}$	
384	$C_3H_5ClO_2$	Methyl chloroacetate ClCH₂CO₂CH₃...	108.497	−32.7	131.5	1.22	
385	$C_3H_5Cl_3$	1, 1, 2-Trichloropropane...............	147.413		137	1.372^{25}	
386	$C_3H_5Cl_3$	1, 1, 3-Trichloropropane...............	147.413		148	1.362^{15}	
387	$C_3H_5Cl_3$	1, 2, 2-Trichloropropane...............	147.413		123	1.318^{25}	
388	$C_3H_5Cl_3$	1, 2, 3-Trichloropropane...............	147.413	−14.7	156	1.417^{15}	
389	$C_3H_5Cl_3O$	1, 1, 1-Trichloroisopropyl alcohol........	163.413	50	161.3		
390	C_3H_5I	2-Iodopropylene CH₃CI:CH₂..........	167.97		103	1.835	
391	C_3H_5I	3-Iodopropylene ICH₂CH:CH₂........	167.97	−99.3	103.1	1.848^{12}_{12}	
392	C_3H_5IO	Iodoacetone CH₃COCH₂I.............	183.97		58.4^{11}	2.17^{15}	
393	$C_3H_5IO_2$	1-Iodopropionic acid CH₃CHICO₂H....	199.97	45.5	$105^{0.3}$		
394	$C_3H_5IO_2$	2-Iodopropionic acid ICH₂CH₂CO₂H...	199.97	82			
395	C_3H_5N	Propionitrile C₂H₅CN................	55.047	−91.9	97.1	0.783	22
396	C_3H_5N	Ethyl isocyanide C₂H₅NC............	55.047	<−66	79	$0.742^{21.3}$	19
397	C_3H_5NO	Ethyl isocyanate C₂H₅CNO...........	71.047		60	0.898	
398	C_3H_5NO	Acrylamide CH₂:CHCONH₂..........	71.047	85			
399	C_3H_5NO	2-Hydroxypropionitrile HOCH₂CH₂CN	71.047		221	1.059	
400	C_3H_5NO	Lactonitrile CH₃CH(OH)CN..........	71.047	−40.0	184 s. d.	0.992	944
401	$C_3H_5NO_2$	Isonitrosoacetone CH₃COCH(:NOH)...	87.407	69			
402	$C_3H_5NO_2$	Allyl nitrite C₃H₅ONO...............	87.047		44	0.955^{0}	
403	C_3H_5NS	Ethyl thiocyanate C₂H₅CNS..........	87.112	−85.5	144.4	0.996	494
404	C_3H_5NS	Ethyl isothiocyanate C₂H₅CSN........	87.112	−5.9	132	0.995	651
405	$C_3H_5NS_2$	μ-Mercaptothiazoline..................	119.177		217		
406	$C_3H_5N_3O_6$	Glycerol trinitrite.....................	179.06		154	$1.291^{10}_{15.5}$	
407	$C_3H_5N_3O_9$	Glycerol trinitrate....................	227.06	2.9 13.2	160^{15} exp. 260	1.601^{15}	
408	C_3H_6	Cyclopropane.........................	42.046	−126.6	−34.4	0.720^{-79}	
409	C_3H_6	Propylene CH₃CH:CH₂...............	42.046	−185.2	−47.0	0.609^{-47}_{4}	
410	C_3H_6AsN	Cacodyl cyanide (CH₃)₂AsCN.........	131.014		138		
411	$C_3H_6Br_2$	1, 1-Dibromopropane CH₃CH₂CHBr₂..	201.88		130		
412	$C_3H_6Br_2$	1, 2-Dibromopropane CH₃CHBrCH₂Br	201.88	−55.5	140	1.933	664
413	$C_3H_6Br_2$	1, 3-Dibromopropane..................	201.88	−34.4	167.0	1.979	671
414	$C_3H_6Br_2$	2, 2-Dibromopropane CH₃CBr₂CH₃....	201.88		114.5	1.783	
415	$C_3H_6Br_2O$	1, 1′-Dibromoisopropyl alcohol.........	217.88		219	2.11^{18}	

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
416	$C_3H_6Br_2O$	2, 3-Dibromopropyl alcohol	217.88		219	2.168^{0}	
417	$C_3H_6Cl_2$	1, 1-Dichloropropane $CH_3CH_2CHCl_2$	112.962		87	1.143^{10}	
418	$C_3H_6Cl_2$	1, 2-Dichloropropane $CH_3CHClCH_2Cl$	112.962		96.8	1.166^{14}	
419	$C_3H_6Cl_2$	1, 3-Dichloropropane $ClCH_2CH_2CH_2Cl$	112.962		125	1.201^{15}	
420	$C_3H_6Cl_2$	2, 2-Dichloropropane $CH_3CCl_2CH_3$	112.962		69.7	1.093	177
421	$C_3H_6Cl_2O$	1, 1-Dichloroisopropyl alcohol	128.96		147.8	1.333	
422	$C_3H_6Cl_2O$	1, 1′-Dichloroisopropyl alcohol	128.96		174	1.367	532
423	$C_3H_6Cl_2O$	2, 3-Dichloropropyl alcohol	128.96		183	1.355	
424	$C_3H_6Cl_2O_2$	Dichloromethylal $H_2C(OCH_2Cl)_2$	144.96		166	1.352$^{11}_{11}$	
425	$C_3H_6Cl_9N_3$	*cis*-Chloralimide	403.19	155			
426	C_3H_6INO	Iodoacetoxime $ICH_2C(:NOH)CH_3$	198.99	64.5			
427	$C_3H_6I_2$	1, 2-Diiodopropane CH_3CHICH_2I	295.91		d.	2.490	
428	$C_3H_6I_2$	1, 3-Diiodopropane $ICH_2CH_2CH_2I$	295.91	−13.0	224	2.576^{15}	797
429	$C_3H_6I_2$	2, 2-Diiodopropane $(CH_3)_2CI_2$	295.91		148 d.	2.446^{0}	
431	$C_3H_6N_2$	Pyrazoline	70.062		144		
432	$C_3H_6N_2O$	Ethyleneurea —$CH_2NHCONHCH_2$—	86.062	131			
433	$C_3H_6N_2O$	Ethylideneurea $CH_3CH:NCONH_2$	86.062	154	160 d		
434	$C_3H_6N_2OS$	Acetylthiourea $CH_3CONHCSNH_2$	118.13	165			
435	$C_3H_6N_2O_2$	Acetylurea $NH(COCH_3)_2$	102.062	217			
436	$C_3H_6N_2O_2$	Malonamide $H_2C(CONH_2)_2$	102.062	170			
437	$C_3H_6N_2O_2$	Methylglyoxime	102.06	153			
438	$C_3H_6N_2O_3$	Hydantoic acid	118.062	171			
439	$C_3H_6N_2O_3$	Propylnitrolic acid	118.06	66			
440	$C_3H_6N_2O_3$	Methyl allophanate	118.06	208			
441	$C_3H_6N_2O_3$	Propylpseudonitrole	118.06	76			
442	$C_3H_6N_2O_4$	Nitrourethane $C_2H_5CO_2NHNO_2$	134.06	64			
443	$C_3H_6N_2O_7$	Glycerol-1, 3-dinitrate	182.06	<-30	148^{15}	1.47^{15}	
444	$C_3H_6N_4O_3$	Ammonium fulminurate	146.078	d.			1166
445	$C_3H_6N_6$	Melamine $(CNNH_2)_3$	126.094	<250		1.573^{250}	1311
446	C_3H_6O	Allyl alcohol $CH_2:CHCH_2OH$	58.046	−129	97.0	0.855	204
447	C_3H_6O	Propionaldehyde C_2H_5CHO	58.046	−81	48.8	0.807	20
448	C_3H_6O	Acetone CH_3COCH_3	58.046	−94.3	56.1	0.7915	14
449	$C_3H_6O_2$	Acetyl carbinol CH_3COCH_2OH	74.046	−17	146	1.082$^{20}_{20}$	315
450	$C_3H_6O_2$	Propionic acid $C_2H_5CO_2H$	74.046	−22	141.1	0.992	63
451	$C_3H_6O_2$	Ethyl formate $HCO_2C_2H_5$	74.046	−80.5	54.3	0.906	15
452	$C_3H_6O_2$	Methyl acetate $CH_3CO_2CH_3$	74.046	−98.1	57.1	0.933	18
453	$C_3H_6O_2$	Glycide $C_2H_3OCH_2OH$	74.046		162 d.	1.165	
454	$C_3H_6O_3$	Glyceric aldehyde $HOCH_2CHOHCHO$	90.046	138			
455	$C_3H_4O_3$	Dihydroxyacetone $HOCH_2COCH_2OH$	90.046	75			
456	$C_3H_6O_3$	*d(l)*-Lactic acid $CH_3CH(OH)CO_2H$	90.046	27			
457	$C_3H_6O_3$	*dl*-Lactic acid $CH_3CH(OH)CO_2H$	90.046	18	122^{15}	1.249$^{15}_{4}$	381
458	$C_3H_6O_3$	Dimethyl carbonate $(CH_3O)_2CO$	90.046	0.5	89.7	1.069^{22}	
459	$C_3H_6O_3$	Ethyl acid carbonate $C_2H_5HCO_3$	90.046	−57			
460	$C_3H_6O_3$	Methyl glycollate $HOCH_2CO_2CH_3$	90.046		151.2	1.168^{18}	
461	$C_3H_6O_3$	α-Trihydroxymethylene	90.046	64	s. 46		
462	C_3H_6S	Allyl mercaptan $CH_2:CHCH_2SH$	74.111		90		
463	$C_3H_7AsO_3$	Allylarsonic acid	166.01	128			
464	C_3H_7Br	*n*-Propyl bromide $CH_3CH_2CH_2Br$	122.97	−110.0	70.9	1.353	346
465	C_3H_7Br	Isopropyl bromide $(CH_3)_2CHBr$	122.97	−89.0	59.6	1.310	289
466	C_3H_7BrO	Bromoisopropyl alcohol	138 97		148		
467	C_3H_7BrO	3-Bromopropyl alcohol	138.97		112^{135}	1.537	
468	C_3H_7Cl	*n*-Propyl chloride $CH_3CH_2CH_2Cl$	78.512	−122.8	46.6	0.890	71
469	C_3H_7Cl	Isopropyl chloride $(CH_3)_2CHCl$	78.512	−117.0	36.5	0.860	
470	C_3H_7ClO	Chloroisopropyl alcohol	94.512		126	1.115$^{20}_{20}$	371
471	C_3H_7ClO	2-Chloropropyl alcohol	94.512		134	1.103	354
472	$C_3H_7ClO_2$	2-Chloro-1, 3-dihydroxypropane	110.512		124.5$^{14.5}$	1.321	
473	$C_3H_7ClO_2$	3-Chloro-1, 2-dihydroxypropane	110.512		213 d.	1.322	
474	C_3H_7F	*n*-Propyl fluoride $CH_3CH_2CH_2F$	62.054		2		
475	C_3H_7I	*n*-Propyl iodide $CH_3CH_2CH_2I$	169.99	−101.4	102.4	1.747	621
476	C_3H_7I	Isopropyl iodide $(CH_3)_2CHI$	169.99	−90.8	89.5	1.703	597
477	C_3H_7IO	Iodoisopropyl alcohol	185.99		105^{60}		
478	C_3H_7IO	3-Iodopropyl alcohol	185.99		225.4	2.349^{13}	
479	C_3H_7N	Allylamine $CH_2:CHCH_2NH_2$	57.062		53.2	0.761	237

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
480	C_3H_7NO	Aminoacetone $CH_3COCH_2NH_2$	73.062		189 d.		
481	C_3H_7NO	Acetoxime $CH_3CH{:}NOH$	73.062	61	136.3	0.97_{20}^{20}	1162
482	C_3H_7NO	Propionamide $C_2H_5CONH_2$	73.062	79	213	1.042	1153
483	C_3H_7NOS	Thiourethane $C_2H_5COSNH_2$	105.13	108			
484	$C_3H_7NO_2$	*d*-Alanine $CH_3CH(NH_2)CO_2H$	89.062				1225
485	$C_3H_7NO_2$	*dl*-Alanine	89.062	295	s. >200		
486	$C_3H_7NO_2$	Sarcosine $CH_3NHCH_2CO_2H$	89.062	210 d.			
487	$C_3H_7NO_2$	1-Nitropropane $C_2H_5CH_2NO_2$	89.062		131.5	1.011^{15}	136
488	$C_3H_7NO_2$	2-Nitropropane $CH_3CH(NO_2)CH_3$	89.062		120	1.024^{0}	
489	$C_3H_7NO_2$	Propyl nitrite C_3H_7ONO	89.062		57	0.935	16
490	$C_3H_7NO_2$	Isopropyl nitrite $(CH_3)_2CHONO$	89.062		45	0.844^{25}	
491	$C_3H_7NO_2$	Lactamide $CH_3CH(OH)CONH_2$	89.062	74		1.138_{4}^{80}	
492	$C_3H_7NO_2$	Urethane $C_2H_5OCONH_2$	89.062	48	180	1.11_{20}^{20}	
493	$C_3H_7NO_3$	*dl*-Serine $HOCH_2CH(NH_2)CO_2H$	105.062	246 d.			
493.1	$C_3H_7NO_3$	*d*-Serine $HOCH_2CH(NH_2)CO_2H$	105.062	228 d.			1249
494	$C_3H_7NO_3$	Isoserine $H_2NCH_2CH(OH)CO_2H$	105.062	242 d.			
495	$C_3H_7NO_3$	Propyl nitrate $C_3H_7ONO_2$	105.062		100.5	1.053^{25}	105
496	$C_3H_7NO_3$	Isopropyl nitrate $(CH_3)_2CHONO_2$	105.062		102	1.036	
497	$C_3H_7NO_5$	Glycerol-1-nitrate	137.06	58	160	1.40	
498	$C_3H_7NO_5$	Glycerol-2-nitrate	137.06	54	160	1.40	
499	$C_3H_7N_3O$	Acetaldehyde semicarbazone	101.08	162			
500	C_3H_8	Propane $CH_3CH_2CH_3$	44.062	−189.9	−44.5	$0.585_{4}^{-44.5}$	
501	$C_3H_8ClNO_2S$	Cysteine hydrochloride	157.59	175			
502	$C_3H_8N_2O$	1, 2-Dimethylurea $CO(NHCH_3)_2$	88.078	102.5	270	1.142	
503	$C_3H_8N_2O$	1, 1-Dimethylurea $(CH_3)_2NCONH_2$	88.078	182		1.255	
504	$C_3H_8N_2O$	Ethylurea $C_2H_5NHCONH_2$	88.078	92		1.213^{18}	
505	C_3H_8O	*n*-Propyl alcohol $C_2H_5CH_2OH$	60.062	−127	97.8	0.804	59
506	C_3H_8O	Isopropyl alcohol $(CH_3)_2CHOH$	60.062	−85.8	82.3	0.786	37
508	C_3H_8O	Methyl ethyl ether $CH_3OC_2H_5$	60.062		7.9	0.697	
509	$C_3H_8OS_2$	1, 2-Dithioglycerol	124.192	130 d.		$1.342^{14.4}$	
510	$C_3H_8O_2$	1, 2-Propyleneglycol	76.062		189	1.038^{23}	
511	$C_3H_8O_2$	Trimethyleneglycol $HO(CH_2)_3OH$	76.062		214 d.	1.053	
512	$C_3H_8O_2$	Glycol methyl ether $HOCH_2CH_2OCH_3$	76.062		124.6	0.969_{15}^{15}	
513	$C_3H_8O_2$	Methylal $HCH(OCH_3)_2$	76.062	−104.8	44	0.862	8
514	$C_3H_8O_2S$	1-Thioglycerol $HOCH_2CH_2(OH)CH_2SH$	108.127		d.	$1.295^{14.4}$	
515	$C_3H_8O_3$	Glycerol $HOCH(CH_2OH)_2$	92.062	17.9	290	1.260	512
516	$C_3H_8S_3$	Trithioglycerol $HSCH(CH_2SH)_2$	140.257	d.		$1.391^{14.4}$	
517	C_3H_8S	Methyl ethyl sulfide $CH_3SC_2H_5$	76.127	−104.8	66	0.837	
518	C_3H_8S	*n*-Propyl mercaptan C_3H_7SH	76.127	−111.5	68		
519	C_3H_8S	Isopropyl mercaptan $(CH_3)_2CHSH$	76.127		60		
520	C_3H_9As	Trimethylarsine $(CH_3)_3As$	120.029		52.8	1.124^{22}	
521	$C_3H_9AsO_3$	Propylarsonic acid $C_3H_7AsO_3H$	168.03	126			
522	C_3H_9Bi	Trimethyl bismuthine $(CH_3)_3Bi$	254.07		110	2.300^{18}	
523	$C_3H_9ClN_2O$	Lactamidine hydrochloride	124.54	171			
524	C_3H_9N	*n*-Propylamine $C_3H_7NH_2$	59.077	−83.0	48.7	0.719	72
525	C_3H_9N	Isopropylamine $(CH_3)_2CHNH_2$	59.077	−101.2	34	0.694	875
526	C_3H_9N	Trimethylamine $(CH_3)_3N$	59.077	−124.0	3.5	$0.662^{-5.2}$	
527	$C_3H_9N_3O_2$	Guanidine acetate	119.09	230			
528	$C_3H_9O_4P$	Trimethyl phosphate $(CH_3)_3PO_4$	140.09		193	1.220^{15}	
529	C_3H_9P	Propylphosphine $C_3H_7PH_2$	76.093		53.5		
530	C_3H_9P	Trimethylphosphine $(CH_3)_3P$	76.093		42	>1	
531	C_3H_9Sb	Trimethylstibine $(CH_3)_3Sb$	166.84		80.6	1.523^{15}	
532	$C_3H_{10}ClN$	Trimethylamine hydrochloride	95.543	275 d.			
533	$C_3H_{10}N_2$	*dl*-Propylenediamine $CH_2(CH_2NH_2)_2$	74.093		119	0.878	
534	$C_3H_{10}N_2$	Trimethylenediamine $H_2N(CH_2)_3NH_2$	74.093		135.5		
535	$C_3H_{12}N_6O_3$	Guanidine carbonate	180.14	197		1.251^{4}	1169
537	C_4Br_4S	Thiophene tetrabromide	399.73	112			
538	$C_4Cl_{10}O$	Perchloroether $(C_2Cl_5)_2O$	418.58	69		1.900^{14}	
539	$C_4F_6O_3$	Trifluoroacetic anhydride $(F_3CCO)_2O$	210.00	−65	40.5		
540	C_4I_2	Diiododiacetylene $IC{:}CC{:}CI$	301.86	101			
541	C_4HBr_4N	Tetrabromopyrrole	382.68	250			
542	C_4HI_4N	Tetraiodopyrrole	570.74	150 d.			
543	C_4HN_3	Cyanoform $CH(CN)_3$	91.032	93.5			

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
544	$C_4H_2ClN_2O_3$	5, 5-Dichlorobarbituric acid	196.95	211 d.			
545	$C_4H_2Cl_2O_2$	Fumaryl chloride ClOCCH:CHCOCl	152.93		160	1.410	938
546	$C_4H_2I_2S$	Thiophene diiodide	335.94	40			
547	$C_4H_2N_2O_4$	Alloxan $OC(NHCO)_2CO$	142.03	256 d.			
548	$C_4H_2O_3$	Maleic anhydride $(:CHCO)_2O$	98.015	57	202	0.934	
549	$C_4H_2O_4$	Acetylenedicarboxylic acid	114.02	179			
550	$C_4H_3BrO_4$	Bromofumaric acid	194.94	186			
551	$C_4H_3BrO_4$	Bromomaleic acid $HO_2CCBr:CHCO_2H$	194.94	141			
552	$C_4H_3ClN_2O_3$	5-Chlorobarbituric acid	162.50	295 s. d.			
553	$C_4H_3NO_2S$	2-Nitrothiophene	129.096	46.5	225		
554	$C_4H_3N_3O_4$	Violuric acid	157.05	224 d.			
555	$C_4H_4AsCl_3$	*bis*-2-Chlorovinyl chloroarsine	233.36		230	1.702	
556	C_4H_4BrNS	2-Bromoallyl isothiocyanate	178.02		200		
557	$C_4H_4Br_2O_4$	1, 2-Dibromosuccinic acid	275.86	255			
558	$C_4H_4Cl_2O_2$	Succinyl chloride $(CH_2COCl)_2$	154.95	17	192	1.395	872
559	$C_4H_4Cl_2O_3$	Chloroacetic anhydride $(ClCH_2CO)_2O$	170.95	46	163^{116}		
560	$C_4H_4N_2$	Succinyl nitrile $(CH_2CN)_2$	80.047	54.5	267	$0.985_4^{63.1}$	1097
561	$C_4H_4N_2$	Pyridazine (1, 2-Diazine)	80.047	−8	208	1.107	1015
562	$C_4H_4N_2$	Pyrimidine (1, 3-Diazine)	80.047	22	124		
563	$C_4H_4N_2$	Pyrazine (1, 4-Diazine)	80.047	53	118	1.031_4^{61}	1091
564	$C_4H_4N_2O_2$	Uracil —NHCONHCH:CHCO—	112.05	338			
565	$C_4H_4N_2O_3$	Barbituric acid $OC(NHCO)_2CH_2$	128.047	245	260 d.		
567	$C_4H_4N_4$	Hydrocyanic acid (tetramer)	108.063	179 d.			
568	C_4H_4O	Tetrolic aldehyde $CH_3C\vdots CCHO$	68.031	−26	107	0.927^{17}	913
569	C_4H_4O	Furfural (Furan)	68.031		31	0.937	260
570	$C_4H_4O_2$	Tetrolic acid $CH_3C\vdots CCO_2H$	84.031	76.5	203		
571	$C_4H_4O_3$	Succinic anhydride	100.031	119.6	261	1.104	
572	$C_4H_4O_3$	Tetronic acid $—OCH_2C(OH):CHCO—$	100.03	141			
573	$C_4H_4O_4$	Fumaric acid $(:CHCO_2H)_2$	116.031	287	290	1.635	
574	$C_4H_4O_4$	Maleic acid $(:CHCO_2H)_2$	116.031	130.5	135 d.	1.590	
575	$C_4H_4O_5$	Hydroxymaleic acid	132.03	152			
576	C_4H_4S	Thiophene	84.096	−40.0	85	1.065	693
577	$C_4H_5BrO_4$	Bromosuccinic acid	196.95	159			
578	C_4H_5ClO	Crotonyl chloride $CH_3CH:CHCOCl$	104.497		125	1.091	
579	$C_4H_5ClO_2$	1-Chloro-α-crotonic acid	120.50	99			
580	$C_4H_5ClO_2$	1-Chloro-β-crotonic acid	120.50	66			
581	$C_4H_5ClO_2$	2-Chloro-β-crotonic acid	120.50	61			
582	$C_4H_5Cl_3O$	1, 1, 2-Trichlorobutyraldehyde	175.41		165.4	1.396	523
583	$C_4H_5Cl_3O_2$	1, 1, 2-Trichlorobutyric acid	191.41	60	238		
584	$C_4H_5Cl_3O_2$	1, 1, 3-Trichlorobutyric acid	191.41	75			
585	$C_4H_5Cl_3O_2$	Ethyl trichloroacetate $Cl_3CCO_2C_2H_5$	191.41		168	1.383	437
586	$C_4H_5F_3O_2$	Ethyl trifluoroacetate $F_3CCO_2C_2H_5$	142.039		61.7	1.195^{18}	1
587	C_4H_5N	Allyl cyanide $CH_2:CHCH_2CN$	67.047		116.1	0.832	212
588	C_4H_5N	Allyl isocyanide $CH_2:CHCH_2NC$	67.047		106	0.794^{17}	
589	C_4H_5N	Pyrrole	67.047		131	0.948	612
590	$C_4H_5NO_2$	Ethyl cyanoformate $NCCO_2C_2H_5$	99.047		116	1.013	
591	$C_4H_5NO_2$	Methyl cyanoacetate $NCCH_2CO_2CH_3$	99.047		200	1.123_4^{15}	
592	$C_4H_5NO_2$	Succinimide	99.047	124	288	1.412^{16}	1333
593	C_4H_5NS	Allyl thiocyanate $CH_2:CHCH_2CNS$	99.112		161	1.050	
594	C_4H_5NS	Allyl isothiocyanate $CH_2:CHCH_2CSN$	99.112	−100.0	150.7	1.010^{20}	687
595	C_4H_6	1, 2-Butadiene $CH_2:C:CHCH_3$	54.046		19		
596	C_4H_6	1, 3-Butadiene $CH_2:CHCH:CH_2$	54.046		−2.6		
597	C_4H_6	Dimethylacetylene $(CH_3C\vdots)_2$	54.046		28.9		
598	C_4H_6	Ethylacetylene $C_2H_5C\vdots CH$	54.046	−130	18.5	0.668^{0}	101
599	$C_4H_6As_2O_4$	Diarsenodiacetic acid	267.97	205 d.			
600	$C_4H_6Br_2O_2$	Ethyl dibromoacetate $Br_2CHCO_2C_2H_5$	245.88		194	1.903	588
601	$C_4H_6Br_4$	1, 1, 4, 4-Tetrabromobutane	373.71		145^{10}	2.529	782
602	$C_4H_6Br_4$	1, 2, 3, 4-Tetrabromobutane	373.71	19; 39	181^{60}		
603	$C_4H_6Br_4$	2, 2, 3, 3-Tetrabromobutane	373.71	39	230		
604	$C_4H_6Cl_2O_2$	Ethyl dichloroacetate	156.96		158.2	1.282	367
604.1	$C_4H_6Cl_2O_2$	Methyl 1, 2-dichloropropionate	156.96		92^{50}	1.328	
605	$C_4H_6Cl_4O$	1, 2, 2, 2-Tetrachloroethyl ether	211.88		189.7	1.422	
606	$C_4H_6N_2$	1-Methylimidazole	82.062	−6	199	1.036^{10}	

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
607	$C_4H_6N_2$	4-Methylimidazole	82.062	56	262.9	1.008	
608	$C_4H_6N_2$	1-Methylpyrazole	82.062		127	0.993_4^{14}	828
608.1	$C_4H_6N_2$	3-Methylpyrazole	82.062			1.020	898
608.2	$C_4H_6N_2$	5-Methylpyrazole	82.062		204	1.022	
609	$C_4H_6N_2O_2$	Ethyl diazoacetate	114.062	−22	59^{12}	$1.085^{17.6}$	927
609.1	$C_4H_6N_2O_3S$	3-Methylpyrazole-4-sulfonic acid	162.22	258			1267
610	$C_4H_6N_4O_3$	Allantoin	158.08	235			1328
611	$C_4H_6N_4O_{12}$	Erythritol tetranitrate	302.08	61			
612	C_4H_6O	Methyl propargyl ether	70.046		62	$0.83^{12.5}$	
613	C_4H_6O	Vinyl ether $(CH_2:CH)_2O$	70.046		39		
614	C_4H_6O	Crotonaldehyde $CH_3CH:CHCHO$	70.046	−75	104	0.859_4^{14}	361
615	C_4H_6O	Dimethylketene $(CH_3)_2C:CO$	70.046	−97.5	34.3		
616	$C_4H_6O_2$	Succinic dialdehyde $(CH_2CHO)_2$	86.046		57^{10}	1.064	290
617	$C_4H_6O_2$	α-Crotonic acid $CH_3CH:CHCO_2H$	86.046	72	185	$0.964^{79.7}$	1112
619	$C_4H_6O_2$	β-Crotonic acid $CH_2:C(CH_3)CO_2H$	86.046	14.6	171.9 d.	1.027	411
620	$C_4H_6O_2$	1-Methylacrylic acid	86.046	16	163	1.015	333
621	$C_4H_6O_2$	Trimethylenecarboxylic acid	86.046	17	182.5	1.088	
622	$C_4H_6O_2$	Vinylacetic acid $CH_2:CHCH_2CO_2H$	86.046	−39	163	1.013_{15}^{15}	849
623	$C_4H_6O_2$	Allyl formate $HCO_2C_3H_5$	86.046		83	0.948^{18}	
624	$C_4H_6O_2$	Methyl acrylate $CH_2:CHCO_2CH_3$	86.046		80.5	0.956^{18}	113
625	$C_4H_6O_2$	Diacetyl $CH_3COCOCH_3$	86.046		88	0.975	85
626	$C_4H_6O_3$	Acetic anhydride $(CH_3CO)_2O$	102.046	−73.0	139.6	1.082	81
627	$C_4H_6O_3$	1-Ketobutyric acid $C_2H_5COCO_2H$	102.046	32	85^{21}		
628	$C_4H_6O_3$	Methyl pyruvate $CH_3COCO_2CH_3$	102.046		137	1.154^0	
629	$C_4H_6O_4$	Succinic acid $(CH_2CO_2H)_2$	118.046	185	235	1.562	1220
630	$C_4H_6O_4$	Isosuccinic acid $CH_3CH(CO_2H)_2$	118.046	135		1.455	
631	$C_4H_6O_4$	Dimethyl oxalate $(CO_2CH_3)_2$	118.046	54.0	163.3	1.120_4^{82}	1122
632	$C_4H_6O_4$	Ethyl hydrogen oxalate $HO_2CCO_2C_2H_5$	118.046		117^{15}	1.218	
633	$C_4H_6O_5$	Diglycollic acid $O(CH_2CO_2H)_2$	134.05	148			
634	$C_4H_6O_5$	Glycollic anhydride $(CH_2OHCO)_2O$	134.05	130			
635	$C_4H_6O_5$	*l*-Malic acid $HO_2CCH_2CH(OH)CO_2H$	134.05	100	140 d.	1.595	
636	$C_4H_6O_5$	*dl*-Malic acid	134.05	129	150 d.	1.601	
637	$C_4H_6O_5$	Isomalic acid $CH_3C(OH)(CO_2H)_2$	134.05	160 d.			
638	$C_4H_6O_6$	Mesotartaric acid	150.05	140		1.666	1224
639	$C_4H_6O_6$	*d*-Tartaric acid	150.05	170		1.760	1222
640	$C_4H_6O_6$	*dl*-Tartaric acid	150.05	206		1.687	
641	$C_4H_6O_8$	Dihydroxytartaric acid	182.05	114			
642	C_4H_6S	Divinyl sulfide $(CH_2:CH)_2S$	86.111		101	0.912	
643	C_4H_7Br	Vinylethyl bromide $CH_2:CHCH_2CH_2Br$	134.97		99.0		
644	C_4H_7BrO	Bromomethyl ethyl ketone	150.97		146		
645	$C_4H_7BrO_2$	1-Bromobutyric acid $C_2H_5CHBrCO_2H$	166.97	−4	115^{20}	1.574_{15}^{15}	
646	$C_4H_7BrO_2$	2-Bromobutyric acid	166.97	18	122^{16}		
647	$C_4H_7BrO_2$	3-Bromobutyric acid	166.97	32			
648	$C_4H_7BrO_2$	1-Bromoethyl acetate	166.97		63^{39}	1.4620	395
648.1	$C_4H_7BrO_2$	2-Bromoethyl acetate	166.97		70^{27}	1.5140	450
648.2	$C_4H_7BrO_2$	Ethyl bromoacetate $BrCH_2CO_2C_2H_5$	166.97		159	1.514_4^{13}	438
648.3	$C_4H_7BrO_2$	Methyl 1-bromopropionate	166.97		68.5^{48}	1.4917	436
648.4	$C_4H_7BrO_2$	Methyl 2-bromopropionate	166.97		79^{36}	1.5192	460
649	$C_4H_7Br_3$	1, 2, 3-Tribromobutane	294.80		113^{19}	2.190	752
650	$C_4H_7Br_3O$	1, 1, 1-Tribromo-*tert.*-butyl alcohol	310.80	176			
651	C_4H_7ClO	Butyryl chloride C_3H_7COCl	106.51	−89.0	102	1.028	194
652	C_4H_7ClO	Isobutyryl chloride $(CH_3)_2CHCOCl$	106.51	−90.0	92	1.017	168
653	$C_4H_7ClO_2$	1-Chlorobutyric acid $C_2H_5CHClCO_2H$	122.51		101.3^{15}		
654	$C_4H_7ClO_2$	*d*-2-Chlorobutyric acid	122.51	44	100^{13}		
655	$C_4H_7ClO_2$	*dl*-2-Chlorobutyric acid	122.51	16.5	116^{22}	1.186	386
656	$C_4H_7ClO_2$	3-Chlorobutyric acid	122.51	16	196^{22}	1.250^{10}	
657	$C_4H_7ClO_2$	1-Chloroethyl acetate	122.51		46^{35}	1.1124	190
657.1	$C_4H_7ClO_2$	2-Chloroethyl acetate	122.51		145	1.178^0	285
658	$C_4H_7ClO_2$	Ethyl chloroacetate $ClCH_2CO_2C_2H_5$	122.51		144.2	1.159	267
659	$C_4H_7ClO_2$	Methyl 2-chloropropionate	122.51		148	1.187	
660	$C_4H_7ClO_2$	*n*-Propyl chloroformate $ClCO_2C_3H_7$	122.51		116	1.083_{25}^{25}	
661	$C_4H_7Cl_3O$	1, 2, 2-Trichloroethyl ethyl ether	177.43		170	1.330^{14}	
662	$C_4H_7Cl_3O$	1, 1, 1-Trichloro-*tert.*-butyl alcohol	177.43	97	166.4		

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
663	$C_4H_7Cl_3O_2$	Chloral alcoholate $Cl_3CCHO.C_2H_5OH$	193.43	55	115	1.143^{40}	
664	$C_4H_7Cl_3O_2$	1, 1, 2-Trichlorobutyraldehyde hydrate	193.43	78		1.694^{4}	
665	$C_4H_7FO_2$	Ethyl fluoroacetate $FCH_2CO_2C_2H_5$	106.054			1.093	33
666	$C_4H_7IO_2$	Ethyl iodoacetate $ICH_2CO_2C_2H_5$	213.99		180	$1.817^{12.7}$	618
667	C_4H_7N	*n*-Butyronitrile C_3H_7CN	69.062	−112.6	118	0.794	47
668	C_4H_7N	Isobutyronitrile $(CH_3)_2CHCN$	69.062		108		
669	C_4H_7N	Isopropylisocyanide $(CH_3)_2CHNC$	69.062		87	0.760	
670	C_4H_7N	Pyrroline	69.062		91	0.910	
671	C_4H_7NO	Acetonecyanhydrin $(CH_3)_2C(OH)CN$	85.062	−19	82^{23}	0.932^{19}	117
672	C_4H_7NO	α-Pyrrolidone	85.062	25	250.8	1.116	
673	$C_4H_7NO_2$	Diacetamide $NH(COCH_3)_2$	101.062	78	223.5		
674	$C_4H_7NO_2$	Diacetylmonoxime $CH_3COC(:NOH)CH_3$	101.062	74	186		
675	$C_4H_7NO_2S$	Ethyl thiooxamate $H_2NCSCO_2C_2H_5$	133.13	63			
676	$C_4H_7NO_3$	Acetylaminoacetic acid	117.062	206			
677	$C_4H_7NO_3$	Diacetohydroxamic acid	117.06	89			
678	$C_4H_7NO_3$	Ethyl oxamate $H_2NCO.CO_2C_2H_5$	117.06	115			
679	$C_4H_7NO_4$	*l*-Aspartic acid	133.06	270		$1.661^{12.5}_{12.5}$	
679.1	$C_4H_7NO_7$	Nitrotetronic acid dihydrate	181.06	d. 184		1.684	1190
680	$C_4H_7NO_8$	Ammonium tetraoxalate	197.06	130.5		1.607	
681	C_4H_7NS	Propyl isothiocyanate	101.127		153	0.991	
682	$C_4H_7N_3O$	Creatinine	113.078	260 d.			
683	C_4H_8	Cyclobutane $(CH_2)_4$	56.062	−50	13	0.703^{0}_{4}	801
684	C_4H_8	1, 1-Dimethylethylene $CH_2:C(CH_3)_2$	56.062		−6		
685	C_4H_8	1, 2-Dimethylethylene $CH_3CH:CHCH_3$	56.062		1.4		
686	C_4H_8	Ethylethylene $C_2H_5CH:CH_2$	56.062	−130	−18	0.668^{0}	102
687	C_4H_8	Methylcyclopropane $(CH_2)_2CHCH_3$	56.062		5	0.691^{-20}	
688	$C_4H_8Br_2$	1, 2-Dibromobutane $C_2H_5CHBrCH_2Br$	215.89		166	1.820	
689	$C_4H_8Br_2$	1, 3-Dibromobutane	215.89		174	1.807	632
690	$C_4H_8Br_2$	1, 4-Dibromobutane $Br(CH_2)_4Br$	215.89	−20	198 d.	1.79^{18}	
691	$C_4H_8Br_2$	2, 3-Dibromobutane $CH_3(CHBr)_2CH_3$	215.89		158	1.83^{0}	
693	$C_4H_8Br_2$	1, 2-Dibromo-2-methylpropane	215.89	−70.3	149.0	1.759	639
694	$C_4H_8Br_2S$	Di-(1-bromoethyl) sulfide	247.96		87^{15}	1.742	
695	$C_4H_8Cl_2$	1, 2-Dichloro-2-methylpropane	126.98		108		
696	$C_4H_8Cl_2O$	2-Chloroethyl ether $(ClCH_2CH_2)_2O$	142.98		178	1.213^{20}_{20}	461
697	$C_4H_8Cl_2O$	1, 2-Dichloroethyl ethyl ether	142.98		145	1.174^{23}	
697.1	$C_4H_8Cl_2O_2$	Dichlorobutylene glycol	158.98	126			1177
698	$C_4H_8Cl_2S$	Di-(1-chloroethyl) sulfide	159.04		67.5^{27}	1.199^{14}_{4}	
699	$C_4H_8Cl_2S$	Di-(2-chloroethyl) sulfide $(CH_3CHCl)_2S$	159.04	13.5	120^{34}	1.285^{15}_{4}	701
700	$C_4H_8Cl_2OS$	Di-(2-chloroethyl) sulfoxide	175.04	110	140^{28} d.		
701	$C_4H_8Cl_2O_2S$	Di-(2-chloroethyl) sulfone	191.04	53.5	181^{15}		
702	$C_4H_8N_2$	2-Methyl-4, 5-dihydroimidazole	84.078	106	198		
703	$C_4H_8N_2O_2$	1-Acetyl-2-methylurea	116.08	180			
704	$C_4H_8N_2O_2$	Dimethyloxamide $(CONHCH_3)_2$	116.08	210			
705	$C_4H_8N_2O_2$	Dimethylglyoxime	116.08	246			
706	$C_4H_8N_2O_2$	Succinamide $(CH_2CONH_2)_2$	116.078	243			
707	$C_4H_8N_2O_3$	Ethyl allophanate $H_2NCONHCO_2C_2H_5$	132.08	192			
708	$C_4H_8N_2O_3$	*l*-Asparagine	132.08	226	235 d.	1.543^{15}_{4}	1254
709	$C_4H_8N_2O_4$	*d*-Tartaramide $[CH(OH)CONH_2]_2$	148.08	195			
710	$C_4H_8N_2S$	Allylthiourea $CH_2:CHCH_2NHCONH_2$	116.143	78.4		1.219^{20}_{20}	
711	C_4H_8O	Crotonyl alcohol $CH_3CH:CHCH_2OH$	72.062	> −30	118	0.854	276
712	C_4H_8O	Cyclobutanol $(CH_2)_3CHOH$	72.062		124.1	0.923^{15}_{15}	343
713	C_4H_8O	Cyclopropyl carbinol $(CH_2)_2CHCH_2OH$	72.062		124.3	0.899	850
714	C_4H_8O	Vinylethyl alcohol $CH_2:CHCH_2CH_2OH$	72.062		114	0.856^{0}	
715	C_4H_8O	Methyl allyl ether $CH_2:CHCH_2OCH_3$	72.062		46	0.77^{11}	
716	C_4H_8O	Vinyl ethyl ether $CH_2:CHOC_2H_5$	72.062		35.5	$0.763^{14.5}_{17.5}$	
717	C_4H_8O	*n*-Butyraldehyde C_3H_7CHO	72.062	−99.0	75.7	0.817	50
718	C_4H_8O	Isobutyraldehyde $(CH_3)_2CHCHO$	72.062	−65.9	61	0.794	30
719	C_4H_8O	Methyl ethyl ketone $CH_3COC_2H_5$	72.062	−86.4	79.6	0.805	40
720	$C_4H_8O_2$	Erythrol	88.062		196.5	1.047	
721	$C_4H_8O_2$	Methylacetyl carbinol (Acetoin)	88.062	15	142	1.002^{15}_{4}	303
722	$C_4H_8O_2$	2-Hydroxybutyraldehyde (Aldol)	88.062		83^{20}	1.103	
723	$C_4H_8O_2$	*n*-Butyric acid $C_3H_7CO_2H$	88.062	−7.9	163.5	0.959	109
724	$C_4H_8O_2$	Isobutyric acid $(CH_3)_2CHCO_2H$	88.062	−47.0	154.4	0.949	88

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
725	$C_4H_8O_2$	Ethyl acetate $CH_3COC_2H_5$	88.062	−83.6	77.1	0.899	29
726	$C_4H_8O_2$	Methyl propionate $C_2H_5CO_2CH_3$	88.062	−87.5	79.9	0.917	36
727	$C_4H_8O_2$	*n*-Propyl formate $HCO_2C_3H_7$	88.062	−92.9	81.3	0.901	35
728	$C_4H_8O_2$	Isopropyl formate $HCO_2CH(CH_3)_2$	88.062		71.3	0.883^{0}	
729	$C_4H_8O_3$	Ethoxyacetic acid $C_2H_5OCH_2CO_2H$	104.062		206		
730	$C_4H_8O_3$	1-Hydroxybutyric acid	104.062	42.5	260		
731	$C_4H_8O_3$	1-Hydroxyisobutyric acid	104.062	79	212		
732	$C_4H_8O_3$	2-Hydroxybutyric acid	104.062		130^{14}		
733	$C_4H_8O_3$	Ethyl glycollate $HOCH_2CO_2C_2H_5$	104.062		160	1.083^{23}	
734	$C_4H_8O_3$	Glycol acetate $HOCH_2CH_2OCOCH_3$	104.062		182		
735	$C_4H_8O_3$	Methylethyl carbonate $CH_3(C_2H_5)CO_3$	104.062	−14.5	109.2	1.002^{27}	
736	$C_4H_8O_3$	Methyl hydracrylate	104.062		79^{12}	1.118	336
737	$C_4H_8O_3$	Methyl lactate $CH_3CH(OH)CO_2CH_3$	104.062		144.8	1.08^{16}	883
738	$C_4H_8O_4$	1, 2-Dihydroxybutyric acid	120.06	75			
739	$C_4H_8O_4$	*d*-Methyl glycerinate	120.06		120^{14}	1.280^{15}_{15}	
740	$C_4H_8S_2$	Diethylene disulfide	120.192	112	200		
741	C_4H_9Br	*n*-Butyl bromide C_4H_9Br	136.99	−112.4	101.6	1.275	372
742	C_4H_9Br	Isobutyl bromide $(CH_3)_2CHCH_2Br$	136.99	−118.5	91.5	1.264	352
743	C_4H_9Br	*sec.*-Butyl bromide $C_2H_5CHBrCH_3$	136.99		91.3	1.251^{25}_{4}	347
744	C_4H_9Br	*tert.*-Butyl bromide $(CH_3)_3CBr$	136.99	−20	73.3	1.222	309
745	C_4H_9BrO	2-Bromoethyl ethyl ether	152.99		128.2	1.370^{0}	
746	C_4H_9Cl	*n*-Butyl chloride C_4H_9Cl	92.527	−123.1	78.0	0.884	132
747	C_4H_9Cl	Isobutyl chloride $(CH_3)_2CHCH_2Cl$	92.527	−131.2	68.9	0.875	98
748	C_4H_9Cl	*sec.*-Butyl chloride $C_2H_5CHClCH_3$	92.527		68	0.871	110
749	C_4H_9Cl	*tert.*-Butyl chloride $(CH_3)_3CCl$	92.527	−28.5	51.0	0.840	60
751	C_4H_9ClO	1-Chloroethyl ethyl ether	108.527		98		
752	C_4H_9ClO	*tert.*-Butyl hypochlorite $(CH_3)_3CClO$	108.527		80	0.958	
753	C_4H_9ClS	2-Chloroethyl ethyl sulfide	124.59		157		
754	C_4H_9I	*n*-Butyl iodide C_4H_9I	184.00	−103.5	127	1.617	600
755	C_4H_9I	Isobutyl iodide $(CH_3)_2CHCH_2I$	184.00	−93.5	120.4	1.605	578
756	C_4H_9I	*sec.*-Butyl iodide $C_2H_5CHICH_3$	184.00	−104.0	117.5	1.595	
757	C_4H_9IO	2-Iodoethyl ethyl ether $C_2H_5OCH_2CH_2I$	200.00		155	1.670	
758	C_4H_9N	Crotonylamine $CH_3CH:CHCH_2NH_2$	71.077		81		
759	C_4H_9N	Tetrahydropyrrole (Pyrrolidine)	71.077		88.5	0.871^{10}	
760	C_4H_9NO	*n*-Butyramide $C_3H_7CONH_2$	87.077	116	216	1.032	
761	C_4H_9NO	Isobutyramide $(CH_3)_2CHCONH_2$	87.077	129	220	1.013	
762	C_4H_9NO	*N*-Dimethylacetamide $CH_3CON(CH_3)_2$	87.077		165.7	0.943	365
763	C_4H_9NO	*N*-Ethylacetamide $CH_3CONHC_2H_5$	87.077		205	0.942	
764	C_4H_9NO	Methyl ethyl ketoxime	87.077		152	0.923	393
765	$C_4H_9NO_2$	Iminoethyl alcohol $HN(CHCH_2O_2H)_2$	103.077	28	270		
766	$C_4H_9NO_2$	1-Aminobutyric acid	103.077	285			
767	$C_4H_9NO_2$	2-Aminobutyric acid	103.077	184			
768	$C_4H_9NO_2$	3-Aminobutyric acid	103.08	193			
769	$C_4H_9NO_2$	1-Aminoisobutyric acid	103.077		280		
770	$C_4H_9NO_2$	Ethylaminoacetic acid	103.08	> 160			
771	$C_4H_9NO_2$	Propyl carbamate $C_3H_7OCONH_2$	103.077	53	200		
772	$C_4H_9NO_2$	*n*-Butyl nitrite C_4H_9ONO	103.077		75	0.911^{0}	
773	$C_4H_9NO_2$	Isobutyl nitrite $(CH_3)_2CHCH_2ONO$	103.077		67	0.877^{16}	28
773.1	$C_4H_9NO_2$	Methy urethane $CH_3NHCO_2C_2H_5$	103.077		170	$1.009^{18.9}_{4}$	950
774	$C_4H_9NO_3$	*n*-Butyl nitrate $C_4H_9ONO_2$	119.077		136	1.048^{0}	
775	$C_4H_9NO_3$	Isobutyl nitrate $(CH_3)_2CHCH_2ONO_2$	119.077		122.9	1.014^{25}_{25}	137
776	$C_4H_9NO_5$	*d*-Ammonium hydrogen malate	151.077	170			1205
777	$C_4H_9NO_5$	*l*-Ammonium hydrogen malate	151.077	161		1.509	
778	$C_4H_9NO_6$	Ammonium hydrogen tartrate	167.077	d.		1.680	1241
779	C_4H_9NS	1, 4-Thiazan	103.142		169		
780	$C_4H_9N_3O_2$	Creatine	131.093	295			
781	$C_4H_{10}ClNO_2$	Ethylaminoacetic acid hydrochloride	139.54	144			
781.1	C_4H_{10}	*n*-Butane $CH_3CH_2CH_2CH_3$	58.077	−135.0	0.6	0.601^{0} (liq.)	
781.2	C_4H_{10}	Trimethylmethane (Isobutane)	58.077	−145.0	−10.2		
782	$C_4H_{10}N_2$	Diethylenediamine (Piperazine)	86.093	105.6	146		1156
783	$C_4H_{10}N_2O$	Nitrosodiethylamine $(C_2H_5)_2NNO$	102.093		175.4	$0.951^{17.5}$	
784	$C_4H_{10}N_2O$	Trimethylurea $(CH_3)_2NCONHCH_3$	102.093	75.5	232.5		
785	$C_4H_{10}N_2S$	Propylthiourea $C_3H_7NHCSNH_2$	118.16	110			

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
786	$C_4H_{10}N_3O_2$	Guanidine lactate	132.10	d.			1236
788	$C_4H_{10}N_4S_2$	Ethylenediamine thiocyanate	178.24				1285
789	$C_4H_{10}O$	*n*-Butyl alcohol C_4H_9OH	74.077	−89.8	117.7	0.810	116
790	$C_4H_{10}O$	Isobutyl alcohol $(CH_3)_2CHCH_2OH$	74.077	−108	107.3	0.802	99
791	$C_4H_{10}O$	*sec.*-Butyl alcohol $C_2H_5CH(OH)CH_3$	74.077		99.5	0.808	104
792	$C_4H_{10}O$	*tert.*-Butyl alcohol $(CH_3)_3COH$	74.077	25.5	82.8	0.789	64
793	$C_4H_{10}O$	Ether $(C_2H_5)_2O$	74.077	α−116.3; β−123.3	34.5	0.714	7
794	$C_4H_{10}O$	Methyl propyl ether $CH_3OC_3H_7$	74.077		38.9	0.738	13
794.1	$C_4H_{10}O$	Methyl isopropyl ether	74.077		32.5^{777}	0.735^{20}_{20}	12
795	$C_4H_{10}O_2$	1, 4-Dihydroxybutane $(CH_2CH_2OH)_2$	90.077	16	230	1.020	
796	$C_4H_{10}O_2$	2, 3-Dihydroxybutane $(CH_3CHOH)_2$	90.077		184	1.048^0	
797	$C_4H_{10}O_2$	1, 2-Dihydroxy-2-methylpropane	90.077		177	1.003	
798	$C_4H_{10}O_2$	Glycol dimethyl ether $(CH_3OCH_2)_2$	90.077		84.5	0.873	
799	$C_4H_{10}O_2$	Glycol ethyl ether $HOCH_2CH_2OC_2H_5$	90.077		135.3	0.935	
800	$C_4H_{10}O_2$	Diethyl peroxide $(C_2H_5O)_2$	90.077		65	0.827	
801	$C_4H_{10}O_2$	Dimethyl acetal $CH_3CH(OCH_3)_2$	90.077		64.4	0.866	
802	$C_4H_{10}O_2S$	Ethyl sulfone $(C_2H_5)_2SO_2$	122.142	70	248	1.357	
803	$C_4H_{10}O_2S_2$	Diethyl disulfoxide $C_2H_5(SO)_2C_2H_5$	154.21		140 d.	1.24	
804	$C_4H_{10}O_3$	1, 2, 3-Trihydroxybutane	106.077		136^{28}	1.232^{17}	
805	$C_4H_{10}O_3$	Di-(2-hydroxyethyl) ether	106.077		250	1.132	
806	$C_4H_{10}O_3$	Glycerol 1-methyl ether	106.077		197	1.270^{25}_{25}	
807	$C_4H_{10}O_3S$	Diethyl sulfite $(C_2H_5)_2SO_3$	138.14		161.3	1.077	811
808	$C_4H_{10}O_4$	*dl*-Erythritol $HOCH_2(CHOH)_2CH_2OH$	122.08	126	331	1.451	1174
809	$C_4H_{10}O_4S$	Diethyl sulfate $(C_2H_5O)_2SO_2$	154.14	−26.0	208 s. d.	1.172^{25}_4	78
810	$C_4H_{10}S$	*n*-Butyl mercaptan C_4H_9SH	90.142	>-74	98	0.836^{20}	
811	$C_4H_{10}S$	Isobutyl mercaptan $(CH_3)_2CHCH_2SH$	90.142	<-79	88	0.836	368
812	$C_4H_{10}S$	*sec.*-Butyl mercaptan $C_2H_5CH(SH)CH_3$	90.142		85	0.830^{17}	
813	$C_4H_{10}S$	*tert.*-Butyl mercaptan $(CH_3)_3CSH$	90.142		67		
814	$C_4H_{10}S$	Ethyl sulfide $(C_2H_5)_2S$	90.142	−102.1	91.6	0.837	390
815	$C_4H_{10}S_2$	Ethyl disulfide $(C_2H_5S)_2$	122.21		153.5	0.993	630
816	$C_4H_{10}Se$	Ethyl selenide $(C_2H_5)_2Se$	137.28		108	$1.230^{27.5}_4$	1035
817	$C_4H_{10}Te$	Ethyl telluride $(C_2H_5)_2Te$	185.58		138		
818	$C_4H_{11}AsO_2$	Diethylarsonic acid $(C_2H_5)_2AsO(OH)$	166.05	190			
819	$C_4H_{11}AsO_3$	N-Butylarsonic acid $C_4H_9AsO(OH)_2$	182.05	159			
820	$C_4H_{11}N$	*n*-Butylamine $C_4H_9NH_2$	73.093	−50.5	76	0.740^{20}	131
821	$C_4H_{11}N$	Isobutylamine $(CH_3)_2CHCH_2NH_2$	73.093	−85.5	68	0.736	111
822	$C_4H_{11}N$	*sec.*-Butylamine $C_2H_5CH(NH_2)CH_3$	73.093	−104.5	63	0.718^{20}	93
823	$C_4H_{11}N$	*tert.*-Butylamine $(CH_3)_3CNH_2$	73.093	−67.5	43.8	0.696	39
824	$C_4H_{11}N$	Diethylamine $(C_2H_5)_2NH$	73.093	−50.0	56.0	0.711	65
825	$C_4H_{11}P$	Diethylphosphine $(C_2H_5)_2PH$	90.109		85		
826	$C_4H_{12}As_2$	Cacodyl $(CH_3)_2As.As(CH_3)_2$	210.01	−6	170	>1	
827	$C_4H_{12}As_2O$	Cacodylic oxide $[(CH_3)_2As]_2O$	226.01	−25	120	1.462^{15}	
828	$C_4H_{12}As_2S$	Cacodylic sulfide $[(CH_3)_2As]_2S$	242.08		211		
829	$C_4H_{12}BrN$	Tetramethylammonium bromide	154.02			1.56	
830	$C_4H_{12}BrNO$	Diethylbromoacetamide	170.02	67			
831	$C_4H_{12}ClN$	Diethylamine hydrochloride	109.56	217	330	1.048	
832	$C_4H_{12}ClN$	Tetramethylammonium chloride	109.56			1.169	
833	$C_4H_{12}N_2$	Tetramethylenediamine	88.108	27	158		
834	$C_4H_{12}N_2O_4$	Ammonium succinate	152.11			1.367^{10}	
835	$C_4H_{12}N_2O_6$	Ammonium *d*-tartrate	184.11	d.		1.608	1253
835.1	$C_4H_{12}N_2O_6$	Ammonium *dl*-tartrate	184.11			1.601	1323
836	$C_4H_{12}N_4$	Tetramethylammonium trinitride	116.124	125 d.			
837	$C_4H_{12}OS$	Dimethylethylsulfonium hydroxide	108.15	−99.5	93	0.837	
838	$C_4H_{13}NO$	Tetramethylammonium hydroxide	91.108	63	d.		
839	$C_4H_{16}N_6O_4S$	Methylguanidine sulfate	244.24	240			
840	$C_5HCl_3N_4$	2, 6, 8-Trichloropurine	223.41	187			
841	C_5HCl_4N	2, 3, 4, 5-Tetrachloropyridine	216.85	21	137^{24}		
842	C_5HCl_4N	2, 3, 4, 6-Tetrachloropyridine	216.85	75	135^{20}		
843	C_5HCl_4N	2, 3, 5, 6-Tetrachloropyridine	216.85	91	130^{20}		
844	$C_5H_2Cl_3N$	2, 3, 5-Trichloropyridine	182.40	50	120^{16}		
845	$C_5H_3Cl_2N$	3, 5-Dichloropyridine	147.95	67			
846	$C_5H_3N_3$	1, 1, 1-Tricyanoethane $CH_3C(CN)_3$	105.05	93.5		0.760	

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
847	C_5H_4BrN	3-Bromopyridine	157.96		173	1.632^{10}	
848	C_5H_4ClN	2-Chloropyridine	113.50		167.5	1.205^{15}	
849	C_5H_4ClN	3-Chloropyridine	113.50		148.5		
850	C_5H_4ClN	4-Chloropyridine	113.50		148		
851	$C_5H_4N_2$	Glutaconic nitrile $NCCH_2CH{:}CHCN$	92.047	31.5	130^{12}		
852	$C_5H_4N_2O_2$	3-Nitropyridine	124.05	41	216		
853	$C_5H_4N_2O_4$	Methylalloxan	156.05	156 d.			
853.1	$C_5H_4N_2O_4$ (H_2O)	3, 5-Pyrazoledicarboxylic acid	156.05			1.626	1239
854	$C_5H_4N_4$	Purine	120.06	217			
855	$C_5H_4N_4O$	Hypoxanthine	136.06	> 150			
857	$C_5H_4N_4O_3$	Uric acid	168.06	d.		1.893	
858	C_5H_4OS	Thiophene-2-aldehyde	112.10		198	1.215	
859	$C_5H_4O_2$	Furfural	96.031	−38.7	161.7	1.159	685
860	$C_5H_4O_2$	1, 4-Pyrone	96.031	32.5	217.7	$1.190^{40.3}$	1063
861	$C_5H_4O_2S$	Thiophene-2-carboxylic acid	128.10	126.5	260 d.		
862	$C_5H_4O_2S$	Thiophene-3-carboxylic acid	128.10	136			
863	$C_5H_4O_3$	Citraconic anhydride	112.03	7	228	1.245	508
864	$C_5H_4O_3$	Glutaconic anhydride	112.03	87	152^{15}		
865	$C_5H_4O_3$	Itaconic anhydride	112.03	68			
866	$C_5H_4O_3$	Pyromeconic acid	112.03	117	228		
867	$C_5H_4O_3$	Pyromucic acid	112.03	133			
868	$C_5H_4O_4$	Aconic acid	128.03	164			1324
869	$C_5H_4O_4$	Glutinic acid $HO_2CC{:}CCH_2CO_2H$	128.03	146			
870	C_5H_5N	Pyridine	79.047	−42	115.3	0.982	641
871	C_5H_5NO	2-Hydroxypyridine	95.047	107	281		
872	C_5H_5NO	3-Hydroxypyridine HOC_5H_4N	95.047	129			
873	C_5H_5NO	4-Hydroxypyridine	95.047	148.5			
874	C_5H_5NO	Pyrrole-2-aldehyde $CHOC_4H_4N$	95.047	47			
875	$C_5H_5NO_2$	2, 4-Dihydroxypyridine $(HO)_2C_5H_3N$	111.05	265			
876	$C_5H_5NO_2$	2, 6-Dihydroxypyridine $(HO)_2C_5H_3N$	111.05	195			
877	$C_5H_5NO_2$	Pyrrole-2-carboxylic acid $HO_2C.C_4H_4N$	111.05	191.5			
878	$C_5H_5NO_3$	2, 4, 6-Trihydroxypyridine	127.05	230 d.			
879	$C_5H_5N_5$	Adenine	135.08	365			
880	C_5H_6	Cyclopentadiene	66.046		42.5	0.805	903
881	C_5H_6	2-Methyl-1, 3-butenine (Valylene)	66.046		50		
882	$C_5H_6N_2$	2-Aminopyridine	94.062	56	204		
883	$C_5H_6N_2$	3-Aminopyridine	94.062	64	252		
884	$C_5H_6N_2$	4-Aminopyridine $H_2NC_5H_4N$	94.062	157			
886	$C_5H_6N_2$	Glutaric nitrile $NC(CH_2)_3NC$	94.062	−29	287.4	0.995^{15}	1007
887	$C_5H_6N_2O$	2-Hydroxyglutaric nitrile	110.06		203^{11}	1.181	534
888	$C_5H_6N_2O_2$	Thymine	126.06	335 d.			
889	$C_5H_6N_2O_3$	Dimethylparabanic acid	142.06	145	277		
890	$C_5H_6N_2O_3$	Pyridine nitrate	142.06				1333
891	C_5H_6O	2-Methylfurfuran	82.046		64.3	0.916	
892	C_5H_6OS	Thiophene-2-alcohol	114.11		207		
893	$C_5H_6O_2$	Furfuryl alcohol	98.046		170.2	1.136	996
894	$C_5H_6O_2$	Pentinoic acid	98.046	103			
895	$C_5H_6O_2$	Ethyl propiolate $CH{:}CCO_2C_2H_5$	98.046		119.5	0.968^{15}_{15}	
896	$C_5H_6O_2$	Propargyl acetate $CH{:}CCH_2O_2CCH_3$	98.046		125	1.005	252
897	$C_5H_6O_3$	Glutaric anhydride	114.05	57	287		
898	$C_5H_6O_4$	Citraconic acid $CH_3C(CO_2H){:}CHCO_2H$	130.05	91		1.617	
899	$C_5H_6O_4$	Glutaconic acid	130.05	134			
900	$C_5H_6O_4$	Itaconic acid $CH_2{:}C(CO_2H)CH_2CO_2H$	130.05	161 d.		1.632	
901	$C_5H_6O_4$	Mesaconic acid $CH_3(CO_2H)C{:}CHCO_2H$	130.05	202	250		
902	$C_5H_6O_4$	Paraconic acid	130.05	58			
903	$C_5H_6O_4$	Trimethylene-1, 1-dicarboxylic acid	130.05	175	210^{30}		
904	$C_5H_6O_5$	Acetone-1-1′-dicarboxylic acid	146.05	135 d.			
905	$C_5H_6O_5$	1-Ketoglutaric acid	146.05	113			
906	$C_5H_6N_2O_3$	1-Methylbarbituric acid	142.06	132			
907	$C_5H_7Cl_3O_2$	Chloral acetone	205.43	76			
908	C_5H_7N	1-Methylpyrrole	81.062		115.4	0.911	892
909	C_5H_7N	2-Methylpyrrole	81.062		148	0.945	
910	C_5H_7N	3-Methylpyrrole	81.062		143		

No.	Formula	Name	Mol. wt.	M. P.	B. P.	*d*	R. I. No.
911	$C_5H_7NO_2$	Ethyl cyanoacetate $NCCH_2CO_2C_2H_5$	113.06	−22.5	206	1.063	232
912	C_5H_7NS	Crotonyl isothiocyanate	113.13		85^{50}	0.993^{0}	
913	C_5H_8	Cyclopentene	68.062		43.6	0.776	
914	C_5H_8	2, 3-Pentadiene $CH_3CH{:}C{:}CHCH_3$	68.082		51	0.702	
915	C_5H_8	*unsym.*-Dimethylallene $(CH_3)_2C{:}C{:}CH_2$	68.062	−120	40.5	0.678	
916	C_5H_8	Isoprene $CH_2{:}C(CH_3)CH{:}CH_2$	68.062	−120	34	0.679	943
917	C_5H_8	Methylethylacetylene $CH_3C{:}CC_2H_5$	68.062		56	0.687	121
918	C_5H_8	1, 3-Pentadiene $CH_3CH{:}CHCH{:}CH_2$	68.062		44	0.696	901
920	C_5H_8	Propylacetylene $C_3H_7C{:}CH$	68.062	−95	40	0.722^{0}	932
921	C_5H_8	Isopropylacetylene $(CH_3)_2CHC{:}CH$	68.062		29.3	0.685^{0}	
921.1	$C_5H_8Cl_2O_2$	Ethyl 1, 2-dichloropropionate	170.98		184	1.246	424
921.2	$C_5H_8N_2$	3, 4-Dimethylpyrazole	96.078	58		$0.933_4^{99.3}$	1131
922	$C_5H_8N_2$	3, 5-Dimethylpyrazole	96.078	107	220		
923	$C_5H_8N_4O_6$	Uroxanic acid	220.09	162 d.			
924	C_5H_8O	Cyclopentanone	84.062		130.6	0.951	353
925	C_5H_8O	Ethyl propargyl ether $CH{:}CCH_2OC_2H_5$	84.062		80	0.833	325
926	C_5H_8O	Tiglic aldehyde $CH_3CH{:}C(CH_3)CHO$	84.062		116.5	0.870	430
927	C_5H_8O	Ethylideneacetone $CH_3CH{:}CHCOCH_3$	84.062		124	0.856	370
928	$C_5H_8O_2$	Levulinic aldehyde	100.062		188	1.018	295
929	$C_5H_8O_2$	Acetylacetone $CH_3COCH_2COCH_3$	100.062	−23.2	137	0.976	439
930	$C_5H_8O_2$	Allylacetic acid $CH_2{:}CH(CH_2)_2CO_2H$	100.062	<−18	189	0.984	805
931	$C_5H_8O_2$	Angelic acid	100.062	45	185	$0.983^{46.7}$	1069
932	$C_5H_8O_2$	2, 2-Dimethylacrylic acid	100.062	70	195		
933	$C_5H_8O_2$	1-Ethylacrylic acid $CH_2{:}C(C_2H_5)CO_2H$	100.062	45	180		
934	$C_5H_8O_2$	1, 2-Pentenic acid $C_2H_5CH{:}CHCO_2H$	100.062	10	108^{17}	0.990	904
935	$C_5H_8O_2$	2, 3-Pentenic acid	100.062		95^{16}	0.987	949
936	$C_5H_8O_2$	Tiglic acid $CH_3CH{:}C(CH_3)CO_2H$	100.062	64	198.5	0.872	1121
937	$C_5H_8O_2$	Allyl acetate $CH_3CO_2C_3H_5$	100.062		105	0.928	146
938	$C_5H_8O_2$	Ethyl acrylate $C_2H_3COC_2H_5$	100.062		99.8	0.924	
939	$C_5H_8O_2$	Methyl *α*-crotonate	100.062		120.7	0.981^{4}	
941	$C_5H_8O_3$	Levulinic acid $CH_3COCH_2CH_2CO_2H$	116.06	33.1	246	1.143^{17}	383
942	$C_5H_8O_3$	Ethyl pyruvate $CH_3COCO_2C_2H_5$	116.06		144	1.060_4^{16}	882
943	$C_5H_8O_3$	Methyl acetoacetate	116.06		170	1.077	241
944	$C_5H_8O_4$	Dimethylmalonic acid $(CH_3)_2C(CO_2H)_2$	132.06	193			
945	$C_5H_8O_4$	Ethylmalonic acid $C_2H_5CH(CO_2H)_2$	132.06	111.5	160 d.		
946	$C_5H_8O_4$	Glutaric acid $CH_2(CH_2CO_2H)_2$	132.06	97.5	304	1.192^{106}	1151
947	$C_5H_8O_4$	Pyrotartaric acid	132.06	111		1.411	1333
947.1	$C_5H_8O_4$	Methyltetronic lactone	132.06	123			1213
948	$C_5H_8O_4$	Dimethyl malonate $H_2C(CO_2CH_3)_2$	132.06	−62	181.5	1.154	206
949	$C_5H_8O_4$	Ethyl hydrogen malonate	132.06		147^{21}	1.176	301
950	$C_5H_8O_4$	Methyl ethyl oxalate	132.06		173.7	1.156^{0}	
951	$C_5H_8O_4$	Methylene diacetate $CH_2(CO_2CH_3)_2$	132.06		170		
952	$C_5H_8O_5$	*α*-Citramalic acid	148.06	95			
953	$C_5H_8O_5$	*dl*-Citramalic acid	148.06	117			
954	$C_5H_8O_5$	*β*-Methylmalic acid	148.06	123			
955	$C_5H_8O_5$	Arabonic lactone	148.06	98			
956	$C_5H_8O_5$	Dimethyl tartronate	148.06	53.3			
957	$C_5H_8O_6$ (H_2O)	*d*-Methyl hydrogen tartrate	164.06	76			
958	$C_5H_8O_7$	Aposorbinic acid	180.06	110			
959	$C_5H_9BrO_2$	1-Bromovaleric acid $C_3H_7CHBrCO_2H$	180.99		105^{10}		
960	$C_5H_9BrO_2$	2-Bromovaleric acid	180.99	60			
961	$C_5H_9BrO_2$	3-Bromovaleric acid	180.99	40			
962	$C_5H_9BrO_2$	2-Bromoisovaleric acid	180.99	73.5			
963	$C_5H_9BrO_2$	Ethyl 1-bromopropionate	180.99		160	1.393	419
964	$C_5H_9Br_3$	1, 2, 3-Tribromopentane	308.82		128^{21}	2.095_4^{14}	743
965	C_5H_9Cl	Isoprene hydrochloride	104.53		109	0.933	
966	C_5H_9ClO	*n*-Valeryl chloride C_4H_9COCl	120.53		128	1.016^{15}	223
967	C_5H_9ClO	Isovaleryl chloride $(CH_3)_2CHCH_2COCl$	120.53		113		
968	$C_5H_9ClO_2$	Ethyl 1-chloropropionate	136.53		146	1.087	235
969	$C_5H_9ClO_2$	Ethyl 2-chloropropionate	136.53		162.5	1.114	236
969.1	$C_5H_9ClO_2$	*n*-Butyl chloroformate $ClCO_2C_4H_7$	136.53		138.9	1.078	807
970	$C_5H_9ClO_2$	Isobutyl chloroformate	136.53		130	1.040_{25}^{25}	
971	$C_5H_9IO_2$	Ethyl 2-iodopropionate	228.00		202	1.679^{15}	

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
972	C_5H_9N	*n*-Valeryl nitrile C_4H_9CN	83.077		141	0.801	82
973	C_5H_9N	Isovaleryl nitrile $(CH_3)_2CHCH_2CN$	83.077		129.3	0.802	
974	C_5H_9NO	Piperidone	99.077	40	256		
975	$C_5H_9NO_3$	Acetylurethane $CH_3CONHCO_2C_2H_5$	131.08	78	215		
975.1	$C_5H_9NO_3$	*α*-Acetylaminopropionic acid	131.08	133			1215
976	$C_5H_9NO_4$	*dl*-Glutaminic acid	147.08	198		1.460	1261
977	$C_5H_9NO_4$	*d*-Glutaminic acid	147.08	208 d.		1.538	1266
978	C_5H_9NS	Isobutyl isothiocyanate	115.14		162	0.943	
979	C_5H_{10}	Cyclopentane $CH_2<(CH_2CH_2)_2>$	70.077	−93.3	49.5	0.754	843
980	C_5H_{10}	1, 1-Dimethyltrimethylene	70.077		21	0.660	
981	C_5H_{10}	Methylcyclobutane	70.077		42		
982	C_5H_{10}	*β*-Amylene $CH_3CH:CHC_2H_5$	70.077	−139	36.4	0.651	921
983	C_5H_{10}	*α*-Amylene $C_2H_5C(CH_3):CH_2$	70.077		32	0.667_{0}^{0}	880
984	C_5H_{10}	*n*-Propylethylene $C_3H_7CH:CH_2$	70.077		40		31
985	C_5H_{10}	2-Methyl-3-butene $CH_2:CHCH(CH_3)_2$	70.077	−135	20.1	0.632^{15}	
986	C_5H_{10}	2-Methyl-2-butene $CH_3CH:C(CH_3)_2$	70.077	−124	38.4	0.668^{13}	
987	$C_5H_{10}Br_2$	1, 5-Dibromopentane $CH_2(CH_2CH_2Br)_2$	229.91	−35	224	1.706^{18}	
988	$C_5H_{10}Br_2$	2, 3-Dibromopentane $C_2H_5(CHBr)_2CH_3$	229.91		175	1.7087^{0}	866
988.1	$C_5H_{10}ClNO_4$	*d*(*l*)-Glutaminic acid hydrochloride	183.54	193			1240
989	$C_5H_{10}Cl_2$	3, 3-Dichloro-2-methylbutane	140.99		145	1.065	
990	$C_5H_{10}Cl_2$	1, 4-Dichloropentane	140.99		61^{17}		
991	$C_5H_{10}Cl_2$	1, 5-Dichloropentane $CH_2(CH_2CH_2Cl)_2$	140.99		178		
992	$C_5H_{10}Cl_2$	2, 3-Dichloropentane $C_2H_5(CHCl)_2CH_3$	140.99		139		
993	$C_5H_{10}N_2$	Diethylcyanamide $NCN(C_2H_5)_2$	98.093		187 d.	0.854	1072
994	$C_5H_{10}N_2O_2$	1-Nitropiperidine	130.09	−5.5	245	1.158	1033
994.1	$C_5H_{10}N_2O_2$	Dimethylmalonamide	130.09	198			1208
995	$C_5H_{10}N_2O_3$	*dl*-Glutamine	146.09	256			
996	$C_5H_{10}N_2O_4$	Amylene nitrosate	162.09	99			1207
997	$C_5H_{10}O$	Cyclopentanol	86.077		141	0.946	
998	$C_5H_{10}O$	Methylallyl carbinol	86.077		116.4	0.834	
999	$C_5H_{10}O$	Vinylethyl carbinol	86.077		114.7	0.837	277
1000	$C_5H_{10}O$	2-Pentene-4-ol	86.077		64^{62}	0.838	933
1001	$C_5H_{10}O$	Ethyl allyl ether $C_2H_5OCH_2CH:CH_2$	86.077		67.6	0.765	69
1002	$C_5H_{10}O$	Isovaleraldehyde $(CH_3)_2CHCH_2CHO$	86.077	−51	92.5	0.803^{17}	79
1003	$C_5H_{10}O$	Trimethylacetaldehyde $(CH_3)_3CCHO$	86.077	3	75	0.793	
1004	$C_5H_{10}O$	*n*-Valeric aldehyde C_4H_9CHO	86.077		103.4	0.819^{11}	70
1005	$C_5H_{10}O$	Diethyl ketone $(C_2H_5)_2CO$	86.077	−42.0	101.7	0.814	86
1006	$C_5H_{10}O$	Methyl propyl ketone $CH_3COC_3H_7$	86.077	−77.8	101.7	0.812_{15}^{15}	75
1007	$C_5H_{10}O$	Methyl isopropyl ketone	86.077	−92.0	93	0.815^{15}	62
1008	$C_5H_{10}O$	Pentamethylene oxide	86.077		87	0.880^{0}	
1009	$C_5H_{10}O_2$	3-Acetylpropyl alcohol	102.08		209	1.016^{0}	
1010	$C_5H_{10}O_2$	*dl*-Methylethylacetic acid	102.08	<-80	174	0.941	153
1011	$C_5H_{10}O_2$	Trimethylacetic acid $(CH_3)_3CCO_2H$	102.08	35.5	163.8	0.905^{50}	1050
1012	$C_5H_{10}O_2$	*n*-Valeric acid $C_5H_{11}CO_2H$	102.08	−59; −34.5	187.0	0.942	175
1013	$C_5H_{10}O_2$	Isovaleric acid $(CH_3)_2CHCH_2CO_2H$	102.08	−37.6	176.7	0.937_{4}^{15}	145
1014	$C_5H_{10}O_2$	*n*-Butyl formate $HCO_2C_4H_9$	102.08	−90.0	106.8	0.911^{0}	74
1015	$C_5H_{10}O_2$	*d-sec.*-Butyl formate	102.08		97	0.882	48
1016	$C_5H_{10}O_2$	Isobutyl formate $(CH_3)_2CHCH_2CO_2H$	102.08	−95.3	98.2	0.875	58
1017	$C_5H_{10}O_2$	Ethyl propionate $C_2H_5CO_2C_2H_5$	102.08	−72.6	99.1	0.891	51
1018	$C_5H_{10}O_2$	Methyl *n*-butyrate $C_3H_7CO_2CH_3$	102.08	<-95	102.3	0.898	68
1019	$C_5H_{10}O_2$	Methyl isobutyrate $(CH_3)_2CHCO_2CH_3$	102.08	−84.7	92.6	0.891	49
1020	$C_5H_{10}O_2$	*n*-Propyl acetate $CH_3CO_2C_3H_7$	102.08	−92.5	101.6	0.887	52
1021	$C_5H_{10}O_2$	Isopropyl acetate $CH_3COCH_2(CH_3)_2$	102.08	−73.4	89	$0.877^{15.6}$	
1022	$C_5H_{10}O_2S$	Ethyl thiocarbonate $CS(OC_2H_5)_2$	134.14		162	1.028	939
1023	$C_5H_{10}O_3$	1-Hydroxyvaleric acid	118.08	31			
1024	$C_5H_{10}O_3$	1-Hydroxyisovaleric acid	118.08	86			
1025	$C_5H_{10}O_3$	2-Hydroxyvaleric acid	118.08	<-32			
1026	$C_5H_{10}O_3$	Diethyl carbonate $(C_2H_5O)_2CO$	118.08	−43.0	125.8	0.979	57
1027	$C_5H_{10}O_3$	Ethyl hydracrylate	118.08		84^{12}	1.064_{4}^{25}	313
1028	$C_5H_{10}O_3$	Ethyl lactate $CH_3CH(OH)CO_2C_2H_5$	118.08		154	1.031	
1028.1	$C_5H_{10}O_3$	Methyl *l*-1-methoxypropionate	118.08		131	$0.9986^{16.4}$	
1029	$C_5H_{10}O_3$	Propyl glycollate $HOCH_2CO_2C_3H_7$	118.08		170.5	1.062^{18}	
1030	$C_5H_{10}O_4$	Ethyl glycerate	134.08		121^{14}	1.191_{15}^{15}	

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
1031	$C_5H_{10}O_4$	Glycerol acetate (Monoacetin)	134.08		158^{165}	1.20	
1032	$C_5H_{10}O_5$	*d(l)*-α-Arabinose	150.08	159.5		1.585	1243
1033	$C_5H_{10}O_5$	*d(l)*-β-Arabinose	150.08			1.605	1248
1034	$C_5H_{10}O_5$	*dl*-Arabinose	150.08	164.5			
1035	$C_5H_{10}O_5$	*d*-Lyxose	150.08	105		1.545	1228
1036	$C_5H_{10}O_5$	*d*-Ribose	150.08	87			
1037	$C_5H_{10}O_5$	*l*-Xylose	150.08	153		1.525	1231
1038	$C_5H_{10}O_5$	*dl*-Xylose	150.08	131			
1039	$C_5H_{10}O_6$	Arabonic acid $HO_2C(CHOH)_3CH_2OH$	166.08	89			
1040	$C_5H_{11}Br$	*n*-Amyl bromide $CH_3(CH_2)_4Br$	151.00		127.9	1.223	401
1041	$C_5H_{11}Br$	Isoamyl bromide $(CH_3)_2CHCH_2CH_2Br$	151.00		121	1.215	378
1042	$C_5H_{11}Br$	*tert.*-Amyl bromide $(CH_3)_2(C_2H_5)CBr$	151.00		109.2	1.190	389
1043	$C_5H_{11}Cl$	*n*-Amyl chloride $CH_3(CH_2)_4Cl$	106.54		105.7	0.883	191
1044	$C_5H_{11}Cl$	Isoamyl chloride $(CH_3)_2CHCH_2CH_2Cl$	106.54		99.1	0.893	181
1045	$C_5H_{11}Cl$	*tert.*-Amyl chloride $(CH_3)_2(C_2H_5)CCl$	106.54	−72.9	85.7	0.870^{15}	155
1046	$C_5H_{11}Cl$	*sec.*-Amyl chloride $C_3H_7(CH_3)CHCl$	106.54		105	0.870	157
1047	$C_5H_{11}Cl$	3-Chloropentane $(C_2H_5)_2CHCl$	106.54		105	0.895	
1048	$C_5H_{11}ClO$	*tert.*-Amyl hypochlorite	122.54		76.3	0.855	
1049	$C_5H_{11}F$	*n*-Amyl fluoride $CH_3(CH_2)_4F$	90.085	> -80	62.8	0.788	11
1050	$C_5H_{11}F$	Isoamyl fluoride $(CH_3)_2CHCH_2CH_2F$	90.085	< -11	53.5		
1051	$C_5H_{11}I$	*n*-Amyl iodide $CH_3(CH_2)_4I$	198.02		156	1.517	572
1052	$C_5H_{11}I$	Isoamyl iodide $(CH_3)_2CHCH_2CH_2I$	198.02		148	1.510	
1053	$C_5H_{11}I$	*tert.*-Amyl iodide $(CH_3)_2(C_2H_5)CHI$	198.02		125	1.497^{19}	
1054	$C_5H_{11}N$	Piperidine	85.093	−9	105.8	0.860	444
1055	$C_5H_{11}NO$	Diethylketoxime $(C_2H_5)_2C{:}NOH$	101.09		168.3	0.914	407
1056	$C_5H_{11}NO$	Methylpropylketoxime	101.09		168	0.909	403
1057	$C_5H_{11}NO$	Valeramide $C_4H_9CONH_2$	101.09	106		1.023	
1058	$C_5H_{11}NO$	Isovaleramide $(CH_3)_2CHCH_2CONH_2$	101.09	137	232	0.965	
1059	$C_5H_{11}NO_2$	1-Aminovaleric acid	117.09	291.5			
1060	$C_5H_{11}NO_2$	3-Aminovaleric acid	117.09	193			
1061	$C_5H_{11}NO_2$	4-Aminovaleric acid	117.09	157			
1062	$C_5H_{11}NO_2$	2-Aminoisovaleric acid	117.09	217			
1063	$C_5H_{11}NO_2$	*n*-Amyl nitrite $CH_3(CH_2)_4ONO$	117.09		104^{76}	0.853	56
1064	$C_5H_{11}NO_2$	Isoamyl nitrite $(CH_3)_2CH(CH_2)_2ONO$	117.09		99	0.872	67
1065	$C_5H_{11}NO_2$	*tert.*-Amyl nitrite $(CH_3)_2(C_2H_5)CONO$	117.09		93	0.903^{0}	
1066	$C_5H_{11}NO_2$	*n*-Butyl carbamate $C_4H_9CO_2NH_2$	117.09	54			
1067	$C_5H_{11}NO_2$	Isobutyl carbamate $H_2NCO_2C_4H_9$	117.09	67	206		
1067.1	$C_5H_{11}NO_2$	Ethylurethane $C_2H_5NHCO_2C_2H_5$	117.09		176	0.981	262
1068	$C_5H_{11}NO_2$	Betaine	117.09	273 d.			
1069	$C_5H_{11}NO_2$	*dl*-Valine $(CH_3)_2CHCH(NH_2)CO_2H$	117.09	298 d.			
1069.1	$C_5H_{11}NO_2$	*d*-Valine	117.09	315			1327
1070	$C_5H_{11}NO_3$	Isoamyl nitrate	133.09		148	$0.996^{21.7}$	200
1070.1	$C_5H_{11}NO_3$	Bios	133.09	223			1163
1070.2	$C_5H_{11}NO_4$	Methyltetronic amide	149.09	135 d.			1218
1071	$C_5H_{11}NO_5$	*l*-Arabinose oxime	165.09	139			
1072	C_5H_{12}	2-Methylbutane (Isopentane)	72.092	−159.7	28.0	$0.621^{19.1}$	9
1073	C_5H_{12}	*n*-Pentane $CH_3(CH_2)_3CH_3$	72.092	−131.5	36.2	0.631	10
1074	C_5H_{12}	2, 2-Dimethypropane $(CH_3)_4C$	72.092	−20	9.5		
1075	$C_5H_{12}ClN$	Piperidine hydrochloride	121.56	237			
1076	$C_5H_{12}ClNO_2$	Betaine hydrochloride	153.56	235			
1077	$C_5H_{12}N_2O$	1, 2-Diethylurea $CO(NHC_2H_5)_2$	116.11	106	263	1.042	
1078	$C_5H_{12}O$	*n*-Amyl alcohol $CH_3(CH_2)_3CH_2OH$	88.092	−78.5	137.9	0.817^{20}_{20}	823
1079	$C_5H_{12}O$	Isoamyl alcohol* $(CH_3)_2CHCH_2CH_2OH$	88.092	−117.2	130.5	0.812	166
1080	$C_5H_{12}O$	Diethyl carbinol $(C_2H_5)_2CHOH$	88.092		115.6	0.815^{25}_{4}	179
1081	$C_5H_{12}O$	*tert.*-Amyl alcohol $(CH_3)_2(C_2H_5)COH$	88.092	−11.9	101.8	0.809	158
1082	$C_5H_{12}O$	*tert.*-Butyl carbinol	88.092	53	114		
1083	$C_5H_{12}O$	*d*-Amyl alcohol $CH_3(C_2H_5)CHCH_2OH$	88.092		128	0.816	
1084	$C_5H_{12}O$	*sec.*-Amyl alcohol $CH_3(C_3H_7)CH_2OH$	88.092		119.5	0.809	165
1084.1	$C_5H_{12}O$	*d-sec.*-Amyl alcohol	88.092		118	0.8103	154
1085	$C_5H_{12}O$	Methyl isopropyl carbinol	88.092		114	0.819	
1085.1	$C_5H_{12}O$	*d*-Methyl isopropyl carbinol	88.092			0.818	106
1086	$C_5H_{12}O$	Ethyl propyl ether $C_2H_5OC_3H_7$	88.092	< -79	61.4	0.732	24
1087	$C_5H_{12}O$	Ethyl isopropyl ether $C_2H_5OCH(CH_3)_2$	88.092		54	0.745^{0}	

*Commercially known as "Amyl alcohol."

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
1088	$C_5H_{12}O$	Methyl *n*-butyl ether $CH_3OC_4H_9$	88.092		70.3	0.764^{0}	
1089	$C_5H_{12}O_2$	Pentane-1, 2-diol $C_3H_7CHOHCH_2OH$	104.09		211.8	0.980^{20}_{20}	376
1090	$C_5H_{12}O_2$	Pentane-1, 5-diol $CH_2(CH_2CH_2OH)_2$	104.09		239.4	0.994^{20}_{20}	432
1091	$C_5H_{12}O_2$	Methylene diethyl ether $CH_2(OC_2H_5)_2$	104.09		89	0.851^{0}	
1092	$C_5H_{12}O_3$	Glycerol 1-ethyl ether	120.09		230	1.091	
1093	$C_5H_{12}O_4$	Pentaerythritol	136.09	253			1178
1094	$C_5H_{12}O_5$	Adonitol	152.09	102			1333
1095	$C_5H_{12}O_5$	*d*-Arabitol	152.09	103			
1096	$C_5H_{12}S$	*n*-Amyl mercaptan $C_5H_{11}SH$	104.16		126	0.857^{20}	396
1097	$C_5H_{12}S$	*act.*-Amyl mercaptan	104.16		118	0.848^{13}	
1098	$C_5H_{12}S$	Isoamyl mercaptan	104.16		129.5	0.835	379
1099	$C_5H_{13}N$	*n*-Amylamine $C_5H_{11}NH_2$	87.108	−55.0	104	0.766^{19}	
1100	$C_5H_{13}N$	Isoamylamine $(CH_3)_2CHCH_2CH_2NH_2$	87.108		95	0.751	176
1101	$C_5H_{13}N$	*sec.*-Amylamine $CH_3(C_3H_7)CH_2NH_2$	87.108		91	0.749	
1102	$C_5H_{13}N$	*tert.*-Amylamine $(CH_3)_2(C_2H_5)CNH_2$	87.108	−105.0	78		
1103	$C_5H_{13}NO_2$	Ammonium valerate	119.11				1333
1105	$C_5H_{14}N_2$	Pentamethylenediamine	102.12	9	178	0.885^{15}_{15}	482
1106	$C_6Br_4O_2$	Bromanil OC:(CBrCBr)$_2$:CO	423.66	300			
1107	C_6Br_6	Hexabromobenzene	551.50	306			
1108	C_6Br_6O	"Hexabromophenol"	367.50	128			
1109	$C_6Cl_4O_2$	Chloranil OC:(CClCCl)$_2$:CO	245.83	290			
1110	C_6Cl_6	Hexachlorobenzene	284.75	226	326	1.569^{236}	
1111	C_6Cl_6O	"Hexachlorophenol"	300.75	46			
1111.1	C_6Cl_8O	*β*-Octachlorocyclohexenone	371.67	90		2.016	1292
1111.2	C_6Cl_8O	*γ*-Octachlorocyclohexenone	371.67	89		2.058	1305
1112	C_6I_6	Hexaiodobenzene	833.59	350 d.			
1113	C_6HBr_5	Pentabromobenzene	472.59	293			
1114	C_6HBr_5O	Pentabromophenol $C(Br_5)OH$	488.59	225			
1115	$C_6HCl_3O_2$	Trichloroquinone	211.38	168			
1116	$C_6HCl_4NO_2$	2, 3, 4, 5-Tetrachloronitrobenzene	260.85	64.5			
1117	$C_6HCl_4NO_2$	2, 3, 4, 6-Tetrachloronitrobenzene	260.85	22			
1118	$C_6HCl_4NO_2$	2, 3, 5, 6-Tetrachloronitrobenzene	260.85	99	304 d.		
1119	C_6HCl_5	Pentachlorobenzene	250.30	86	277	1.842^{10}	
1120	C_6HCl_5O	Pentachlorophenol HOC_6Cl_5	266.30	188	310.2	1.978	
1121	$C_6HN_5O_{11}$	Pentanitrophenol $C_6(NO_2)_5OH$	319.05	190 d.			
1122	$C_6H_2BrN_3O_6$	Picryl bromide 2, 4, 6$(NO_2)_3C_6H_2Br$	291.96	123			
1122.1	$C_6H_2Br_2N_2O_4$	1, 2-Dinitro-4, 5-dibromobenzene	325.86	115		2.313	
1122.2	$C_6H_2Br_2N_2O_4$	1, 3-Dinitro-4, 6-dibromobenzene	325.86	117		2.295	
1123	$C_6H_2Br_4$	1, 2, 3, 5-Tetrabromobenzene	393.68	98.5	329		
1124	$C_6H_2Br_4$	1, 2, 4, 5-Tetrabromobenzene	393.68	178		3.027	
1125	$C_6H_2Br_4O$	2, 3, 4, 6-Tetrabromophenol	409.68	120			
1126	$C_6H_2Br_5N$	Pentabromoaniline $C_6(Br_5)NH_2$	487.60	222			
1127	$C_6H_2ClN_3O_6$	Picryl chloride $(NO_2)_3C_6H_2Cl$	247.50	83		1.797	
1128	$C_6H_2ClN_3O_6$	5-Chloro-1, 2, 4-trinitrobenzene	247.50	116			
1129	$C_6H_2Cl_2O_2$	2, 5-Dichloroquinone	176.93	161			
1130	$C_6H_2Cl_2O_2$	2, 6-Dichloroquinone	176.93	121			
1131	$C_6H_2Cl_3NO_2$	2, 3, 4-Trichloronitrobenzene	226.40	56			
1132	$C_6H_2Cl_3NO_2$	2, 3, 6-Trichloronitrobenzene	226.40	89			
1133	$C_6H_2Cl_3NO_2$	2, 4, 5-Trichloronitrobenzene	226.40	57	288	1.790	
1134	$C_6H_2Cl_3NO_2$	2, 4, 6-Trichloronitrobenzene	226.40	68			
1135	$C_6H_2Cl_4$	1, 2, 3, 4-Tetrachlorobenzene	215.85	47.5	254		
1136	$C_6H_2Cl_4$	1, 2, 3, 5-Tetrachlorobenzene	215.85	51	246		
1137	$C_6H_2Cl_4$	1, 2, 4, 5-Tetrachlorobenzene	215.85	138	246	1.734^{10}	
1138	$C_6H_2Cl_4O$	2, 3, 4, 6-Tetrachlorophenol	231.85	69	164^{23}		
1139	$C_6H_2Cl_4O_2$	Tetrachlorohydroquinone	247.85	232			
1140	$C_6H_2Cl_5N$	Pentachloroaniline $C_6(Cl_5)NH_2$	265.31	232			
1141	$C_6H_2IN_3O_6$	Picryl iodide $(NO_2)_3C_6H_2I$	338.97	165		$2.285^{22.5}$	
1142	$C_6H_2I_2N_2O_4$	2, 4-Diiodo-1, 3-dinitrobenzene	419.90	162			1315
1143	$C_6H_2I_2N_2O_4$	4, 6-Diiodo-1, 3-dinitrobenzene	419.90	168.4		2.744	
1144	$C_6H_2I_4$	1, 2, 3, 4-Tetraiodobenzene	581.74	136			
1145	$C_6H_2I_4$	1, 2, 3, 5-Tetraiodobenzene	581.74	148			
1146	$C_6H_2I_4$	1, 2, 4, 5-Tetraiodobenzene	581.74	254			
1147	$C_6H_2N_4O_9$	2, 3, 4, 6-Tetranitrophenol	274.05	140	d.		

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
1148	$C_6H_2O_4$	Diacetylenedicarboxylic acid	138.02	178 exp.			
1149	$C_6H_3BrN_2O_4$	3-Bromo-1, 2-dinitrobenzene	246.96	101.5	320		1302
1150	$C_6H_3BrN_2O_4$	4-Bromo-1, 2-dinitrobenzene	246.96	59.4			
1151	$C_6H_3BrN_2O_4$	4-Bromo-1, 3-dinitrobenzene	246.96	75.3			
1152	$C_6H_3Br_2NO_2$	2, 4-Dibromonitrobenzene	280.86	62		2.356	
1153	$C_6H_3Br_2NO_2$	2, 5-Dibromonitrobenzene	280.86	85		2.368	
1154	$C_6H_3Br_2NO_2$	3, 4-Dibromonitrobenzene	280.86	58	296	2.354	
1155	$C_6H_3Br_2NO_2$	3, 5-Dibromonitrobenzene	280.86	106			
1155.1	$C_6H_3Br_2NO_3$	4, 6-Dibromo-2-nitrophenol	296.86	117.5		2.434	
1156	$C_6H_3Br_3$	1, 2, 3-Tribromobenzene	314.77	87.4		2.658	
1157	$C_6H_3Br_3$	1, 2, 4-Tribromobenzene	314.77	44	276		
1158	$C_6H_6Br_3$	1, 3, 5-Tribromobenzene	314.77	119.6	278		
1159	$C_6H_3Br_3O$	2, 3, 5-Tribromophenol $Br_3C_6H_2OH$	330.77	92.5			
1160	$C_6H_3Br_3O$	2, 4, 6-Tribromophenol $Br_3C_6H_2OH$	330.77	96		2.55	
1161	$C_6H_3Br_3O_2$	2, 4, 6-Tribromoresorcinol	346.77	111			
1162	$C_6H_3ClN_2O_4$	3-Chloro-1, 2-dinitrobenzene	202.50	86.8			
1163	$C_6H_3ClN_2O_4$	4-Chloro-1, 2-dinitrobenzene	202.50	α 36.3 β 37.1 γ 38.8 δ 28	315 d.		
1164	$C_6H_3ClN_2O_4$	2-Chloro-1, 3-dinitrobenzene	202.50	87			
1165	$C_6H_3ClN_2O_4$	*α*-4-Chloro-1, 3-dinitrobenzene	202.50	53.4	315	1.697	
1166	$C_6H_3ClN_2O_4$	*β*-4-Chloro-1, 3-dinitrobenzene	202.50	43	315	1.680	
1167	$C_6H_3ClN_2O_4$	5-Chloro-1, 3-dinitrobenzene	202.50	59			
1168	$C_6H_3ClN_2O_4$	2-Chloro-1, 4-dinitrobenzene	202.50	60			
1169	$C_6H_3Cl_2NO_2$	2, 3-Dichloronitrobenzene	191.95	62	258	1.721^{14}	
1170	$C_6H_3Cl_2NO_2$	2, 4-Dichloronitrobenzene	191.95	33		1.439^{80}	
1171	$C_6H_3Cl_2NO_2$	2, 5-Dichloronitrobenzene	191.95	54.5	266	1.669^{22}	
1172	$C_6H_3Cl_2NO_2$	2, 6-Dichloronitrobenzene	191.95	72.5	130^{8}	1.603^{17}	
1173	$C_6H_3Cl_2NO_2$	3, 4-Dichloronitrobenzene	191.95	43	256	1.451^{80}	
1174	$C_6H_3Cl_2NO_2$	3, 5-Dichloronitrobenzene	191.95	65.4		1.692^{14}	
1174.1	$C_6H_3Cl_2NO_3$	4, 6-Dichloro-2-nitrophenol	207.95	122		1.822	
1175	$C_6H_3Cl_3$	1, 2, 3-Trichlorobenzene	181.40	52	219		
1176	$C_6H_3Cl_3$	1, 2, 4-Trichlorobenzene	181.40	17	213	1.574^{10}	754
1177	$C_6H_3Cl_3$	1, 3, 5-Trichlorobenzene	181.40	63	208.5		
1178	$C_6H_3Cl_3O$	2, 3, 5-Trichlorophenol	197.40	53.4	253		
1179	$C_6H_3Cl_3O$	2, 4, 6-Trichlorophenol	197.40	68	244.5		
1180	$C_6H_3Cl_3O_2$	2, 3, 5-Trichlorohydroquinone	213.40	134			
1181	$C_6H_3Cl_3O_2$	2, 4, 6-Trichlororesorcinol	213.40	83			
1182	$C_6H_3Cl_3O_6S_3$	Benzene-1, 3, 5-trisulfonyl chloride	373.59	184			
1183	$C_6H_3Cl_4N$	2, 3, 4, 5-Tetrachloroaniline	230.86	118			
1184	$C_6H_3Cl_4N$	2, 3, 4, 6-Tetrachloroaniline	230.86	88			
1185	$C_6H_3Cl_4N$	2, 3, 5, 6-Tetrachloroaniline	230.86	90			
1186	$C_6H_3I_3$	1, 2, 3-Triiodobenzene	455.82	116			
1187	$C_6H_3I_3$	1, 2, 4-Triiodobenzene	455.82	84			
1188	$C_6H_3I_3$	1, 3, 5-Triiodobenzene	455.82	181			
1189	$C_6H_3I_3O$	2, 4, 6-Triiodophenol $I_3C_6H_2(OH)$	471.82	156			
1190	$C_6H_3N_3O_6$	1, 2, 3-Trinitrobenzene	213.05	127.5			
1191	$C_6H_3N_3O_6$	1, 2, 4-Trinitrobenzene	213.05	61		$1.73^{15.5}$	
1192	$C_6H_3N_3O_6$	1, 3, 5-Trinitrobenzene	213.05	121; 61	d.	1.688	
1193	$C_6H_3N_3O_6S$	Thiopicric acid	245.11	114	exp. 115		
1194	$C_6H_3N_3O_7$	2, 3, 5-Trinitrophenol $C_6H_2(NO_2)_3OH$	229.05	120			
1195	$C_6H_3N_3O_7$	2, 3, 6-Trinitrophenol $C_6H_2(NO_2)_3OH$	229.05	118			
1196	$C_6H_3N_3O_7$	2, 4, 5-Trinitrophenol $C_6H_2(NO_2)_3OH$	229.05	96			
1197	$C_6H_3N_3O_7$	Picric acid $(NO_2)_3C_6H_2OH$	229.05	121.8	exp. >300	1.763	1313
1198	$C_6H_3N_3O_8$	Styphnic acid	245.05	180		1.829	
1199	$C_6H_3N_3O_9S$	Picrylsulfonic acid	293.11	100			
1200	$C_6H_3N_5O_8$	2, 3, 4, 6-Tetranitroaniline	273.06	170	exp. 237	1.89	1314
1200.1	C_6H_4BrCl	*o*-Bromochlorobenzene	191.40	−12.6	204^{765}	$1.656^{12.5}$	765
1200.2	C_6H_4BrCl	*m*-Bromochlorobenzene	191.40	−21.2	196	1.627^{14}	764
1200.3	C_6H_4BrCl	*p*-Bromochlorobenzene	191.40	67.4	196.3		
1200.4	C_6H_4BrI	*o*-Bromoiodobenzene	282.88	2.1	257.4^{754}		
1200.5	C_6H_4BrI	*m*-Bromoiodobenzene	282.88	−9.3	252^{754}		

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
1200.6	C_6H_4BrI	p-Bromoiodobenzene	282.88	92	251.6^{754}		
1201	$C_6H_4BrNO_2$	o-Bromonitrobenzene	201.96	43.0	261	1.623_4^{80}	
1202	$C_6H_4BrNO_2$	m-Bromonitrobenzene	201.96	56.0	256.5	1.704	777
1203	$C_6H_4BrNO_2$	p-Bromonitrobenzene	201.96	127	256		
1204	$C_6H_4Br_2$	o-Dibromobenzene	235.86	1.8	221	1.966_4^{15}	787
1205	$C_6H_4Br_2$	m-Dibromobenzene	235.86	−6.9	217	1.955	783
1206	$C_6H_4Br_2$	p-Dibromobenzene	235.86	86.8	219	1.954	1132
1207	$C_6H_4Br_2O$	2, 4-Dibromophenol	251.86	36	239		
1208	$C_6H_4Br_2O$	2, 6-Dibromophenol	251.86	56			
1209	$C_6H_4Br_2O$	3, 4-Dibromophenol	251.86	80			
1210	$C_6H_4Br_2O$	3, 5-Dibromophenol	251.83	76.5			
1211	$C_6H_4Br_2O_2$	2, 4-Dibromoresorcinol	267.86	92.5			
1212	$C_6H_4Br_2O_2$	4, 6-Dibromoresorcinol	267.86	112	130 (in CO_2)		
1213	$C_6H_4Br_3N$	2, 4, 6-Tribromoaniline	329.79	119	300		
1214	$C_6H_4Br_3N$	3, 4, 5-Tribromoaniline	329.79	118			
1214.1	C_6H_4ClI	p-Chloroiodobenzene	238.42	57	227.6^{751}		
1215	$C_6H_4ClNO_2$	o-Chloronitrobenzene	157.50	32.5	245.7	1.365	
1216	$C_6H_4ClNO_2$	m-Chloronitrobenzene	157.50	44.4; 23.7	235.6	1.534	
1217	$C_6H_4ClNO_2$	p-Chloronitrobenzene	157.50	83.5	242	1.520	
1218	$C_6H_4ClNO_3$	4-Chloro-2-nitrophenol	173.50	87			
1219	$C_6H_4ClNO_3$	5-Chloro-2-nitrophenol	173.50	38.9			
1220	$C_6H_4ClNO_3$	6-Chloro-2-nitrophenol	173.50	70			
1221	$C_6H_4ClNO_3$	2-Chloro-3-nitrophenol	173.50	120			
1222	$C_6H_4ClNO_3$	4-Chloro-3-nitrophenol	173.50	127			
1223	$C_6H_4ClNO_3$	5-Chloro-3-nitrophenol	173.50	147			
1224	$C_6H_4ClNO_3$	6-Chloro-3-nitrophenol	173.50	118			
1225	$C_6H_4ClNO_3$	2-Chloro-4-nitrophenol	173.50	111			
1226	$C_6H_4ClNO_3$	3-Chloro-4-nitrophenol	173.50	133			
1227	$C_6H_4ClNO_5S$	2-Chloronitrobenzene-5-sulfonic acid	237.56	>200 d.			
1228	$C_6H_4ClNO_5S$	5-Chloronitrobenzene-3-sulfonic acid	237.56	200 d.			
1229	$C_6H_4Cl_2$	o-Dichlorobenzene	146.95	−17.6	179	1.298	731
1230	$C_6H_4Cl_2$	m-Dichlorobenzene	146.95	−24.8	173	1.288	723
1231	$C_6H_4Cl_2$	p-Dichlorobenzene	146.95	52.9	173	1.458	1101
1232	$C_6H_4Cl_2O$	2, 3-Dichlorophenol	162.95	57			
1233	$C_6H_4Cl_2O$	2, 4-Dichlorophenol	162.95	45	210		
1234	$C_6H_4Cl_2O$	2, 5-Dichlorophenol	162.95	58	211.7		
1235	$C_6H_4Cl_2O$	2, 6-Dichlorophenol	162.95	67	220		
1236	$C_6H_4Cl_2O$	3, 4-Dichlorophenol	162.95	68	253 5		
1237	$C_6H_4Cl_2O$	3, 5-Dichlorophenol	162.95	68	233.1		
1238	$C_6H_4Cl_2O_2$	2, 3-Dichlorohydroquinone	178.95	145			
1239	$C_6H_4Cl_2O_2$	2, 5-Dichlorohydroquinone	178.95	170		1.824	
1240	$C_6H_4Cl_2O_2$	2, 6-Dichlorohydroquinone	178.95	164			
1241	$C_6H_4Cl_2O_3S$	2, 5-Dichlorobenzenesulfonic acid	227.01	97			
1242	$C_6H_4Cl_2O_4S_2$	o-Benzenedisulfonyl chloride	275.08	105			
1243	$C_6H_4Cl_2O_4S_2$	m-Benzendisulfonyl chloride	275.08	63			
1244	$C_6H_4Cl_2O_4S_2$	p-Benzenedisulfonyl chloride	275.08	131			
1245	$C_6H_4Cl_3N$	2, 3, 4-Trichloroaniline	196.41	67.5	291.5		
1246	$C_6H_4Cl_3N$	2, 4, 5-Trichloroaniline	196.41	96	270		
1247	$C_6H_4Cl_3N$	2, 4, 6-Trichloroaniline	196.41	77.5	262.4		
1248	$C_6H_4Cl_3N$	3, 4, 5-Trichloroaniline $Cl_3C_6H_2NH_2$	196.41	100			
1249	$C_6H_4FNO_2$	o-Fluoronitrobenzene	141.04	−5.9	214.6	1.338	706
1250	$C_6H_4FNO_2$	m-Fluoronitrobenzene	141.04	1.7	205	1.327	688
1251	$C_6H_4FNO_2$	p-Fluoronitrobenzene	141.04	26.5; 21.5	205	1.326	1084
1252	$C_6H_4F_2$	m-Difluorobenzene	114.03		83	1.172	384
1253	$C_6H_4F_2$	p-Difluorobenzene	114.03	−23.7	88.9	1.164	362
1254	$C_6H_4INO_2$	o-Iodonitrobenzene	248.97	49.4	290	$1.810_4^{15.5}$	
1255	$C_6H_4INO_2$	m-Iodonitrobenzene	248.97	36	280	$1.804_4^{15.5}$	
1256	$C_6H_4INO_2$	p-Iodonitrobenzene	248.97	171.5	288.1	$1.809_4^{15.5}$	
1257	$C_6H_4INO_3$	4-Iodo-6-nitrophenol $IC_6H_3(NO_2)OH$	264.97	81			
1258	$C_6H_4I_2$	o-Diiodobenzene	329.90	23.4	286.8		
1259	$C_6H_4I_2$	m-Diiodobenzene	329.90	34.2	284.8		
1260	$C_6H_4I_2$	p-Diiodobenzene	329.90	129.4	285		

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
1261	$C_6H_4I_2O$	2, 4-Diiodophenol	345.90	72	100		
1262	$C_6H_4I_2O$	2, 6-Diiodophenol $I_2C_6H_3OH$	345.90	68			
1263	$C_6H_4I_2O$	3, 4-Diiodophenol $I_2C_6H_3OH$	345.90	83			
1264	$C_6H_4I_2O$	3, 5-Diiodophenol $I_2C_6H_3OH$	345.90	104			
1265	$C_6H_4I_2O_4S$	2, 6-Diiodophenol-4-sulfonic acid	425.96	120	190 d.		
1266	$C_6H_4I_3N$	2, 4, 6-Triiodoaniline $I_3C_6H_2NH_2$	470.84	185.5			
1267	$C_6H_4N_2$	Pyridyl-2-cyanide $CN.C_5H_4N$	104.05	29			
1268	$C_6H_4N_2$	Pyridyl-3-cyanide $CN.C_5H_4N$	104.05	50			
1269	$C_6H_4N_2$	Pyridyl-4-cyanide $CN.C_5H_4N$	104.05	79			
1270	$C_6H_4N_2O$	*p*-Diazophenol	120.05	exp. 38			
1271	$C_6H_4N_2O_4$	*o*-Dinitrobenzene	168.05	116.5	319	1.59	
1272	$C_6H_4N_2O_4$	*m*-Dinitrobenzene	168.05	89.7	302	1.575	
1273	$C_6H_4N_2O_4$	*p*-Dinitrobenzene	168.05	172.1	299	1.625	
1274	$C_6H_4N_2O_5$	2, 3-Dinitrophenol $(NO_2)_2C_6H_3OH$	184.05	144			
1275	$C_6H_4N_2O_5$	2, 4-Dinitrophenol	184.05	111.6		1.683	
1276	$C_6H_4N_2O_5$	2, 5-Dinitrophenol $(NO_2)_2C_6H_3OH$	184.05	104			
1277	$C_6H_4N_2O_5$	2, 6-Dinitrophenol $(NO_2)_2C_6H_3OH$	184.05	61.8			
1278	$C_6H_4N_2O_5$	3, 4-Dinitrophenol $(NO_2)_2C_6H_3OH$	184.05	134			
1279	$C_6H_4N_2O_5$	3, 5-Dinitrophenol	184.05	126.1			
1280	$C_6H_4N_2O_6$	2, 4-Dinitroresorcinol	200.05	148	d.		
1281	$C_6H_4N_2O_6$	4, 6-Dinitroresorcinol	200.05	215			
1282	$C_6H_4N_2O_7S$	2, 4-Dinitrobenzenesulfonic acid	248.11	108			
1283	$C_6H_4N_2S$	Benzisothiodiazole	136.11	44	206		
1284	$C_6H_4N_4O_6$	Picramide 2, 4, 6-$(NO_2)_3C_6H_2NH_2$	228.06	188			
1285	$C_6H_4N_4O_7$	2, 4, 6-Trinitroaminophenol	244.06	178			
1286	$C_6H_4N_6$	Hexaazobenzene	160.08	83			
1287	$C_6H_4O_2$	Quinone	108.03	115.7		1.318	
1288	$C_6H_4O_4$	2, 5-Dihydroxyquinone	140.03	220			
1289	$C_6H_4O_6$	Sarsapic acid	172.03	305			
1290	$C_6H_4O_8$	Ethanetetracarboxylic acid	204.03	169 d.			
1291	$C_6H_5AsCl_2$	Phenyl dichloroarsine	222.92		253		
1292	C_6H_5AsO	Phenylarsine oxide	168.00	120			
1294	C_6H_5Br	Bromobenzene	156.96	−30.6	156.2	1.497	747
1295	$C_6H_5BrN_2O_2$	4-Bromo-2-nitroaniline	216.97	111			
1296	C_6H_5BrO	*o*-Bromophenol	172.96	5.6	195	1.553^{8C}	
1297	C_6H_5BrO	*m*-Bromophenol	172.96	33	236.5		
1298	C_6H_5BrO	*p*-Bromophenol	172.96	63.5	238	1.588^{80}	
1299	$C_6H_5BrO_2$	Bromohydroquinone	188.96	115			
1300	$C_6H_5BrO_2$	2(4)-Bromoresorcinol	188.96	91			
1301	$C_6H_5BrO_3S$	*p*-Bromobenzenesulfonic acid	237.02	88			
1302	$C_6H_5Br_2N$	2, 4-Dibromoaniline	250.88	79.5			
1303	$C_6H_5Br_2N$	2, 5-Dibromoaniline	250.88	52			
1304	$C_6H_5Br_2N$	2, 6-Dibromoaniline	250.88	84	264		
1305	$C_6H_5Br_2N$	3, 4-Dibromoaniline	250.88	80.4			
1306	$C_6H_5Br_2N$	3, 5-Dibromoaniline	250.88	56.5			
1307	C_6H_5Cl	Chlorobenzene	112.50	−45.2	132.1	1.107	681
1308	$C_6H_5ClN_2O_2$	2-Chloro-4-nitroaniline	172.51	105			
1309	$C_6H_5ClN_2O_2$	2-Chloro-5-nitroaniline	172.51	118			
1310	$C_6H_5ClN_2O_2$	3-Chloro-4-nitroaniline	172.51	157			
1311	$C_6H_5ClN_2O_2$	3-Chloro-6-nitroaniline	172.51	125			
1312	$C_6H_5ClN_2O_2$	4-Chloro-2-nitroaniline	172.51	115			
1313	$C_6H_5ClN_2O_2$	4-Chloro-3-nitroaniline	172.51	103			
1314	C_6H_5ClO	*o*-Chlorophenol	128.50	α 7; β 0; γ −4.1	173	$1.241_{15}^{18.2}$	1058
1315	C_6H_5ClO	*m*-Chlorophenol	128.50	32.8	214		1059
1316	C_6H_5ClO	*p*-Chlorophenol	128.50	37	217	1.306	1060
1317	$C_6H_5ClO_2$	Chlorohydroquinone	144.50	106	263		
1318	$C_6H_5ClO_2S$	Benzenesulfone chloride	176.56	14.5	247	1.383^{15}	
1319	$C_6H_5ClO_3S$	*p*-Chlorobenzenesulfonic acid	192.56	67	146^{25}		
1320	$C_6H_5Cl_2N$	2, 3-Dichloroaniline	161.96	24	252		
1321	$C_6H_5Cl_2N$	2, 4-Dichloroaniline	161.96	63	245	1.567	
1322	$C_6H_5Cl_2N$	2, 5-Dichloroaniline	161.96	50	251		
1323	$C_6H_5Cl_2N$	2, 6-Dichloroaniline $Cl_2C_6H_3NH_2$	161.96	39			

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
1324	$C_6H_5Cl_2N$	3, 4-Dichloroaniline	161.96	71.5	272		
1325	$C_6H_5Cl_2N$	3, 5-Dichloroaniline	161.96	50.5	260		
1326	$C_6H_5Cl_2OP$	Phosphenyl oxychloride	194.98		258	1.375	
1327	$C_6H_5Cl_2P$	Phosphenyl chloride	178.98		224.6	1.319	804
1328	C_6H_5F	Fluorobenzene	96.039	−41.2	86	1.024	487
1329	C_6H_5FO	*o*-Fluorophenol FC_6H_4OH	112.04	16.1			
1330	C_6H_5FO	*m*-Fluorophenol	112.04	13.8	183^{69}	1.222	652
1331	C_6H_5FO	*p*-Fluorophenol	112.04	28.5; 48.2	188	1.189_{4}^{56}	1083
1332	$C_6H_5F_2N$	2, 5-Difluoroaniline	129.05	13.5	85.8^{30}	$1.288^{17.2}$	
1333	C_6H_5I	Iodobenzene	203.97	−31.4	188.6	1.832	792
1334	C_6H_5IO	*o*-Iodophenol	219.97	40.4	187^{160}	1.876^{80}	
1335	C_6H_5IO	*m*-Iodophenol IC_6H_4OH	219.97	40			
1336	C_6H_5IO	*p*-Iodophenol IC_6H_4OH	219.97	94			
1337	C_6H_5IO	Iodosobenzene	219.97	exp. 210			
1338	$C_6H_5IO_2$	Iodoxybenzene	235.97	exp. 238			
1339	$C_6H_5IO_2S$	Benzenesulfone iodide $C_6H_5SO_2I$	268.04	45			
1340	$C_6H_5I_2N$	2, 4-Diiodoaniline $I_2C_6H_3NH_2$	344.91	96			
1341	C_6H_5NO	Pyridyl-α-aldehyde	107.05		181	1.126	947
1342	C_6H_5NO	Pyridyl-β-aldehyde	107.05		97^{15}		
1343	C_6H_5NO	Nitrosobenzene	107.05	68	59^{18}		
1344	$C_6H_5NO_2$	Picolinic acid	123.05	137			
1345	$C_6H_5NO_2$	Nicotinic acid	123.05	232			
1346	$C_6H_5NO_2$	Isonicotinic acid	123.05	317			
1347	$C_6H_5NO_2$	Nitrobenzene	123.05	5.7	210.9	1.207	736
1348	$C_6H_5NO_2$	*p*-Nitrosophenol ONC_6H_4OH	123.05	126			
1349	$C_6H_5NO_3$	*o*-Nitrophenol	139.05	45	214.5	1.447	
1350	$C_6H_5NO_3$	*m*-Nitrophenol	139.05	96	194^{70}	1.485	
1351	$C_6H_5NO_3$	*p*-Nitrophenol	139.05	113		1.468	
1352	$C_6H_5NO_4$	2-Nitroresorcinol *m*-$(OH)_2C_6H_3NO_2$	155.05	85			
1353	$C_6H_5NO_4$	4-Nitroresorcinol *m*-$(OH)_2C_6H_3NO_2$	155.05	115			
1354	$C_6H_5NO_4$	Nitrohydroquinone	155.05	134			
1355	$C_6H_5NO_6S$	2-Nitrophenol-4-sulfonic acid	219.11	141			
1356	$C_6H_5N_2$	Aziminobenzene	119.06	99			
1357	$C_6H_5N_3$	Triazobenzene	119.06		73.5^{24}	1.098^{10}	991
1358	$C_6H_5N_3O_4$	2, 3-Dinitroaniline $(NO_2)_2C_6H_3NH_2$	183.06	127			
1359	$C_6H_5N_3O_4$	2, 4-Dinitroaniline	183.06	188			
1360	$C_6H_5N_3O_4$	2, 5-Dinitroaniline $(NO_2)_2C_6H_3NH_2$	183.06	137			
1361	$C_6H_5N_3O_4$	2, 6-Dinitroaniline	183.06	138			
1362	$C_6H_5N_3O_4$	3, 4-Dinitroaniline $(NO_2)_2C_6H_3NH_2$	183.06	154			
1363	$C_6H_5N_3O_4$	3, 5-Dinitroaniline $(NO_2)_2C_6H_3NH_2$	183.06	159			
1364	$C_6H_5N_3O_5$	Picramic acid	199.06	165			1320
1365	C_6H_6	Benzene	78.046	5.5	79.6	0.878	606
1366	C_6H_6	Dipropargyl	78.046	−6	85.4	0.805	380
1367	$C_6H_6AsCl_3$	Tri- (2-chlorovinyl)arsine	259.38		260	1.572	
1368	C_6H_6BrN	*o*-Bromoaniline	171.97	31.5	251		
1369	C_6H_6BrN	*m*-Bromoaniline	171.97	18.5	251	$1.587_{15}^{16.3}$	793
1370	C_6H_6BrN	*p*-Bromoaniline $BrC_6H_4NH_2$	171.97	66.4			
1371	$C_6H_6Br_2N_2$	3, 4-Dibromophenylhydrazine	265.89	75			
1372	$C_6H_6Br_2N_2$	3, 5-Dibromophenylhydrazine	265.89	95.5			
1373	$C_6H_6Br_6$	α-*trans*-Benzenehexabromide	557.54	212			
1374	$C_6H_6Br_6$	β-*cis*-Benzenehexabromide	557.54	253			
1375	C_6H_6ClN	*o*-Chloroaniline $ClC_6H_4NH_2$	127.51	0	210.5	1.213	774
1376	C_6H_6ClN	*m*-Chloroaniline	127.51	−10.4	229.8	1.215	776
1377	C_6H_6ClN	*p*-Chloroaniline	127.51	71	231	1.170_{4}^{70}	
1378	C_6H_6ClNO	2-Chloro-3-aminophenol	143.51	87			
1379	C_6H_6ClNO	2-Chloro-4-aminophenol	143.51	153			
1380	$C_6H_6ClNO_3S$	*p*-Chlorometanilic acid	207.58	280 d.			
1381	$C_6H_6Cl_2N_2$	2, 4-Dichlorophenylhydrazine	176.98	94			
1382	$C_6H_6Cl_2N_2$	2, 5-Dichlorophenylhydrazine	176.98	105			
1383	$C_6H_6Cl_2N_2$	3, 5-Dichlorophenylhydrazine	176.98	118			
1384	$C_6H_6Cl_6$	α-*trans*-Benzenehexachloride	290.79	157	288	1.87	
1385	$C_6H_6Cl_6$	β-*cis*-Benzenehexachloride	290.79	310		1.89^{19}	

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
1386	$C_6H_6Cl_6$	γ-Benzenehexachloride	290.79	112			
1387	$C_6H_6Cl_6$	δ-Benzenehexachloride	290.79	129			
1388	C_6H_6FN	*o*-Fluoroaniline	111.05	−34.6	68.5^{14}	1.151	716
1389	C_6H_6FN	*m*-Fluoroaniline	111.05		186.3	1.160	722
1390	C_6H_6FN	*p*-Fluoroaniline	111.05	−1.9	189	1.152	707
1391	C_6H_6IN	*o*-Iodoaniline	218.99	56.5			
1392	C_6H_6IN	*m*-Iodoaniline	218.99	27			
1393	C_6H_6IN	*p*-Iodoaniline	218.99	62			
1394	$C_6H_6N_2O$	*p*-Nitrosoaniline	122.06	174			
1395	$C_6H_6N_2O_2$	Phenylnitroamine	138.06	46			
1396	$C_6H_6N_2O_2$	*o*-Nitroaniline	138.06	71.5			
1397	$C_6H_6N_2O_2$	*m*-Nitroaniline $O_2NC_6H_4NH_2$	138.06	111.8	286	1.430	
1398	$C_6H_6N_2O_2$	*p*-Nitroaniline	138.06	148		1.424	
1399	$C_6H_6N_2O_2$	Quinonedioxime *p*-$C_6H_4(NOH)_2$	138.06	240			
1400	$C_6H_6N_2O_3$	3-Nitro-2-aminophenol	154.06	136			
1401	$C_6H_6N_2O_3$	4-Nitro-2-aminophenol	154.06	143			
1402	$C_6H_6N_2O_3$	5-Nitro-2-aminophenol	154.06	202			
1403	$C_6H_6N_2O_3$	6-Nitro-2-aminophenol	154.06	111			
1404	$C_6H_6N_2O_3$	5-Nitro-3-aminophenol	154.06	165			
1405	$C_6H_6N_2O_3$	2-Nitro-4-aminophenol	154.06	206			
1406	$C_6H_6N_2O_3$	3-Nitro-4-aminophenol	154.06	148			
1407	$C_6H_6N_2O_4$	5-Acetylbarbituric acid	170.06	300			
1408	$C_6H_6N_2O_4$	Dimethylalloxan	170.06	255 d.			
1409	$C_6H_6N_4O_3$	1-Methyluric acid	182.08	400 d.			
1410	$C_6H_6N_4O_3$	3-Methyluric acid	182.08	>360 d.			
1411	$C_6H_6N_4O_3$	7-Methyluric acid	182.08	370 d.			
1412	$C_6H_6N_4O_7$	Ammonium picrate	246.08	d.		1.719	1318
1413	C_6H_6O	Phenol	94.046	41	182	1.071^{25}_{4}	1064
1414	$C_6H_6O_2$	*o*-Dihydroxybenzene 1, 2-$C_6H_4(OH)_2$*	110.05	105	245	1.344	1272
1415	$C_6H_6O_2$	Resorcinol 1, 3-$C_6H_4(OH)_2$	110.05	110	276.5	1.285^{15}	1275
1416	$C_6H_6O_2$	Hydroquinol 1, 4-$C_6H_4(OH)_2$	110.05	170.5	286.2	1.332^{15}	1184
1417	$C_6H_6O_2$	5-Methylfurfural	110.05		187	1.109^{18}	
1418	$C_6H_6O_2S$	Benzenesulfinic acid	142.11	84	100 d.		
1419	$C_6H_6O_3$	Pyrogallol 1, 2, 3-$C_6H_3(OH)_3$	126.05	134	309	1.453	1333
1420	$C_6H_6O_3$	Hydroxyhydroquinone	126.05	140.5			
1421	$C_6H_6O_3$	Phloroglucinol	126.05	219			
1422	$C_6H_6O_3$	Acrylic anhydride	126.05		97^{35}	1.094^{0}	
1423	$C_6H_6O_3S$	Benzenesulfonic acid	158.11	46	d.		
1424	$C_6H_6O_4$	Apionol 1, 2, 3, 4-$C_6H_2(OH)_4$	142.05	161			
1425	$C_6H_6O_4$	1, 2, 3, 5-Tetrahydroxybenzene	142.05	165			
1426	$C_6H_6O_4$	1, 2, 4, 5-Tetrahydroxybenzene	142.05	220			
1427	$C_6H_6O_4$	Muconic acid $(CH{:}CHCO_2H)_2$	142.05	320 d.			
1428	$C_6H_6O_4S$	*o*-Phenolsulfonic acid	174.11	50			
1429	$C_6H_6O_6$	Aconitic acid	174.05	191			
1430	C_6H_6S	Thiophenol C_6H_5SH	110.11		169.5	1.074	1002
1431	C_6H_6Se	Selenophenol C_6H_5SeH	157.25		183.6	1.487^{15}	
1432	$C_6H_6S_2$	Dithioresorcinol 1, 3-$C_6H_4(SH)_2$	142.18	27	243		
1433	$C_6H_6S_2$	Dithiohydroquinone 1, 4-$C_6H_4(SH)_2$	142.18	98			
1434	C_6H_7As	Phenylarsine $C_6H_5AsH_2$	154.01		148		
1435	$C_6H_7AsO_3$	Phenylarsonic acid	202.01	158 d.		1.840	
1436	$C_6H_7BrN_2$	*p*-Bromophenylhydrazine	186.99	107			
1437	$C_6H_7ClN_2$	4-Chloro-*o*-phenylenediamine	142.53	72			
1438	$C_6H_7ClN_2$	4-Chloro-*m*-phenylenediamine	142.53	86			
1439	$C_6H_7ClN_2$	*o*-Chlorophenylhydrazine	142.53	47			
1440	$C_6H_7ClN_2$	*p*-Chlorophenylhydrazine	142.53	90			
1441	C_6H_7ClO	Sorbic chloride	130.51		78^{15}	1.065	741
1441.1	$C_6H_7ClO_4$	Methyl chloromaleate	178.51		106.5^{18}	1.278^{25}	
1441.2	$C_6H_7ClO_4$	Methyl chlorofumarate	178.51		115.5^{18}	1.290^{25}	
1442	C_6H_7N	Aniline	93.062	−6.2	184.4	1.022	769
1443	C_6H_7N	α-Picoline	93.062	−69.9	128.0	0.950	604
1444	C_6H_7N	β-Picoline	93.062		143.5	0.952	1018
1445	C_6H_7N	γ-Picoline	93.062		143.1	0.957	
1446	C_6H_7NO	*o*-Aminophenol	109.06	170			

* Commonly known as catechol, pyrocatechol, catechin, pyrocatechin.

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
1447	C_6H_7NO	*m*-Aminophenol	109.06	123			
1448	C_6H_7NO	*p*-Aminophenol	109.06	184			1333
1449	C_6H_7NO	Methyl 2-pyrryl ketone	109.06	90	220		
1450	C_6H_7NO	β-Phenylhydroxylamine	109.06	82			
1451	$C_6H_7NO_2$	Phloramine 3, 5-$(OH)_2C_6H_3NH_2$	125.06	152			
1452	$C_6H_7NO_2S$	Benzenesulfoneamide	157.13	156			
1455	$C_6H_7NO_3S$	*p*-Anilinesulfonic acid	173.13	288			
1458	C_6H_7NS	2-Aminothiophenol	125 13	26	234		
1459	$C_6H_7N_3O_2$	4-Nitro-*o*-phenylenediamine	153.08	198			
1460	$C_6H_7N_3O_2$	4-Nitro-*m*-phenylenediamine	153.08	161			
1461	$C_6H_7N_3O_2$	2-Nitro-*p*-phenylenediamine	153.08	135			
1462	$C_6H_7N_5O_{16}$	*d*-Glucose pentanitrate	405.09	135 d.			
1463	$C_6H_7O_2P$	Phenylphosphenous acid	142.08	70			
1464	$C_6H_7O_3P$	Phenylphosphenic acid	158.08	158	250 d.	1.475	
1465	C_6H_7P	Phenyl phosphine $C_6H_5PH_2$	110.08		160	1.001^{15}	
1466	C_6H_8	1, 3-Cyclohexadiene	80.062	−98	80.5	0.842	519
1467	C_6H_8	Diallylene $(CH_2C{:}CH)_2$	80.062		70	$0.858^{18.2}$	
1468	C_6H_8	*o*-Dihydrobenzene	80.062		78.5	0.848	
1469	C_6H_8	*m*-Dihydrobenzene	80.062		80.5	0.830	
1470	C_6H_8	*p*-Dihydrobenzene	80.062		85.5	0.848	
1471	$C_6H_8AsNO_3$	Arsanilic acid *p*-$NH_2C_6H_4AsO(OH)_2$	217.03	<200			
1471.1	C_6H_8BrN	Aniline hydrobromide	173.99	286			
1472	C_6H_8ClN	Aniline hydrochloride	129.53	198	245	1.222^{4}	1245
1474	C_6H_8ClNO	*m*-Aminophenol hydrochloride	145.53	229			
1475	C_6H_8ClNO	*p*-Aminophenol hydrochloride	145.53	306 d.			1333
1476	$C_6H_8Cl_2O_2$	Adipyl dichloride	182.98		132^{18} s. d.		
1477	C_6H_8N	Piturine	94.070		244		
1478	$C_6H_8N_2$	Adipyldinitrile	108.08	1	295	0.951^{19}_{19}	471
1479	$C_6H_8N_2$	*o*-Phenylenediamine	108.08	103.8	252		
1480	$C_6H_8N_2$	*m*-Phenylenediamine	108.08	62.8	287	$1.107^{57.7}_{4}$	1086
1481	$C_6H_8N_2$	*p*-Phenylenediamine	108.08	139.7	267		
1482	$C_6H_8N_2$	2, 5-Dimethylpyrazine (Ketine)	108.08	15	155	0.990	1017
1483	$C_6H_8N_2$	Phenylhydrazine $C_6H_5NHNH_2$	108.08	19.6	243.5	1.098	784
1484	$C_6H_8N_2O$	2, 5-Diaminophenol	124.08	68			
1485	$C_6H_8N_2O$	3, 4-Diaminophenol	124.08	168			
1486	$C_6H_8N_2O$	3, 5-Diaminophenol	124.08	170			
1487	$C_6H_8N_2O_3$	1, 3-Dimethylbarbituric acid	156.08	123			
1488	$C_6H_8N_2O_3$	1-Ethylbarbituric acid	156.08	120			
1489	$C_6H_8N_2O_3$	Aniline nitrate	156.08		190 d.	1.358^{4}	
1490	$C_6H_8N_2O_3S$	*o*-Phenylenediamine-3-sulfonic acid	188.14	d.			
1491	$C_6H_8N_2O_3S$	*p*-Phenylhydrazinesulfonic acid	188.14	286			
1492	$C_6H_8N_2O_4S_2$	*o*-Benzenedisulfoneamide	236.21	233			
1493	$C_6H_8N_2O_4S_2$	*m*-Benzenedisulfoneamide	236.21	229			
1494	$C_6H_8N_2O_4S_2$	*p*-Benzenedisulfoneamide	236.21	188			
1495	$C_6H_8N_6O_{18}$	Mannitol hexanitrate	452.11	113		1.8	
1496	C_6H_8O	2, 5-Dimethylfuran	96.062		94	0.888	974
1497	$C_6H_8O_2$	Dihydroresorcinol *m*-$(OH)_2C_6H_6$	112.06	104			
1498	$C_6H_8O_2$	Sorbic acid $CH_3(CH{:}CH)_2CO_2H$	112.06	134.5	228 d.		1333
1499	$C_6H_8O_4$	Dimethyl fumarate	144.06	102	192		
1500	$C_6H_8O_4$	Dimethyl maleate	144.06		203	1.153^{14}	382
1501	$C_6H_8O_4$	Ethyl fumarate $CO_2HCH{:}CHCO_2C_2H_5$	144.06	70			
1502	$C_6H_8O_4$	Lactide	144.06	125	255	0.862	
1503	$C_6H_8O_5$	Acetonylmalonic acid	160.06	150			
1504	$C_6H_8O_5$	Acetylmalic acid	160.06	134			
1504.1	$C_6H_8O_5$	1-Ketoadipic acid	160.06	124			
1505	$C_6H_8O_6$	Tricarballylic acid	176.06	166	d.		
1506	$C_6H_8O_6$	Glycerol triformate (Triformin)	176.06	18	266	1.320	373
1507	$C_6H_8O_7$	Citric acid $(HO_2CCH_2)_2C(OH)CO_2H$	192.06	153		1.542	1202
1508	$C_6H_8O_8$	Hydroxycitric acid	208.06	160			
1509	C_6H_8S	2, 3-Dimethylthiophene	112.13		137	0.994	
1510	C_6H_8S	2, 4-Dimethylthiophene	112.13		138	0.996	
1511	C_6H_8S	2, 5-Dimethylthiophene	112.13		137.5	$0.976^{17.5}$	
1512	C_6H_8S	3, 4-Dimethylthiophene	112.13		146	$1.008^{23}_{21.6}$	

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
1513	$C_6H_9AsO_6$	Arsenic acetate	252.03	82	170^{31}		
1514	$C_6H_9ClN_2$	Phenylhydrazine hydrochloride	144.54	243			
1515	$C_6H_9ClO_3$	Ethyl chloroacetoacetate	164.53		200	1.179^{25}_{25}	
1516	C_6H_9N	1, 2-Dimethylpyrrol	95.077		65^{14}		
1517	C_6H_9N	2, 3-Dimethylpyrrol	95.077		165		
1518	C_6H_9N	2, 4-Dimethylpyrrol	95.077		171	0.927^{14}_{4}	829
1519	C_6H_9N	2, 5-Dimethylpyrrol	95.077		169	0.935	909
1520	C_6H_9N	1-Ethylpyrrol	95.077		131	0.888^{16}	
1521	$C_6H_9NO_2$	Guavacine	127.08	285 d.			
1522	$C_6H_9NO_3$	Triacetamide $(CH_3CO)_3N$	143.08	79			
1523	$C_6H_9NO_3S$	Ammonium benzenesulfonate	175.14	256			
1524	$C_6H_9NO_5S$	*m*-Aminophenol sulfate	207.14	152			
1525	$C_6H_9N_3$	1, 2, 3-Triaminobenzene	123.09	103	336		
1526	$C_6H_9N_3$	1, 2, 4-Triaminobenzene	123.09	100	340		
1527	$C_6H_9N_3O$	2, 4, 6-Triaminophenol	139.09		257		
1528	$C_6H_9N_3O_2$	Cupferron	155.09	164			
1529	$C_6H_9N_3O_2$	Histidine	155.09	253 d.			
1530	$C_6H_9N_3O_3$	Phloroglucinol trioxime	171.09	155 exp.			
1531	$C_6H_9N_3O_4$	Caffuric acid	187.09	220			
1532	C_6H_{10}	*n*-Butylacetylene $C_4H_9C⋮CH$	82.077	−150	71.5		
1533	C_6H_{10}	Diisopropenyl $(CH_3C:CH_2)_2$	82.077		69.6	0.731^{15}	852
1534	C_6H_{10}	1, 5-Hexadiene $(CH_2CH:CH_2)_2$	82.077		60	0.688	127
1535	C_6H_{10}	2, 4-Hexadiene $(CH:CHCH_3)_2$	82.077		82	0.718	819
1536	C_6H_{10}	Methylpropylacetylene $CH_3C⋮CC_3H_7$	82.077		84	0.749^{0}	
1537	C_6H_{10}	1, 2, 3, 4-Tetrahydrobenzene	82.077	−103.7	83	0.810	404
1539	$C_6H_{10}ClN_3O_2$	Histidine hydrochloride	191.56	251 d.			
1540	$C_6H_{10}N_4O_{13}$	Tetranitrodiglycerol	346.11		250^{8}	1.33	
1541	$C_6H_{10}O$	Cyclohexanone	98.077		156.7	0.949	874
1542	$C_6H_{10}O$	1, 2, 3, 4-Tetrahydrophenol	98.077		166 d.		
1543	$C_6H_{10}O$	1, 2, 3, 6-Tetrahydrophenol	98.077		166		
1544	$C_6H_{10}O$	Allyl ether $(CH_2:CHCH_2)_2O$	98.077		94.3	0.805	
1545	$C_6H_{10}O$	1-Ethyl-2-methylacrolein	98.077		137.3	0.858	
1546	$C_6H_{10}O$	Allylacetone $CH_2:CH(CH_2)_2COCH_3$	98.077		129.5	0.846	876
1547	$C_6H_{10}O$	Diethylketene $(C_2H_5)_2C:CO$	98.077		89.5	0.831	
1548	$C_6H_{10}O$	Mesityl oxide $(CH_3)_2C:CHCOCH_3$	98.077	−59.0	135	0.863	899
1549	$C_6H_{10}O_2$	Adipyl dialdehyde $OCH(CH_2)_4CHO$	114.08		94^{9}		
1550	$C_6H_{10}O_2$	Propionylpropionic aldehyde	114.08	40	166		
1551	$C_6H_{10}O_2$	Acetonylacetone $(CH_3COCH_2)_2$	114.08	−9	194	0.970	428
1552	$C_6H_{10}O_2$	*α*-Ethylcrotonic acid	114.08	45	209		
1553	$C_6H_{10}O_2$	1, 2-Hexenic acid $C_3H_7CH:CHCO_2H$	114.08	32	217	0.965	1055
1554	$C_6H_{10}O_2$	2, 3-Hexenic acid	114.08		208	0.962	953
1555	$C_6H_{10}O_2$	1, 2-Isohexenic acid	114.08		108^{12}	0.959	885
1556	$C_6H_{10}O_2$	Crotonyl acetate	114.08		129	0.934^{0}	
1557	$C_6H_{10}O_2$	Ethyl *α*-crotonate	114.08		139	0.919	283
1558	$C_6H_{10}O_2$	Ethyl isocrotonate	114.08		131.2	0.925	
1559	$C_6H_{10}O_3$	Glyceryl ether	130.08		173	1.091	
1560	$C_6H_{10}O_3$	Propionic anhydride $(CH_3CH_2CO)_2O$	130.08	−45.0	196.0	1.012	142
1561	$C_6H_{10}O_3$	Ethyl acetoacetate	130.08	< -80	180	1.025	243
1562	$C_6H_{10}O_4$	Adipic acid $HO_2C(CH_2)_4CO_2H$	146.08	151	265^{100}		
1563	$C_6H_{10}O_4$	1, 1-Dimethylsuccinic acid	146.08	142	165 d.		
1564	$C_6H_{10}O_4$	Ethylsuccinic acid	146.08	98			
1565	$C_6H_{10}O_4$	Methylethylmalonic acid	146.08	117.5			
1566	$C_6H_{10}O_4$	Propylmalonic acid $C_3H_7CH(CO_2H)_2$	146.08	96			
1567	$C_6H_{10}O_4$	Isopropylmalonic acid	146.08	87			
1568	$C_6H_{10}O_4$	Dimethyl succinate $(CH_2CO_2CH_3)_2$	146.08	19.5	192.8	1.121	942
1569	$C_6H_{10}O_4$	Dimethyl isosuccinate	146.08		179	1.028^{25}_{25}	
1570	$C_6H_{10}O_4$	Diethyl oxalate $(CO_2C_2H_5)_2$	146.08	−40.6	186.1	1.080	182
1571	$C_6H_{10}O_4$	Glycol diacetate $(CH_2OCOCH_3)_2$	146.08	−31	190.5	1.104	216
1572	$C_6H_{10}O_4$	Ethylidene diacetate	146.08		169	0.852	
1572.1	$C_6H_{10}O_4$	Methyl *l*-1-acetoxypropionate	146.08		172	1.089	
1573	$C_6H_{10}O_4$	Mannide	146.08		317		
1574	$C_6H_{10}O_4$	Isomannide	146.08	87	274		
1575	$C_6H_{10}O_5$	Lactic anhydride $(CH_3CHOHCO)_2$	162.08	260 d.			

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
1576	$C_6H_{10}O_5$	Dimethyl malate	162.08		242	1.233	391
1577	$C_6H_{10}O_5$	β-Glucosan	162.08	178			
1578	$(C_6H_{10}O_5)_x$	Glycogen	$(162.08)_x$	240			
1578.1	$(C_6H_{10}O_5)_x$	Starch	$(162.08)_x$	d.		1.50^{21}	1164
1579	$C_6H_{10}O_5$	*d*-Saccharine	162.08	161			
1580	$C_6H_{10}O_6$	Dimethyl *dl*-tartrate $(CH(OH)CO_2CH_3)_2$	178.08	85	282		
1581	$C_6H_{10}O_6$	Dimethyl *d*-tartrate	178.08	48; 61.5	280	1.328	
1582	$C_6H_{10}O_6$	Ethyl *d*-tartrate	178.08	90			
1583	$C_6H_{10}O_8$	Allomucic acid	210.08	171 d.			
1584	$C_6H_{10}O_8$	Mucic acid $HO_2C(CHOH)_4CO_2H$	210.08	206 d.			
1585	$C_6H_{10}O_8$	*d*(*l*)-Talomucic acid	210.08	158 d.			
1586	$C_6H_{10}O_8$	Isosaccharic acid	210.08	185			
1587	$C_6H_{10}S$	Diallyl sulfide $(CH_2:CHCH_2)_2S$	114.14	−83.0	138.7	$0.888_4^{26.8}$	1034
1588	$C_6H_{11}Br$	Cyclohexyl bromide	163.00		165.5	1.333	575
1589	$C_6H_{11}BrN_2O_2$	Bromural	223.02	154			
1590	$C_6H_{11}BrO_2$	1-Bromocaproic acid $C_4H_9CHBrCO_2H$	195.00		131^{10}		
1591	$C_6H_{11}BrO_2$	2-Bromocaproic acid	195.00	35			
1592	$C_6H_{11}BrO_2$	Ethyl 1-bromobutyrate	195.00		179 d.	1.325_{25}^{25}	
1593	$C_6H_{11}BrO_2$	Ethyl 1-bromoisobutyrate	195.00		164 d.	1.315_{25}^{25}	
1595	$C_6H_{11}Cl$	Cyclohexyl chloride	118.54		142.5	0.973	451
1596	$C_6H_{11}ClO$	*n*-Caproyl chloride $C_5H_{11}COCl$	134.54		153		543
1597	$C_6H_{11}ClO_2$	Isoamyl chloroformate	150.54		156	1.024_{25}^{25}	
1598	$C_6H_{11}Cl_2N_3O_2$	Histidine dihydrochloride	228.03	235 d.			
1599	$C_6H_{11}Cl_3O_2$	Trichloroacetal $Cl_3CCH(OC_2H_5)_2$	221.46		197	1.266^{15}	
1600	$C_6H_{11}Cl_3O_2$	Trichloroacetal (solid)	221.46	83	230 d.		
1601	$C_6H_{11}I$	Cyclohexyl iodide	210.02		192	1.626	
1602	$C_6H_{11}N$	Capronitrile $C_5H_{11}CN$	97.09		163	0.809	188
1603	$C_6H_{11}N$	Isocapronitrile $(CH_3)_2CH(CH_2)_2CN$	97.09	−51.1	155.5	0.806	159
1604	$C_6H_{11}N$	Isocaproisonitrile $(CH_3)_2CH(CH_2)_2NC$	97.09		137		
1605	$C_6H_{11}NO_2$	Hygric acid	129.09	169			
1606	$C_6H_{11}NO_2$	Nitrocyclohexane	129.09	−34	205.5	1.068	
1607	$C_6H_{11}NO_3$	Adipyl amide $HO_2C(CH_2)_4CONH_2$	145.09	130			
1608	$C_6H_{11}NS$	Isoamyl isothiocyanate	129.16		182		
1609	$C_6H_{11}N_3O_4$	Citramide $(H_2NOCCH_2)_2C(OH)CONH_2$	189.11	215			
1610	C_6H_{12}	Butylethylene $C_4H_9CH:CH_2$	84.092	−98.5	64.1	0.683	44
1611	C_6H_{12}	2, 2-Dimethyl-4-butene	84.092		42.3		
1612	C_6H_{12}	Cyclohexane	84.092	6.5	81.4	0.779	304
1613	C_6H_{12}	2-Methyl-2-pentene $(CH_3)_2C:CHC_2H_5$	84.092		67.1	0.692	881
1615	C_6H_{12}	Methylcyclopentane	84.092	−140.5	73	0.750	
1616	C_6H_{12}	3-Methyl-2-pentene (isomer 1)	84.092		65.7	0.722^{15}	848
1617	C_6H_{12}	3-Methyl-2-pentene (isomer 2)	84.092		70.2	0.698	128
1618	C_6H_{12}	2, 3-Dimethyl-1-butene	84.092		59	0.680^0	
1619	C_6H_{12}	Tetramethylethylene	84.092		73	0.712	199
1620	$C_6H_{12}As_2$	Cacodyl carbide	234.01		84.5^{15}		
1621	$C_6H_{12}As_3BiO_6$	Bismuth cacodylate $(8H_2O)$	613.97	82			
1622	$C_6H_{12}Cl_2O_2$	Dichloroacetal $Cl_2CHCH(OC_2H_5)_2$	187.01		184	1.138^{14}	
1623	$C_6H_{12}N_2O_2$	Adipic diamide $H_2NOC(CH_2)_4CONH_2$	144.11	220			
1624	$C_6H_{12}N_2O_2$	*sym.*-Diethyloxamide	144.11	190			
1625	$C_6H_{12}N_2O_4S_2$	*l*-Cystine	240.24	258 d.			1187
1626	$C_6H_{12}N_4$	Hexamethylenetetramine	140.12		263		
1627	$C_6H_{12}O$	Cyclohexanol	100.09	23.9	161.5	0.962	1051
1628	$C_6H_{12}O$	2-Hexene-4-ol	100.09		59^{27}	0.837	1008
1629	$C_6H_{12}O$	Dimethyl propenyl carbinol	100.09		112	0.835	321
1630	$C_6H_{12}O$	Pinacolin $(CH_3)_3CCOCH_3$	100.09	−52.5	106.2	0.811	
1631	$C_6H_{12}O$	Ethyl isocrotonyl ether	100.09		94		
1632	$C_6H_{12}O$	Isopropyl allyl ether	100.09		84.2	0.776	
1633	$C_6H_{12}O$	*n*-Caproic aldehyde $C_5H_{11}CHO$	100.09		129	0.834	
1634	$C_6H_{12}O$	Isobutylacetaldehyde	100.09		121.7		
1635	$C_6H_{12}O$	Methylpropylacetaldehyde	100.09		121		
1636	$C_6H_{12}O$	Ethyl propyl ketone $C_2H_5COC_3H_7$	100.09		124	$0.818^{17.5}$	124
1637	$C_6H_{12}O$	Ethyl isopropyl ketone	100.09		114.5	0.830_0^0	
1638	$C_6H_{12}O$	Methyl *n*-butyl ketone $CH_3COC_4H_9$	100.09	−56.9	127.2	0.830^0	
1639	$C_6H_{12}O$	Methyl isobutyl ketone	100.09	−84.7	119	0.803	96

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
1640	$C_6H_{12}O$	Methyl *sec.*-butyl ketone	100.09		117.8	0.815	115
1641	$C_6H_{12}O_2$	Diacetone alcohol	116.09		166	0.931^{25}	
1642	$C_6H_{12}O_2$	*tert.*-Butylacetic acid	116.09	−11	190		
1643	$C_6H_{12}O_2$	Caproic acid $C_5H_{11}CO_2H$	116.09	−9.5	202	0.929	207
1644	$C_6H_{12}O_2$	Isocaproic acid	116.09	−35	207.7	0.925	217
1645	$C_6H_{12}O_2$	Diethylacetic acid $(C_2H_5)_2CHCO_2H$	116.09	<−15	197	$0.933_4^{10.2}$	201
1646	$C_6H_{12}O_2$	Dimethylethylacetic acid	116.09	−14	187		
1647	$C_6H_{12}O_2$	Methylpropylacetic acid	116.09		193.5	0.928	
1648	$C_6H_{12}O_2$	*n*-Amyl formate $HCO_2C_5H_{11}$	116.09		130.4	0.902^0	
1649	$C_6H_{12}O_2$	Isoamyl formate	116.09		123.5	0.871	83
1650	$C_6H_{12}O_2$	*tert.*-Amyl formate	116.09		113	0.896^{15}	
1651	$C_6H_{12}O_2$	*n*-Butyl acetate $CH_3CO_2C_4H_9$	116.09	−76.8	126.5	0.882	95
1652	$C_6H_{12}O_2$	Isobutyl acetate $CH_3CO_2CH_2CH(CH_3)_2$	116.09	−98.9	118.3	0.871	118
1653	$C_6H_{12}O_2$	*sec.*-Butyl acetate	116.09		112.2	0.870	73
1654	$C_6H_{12}O_2$	Ethyl *n*-butyrate $C_3H_7CO_2C_2H_5$	116.09	−93.3	121.3	0.879	91
1655	$C_6H_{12}O_2$	Ethyl isobutyrate	116.09	−88.2	111.7	0.871	80
1656	$C_6H_{12}O_2$	Methyl trimethylacetate	116.09		102	1.044^0	
1657	$C_6H_{12}O_2$	Methyl *n*-valerate $C_4H_9CO_2CH_3$	116.09		127.3	0.910^0	
1658	$C_6H_{12}O_2$	Methyl isovalerate	116.09		116.7	0.881	
1659	$C_6H_{12}O_2$	*n*-Propyl propionate $C_2H_5CO_2C_3H_7$	116.09	−75.9	123.4	0.883	92
1660	$C_6H_{12}O_2$	Isopropyl propionate	116.09		111.3	0.893^0	
1661	$C_6H_{12}O_3$	Phloroglucite	132.09	185			
1662	$C_6H_{12}O_3$	Paraldehyde $(CH_3CHO)_3$	132.09	10.5	124	0.994	244
1663	$C_6H_{12}O_3$	1-Hydroxy-*n*-caproic acid	132.09	62			
1664	$C_6H_{12}O_3$	1-Hydroxyisocaproic acid	132.09	81			
1665	$C_6H_{12}O_3$	*dl*-1-Hydroxyisocaproic acid	132.09	76			
1666	$C_6H_{12}O_3$	1-Hydroxy-1, 1-diethylacetic acid	132.09	74.5			
1667	$C_6H_{12}O_3$	Methyl *n*-butyl carbonate	132.09		151		
1668	$C_6H_{12}O_5$	Fucose	164.09	145			
1669	$C_6H_{12}O_5$	Mannitan	164.09	137			
1670	$C_6H_{12}O_5$	*d*-Quercitol	164.09	234		1.585^{13}	
1671	$C_6H_{12}O_5$	*l*-Quercitol	164.09	174			
1672	$C_6H_{12}O_5$ (H_2O)	*β*-Rhamnose	164.09	126		1.471	1219
1673	$C_6H_{12}O_5$	Rhodeose	164.09	144			
1674	$C_6H_{12}O_6$	*d*-Fructose (Levulose)	180.09	104		$1.669^{17.5}$	
1675	$C_6H_{12}O_6$	*d*, *α*-Galactose	180.09	168			
1675.1	$C_6H_{12}O_6$	*d*, *β*-Galactose	180.09	168			
1676	$C_6H_{12}O_6$	*dl*-Galactose	180.09	144			
1677	$C_6H_{12}O_6$	*d*, *α*-Glucose	180.09	146		1.544^{25}	
1678	$C_6H_{12}O_6$	*d*, *β*-Glucose	180.09	150			
1679	$C_6H_{12}O_6$	*d*(*l*)-Inosite	180.09	247	250 vac.		
1680	$C_6H_{12}O_6$	Dambose	180.09	224	d.	1.752	
1681	$C_6H_{12}O_6$	*α*-Mannose	180.09	133	205 d.		
1682	$C_6H_{12}O_6$	*d*-Mannose	180.09	132		1.539	
1683	$C_6H_{12}O_6$	*dl*-Mannose	180.09	133			
1684	$C_6H_{12}O_6$	*d*(*l*)-Sorbose	180.09	154		1.612	
1685	$C_6H_{12}O_6$	*dl*-Sorbose	180.09	154		1.638	
1686	$C_6H_{12}O_6$	*d*-Tagatose	180.09	124			
1687	$C_6H_{12}S$	Cyclohexyl mercaptan	116.16		160		
1688	$C_6H_{12}S_3$	*α*-Trithioacetaldehyde	180.29	101	247		
1689	$C_6H_{12}S_3$	*β*-Trithioacetaldehyde $(C_2H_4S)_3$	180.29	126			
1690	$C_6H_{12}S_3$	*γ*-Trithioacetaldehyde	180.29	81	100		
1690.1	$C_6H_{12}Se$	Hexamethyl selenide	163.29		172	1.122	
1691	$C_6H_{13}Br$	2-Bromo-2, 3-dimethylbutane	165.02	13	132		
1692	$C_6H_{13}Br$	*n*-Hexyl bromide $C_5H_{11}CH_2Br$	165.02		156	1.173	422
1693	$C_6H_{13}BrO_2$	Bromoacetal $BrCH_2CH(OC_2H_5)_2$	197.02		170		
1694	$C_6H_{13}Cl$	2-Chloro-2, 3-dimethylbutane	120.56	−10.4	112.1	0.875^{25}	
1695	$C_6H_{13}Cl$	*n*-Hexyl chloride $C_5H_{11}CH_2Cl$	120.56		134	0.872	238
1696	$C_6H_{13}ClN_4O_4$	Hexamethylenetetramine perchlorate	240.59	158			
1697	$C_6H_{13}I$	*n*-Hexyl iodide $C_5H_{11}CH_2I$	212.03		180	1.441	560
1698	$C_6H_{13}IO_2$	Iodoacetal $ICH_2CH(OC_2H_5)_2$	244.03		132^{90}	1.494^{15}	
1699	$C_6H_{13}N$	1-Methylpiperidine	99.108		107	0.818	416
1700	$C_6H_{13}N$	2-Methylpiperidine (*α*-Pipecoline)	99.108		119	$0.844^{23.6}$	1016

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
1701	$C_6H_{13}N$	3-Methylpiperidine (β-Pipecoline)	99.108		126	$0.845^{24.3}$	1020
1702	$C_6H_{13}N$	4-Methylpiperidine (γ-Pipecoline)	99.108		129	0.867^{0}	
1703	$C_6H_{13}NO_2$	Hedonal $H_2NCO_2CH(CH_3)C_3H_7$	131.11	74	215		
1704	$C_6H_{13}NO_2$	Isoamyl carbamate	131.11	63.5	220		
1704.1	$C_6H_{13}NO_2$	Propyl urethane $C_3H_7NHCO_2C_2H_5$	131.11		186	0.992^{15}	
1705	$C_6H_{13}NO_2$	*l*-Leucine $(CH_3)_2CHCH(NH_2)CO_2H$	131.11	295		1.293	1221
1706	$C_6H_{13}NO_2$	*dl*-Leucine	131.11	290			
1707	$C_6H_{13}NO_2$	*d*(*l*)-Isoleucine	131.11	280 d.			
1708	$C_6H_{13}NO_2$	*dl*-Isoleucine	131.11	275			
1709	$C_6H_{13}NO_5$	*d*-Glucosamine	179.11	110 d.			
1710	$C_6H_{13}NO_5$	*d*-Glucosimine	179.11	128			
1711	$C_6H_{13}NO_6$	*d*-Glucosoxime	195.11	138			
1712	C_6H_{14}	Diisopropyl $(CH_3)_2CHCH(CH_3)_2$	86.108	−135.1	58.1	0.666^{15}	38
1713	C_6H_{14}	*n*-Hexane $CH_3(CH_2)_4CH_3$	86.108	−94.3	69.0	0.660	32
1714	C_6H_{14}	3-Methylpentane $(C_2H_5)_2CHCH_3$	86.108		64	0.668	34
1715	C_6H_{14}	2-Methylpentane $(CH_3)_2CHC_3H_7$	86.108		60.0	0.654	27
1716	C_6H_{14}	2, 2-Dimethylbutane $(CH_3)_3CC_2H_5$	86.108	−98.2	49.7	0.649	23
1717	$C_6H_{14}INO_5$	*d*-Glucosamine hydroiodide	307.05	165 d.			
1718	$C_6H_{14}N_2$	α, 2, 5-Dimethylpiperazine	114.12	119	162		
1719	$C_6H_{14}N_2O$	Diacetoneamineoxime	130.12	58	135^{17}		
1720	$C_6H_{14}N_2O$	Dipropylnitrosamine $(C_3H_7)_2NNO$	130.12		205		
1721	$C_6H_{14}N_2O_7$	Ammonium citrate	226.12			1.483	
1722	$C_6H_{14}N_4O_2$	Arginine	174.14	207.5 d.			
1723	$C_6H_{14}O$	*tert.*-Amyl carbinol	102.11		135	0.844^{0}_{4}	
1724	$C_6H_{14}O$	Isohexyl alcohol	102.11		165	0.840^{0}_{4}	429
1725	$C_6H_{14}O$	Dimethylisopropyl carbinol	102.11	−14	122	0.823	
1726	$C_6H_{14}O$	Ethylpropyl carbinol	102.11		135	0.819	
1726.1	$C_6H_{14}O$	*l*(*d*)-Ethylpropyl carbinol	102.11		134^{733}	$0.825^{13.5}$	211
1727	$C_6H_{14}O$	Ethylisopropyl carbinol	102.11		128	0.824	
1728	$C_6H_{14}O$	*n*-Hexyl alcohol $C_6H_{13}OH$	102.11	−51.6	155.8	0.820	
1730	$C_6H_{14}O$	Methylbutyl carbinol	102.11		131.9	0.803^{25}_{4}	183
1730.1	$C_6H_{14}O$	*d*-Methylbutyl carbinol	102.11		138	0.815	205
1732	$C_6H_{14}O$	Methyl-*sec.*-butyl carbinol	102.11		134	0.831^{18}	245
1733	$C_6H_{14}O$	Pinacolyl alcohol $(CH_3)_3CH(OH)CH_3$	102.11	5.5	121	0.812^{25}	
1733.1	$C_6H_{14}O$	*d*-Pinacolyl alcohol	102.11		120	0.820	214
1734	$C_6H_{14}O$	Methyldiethyl carbinol	102.11	−22	122.6	0.824	242
1735	$C_6H_{14}O$	3-Methyl-3-ethylpropyl alcohol	102.11		152.1	0.830^{15}	
1736	$C_6H_{14}O$	2-Methyl-2-propylethyl alcohol	102.11		147.9	0.829	231
1737	$C_6H_{14}O$	Ethyl *n*-butyl ether $C_4H_9OC_2H_5$	102.11		91.4	0.752	
1738	$C_6H_{14}O$	Ethyl isobutyl ether	102.11		80	0.751	
1739	$C_6H_{14}O$	Methyl *n*-amyl ether $C_5H_{11}OCH_3$	102.11		88.5	0.754	53
1740	$C_6H_{14}O$	Methyl isoamyl ether	102.11		91	0.687^{91}_{4}	
1741	$C_6H_{14}O$	Propyl ether $(C_3H_7)_2O$	102.11	−122.0	89	0.747	41
1742	$C_6H_{14}O$	Isopropyl ether $[(CH_3)_2CH]_2O$	102.11		68.7	$0.735^{16.2}$	
1743	$C_6H_{14}O_2$	Pinacone $[(CH_3)_2COH]_2$	118.11	38	172.8		
1744	$C_6H_{14}O_2$	Hexane-1, 5-diol	118.11		233	0.981^{0}	
1745	$C_6H_{14}O_2$	Hexane-1, 6-diol $HOCH_2(CH_2)_4CH_2OH$	118.11	42	250		
1746	$C_6H_{14}O_2$	Acetal $CH_3CH(OC_2H_5)_2$	118.11		102.2	0.831	42
1747	$C_6H_{14}O_5$	Diglycerol $[(HO)_2C_3H_5]_2O$	166.11		230^{10}		
1748	$C_6H_{14}O_5$	Fucitol	166.11	153			
1749	$C_6H_{14}O_5$	Rhamnitol	166.11	121			
1750	$C_6H_{14}O_6$	Dulcitol	182.11	188	$295^{3.5}$	1.466^{15}	1333
1751	$C_6H_{14}O_6$	*d*-Mannitol	182.11	166.1	$295^{3.5}$	1.489	1333
1752	$C_6H_{14}O_6$	*d*-Sorbitol	182.11	110			1333
1753	$C_6H_{14}O_6$	*d*-Talitol	182.11	86			
1754	$C_6H_{14}S$	Dipropyl sulfide $(C_3H_7)_2S$	118.17		142	0.814	
1755	$C_6H_{14}S$	Diisopropyl sulfide $[(CH_3)_2CH]_2S$	118.17		120.4		
1756	$C_6H_{15}As$	Triethyl arsine $(C_2H_5)_3As$	162.08		141 d.	1.150	495
1757	$C_6H_{15}AsO_3$	Triethyl arsenite $(C_2H_5O)_3As$	210.08		166	1.224^{0}_{4}	
1758	$C_6H_{15}AsO_4$	Triethyl arsenate $(C_2H_5O)_3AsO$	226.08		238	1.326^{0}	
1759	$C_6H_{15}Bi$	Triethyl bismuthine $(C_2H_5)_3Bi$	296.12		107^{79}	1.82	
1760	$C_6H_{15}N$	Di-*n*-propylamine $(C_3H_7)_2NH$	101.12	−39.6	110.7	0.738	149
1761	$C_6H_{15}N$	Diisopropylamine $[(CH_3)_2CH]_2NH$	101.12		84	0.722^{22}	

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
1762	$C_6H_{15}N$	*n*-Hexylamine $C_6H_{13}NH_2$	101.12		128		
1762.1	$C_6H_{15}N$	2-Hexylamine $C_4H_9CH(NH_2)CH_3$	101.12	−19	130^{742}	$0.767^{20.4}$	
1763	$C_6H_{15}N$	Isohexylamine $(CH_3)_2CH(CH_2)_3NH_2$	101.12	−94.4	123.9		
1764	$C_6H_{15}N$	Triethylamine $(C_2H_5)_3N$	101.12	−114.8	89.5	0.728	129
1765	$C_6H_{15}NO_2$	Aminoacetal $H_2NCH_2CH(OC_2H_5)_2$	133.12		163		
1766	$C_6H_{15}N_3$	Acetaldehydeammonia (trimeric)	129.14	85			
1767	$C_6H_{15}O_3P$	Triethyl phosphite $(C_2H_5O)_3P$	166.14		156.5	$1.076^{13.4}$	169
1768	$C_6H_{15}O_4P$	Triethyl phosphate $(C_2H_5O)_3PO$	182.14		216	1.072^{12}	150
1769	$C_6H_{15}P$	Triethylphosphine $(C_2H_5)_3P$	118.14		128	0.800	413
1769.1	$C_6H_{15}PS$	Triethyl phosphinesulfide	150.20	94			1182
1770	$C_6H_{15}Sb$	Triethyl stibine $(C_2H_5)_3Sb$	208.89		159.5	1.324^{16}	
1771	$C_6H_{16}ClN$	Triethylamine hydrochloride	137.59	254		1.069	
1772	$C_6H_{16}N_2$	Hexamethylenediamine $H_2N(CH_2)_6NH_2$	116.14	39	196		
1773	$C_6H_{18}N_6O_4S$	1, 1-Dimethylguanidine sulfate	270.25	288 d.			
1775	$C_7HCl_5O_2$	Pentachlorobenzoic acid $C_6Cl_5CO_2H$	294.30	201			
1776	$C_7H_2Br_4O_2$	2, 3, 4, 6-Tetrabromobenzoic acid	437.68	174			
1777	$C_7H_2Cl_4O_2$	2, 3, 4, 5-Tetrachlorobenzoic acid	259.85	186			
1778	$C_7H_3Br_3O_2$	2, 3, 4-Tribromobenzoic acid	358.77	198			
1779	$C_7H_3Br_3O_2$	2, 3, 5-Tribromobenzoic acid	358.77	194			
1780	$C_7H_3Br_3O_2$	2, 4, 5-Tribromobenzoic acid	358.77	196			
1781	$C_7H_3Br_3O_2$	2, 4, 6-Tribromobenzoic acid	358.77	187			
1782	$C_7H_3Br_3O_2$	3, 4, 5-Tribromobenzoic acid	358.77	235			
1783	$C_7H_3Cl_3O_2$	2, 3, 4-Trichlorobenzoic acid	225.40	129			
1784	$C_7H_3Cl_3O_2$	2, 3, 5-Trichlorobenzoic acid	225.40	163			
1785	$C_7H_3Cl_3O_2$	2, 4, 5-Trichlorobenzoic acid	225.40	163			
1786	$C_7H_3Cl_3O_2$	2, 4, 6-Trichlorobenzoic acid	225.40	160			
1787	$C_7H_3Cl_3O_2$	3, 4, 5-Trichlorobenzoic acid	225.40	203			
1788	$C_7H_3N_3O_7$	2, 4, 6-Trinitrobenzaldehyde	241.05	119			
1789	$C_7H_3N_3O_8$	2, 4, 6-Trinitrobenzoic acid	257.05	190			
1790	C_7H_4BrClO	*o*-Bromobenzoyl chloride	219.41		243		
1791	C_7H_4BrClO	*m*-Bromobenzoyl chloride	219.41		239		
1792	C_7H_4BrClO	*p*-Bromobenzoyl chloride	219.41	42	247 s. d.		
1793	C_7H_4BrN	*o*-Bromobenzonitrile	181.96	51	253		
1794	C_7H_4BrN	*m*-Bromobenzonitrile	181.96	38	225		
1795	C_7H_4BrN	*p*-Bromobenzonitrile	181.96	113	237		
1796	$C_7H_4Br_2O_2$	2, 3-Dibromobenzoic acid	279.86	150			
1797	$C_7H_4Br_2O_2$	2, 4-Dibromobenzoic acid	279.86	169			
1798	$C_7H_4Br_2O_2$	2, 5-Dibromobenzoic acid	279.86	153			
1799	$C_7H_4Br_2O_2$	2, 6-Dibromobenzoic acid	279.86	147			
1800	$C_7H_4Br_2O_2$	3, 4-Dibromobenzoic acid	279.86	230			
1801	$C_7H_4Br_2O_2$	3, 5-Dibromobenzoic acid	279.86	214			
1802	$C_7H_4Br_2O_5$	2, 6-Dibromo-3, 4, 5-trihydroxybenzoic acid	327.86	150			
1803	C_7H_4ClFO	*o*-Fluorobenzoyl chloride	158.49		206		
1804	C_7H_4ClFO	*m*-Fluorobenzoyl chloride	158.49		189		
1805	C_7H_4ClFO	*p*-Fluorobenzoyl chloride *p*-FC_6H_4COCl	158.49		193		
1806	$C_7H_4ClNO_3$	*o*-Nitrobenzoyl chloride	185.50	75	205^{105}		
1807	$C_7H_4ClNO_3$	*m*-Nitrobenzoyl chloride	185.50	34	278		
1808	$C_7H_4ClNO_3$	*p*-Nitrobenzoyl chloride	185.50	72	154^{15}		
1809	$C_7H_4Cl_2O$	2, 4-Dichlorobenzaldehyde	174.95	71			
1810	$C_7H_4Cl_2O$	2, 5-Dichlorobenzaldehyde	174.95	58	233	$1.231^{?0}$	
1811	$C_7H_4Cl_2O$	3, 4-Dichlorobenzaldehyde	174.95	44	248		
1812	$C_7H_4Cl_2O$	*o*-Chlorobenzoyl chloride	174.95	−4	238		
1813	$C_7H_4Cl_2O$	*m*-Chlorobenzoyl chloride	174.95		117.5^{26}		
1814	$C_7H_4Cl_2O$	*p*-Chlorobenzoyl chloride	174.95		$119^{27.5}$		
1815	$C_7H_4Cl_2O_2$	2, 3-Dichlorobenzoic acid	190.95	166			
1816	$C_7H_4Cl_2O_2$	2, 4-Dichlorobenzoic acid	190.95	164.2			
1817	$C_7H_4Cl_2O_2$	2, 5-Dichlorobenzoic acid	190.95	154.4	301		
1818	$C_7H_4Cl_2O_2$	2, 6-Dichlorobenzoic acid	190.95	143.7			
1819	$C_7H_4Cl_2O_2$	3, 4-Dichlorobenzoic acid	190.95	204.1			
1820	$C_7H_4Cl_2O_2$	3, 5-Dichlorobenzoic acid	190.95	188.1			
1821	$C_7H_4Cl_3NO_2$	2, 3, 4-Trichloronitrotoluene	240.41	60			
1822	$C_7H_4Cl_4$	2-Chloro-1-trichloromethylbenzene	229.86	30	260	1.51	

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
1823	$C_7H_4FNO_4$	2-Fluoro-5-nitrobenzoic acid	185.04	139			
1824	$C_7H_4FNO_4$	3-Fluoro-4-nitrobenzoic acid	185.04	122			
1825	$C_7H_4FNO_4$	3-Fluoro-6-nitrobenzoic acid	185.04	134.5			
1826	$C_7H_4FNO_4$	4-Fluoro-2-nitrobenzoic acid	185.04	130			
1827	$C_7H_4FNO_4$	4-Fluoro-3-nitrobenzoic acid	185.04	121.5			
1828	$C_7H_4I_2O_3$	3, 5-Diiodosalicylic acid	389.90	230 d.			
1829	$C_7H_4N_2O_2$	*o*-Nitrobenzonitrile	148.05	109			
1830	$C_7H_4N_2O_2$	*m*-Nitrobenzonitrile	148.05	118			
1831	$C_7H_4N_2O_2$	*p*-Nitrobenzonitrile	148.05	147			
1832	$C_7H_4N_2O_5$	2, 4-Dinitrobenzaldehyde	196.05	72			
1833	$C_7H_4N_2O_5$	2, 6-Dinitrobenzaldehyde	196.05	123			
1834	$C_7H_4N_2O_6$	2, 3-Dinitrobenzoic acid	212.05	201			
1835	$C_7H_4N_2O_6$	2, 4-Dinitrobenzoic acid	212.05	179			
1836	$C_7H_4N_2O_6$	2, 5-Dinitrobenzoic acid	212.05	177			
1837	$C_7H_4N_2O_6$	2, 6-Dinitrobenzoic acid	212.05	202 d.			
1838	$C_7H_4N_2O_6$	3, 4-Dinitrobenzoic acid	212.05	163			
1839	$C_7H_4N_2O_6$	3, 5-Dinitrobenzoic acid	212.05	205			
1840	$C_7H_4N_2O_7$	3, 5-Dinitro-2-hydroxybenzoic acid	228.05	174			
1841	$C_7H_4N_4O_9$	2, 3, 5, 6-Tetranitroanisol	288.06	154; 112			
1842	$C_7H_4O_4S$	*o*-Sulfobenzoic anhydride	184.10	130			
1843	$C_7H_4O_7$	Meconic acid	200.03		d.		1333
1844	C_7H_5BrO	Benzoyl bromide C_6H_5COBr	184.96	0	219	1.570	
1845	$C_7H_5BrO_2$	*o*-Bromobenzoic acid	200.96	148			
1846	$C_7H_5BrO_2$	*m*-Bromobenzoic acid	200.96	152			
1847	$C_7H_5BrO_2$	*p*-Bromobenzoic acid	200.96	251			
1848	$C_7H_5BrO_3$	3-Bromo-2-hydroxybenzoic acid	216.96	220			
1849	$C_7H_5BrO_3$	5-Bromo-2-hydroxybenzoic acid	216.96	165			
1850	$C_7H_5Br_3$	2, 3, 4-Tribromotoluene	328.79	45			
1851	$C_7H_5Br_3$	2, 3, 5-Tribromotoluene	328.79	54			
1852	$C_7H_5Br_3$	2, 3, 6-Tribromotoluene	328.79	59			
1853	$C_7H_5Br_3$	2, 4, 5-Tribromotoluene	328.79	113			
1854	$C_7H_5Br_3$	2, 4, 6-Tribromotoluene	328.79	66			
1855	$C_7H_5Br_3$	3, 4, 5-Tribromotoluene	328.79	89			
1856	C_7H_5ClO	*o*-Chlorobenzaldehyde	140.50	−3	205	1.252	753
1857	C_7H_5ClO	*m*-Chlorobenzaldehyde	140.50	18	204	1.241	751
1858	C_7H_5ClO	*p*-Chlorobenzaldehyde	140.50	47.5	214	1.196^{61}	1092
1859	C_7H_5ClO	Benzoyl chloride C_6H_5COCl	140.50	−0.8	197.2	1.211	737
1860	$C_7H_5ClO_2$	*o*-Chlorobenzoic acid	156.50	140.7			
1861	$C_7H_5ClO_2$	*m*-Chlorobenzoic acid	156.50	154.9			
1862	$C_7H_5ClO_2$	*p*-Chlorobenzoic acid	156.50	241.5			
1863	$C_7H_5ClO_2$	Salicyl chloride *o*-HOC_6H_4COCl	156.50	18.0	$59^{1.0}$ s. d.		
1864	$C_7H_5ClO_3$	5-Chloro-2-hydroxybenzoic acid	172.50	167.5			
1865	$C_7H_5Cl_2NO_2$	*m*-Nitrobenzal chloride	205.96	65			
1866	$C_7H_5Cl_2NO_4S$	Halazone	270.03	213			
1868	$C_7H_5Cl_3$	*o*-Chlorobenzal chloride	195.41		228.5	1.399^{15}	
1869	$C_7H_5Cl_3$	*p*-Chlorobenzal chloride	195.41		234		
1870	$C_7H_5Cl_3$	Benzotrichloride $C_6H_5CCl_3$	195.41	−4.8	220.7	1.378^{15}_{4}	
1871	$C_7H_5Cl_3$	2, 3, 4-Trichlorotoluene	195.41	41	234		
1872	$C_7H_5Cl_3$	2, 4, 5-Trichlorotoluene	195.41	82	232		
1873	$C_7H_5Cl_3$	3, 4, 5-Trichlorotoluene	195.41	42.5	247		
1874	$C_7H_5Cl_3O$	2, 4, 6-Trichloro-3-hydroxytoluene	211.41	46			
1875	$C_7H_5Cl_3O$	2, 4, 6-Trichloroanisol	211.41	60.5	240.7		
1876	C_7H_5FO	Benzoyl fluoride C_6H_5COF	124.04		162		
1877	$C_7H_5FO_2$	*o*-Fluorobenzoic acid	140.04	122			
1878	$C_7H_5FO_2$	*m*-Fluorobenzoic acid	140.04	124			
1879	$C_7H_5FO_2$	*p*-Fluorobenzoic acid	140.04	182			
1880	C_7H_5IO	Benzoyl iodide C_6H_5COI	231.97	3	135^{25}		
1881	$C_7H_5IO_2$	*o*-Iodobenzoic acid	247.97	162			
1882	$C_7H_5IO_2$	*m*-Iodobenzoic acid	247.97	185			
1883	$C_7H_5IO_2$	*p*-Iodobenzoic acid	247.97	266			
1884	$C_7H_5IO_3$	3-Iodo-2-hydroxybenzoic acid	263.97	198			
1885	C_7H_5N	Benzonitrile C_6H_5CN	103.05	−13.1	190.7	$1.008^{16.8}$	1028
1886	C_7H_5N	Phenyl isocyanide C_6H_5NC	103.05		166 d.	0.978^{15}	

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
1887	C_7H_5NO	Anthranil	119.05	> −18	215	1.187_4^{15}	768
1888	C_7H_5NO	Benzoxazol	119.05	30.5	182.5		
1889	C_7H_5NO	Phenyl isocyanate $C_6H_5N{:}CO$	119.05		165.6	1.095	
1890	C_7H_5NO	Salicylic nitrile *o*-OHC_6H_4CN	119.05	98			
1891	C_7H_5NOS	1-Hydroxybenzothiazole	151.11	136			
1892	C_7H_5NOS	1-Mercaptobenzoxazole	151.11	193			
1893	$C_7H_5NO_3$	*o*-Nitrobenzaldehyde	151.05	α40.9; β37.9	156^{15}		
1894	$C_6H_5NO_3$	*m*-Nitrobenzaldehyde	151.05	58.0	164^{23}		
1895	$C_7H_5NO_3$	*p*-Nitrobenzaldehyde	151.05	106.5			
1896	$C_7H_5NO_3S$	*o*-Benzoicsulfimide (Saccharin)	183.11	228 d.			
1897	$C_7H_5NO_4$	*o*-Nitrobenzoic acid	167.05	147.5		1.575^4	
1898	$C_7H_5NO_4$	*m*-Nitrobenzoic acid	167.05	141.4		1.494^4	
1899	$C_7H_5NO_4$	*p*-Nitrobenzoic acid	167.05	242.4		1.550_4^{32}	
1900	$C_7H_5NO_4$	Quinolinic acid	167.05	190 d.			
1901	$C_7H_5NO_4$	Lutidinic acid	167.05	248			
1902	$C_7H_5NO_4$	Isocinchomeronic acid	167.05	237			
1903	$C_7H_5NO_4$	Dipicolinic acid	167.05	226 d.			
1904	$C_7H_5NO_4$	Cinchomeronic acid	167.05	258 d.			
1905	$C_7H_5NO_4$	Dinicotinic acid	167.05	323			
1906	$C_7H_5NO_5$	Ammonchelidonic acid	183.05	220 d.			
1907	$C_7H_5NO_5$	3-Nitro-2-hydroxybenzoic acid	183.05	144			
1908	$C_7H_5NO_5$	4-Nitro-2-hydroxybenzoic acid	183.05	235			
1909	$C_7H_5NO_5$	5-Nitro-2-hydroxybenzoic acid	183.05	228			
1910	$C_7H_5NO_5$	6-Nitro-2-hydroxybenzoic acid	183.05	130			
1911	$C_7H_5NO_5$	2-Nitro-3-hydroxybenzoic acid	183.05	178			
1912	$C_7H_5NO_5$	4-Nitro-3-hydroxybenzoic acid	183.05	230			
1913	$C_7H_5NO_5$	5-Nitro-3-hydroxybenzoic acid	183.05	167			
1914	$C_7H_5NO_5$	6-Nitro-3-hydroxybenzoic acid	183.05	169			
1915	$C_7H_5NO_5$	3-Nitro-4-hydroxybenzoic acid	183.05	185			
1916	C_7H_5NS	Benzothiazol	135.11		230	1.248	
1917	C_7H_5NS	Phenyl thiocyanate C_6H_5CNS	135.11		232	1.155	
1918	C_7H_5NS	Phenyl isothiocyanate $C_6H_5N{:}CS$	135.11	−21	218.5	$1.135^{15.5}$	798
1919	$C_7H_5N_3$	1, 2, 3-Benzotriazin	131.06	75	240		
1920	$C_7H_5N_3O_6$	Chrysanisic acid	227.06	259			
1921	$C_7H_5N_3O_6$	2, 3, 4-Trinitrotoluene	227.06	112	302 d.	1.620	
1922	$C_7H_5N_3O_6$	2, 3, 5-Trinitrotoluene	227.06	97	335 d.		
1923	$C_7H_5N_3O_6$	2, 3, 6-Trinitrotoluene	227.06	111	333 d.		
1924	$C_7H_5N_3O_6$	2, 4, 6-Trinitrotoluene (T. N. T.)	227.06	80.7	240 exp.	1.654	
1925	$C_7H_5N_3O_6$	3, 4, 5-Trinitrotoluene	227.06	137.5	313 d.		
1926	$C_7H_5N_3O_6$	3, 4, 6-Trinitrotoluene	227.06	104	291 d.	1.620	
1927	$C_7H_5N_3O_7$	2, 3, 4-Trinitroanisol	243.06	155	exp.		
1928	$C_7H_5N_3O_7$	2, 3, 5-Trinitroanisol	243.06	104		1.618^{15}	
1929	$C_7H_5N_3O_7$	2, 4, 6-Trinitroanisol	243.06	68.4		1.408	
1930	$C_7H_5N_3O_7$	3, 4, 5-Trinitroanisol	243.06	120			
1931	$C_7H_5N_3O_7$	3, 4, 6-Trinitroanisol	243.06	107			
1932	$C_7H_5N_3O_7$	2, 4, 6-Trinitro-3-hydroxytoluene	243.06	106			
1933	$C_7H_5N_5O_8$	2, 4, 6-Trinitrophenylmethylnitramine (Tetryl)	287.08	130	exp. 187		
1934	C_7H_6BrCl	*o*-Bromobenzyl chloride	205.42		115^{15}		
1935	C_7H_6BrCl	*p*-Bromobenzyl chloride	205.42	51			
1936	C_7H_6BrCl	*o*-Chlorobenzyl bromide	205.42		120^{10}		
1937	C_7H_6BrCl	*p*-Chlorobenzyl bromide	205.42	48			
1938	C_7H_6BrNO	*o*-Bromobenzamide	199.97	156			
1939	C_7H_6BrNO	*m*-Bromobenzamide	199.97	150			
1940	C_7H_6BrNO	*p*-Bromobenzamide	199.97	190			
1941	$C_7H_6BrNO_2$	*o*-Nitrobenzyl bromide	215.97	46			
1942	$C_7H_6BrNO_2$	*m*-Nitrobenzyl bromide	215.97	58			
1943	$C_7H_6BrNO_2$	*p*-Nitrobenzyl bromide	215.97	100			
1944	$C_7H_6Br_2$	Benzal bromide $C_6H_5CHBr_2$	249.88		140^{20}	1.51^{15}	716.1
1945	$C_7H_6Br_2$	*o*-Bromobenzyl bromide	249.88	30			
1946	$C_7H_6Br_2$	*m*-Bromobenzyl bromide	249.88	41			
1947	$C_7H_6Br_2$	*p*-Bromobenzyl bromide	249.88	61			
1948	$C_7H_6Br_2$	2, 3-Dibromotoluene	249.88	31			

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
1949	$C_7H_6Br_2$	2, 6-Dibromotoluene	249.88	5.5	246	1.812^{22}	
1950	$C_7H_6Br_2$	3, 5-Dibromotoluene	249.88	39			
1951	C_7H_6ClNO	*o*-Chlorobenzamide	155.51	141			
1952	C_7H_6ClNO	*m*-Chlorobenzamide	155.51	134.5			
1953	C_7H_6ClNO	*p*-Chlorobenzamide	155.51	178.3			
1954	$C_7H_6ClNO_2$	3-Chloro-2-nitrotoluene	171.51	23			
1955	$C_7H_6ClNO_2$	4-Chloro-2-nitrotoluene	171.51	38.2	242	1.256^{80}	
1956	$C_7H_6ClNO_2$	5-Chloro-2-nitrotoluene	171.51	44	250		
1957	$C_7H_6ClNO_2$	6-Chloro-2-nitrotoluene	171.51	37	238		
1958	$C_7H_6ClNO_2$	2-Chloro-3-nitrotoluene	171.51	21.5	263		
1959	$C_7H_6ClNO_2$	4-Chloro-3-nitrotoluene	171.51	7	260.5	1.297^{22}	
1960	$C_7H_6ClNO_2$	5-Chloro-3-nitrotoluene	171.51	61			
1961	$C_7H_6ClNO_2$	*o*-Nitrobenzyl chloride	171.51	49			1093
1962	$C_7H_6ClNO_2$	*m*-Nitrobenzyl chloride	171.51	44.5	183^{35}		1094
1963	$C_7H_6ClNO_2$	*p*-Nitrobenzyl chloride	171.51	71			1095
1964	$C_7H_6Cl_2$	Benzal chloride $C_6H_5CHCl_2$	160.96	−17.4	214	1.295^{16}	
1965	$C_7H_6Cl_2$	*o*-Chlorobenzyl chloride	160.96		214		
1966	$C_7H_6Cl_2$	*p*-Chlorobenzyl chloride	160.96	29	214		
1967	$C_7H_6Cl_2O$	1, 1-Dichloro-2-hydroxytoluene	176.96	82			
1968	$C_7H_6Cl_2O$	3, 5-Dichloro-2-hydroxytoluene	176.96	55			
1969	$C_7H_6Cl_2O$	4, 6-Dichloro-3-hydroxytoluene	176.96	46			
1970	$C_7H_6Cl_2O_2$	4, 5-Dichloro-2-methoxyphenol	192.96	72	270		
1971	C_7H_6FNO	*o*-Fluorobenzamide	139.05	116			
1972	C_7H_6FNO	*m*-Fluorobenzamide	139.05	130			
1973	C_7H_6FNO	*p*-Fluorobenzamide	139.05	154.5			
1974	C_7H_6INO	*o*-Iodobenzamide	246.99	183.6			
1975	C_6H_6INO	*m*-Iodobenzamide	246.99	186.5			
1976	C_7H_6INO	*p*-Iodobenzamide	246.99	217.6			
1977	$C_7H_6N_2$	Benzimidazol	118.06	170	<360		1270
1978	$C_7H_6N_2$	Cyanilide $CNNHC_6H_5$	118.06	47			
1979	$C_7H_6N_2$	Indazole	118.06	146.5	270.6		
1980	$C_7H_6N_2O_2$	Ricininic acid	150.06	298			
1981	$C_7H_6N_2O_3$	*o*-Nitrobenzamide	166.06	176.6	317	1.462^{32}_{4}	
1982	$C_7H_6N_2O_3$	*m*-Nitrobenzamide	166.06	142.7	315		
1983	$C_7H_6N_2O_3$	*p*-Nitrobenazmide	166.06	201.4			
1984	$C_7H_6N_2O_4$	2, 3-Dinitrotoluene	182.06	59.3		1.263^{111}	
1985	$C_7H_6N_2O_4$	2, 4-Dinitrotoluene	182.06	69.6	300 s. d.	1.521^{15}	1297
1986	$C_7H_6N_2O_4$	2, 5-Dinitrotoluene	182.06	50.5		1.282^{111}	
1987	$C_7H_6N_2O_4$	2, 6-Dinitrotoluene	182.06	61		1.283^{111}	1300
1988	$C_7H_6N_2O_4$	3, 4-Dinitrotoluene	182.06	59.8		1.259^{111}	
1989	$C_7H_6N_2O_4$	3, 5-Dinitrotoluene	182.06	93		1.277^{111}	
1990	$C_7H_6N_2O_5$	2, 4-Dinitroanisol	198.06	95.2		1.341	
1991	$C_7H_6N_2O_5$	2, 5-Dinitroanisol	198.06	97.0	360	1.476	
1992	$C_7H_6N_2O_5$	2, 6-Dinitroanisol	198.06	117.5		1.319	
1993	$C_7H_6N_2O_5$	3, 4-Dinitroanisol	198.06	69.3		1.334^{110}	
1994	$C_7H_6N_2O_5$	3, 5-Dinitroanisol	198.06	105.8		1.558^{12}	
1995	$C_7H_6N_2O_5$	2, 4-Dinitro-3-hydroxytoluene	198.06	99			
1996	$C_7H_6N_2O_5$	3, 5-Dinitro-4-hydroxytoluene	198.06	85.8			
1997	$C_7H_6N_2O_6$	4, 6-Dinitro-2-methoxyphenol	214.06	123			
1998	$C_7H_6N_2O_7S$	2, 6-Dinitrotoluene-4-sulfonic acid	262.13	165			
1999	$C_7H_6N_2S$	1-Aminobenzothiazole	150.13	127			
2000	$C_7H_6N_4O_7$	2, 4, 6-Trinitro-3-aminoanisol	258.08	131			
2001	C_7H_6O	Benzaldehyde C_6H_5CHO	106.05	−56.0	179.5	1.046	725
2002	C_7H_6OS	Thiobenzoic acid C_6H_5COSH	138.11	24			
2003	$C_7H_6O_2$	Furfuracrolein	122.05	51	200		
2004	$C_7H_6O_2$	Salicyl aldehyde *o*-HOC_6H_4CHO	122.05	−7	196.5	1.167	759
2005	$C_7H_6O_2$	*m*-Hydroxybenzaldehyde	122.05	106.0	240		
2006	$C_7H_6O_2$	*p*-Hydroxybenzaldehyde	122.05	116.0		1.129^{130}	
2007	$C_7H_6O_2$	Benzoic acid $C_6H_5CO_2H$	122.05	121.7	249.2	1.266^{15}_{4}	1160, 1233
2008	$C_7H_6O_2$	Phenyl formate $HCO_2C_6H_5$	122.05		173	1.088	
2009	$C_7H_6O_2$	Toluquinone $CH_3C_6H_3O_2$	122.05	69			
2010	$C_7H_6O_2S$	Thiosalicylic acid *o*-$SHC_6H_4CO_2H$	154.11	164			

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
2011	$C_7H_6O_3$	2, 3-Dihydroxybenzaldehyde	138.05	108	235		
2012	$C_7H_6O_3$	3, 4-Dihydroxybenzaldehyde	138.05	154			
2013	$C_7H_6O_3$	Salicylic acid *o*-$HOC_6H_4CO_2H$	138.05	159	s. 76	1.443	1333
2014	$C_7H_6O_3$	*m*-Hydroxybenzoic acid	138.05	201.3		1.473^4	
2015	$C_7H_6O_3$	*p*-Hydroxybenzoic acid	138.05	213		1.468^4	
2016	$C_7H_6O_4$	2, 3-Dihydroxybenzoic acid	154.05	204			
2017	$C_7H_6O_4$	2, 4-Dihydroxybenzoic acid	154.05	206			
2018	$C_7H_6O_4$	2, 5-Dihydroxybenzoic acid	154.05	200			
2019	$C_7H_6O_4$	2, 6-Dihydroxybenzoic acid	154.05	167 d.			
2020	$C_7H_6O_4$	3, 4-Dihydroxybenzoic acid	154.05	199		1.542^4	
2021	$C_7H_6O_4$	3, 5-Dihydroxybenzoic acid	154.05	227			
2022	$C_7H_6O_5$	Pyrogallolcarboxylic acid	170.05	200 d.			
2023	$C_7H_6O_5$	Gallic acid 3, 4, 5-$(HO)_3C_6H_2CO_2H$	170.05	220 d.	d.	1.694^4	1333
2024	$C_7H_6O_5S$	*o*-Sulfobenzoic acid	202.11	141			
2025	$C_7H_6O_5S$	*m*-Sulfobenzoic acid $HO_3SC_6H_4CO_2H$	202.11	141			
2026	$C_7H_6O_5S$	*p*-Sulfobenzoic acid $HO_3SC_6H_4CO_2H$	202.11	200			
2027	$C_7H_6O_6S$	Salicylsulfonic acid	218.11	120			
2028	$C_7H_7AsCl_2$	Benzyl arsine dichloride	236.93		175^{50}		
2029	C_7H_7Br	Benzyl bromide	170.97	−4.0	199	1.438^{22}_0	
2030	C_7H_7Br	*o*-Bromotoluene	170.97	−28.1	181.8	1.422	738
2031	C_7H_7Br	*m*-Bromotoluene	170.97	−39.8	183.7	1.410	734
2032	C_7H_7Br	*p*-Bromotoluene	170.97	28	183.6	1.310	732
2033	C_7H_7BrO	5-Bromo-2-hydroxytoluene	186.97	64	235		
2034	C_7H_7BrO	5-Bromo-3-hydroxytoluene	186.97	62			
2035	C_7H_7BrO	3-Bromo-4-hydroxytoluene	186.97		214	$1.547^{24.5}$	
2036	$C_7H_7BrO_2$	6-Bromo-2-methoxyphenol	202.97	63			
2037	$C_7H_7BrO_2$	4-Bromo-2-methoxyphenol	202.97	46	182^{60}		
2038	C_7H_7Cl	Benzyl chloride	126.51	−39	179.4	1.103^{18}	711
2039	C_7H_7Cl	*o*-Chlorotoluene	126.51	−35.1	159.4	1.080	691
2040	C_7H_7Cl	*m*-Chlorotoluene	126.51	−47.8	162.4	1.072	672
2041	C_7H_7Cl	*p*-Chlorotoluene	126.51	7.8	162.5	1.071^{18}	666
2042	C_7H_7ClO	*o*-Chlorobenzyl alcohol	142.51	72	230		
2043	C_7H_7ClO	*m*-Chlorobenzyl alcohol	142.51		234		
2044	C_7H_7ClO	*p*-Chlorobenzyl alcohol	142.51	70.5	235		
2045	C_7H_7ClO	3-Chloro-2-hydroxytoluene	142.51	86	225		
2046	C_7H_7ClO	4-Chloro-2-hydroxytoluene	142.51	49	225		
2047	C_7H_7ClO	5-Chloro-2-hydroxytoluene	142.51	49	220		
2048	C_7H_7ClO	4-Chloro-3-hydroxytoluene	142.51	66	235		
2049	C_7H_7ClO	6-Chloro-3-hydroxytoluene	142.51	53	235		
2050	C_7H_7ClO	2-Chloro-4-hydroxytoluene	142.51		196	1.211^{25}_{25}	
2051	C_7H_7ClO	3-Chloro-4-hydroxytoluene	142.51	55	228		
2052	$C_7H_7ClO_2$	4(5)-Chloro-2-methoxyphenol	158.51	< −18	241.5		
2053	$C_7H_7ClO_2S$	Toluene-*o*-sulfonechloride	190.58	10	126^{21}	1.339	
2054	$C_7H_7ClO_2S$	Toluene-*p*-sulfonechloride	190.58	69	146^{15}		
2055	$C_7H_7ClO_3S$	2-Chlorotoluene-5-sulfonic acid	206.58	78			
2056	$C_7H_7Cl_2NO_2S$	Toluene-*p*-sulfonedichloroamine	240.04	83			
2057	C_7H_7F	*o*-Fluorotoluene	110.05	< −80	114	1.001	505
2058	C_7H_7F	*m*-Fluorotoluene	110.05	−110.8	116	0.999	500
2059	C_7H_7F	*p*-Fluorotoluene	110.05		117	$1.001^{15.3}$	502
2060	C_7H_7I	Benzyl iodide	217.99	24.1	d.	1.733^{25}	
2061	C_7H_7I	*o*-Iodotoluene	217.99		211	1.697	785
2062	C_7H_7I	*m*-Iodotoluene	217.99		204	1.698	
2063	C_7H_7I	*p*-Iodotoluene	217.99	35	211.5		
2064	C_7H_7IO	*o*-Iodoanisol *o*-$CH_3OC_6H_4I$	233.99		240	1.800	
2065	$C_7H_7IO_2$	5-Iodo-2-methoxyphenol	249.99	88			
2066	$C_7H_7IO_2$	4-Iodo-2-methoxyphenol	249.99	43	180 d.	1.5	
2067	C_7H_7NO	*o*-Aminobenzaldehyde	121.06	40			
2068	C_7H_7NO	*m*-Aminobenzaldehyde	121.06	71.5			
2069	C_7H_7NO	*p*-Aminobenzaldehyde	121.06	71			
2070	C_7H_7NO	*syn*-Benzaldoxime $C_6H_5C{:}NOH$	121.06	130			
2071	C_7H_7NO	*anti*-Benzaldoxime $C_6H_5C{:}NOH$	121.06	35	153^{53}	1.111	972
2072	C_7H_7NO	Benzamide $C_6H_5CONH_2$	121.06	130	290	1.341^4	
2073	C_7H_7NO	Formanilide $HCONHC_6H_5$	121.06	47.5	271	1.112^{60}	

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
2074	$C_7H_7NO_2$	Anthranilic acid o-$H_2NC_6H_4CO_2H$	137.06	145			
2075	$C_7H_7NO_2$	*m*-Aminobenzoic acid	137.06	174		1.511^{4}	
2076	$C_7H_7NO_2$	*p*-Aminobenzoic acid	137.06	187			
2077	$C_7H_7NO_2$	Benzohydroxamic acid	137.06	125			
2078	$C_7H_7NO_2$	*o*-Hydroxybenzamide	137.06	140	270 d.		
2079	$C_7H_7NO_2$	*m*-Hydroxybenzamide	137.06	170.5			
2080	$C_7H_7NO_2$	*p*-Hydroxybenzamide	137.06	162			
2081	$C_7H_7NO_2$	*o*-Nitrotoluene	137.06	α −10.6; β −4.1	222.3	1.168^{15}	724
2082	$C_7H_7NO_2$	*m*-Nitrotoluene	137.06	15.5	231	1.164_4^{15}	729
2083	$C_7H_7NO_2$	*p*-Nitrotoluene	137.06	51.3	238	1.098^{80}	1096
2084	$C_7H_7NO_2$	Phenylnitromethane	137.06		227	1.160	702
2085	$C_7H_7NO_3$	*o*-Nitrobenzyl alcohol	153.06	74	168^{20}		
2086	$C_7H_7NO_3$	*m*-Nitrobenzyl alcohol	153.06	27	180^{3}		
2087	$C_7H_7NO_3$	*p*-Nitrobenzyl alcohol	153.06	93	185^{12}		
2088	$C_7H_7NO_3$	3-Nitro-*o*-cresol	153.06	145			
2089	$C_7H_7NO_3$	4-Nitro-*o*-cresol	153.06	94.6			
2090	$C_7H_7NO_3$	5-Nitro-*o*-cresol	153.06	118			
2091	$C_7H_7NO_3$	6-Nitro-*o*-cresol	153.06	69.5			
2093	$C_7H_7NO_3$	4-Nitro-*m*-cresol	153.06	129			
2094	$C_7H_7NO_3$	5-Nitro-*m*-cresol	153.06	91			
2095	$C_7H_7NO_3$	6-Nitro-*m*-cresol	153.06	56			
2096	$C_7H_7NO_3$	3-Nitro-4-hydroxytoluene	153.06	36.5	125^{22}	1.240_4^{39}	1053
2098	$C_7H_7NO_3$	*o*-Nitroanisol	153.06	9.4	277	1.268	749
2099	$C_7H_7NO_3$	*m*-Nitroanisol	153.06	38	258	1.373	
2100	$C_7H_7NO_3$	*p*-Nitroanisol	153.06	54	260	1.233	
2101	$C_7H_7NO_3$	4-Amino-2-hydroxybenzoic acid	153.06	220			
2102	$C_7H_7NO_3$	5-Amino-2-hydroxybenzoic acid	153.06	280 d.			
2103	$C_7H_7NO_4$	6-Nitro-2-methoxyphenol	169.06	62			
2104	$C_7H_7NO_4$	5-Nitro-2-methoxyphenol	169.06	104			
2105	$C_7H_7NO_4$	3-Nitro-2-methoxyphenol	169.06	103			
2106	$C_7H_7NO_4S$	*o*-Sulfoaminobenzoic acid	201.13	167			
2107	$C_7H_7NO_4S$	*m*-Sulfoaminobenzoic acid	201.13	238			
2108	$C_7H_7NO_4S$	*p*-Sulfoaminobenzoic acid	201.13	280 d.			
2109	$C_7H_7NO_5S$	*p*-Nitrotoluene-*o*-sulfonic acid	217.13	130			
2110	C_7H_7NS	Thiobenzamide $C_6H_5CSNH_2$	137.13	116			
2111	C_7H_8	Tropylidene	92.062		118	0.888	686
2112	C_7H_8	Toluene	92.062	−95.1	110.5	0.866	579
2114	C_7H_8BrN	4-Bromo-*o*-toluidine	185.99	32	257 d.		
2115	C_7H_8BrN	5-Bromo-*o*-toluidine	185.99	59.5	240		
2116	C_7H_8BrN	5-Bromo-*m*-toluidine	185.99	36	260	1.144^{19}	
2117	C_7H_8BrN	6-Bromo-*m*-toluidine	185.99	78.8	240		
2118	C_7H_8BrN	2-Bromo-*p*-toluidine	185.99	26	257		
2119	C_7H_8BrN	3-Bromo-*p*-toluidine	185.99	26	240	1.498	
2120	C_7H_8ClN	4-Chloro-*o*-toluidine	141.53	22	238.5		
2120.1	C_7H_8ClN	5-Chloro-*o*-toluidine	141.53	30	239.2		
2121	C_7H_8ClN	6-Chloro-*o*-toluidine	141.53		245		
2122	C_7H_8ClN	2-Chloro-*m*-toluidine	141.53		229		
2123	C_7H_8ClN	4-Chloro-*m*-toluidine	141.53	30	230		
2124	C_7H_8ClN	5-Chloro-*m*-toluidine	141.53		243		
2125	C_7H_8ClN	6-Chloro-*m*-toluidine	141.53	83	241		
2126	C_7H_8ClN	2-Chloro-*p*-toluidine	141.53	26	245		
2127	C_7H_8ClN	3-Chloro-*p*-toluidine	141.53		219	1.151	
2128	$C_7H_8N_2$	Benzalhydrazine $C_6H_5CH_2NHNH_2$	120.08	16	140^{14}		
2129	$C_7H_8N_2$	Benzamidine $C_6H_5C(:NH)NH_2$	120.08	80			
2130	$C_7H_8N_2O$	*o*-Aminobenzamide	136.08	108			
2131	$C_7H_8N_2O$	*m*-Aminobenzamide	136.08	79			
2132	$C_7H_8N_2O$	*p*-Aminobenzamide $NH_2C_6H_4CONH_2$	136.08	183			
2133	$C_7H_8N_2O$	Benzoylhydrazine $C_6H_5CONHNH_2$	136.08	112			
2134	$C_7H_8N_2O$	Nitrosomethylaniline	136.08	15	225 d.	$1.121_4^{22.7}$	998
2135	$C_7H_8N_2O$	Phenylurea $C_6H_5NHCONH_2$	136.08	147			1330
2136	$C_7H_8N_2O_2$	*o*-Nitromethylaniline	152.08	34			
2137	$C_7H_8N_2O_2$	*m*-Nitromethylaniline	152.08	66			

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
2138	$C_7H_8N_2O_2$	p-Nitromethylaniline	152.08	152		$1.201^{155.2}$	
2139	$C_7H_8N_2O_2$	3-Nitro-o-toluidine	152.08	96		1.190^{100}	
2140	$C_7H_8N_2O_2$	4-Nitro-o-toluidine	152.08	105		1.365^{15}	
2141	$C_7H_8N_2O_2$	5-Nitro-o-toluidine	152.08	127.5		1.366^{15}	
2142	$C_7H_8N_2O_2$	6-Nitro-o-toluidine	152.08	91.5		1.378^{15}	
2143	$C_7H_8N_2O_2$	2-Nitro-3-aminotoluene	152.08	53			
2144	$C_7H_8N_2O_2$	4-Nitro-3-aminotoluene	152.08	109			
2145	$C_7H_8N_2O_2$	5-Nitro-3-aminotoluene	152.08	98.4			
2146	$C_7H_8N_2O_2$	6-Nitro-3-aminotoluene	152.08	138			
2147	$C_7H_8N_2O_2$	2-Nitro-4-aminotoluene	152.08	77.5			
2148	$C_7H_8N_2O_2$	3-Nitro-p-toluidine	152.08	117		1.312^{17}	
2149	$C_7H_8N_2O_3$	5-Nitro-3-amino-4-hydroxytoluene	168.08	110			
2150	$C_7H_8N_2S$	Phenylthiourea $C_6H_5NHCSNH_2$	152.14	154			
2151	$C_7H_8N_4O_2$	Theophylline	180.09	272			
2152	$C_7H_8N_4O_2$	Paraxanthine	180.09	299			
2153	$C_7H_8N_4O_2$	Theobromine	180.09	337			
2154	$C_7H_8N_4O_3$	1, 3-Dimethyluric acid	196.09	410 d.			
2155	$C_7H_8N_4O_3$	1, 7-Dimethyluric acid	196.09	390 d.			
2156	$C_7H_8N_4O_3$	1, 9-Dimethyluric acid	196.09	400 d.			
2157	$C_7H_8N_4O_3$	3, 9-Dimethyluric acid	196.09	340 d.			
2158	$C_7H_8N_6O_7$	Guanidine picrate	288.11	290			
2159	C_7H_8O	Benzyl alcohol $C_6H_5CH_2OH$	108.06	−15.3	205.8	1.046	713
2160	C_7H_8O	o-Cresol	108.06	30.1	190.8	1.051	727
2161	C_7H_8O	m-Cresol	108.06	10	202.8	1.035	714
2162	C_7H_8O	p-Cresol	108.06	34.8	201.1	$1.039^{15.5}$	715
2163	C_7H_8O	Phenyl methyl ether (Anisol)	108.06	−37.3	155.8	0.994	659
2164	C_7H_8O	4, 6-Dihydrobenzaldehyde	108.06	<-20	171.5 d.	$1.020^{14.5}$	
2165	C_7H_8OS	Thioguaiacol $CH_3OC_6H_4SH$	140.13		219		
2166	$C_7H_8O_2$	o-Hydroxybenzyl alcohol	124.06	86		1.161	
2167	$C_7H_8O_2$	m-Hydroxybenzyl alcohol	124.06	67	300 d.		
2168	$C_7H_8O_2$	p-Hydroxybenzyl alcohol	124.06	110			
2169	$C_7H_8O_2$	2, 4-Dihydroxytoluene	124.06	104			
2170	$C_7H_8O_2$	2, 5-Dihydroxytoluene	124.06	125			
2171	$C_7H_8O_2$	2, 6-Dihydroxytoluene	124.06	66			
2172	$C_7H_8O_2$	Homocatechol 3, 4-$(HO)_2C_6H_3CH_3$	124.06	65	252	1.129^{74}_4	1103
2173	$C_7H_8O_2$	Orcinol 3, 5-$(HO)_2C_6H_3CH_3$	124.06	108	290	1.290^4	
2174	$C_7H_8O_2$	Guaiacol o-$HOC_6H_4OCH_3$	124.06	28	205.1	1.143^{15}	1179
2175	$C_7H_8O_2$	Resorcinol methyl ether	124.06	<-17.5	244.3	>1	
2176	$C_7H_8O_2$	Hydroquinol methyl ether	124.06	53	243		
2176.1	$C_7H_8O_2$	Dimethyl-γ-pyrone	124.06	132		0.9953^{137}	
2178	$C_7H_8O_2$	Furfurylacetone	124.06	40	229		
2179	$C_7H_8O_2S$	Toluene-o-sulfinic acid	156.13	80			
2180	$C_7H_8O_3$	2, 5-Dimethylfurfurane-3-carboxylic acid (Uvinic acid)	140.06	135			
2181	$C_7H_8O_3S$	Toluene-o-sulfonic acid	172.13		128.8^{25}		
2183	$C_7H_8O_3S$	Toluene-p-sulfonic acid	172.13	105	140^{20}		
2184	$C_7H_8O_4$	Iretol 2, 4, 6-$(OH)_3C_6H_2OCH_3$	156.06	186			
2185	$C_7H_8O_4$	Hydrochelidonic anhydride	156.06	69	210		
2186	$C_7H_8O_4S$	4-Hydroxytoluene-2-sulfonic acid	188.13	188			
2187	$C_7H_8O_4S$	2-Hydroxytoluene-6-sulfonic acid	188.13	118			
2188	$C_7H_8O_6$	Cinchonic acid	188.06	169			
2189	C_7H_8S	Benzyl mercaptan $C_6H_5CH_2SH$	124.13		195	1.058^{20}	
2190	C_7H_8S	o-Thiocresol o-$CH_3C_6H_4SH$	124.13	15	194.3		
2191	C_7H_8S	m-Thiocresol m-$CH_3C_6H_4SH$	124.13	<-20	195.4	1.052^{12}_4	
2192	C_7H_8S	p-Thiocresol p-$CH_3C_6H_4SH$	124.13	43	195		
2193	$C_7H_9AsO_3$	Benzylarsonic acid $C_6H_5CH_2AsO(OH)_2$	216.03	167			
2194	$C_7H_9ClN_4O_2$	Theobromine hydrochloride	216.56				1333
2195	C_7H_9N	Benzylamine $C_6H_5CH_2NH_2$	107.08		184	0.980	720
2196	C_7H_9N	2, 4-Lutidine	107.08		157	0.949^0_4	
2197	C_7H_9N	2, 6-Lutidine	107.08		143	0.942^0	
2198	C_7H_9N	3, 4-Lutidine	107.08		164.5		
2199	C_7H_9N	2-Ethylpyridine	107.08		148.8	0.950	990
2200	C_7H_9N	3-Ethylpyridine	107.08		165.3	0.959	

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
2201	C_7H_9N	4-Ethylpyridine	107.08		166	0.936	
2202	C_7H_9N	α-Lutidine	107.08		156.5	0.947^0	
2203	C_7H_9N	Methylaniline $C_6H_5NHCH_3$	107.08	−57.0	195.70	0.986	757
2204	C_7H_9N	*o*-Toluidine *o*-$CH_3C_6H_4NH_2$	107.08	α −24.4; β −16.3	200.7	0.998	758
2205	C_7H_9N	*m*-Toluidine *m*-$CH_3C_6H_4NH_2$	107.08	−31.5	203.3	0.989	989
2206	C_7H_9N	*p*-Toluidine *p*-$CH_3C_6H_4NH_2$	107.08	43.7	200.5	1.046	1087
2207	C_7H_9NO	*o*-Aminobenzyl alcohol	123.08	82	280 s. d.		
2208	C_7H_9NO	*p*-Aminobenzyl alcohol	123.08	95			
2209	C_7H_9NO	4-Amino-2-hydroxytoluene	123.08	161			
2210	C_7H_9NO	5-Amino-2-hydroxytoluene	123.08	175			
2211	C_7H_9NO	6-Amino-2-hydroxytoluene	123.08	128			
2212	C_7H_9NO	5-Amino-*m*-cresol	123.08	79	345		
2213	C_7H_9NO	4-Amino-3-hydroxytoluene	123.08	174			
2214	C_7H_9NO	2-Amino-4-hydroxytoluene	123.08	144.5			
2215	C_7H_9NO	3-Amino-4-hydroxytoluene	123.08	135			
2216	C_7H_9NO	*o*-Anisidine *o*-$CH_3OC_6H_4NH_2$	123.08	5.2	224	1.108^{26}	
2217	C_7H_9NO	*m*-Anisidine *m*-$CH_3OC_6H_4NH_2$	123.08		251		
2218	C_7H_9NO	*p*-Anisidine *p*-$CH_3OC_6H_4NH_2$	123.08	57.7	245	1.071_4^{55}	
2219	C_7H_9NO	Benzylhydroxylamine $C_6H_5CH_2NHOH$	123.08		123^{50}		
2220	C_7H_9NO	Salicylamine *o*-$OHC_6H_4CH_2NH_2$	123.08	129			
2221	C_7H_9NO	*m*-Tolylhydroxylamine	123.08	68			
2222	C_7H_9NO	*p*-Tolylhydroxylamine	123.08	94			
2223	C_7H_9NO	4, 6-Dihydrobenzaldoxime	123.08	44			
2224	$C_7H_9NO_2$	6-Amino-2-methoxyphenol	139.08	127			
2225	$C_7H_9NO_2$	Ammonium benzoate $C_6H_5CO_2NH_4$	139.08	198		1.262^4	
2226	$C_7H_9NO_2S$	Toluene-*o*-sulfoneamide	171.14	156.3			
2227	$C_7H_9NO_2S$	Toluene-*m*-sulfoneamide	171.14	108			
2228	$C_7H_9NO_2S$	Toluene-*p*-sulfoneamide	171.14	137.5			
2229	$C_7H_9NO_3$	Ammonium salicylate	155.08				1333
2234.1	$C_7H_9NO_5S$	Ammonium *o*-sulfobenzoate	219.14	>250		1.524	1200
2235	$C_7H_9N_3O$	1-Phenylsemicarbazide	151.09	172			
2236	$C_7H_9N_3O$	4-Phenylsemicarbazide	151.09	122			
2237	C_7H_{10}	2, 3-Dihydrocycloheptene	94.077		121		
2238	C_7H_{10}	1, 2-Dihydrotoluene	94.077		108		
2239	C_7H_{10}	1, 3-Dihydrotoluene	94.077		110.1	0.835	524
2240	C_7H_{10}	2, 4-Dihydrotoluene	94.077		106	0.827	498
2241	C_7H_{10}	1, 3, 5-Heptatriene	94.077		114	0.764	
2243	$C_7H_{10}ClN$	*o*-Toluidine hydrochloride	143.54	214.5	242		
2244	$C_7H_{10}ClN$	*m*-Toluidine hydrochloride	143.54	228	249.8		
2245	$C_7H_{10}ClN$	*p*-Toluidine hydrochloride	143.54	239	257.5		
2247	$C_7H_{10}N_2$	Methyl-*p*-phenylenediamine	122.09	35.5	259.5		
2248	$C_7H_{10}N_2$	Benzylhydrazine $C_6H_5CH_2NHNH_2$	122.09	26	103^{41}		
2249	$C_7H_{10}N_2$	2, 3-Diaminotoluene	122.09	62	255		
2250	$C_7H_{10}N_2$	2, 4-Diaminotoluene	122.09	99	280		
2251	$C_7H_{10}N_2$	2, 5-Diaminotoluene	122.09	64	274		
2252	$C_7H_{10}N_2$	Toluylene-2, 6-diamine	122.09	105			
2253	$C_7H_{10}N_2$	3, 4-Diaminotoluene	122.09	88.5	265		
2254	$C_7H_{10}N_2$	3, 5-Diaminotoluene	122.09		285		
2255	$C_7H_{10}N_2$	1, 1-Methylphenylhydrazine	122.09		227.5	1.040	766
2256	$C_7H_{10}N_2$	*o*-Tolylhydrazine *o*-$CH_3C_6H_4NHNH_2$	122.09	56			
2257	$C_7H_{10}N_2$	*m*-Tolylhydrazine	122.09		224		
2258	$C_7H_{10}N_2$	*p*-Tolylhydrazine *p*-$CH_3C_6H_4NHNH_2$	122.09	61			
2259	$C_7H_{10}N_2O_3$	5-Ethyl-5-methylbarbituric acid	170.09	212			
2260	$C_7H_{10}N_2O_3$	Trimethylbarbituric acid	170.09	165			
2260.1	$C_7H_{10}N_4O_5$	Dimethyl ureindihydroxysuccinate	234.10	203			1204
2260.2	$C_7H_{10}N_2O_7$	Isohydroxydimethylurea	230.11	180			1212
2261	$C_7H_{10}O$	1, 2, 3, 4-Tetrahydrobenzaldehyde	110.08		212	1.009^0	
2262	$C_7H_{10}O_2$	Δ^1-Tetrahydrobenzoic acid	126.08			$1.072_4^{47.2}$	552
2263	$C_7H_{10}O_3$	Diacetylacetone $CO(CH_2COCH_3)_2$	142.08	49	121^{10}	1.068_{40}^{40}	1090
2264	$C_7H_{10}O_4$	*cis*-Pentamethylene-1, 2-dicarboxylic acid	158.08	140			
2265	$C_7H_{10}O_4$	Teraconic acid	158.08	161 d.			
2266	$C_7H_{10}O_4$	Terebic acid	158.08	175		0.816	

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
2267	$C_7H_{10}O_4$	Dimethyl citraconate	158.08		210.5	1.110	922
2268	$C_7H_{10}O_5$	3-Ketopimelic acid	174.08	143			
2269	$C_7H_{10}O_5$	Ethyl mesoxalate $(HO)_2C(CO_2C_2H_5)_2$	174.08	<−31	220	1.119^{20}_{20}	
2270	$C_7H_{10}O_5$	Quinic lactone	174.08	187			
2271	$C_7H_{11}BrO_4$	Diethyl bromomalonate	239.00		235	1.426^{15}_{15}	
2272	$C_7H_{11}NO$	Nortropinone	125.09	70			
2273	$C_7H_{11}NO_2$	Arecaidine	141.09	224 d.			
2274	$C_7H_{11}NO_2$	Arecaine	141.09	214 d.			
2275	C_7H_{12}	*n*-Amylacetylene $C_5H_{11}C\vdots CH$	96.092	>−70	110.5	$0.738^{12.6}_4$	160
2276	C_7H_{12}	2, 4-Dimethyl-1, 3-pentadiene	96.092		93.3	0.749^{12}_4	815
2277	C_7H_{12}	2, 4-Dimethyl-2, 3-pentadiene	96.092		70		
2278	C_7H_{12}	3-Heptine $C_3H_7C\vdots CC_2H_5$	96.092		106	0.760^0	
2279	C_7H_{12}	2, 4-Heptadiene	96.092		107	0.731	896
2280	C_7H_{12}	2-Heptine $CH_3C\vdots CC_4H_9$	96.092		113.3	0.763^0	
2281	C_7H_{12}	4-Methylcyclohexene	96.092		102.2	0.800	385
2282	C_7H_{12}	Δ^1-Tetrahydrotoluene	96.092		111	0.809	431
2283	C_7H_{12}	Δ^2-Tetrahydrotoluene	96.092		105	0.805	408
2284	C_7H_{12}	Δ^3-Tetrahydrotoluene	96.092		103	0.799	394
2284.1	$C_7H_{12}Cl_2O_2$	Isobutyl 1, 2-dichloropropionate	199.01			1.156^{21}	
2285	$C_7H_{12}N_2O$	Sinapoline	140.11	100			
2286	$C_7H_{12}N_4O$	Caffeidine	168.12	94			
2287	$C_7H_{12}N_4O_3$	Caffoline	200.12	197			
2288	$C_7H_{12}O$	Diallyl carbinol $(CH_2:CHCH)_2CHOH$	112.09		151	0.857	
2289	$C_7H_{12}O$	Hexahydrobenzaldehyde	112.09		161	0.926	
2289.1	$C_7H_{12}O$	*o*-Methylcyclohexanone	112.09		167^{740}	$0.930^{15.1}$	842
2289.2	$C_7H_{12}O$	*m*-Methylcyclohexanone	112.09		60^{15}	$0.914^{25.2}$	1027
2289.3	$C_7H_{12}O$	*p*-Methylcyclohexanone	112.09		$56.4^{10.5}$	$0.912^{24.4}$	1021
2290	$C_7H_{12}O$	Suberone $<(CH_2CH_2CH_2)_2>CO$	112.09		179.5	0.969^0	
2291	$C_7H_{12}O_2$	Pimelic aldehyde $OCH(CH_2)_5CHO$	128.09		112^{13}		
2292	$C_7H_{12}O_2$	Teracrylic acid	128.09	<−18	218		
2293	$C_7H_{12}O_2$	Hexahydrobenzoic acid	128.09	31	233	1.048	1040
2294	$C_7H_{12}O_2$	1, 2-Isoheptenic acid	128.09	16.5	227	0.942	442
2295	$C_7H_{12}O_2$	Allyl butyrate $C_3H_7CO_2CH_2CH:CH_2$	128.09		143		
2296	$C_7H_{12}O_2$	Allyl isobutyrate	128.09		133.5		
2297	$C_7H_{12}O_2$	Cyclohexyl formate $HCO_2C_6H_{11}$	128.09	<0	162.5	1.010^0	
2298	$C_7H_{12}O_2$	Ethyl angelate	128.09		142	0.918	963
2299	$C_7H_{12}O_2$	Ethyl tiglate $CH_3CH:C(CH_3)CO_2C_2H_5$	128.09		152	0.924	964
2300	$C_7H_{12}O_3$	Hexahydrosalicylic acid	144.09	111			
2301	$C_7H_{12}O_3$	Ethyl levulinate	144.09		205.3	1.017^{16}_4	263
2302	$C_7H_{12}O_3$	Ethyl methylacetoacetate	144.09		186.8	1.019	239
2303	$C_7H_{12}O_3$	Methyl dimethylacetoacetate	144.09		174	0.999^{25}_{25}	
2304	$C_7H_{12}O_4$	Butylmalonic acid $C_4H_9CH(CO_2H)_2$	160.09	101.5	150 d.		
2305	$C_7H_{12}O_4$	Isobutylmalonic acid	160.09	107			
2306	$C_7H_{12}O_4$	*sec.*-Butylmalonic acid	160.09	76			
2307	$C_7H_{12}O_4$	Diethylmalonic acid $(C_2H_5)_2C(CO_2H)_2$	160.09	121			
2308	$C_7H_{12}O_4$	*n*-Pimelic acid $HO_2C(CH_2)_5CO_2H$	160.09	103	272^{100}		
2308.1	$C_7H_{12}O_4$	Trimethylsuccinic acid	160.09	152		1.242	
2309	$C_7H_{12}O_4$	Diethyl malonate $CH_2(CO_2C_2H_5)_2$	160.09	−49.9	198.9	1.054	208
2310	$C_7H_{12}O_4$	Dimethyl pyrotartrate	160.09		198	1.078	
2311	$C_7H_{12}O_4$	Methyl ethyl succinate	160.09	<−20	208.2	1.093^0	
2312	$C_7H_{12}O_5$	Glycerol diacetate (Diacetin)	176.09		176^{40}	1.178^{15}_{15}	
2313	$C_7H_{12}O_6$	Quinic acid	192.09	163	d.	1.637	1333
2314	$C_7H_{12}O_6$	Diethyl mesoxalate	192.09	57	200		
2315	$C_7H_{13}BrN_2O_2$	Adalin $CH_2BrCONHCON(C_2H_5)_2$	237.03	116			
2316	$C_7H_{13}BrO_2$	Ethyl 1-bromo-*n*-valerate	209.02		192	1.226^{18}_4	
2317	$C_7H_{13}BrO_2$	Ethyl 1-bromoisovalerate	209.02		186	1.278^{12}_{12}	
2318	$C_7H_{13}ClO_2$	Amyl chloroacetate $ClCH_2CO_2C_5H_{11}$	164.56		192	1.055	345
2319	$C_7H_{13}ClO_2$	Isoamyl chloroacetate	164.56		192	1.041^{25}_{25}	
2320	$C_7H_{13}N$	Heptylnitrile $C_6H_{13}CN$	111.11		183	0.815	240
2321	$C_7H_{13}NO$	Nortropanol	127.11	161			
2322	$C_7H_{13}NO$	Suberoxime $(CH_2CH_2CH_2)_2C:NOH$	127.11	23	230	1.023	
2323	$C_7H_{13}NO_2$	Stachydrine	143.11	210			
2324	$C_7H_{13}NO_5$	Quinic amide $(OH)_4C_6H_7CONH_2$	191.11	132			

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
2325	C_7H_{14}	2, 4-Dimethyl-2-pentene	98.108		84	0.699^{25}	
2326	C_7H_{14}	3-Ethyl-2-pentene $(C_2H_5)_2C{:}CHCH_3$	98.108		98	0.725^{15}_{4}	192
2327	C_7H_{14}	Heptamethylene (Cycloheptane)	98.108	−12	118.1	0.811	405
2328	C_7H_{14}	Hexahydrotoluene	98.108	−147.5	103	0.764	910
2329	C_7H_{14}	2-Heptene $CH_3CH{:}CHC_4H_9$	98.108		98.5		
2330	C_7H_{14}	Methylcyclohexane	98.108	−126.4	100.8	0.764	272
2331	C_7H_{14}	3-Methyl-2(3)-hexene	98.108		97.4	0.718	186
2332	C_7H_{14}	1-Heptene $C_5H_{11}CH{:}CH_2$	98.108		99		
2333	C_7H_{14}	2, 2, 3-Trimethyl-1-butene	98.108		80		
2334	C_7H_{14}	2, 3-Dimethyl-2-pentene	98.108		95.1	0.719	
2335	$C_7H_{14}O$	Cycloheptanol	114.11		185.2	0.958	
2336	$C_7H_{14}O$	2-Heptene-4-ol	114.11		63^{11}	$0.842^{14.4}_{4}$	838
2337	$C_7H_{14}O$	Hexahydrobenzyl alcohol	114.11		181.2	0.916	816
2338	$C_7H_{14}O$	1-Methylcyclohexane-1-ol	114.11	26	168.3	0.919^{26}_{4}	1029
2339	$C_7H_{14}O$	*o*-Hexahydrocresol	114.11		169	0.923	478
2340	$C_7H_{14}O$	*m*-Hexahydrocresol	114.11	−47	176	0.914	466
2341	$C_7H_{14}O$	*dl-m*-Hexahydrocresol	114.11		175	0.923	467
2342	$C_7H_{14}O$	*p*-Hexahydrocresol	114.11		174	0.924^{14}	833
2343	$C_7H_{14}O$	Heptaldehyde $C_6H_{13}CHO$	114.11	−45.0	155	0.850	202
2344	$C_7H_{14}O$	Dipropyl ketone $(C_3H_7)_2CO$	114.11	−32.6	143.5	0.821^{15}_{4}	173
2345	$C_7H_{14}O$	Diisopropyl ketone $[(CH_3)_2CH]_2CO$	114.11		123.7	0.806	
2346	$C_7H_{14}O$	Ethyl *n*-butyl ketone $C_2H_5COC_4H_9$	114.11		148.5		
2347	$C_7H_{14}O$	Ethyl isobutyl ketone	114.11		136	0.815	
2348	$C_7H_{14}O$	Methyl *n*-amyl ketone $CH_3COC_5H_{11}$	114.11		150	0.822^{15}	
2349	$C_7H_{14}O$	Methyl isoamyl ketone	114.11		144	0.821^{17}	
2350	$C_7H_{14}O_2$	Isoamylacetic acid	130.11		216.5	0.926^{15}	
2351	$C_7H_{14}O_2$	Heptylic acid $C_6H_{13}CO_2H$	130.11	−10	223.5	0.922	269
2353	$C_7H_{14}O_2$	*n*-Amyl acetate $CH_3CO_2C_5H_{11}$	130.11		147.6	0.879^{20}_{20}	130
2354	$C_7H_{14}O_2$	Isoamyl acetate	130.11		142.5	0.875	122
2354.1	$C_7H_{14}O_2$	*d-β*-Amyl acetate	130.11		131	0.868	100
2355	$C_7H_{14}O_2$	*tert.*-Amyl acetate	130.11		124.8	0.874^{19}	
2356	$C_7H_{14}O_2$	Ethyl *n*-valerate $C_4H_9CO_2C_2H_5$	130.11		145.5	0.877	1109
2357	$C_7H_{14}O_2$	Ethyl isovalerate	130.11	−99.3	135	0.866	126
2358	$C_7H_{14}O_2$	*n*-Hexyl formate $HCO_2C_6H_{13}$	130.11		153.6	0.898^{0}	
2359	$C_7H_{14}O_2$	Isobutyl propionate	130.11	−71.4	138	0.869	108
2359.1	$C_7H_{14}O_2$	*d-sec.*-Butyl propionate	130.11		132	0.8657	
2360	$C_7H_{14}O_2$	Methyl *n*-caproate $C_5H_{11}CO_2CH_3$	130.11		149.5	0.904^{0}_{0}	
2361	$C_7H_{14}O_2$	Propyl *n*-butyrate $C_3H_7CO_2C_3H_7$	130.11	−95.2	143	0.879^{15}	123
2362	$C_7H_{14}O_2$	Propyl isobutyrate $(CH_3)_2CHCO_2C_3H_7$	130.11		135.4	0.884^{0}_{4}	97
2363	$C_7H_{14}O_2$	Isopropyl butyrate $C_3H_7CO_2CH(CH_3)_2$	130.11		128	0.865^{13}	
2364	$C_7H_{14}O_2$	Isopropyl isobutyrate	130.11		120.8	0.869^{0}_{4}	
2365	$C_7H_{14}O_3$	Di-*n*-propyl carbonate $CO(OC_3H_7)_2$	146.11		168.2	0.968^{22}	
2366	$C_7H_{14}O_3$	Ethyl butyl carbonate	146.11		169		
2367	$C_7H_{14}O_4$	Glycerol 1-butyrate	162.11		271		
2367.1	$C_7H_{14}O_5$	*l*-Methyl rhamnoside	178.11	109			1227
2368	$C_7H_{14}O_6$	*α*-Methyl galactoside	194.11	112			
2369	$C_7H_{14}O_6$	*β*-Methyl galactoside	194.11	176			
2370	$C_7H_{14}O_6$	*α*-Methyl glucose	194.11	161			
2371	$C_7H_{14}O_6$	*β*-Methyl glucose	194.11	135			
2372	$C_7H_{14}O_6$	*α*-Methyl glucoside	194.11	168	$200^{0.2}$		1230
2373	$C_7H_{14}O_6$	*β*-Methyl glucoside	194.11	104			1171
2373.1	$C_7H_{14}O_6$	*α*-Methyl mannoside	194.11	194			1217
2374	$C_7H_{14}O_6$	*d*-Inosite methyl ether (*β*-Pinite)	194.11	187		1.52	
2375	$C_7H_{14}O_6$	*l*-Inosite methyl ether (Quebrachite)	194.11	191	$210^{vac.}$	1.54	
2376	$C_7H_{14}O_7$	*d, β*-Galaheptose	210.11	199			
2377	$C_7H_{14}O_7$	*d, α*-Glucoheptose	210.11	215 d.			
2378	$C_7H_{14}O_8$	*d*-Mannoheptonic acid	226.11	175 d.			
2379	$C_7H_{14}S$	*m*-Hexahydrothiocresol	130.17		174		
2380	$C_7H_{15}Br$	*n*-Heptyl bromide $C_7H_{15}Br$	179.03		178.8	1.133^{16}	
2381	$C_7H_{15}Cl$	*n*-Heptyl chloride $C_7H_{15}Cl$	134.57		159.5	0.881^{16}	
2382	$C_7H_{15}F$	*n*-Heptyl fluoride $C_7H_{15}F$	118.12	−73	119.2	0.804	61
2383	$C_7H_{15}I$	*n*-Heptyl iodide $C_7H_{15}I$	226.05		203.8	1.401^{0}	469
2384	$C_7H_{15}N$	Ethylpiperidine	113.12		128	0.857^{23}_{4}	1000

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
2385	$C_7H_{15}NO$	*n*-Heptylamide $C_6H_{13}CONH_2$	129.12	96			
2386	$C_7H_{15}NO$	Heptaldoxime $C_6H_{13}CH{:}NOH$	129.12	55.5	195	0.834$^{83}_{4}$	1124
2386.1	$C_7H_{15}NO_2$	Isobutylurethane $C_4H_9NHCO_2C_2H_5$	145.12	<-65	96^{17}	0.943	311
2387	C_7H_{16}	2, 4-Dimethylpentane $CH_2[CH(CH_3)_2]_2$	100.12		83.9	0.681	45
2388	C_7H_{16}	3, 3-Dimethylpentane	100.12		87	0.711^{0}	
2389	C_7H_{16}	*n*-Heptane $CH_3(CH_2)_5CH_3$	100.12	−90.0	98.4	0.684	55
2390	C_7H_{16}	2-Methylhexane $(CH_3)_2CHC_4H_9$	100.12		90.4	0.707$^{0}_{4}$	
2391	C_7H_{16}	*d*, 3-Methylhexane $C_3H_7CH(CH_3)C_2H_5$	100.12		92	0.687	
2392	C_7H_{16}	3-Ethylpentane $(C_2H_5)_3CH$	100.12		93.8	0.670	89
2393	C_7H_{16}	2, 2, 3-Trimethylbutane	100.12	−25	80.8	0.695$^{15}_{4}$	77
2394	C_7H_{16}	2, 2-Dimethylpentane $(CH_3)_3CC_3H_7$	100.12		78.6	0.674	
2396	$C_7H_{16}O$	Dimethylbutyl carbinol	116.12		142.2	0.816	224
2397	$C_7H_{16}O$	Dimethylisobutyl carbinol	116.12		130	0.816	228
2398	$C_7H_{16}O$	Dimethyl-*tert.*-butyl carbinol	116.12	17	132		
2399	$C_7H_{16}O$	Dipropyl carbinol $(C_3H_7)_2CHOH$	116.12		155.4	0.820	256
2400	$C_7H_{16}O$	Diisopropyl carbinol	116.12		140	0.829	265
2400.1	$C_7H_{16}O$	*d*-Ethylbutyl carbinol	116.12		66^{18}	0.823	251
2401	$C_7H_{16}O$	Ethylisobutyl carbinol	116.12		148.2		
2402	$C_7H_{16}O$	Ethyl-*sec.*-butyl carbinol	116.12		150	0.852^{0}	
2403	$C_7H_{16}O$	*n*-Heptyl alcohol $C_7H_{15}OH$	116.12	−34.6	175.8	0.817^{22}	287
2404	$C_7H_{16}O$	2-Hydroxy-3-ethylpentane	116.12		152	0.853^{0}	
2405	$C_7H_{16}O$	1-Hydroxy-2-methylhexane	116.12		162.5	0.831$^{13}_{4}$	266
2406	$C_7H_{16}O$	Isoheptyl alcohol	116.12		167.2	0.831^{0}	291
2407	$C_7H_{16}O$	Methyl-*n*-amyl carbinol	116.12		158	0.819	259
2407.1	$C_7H_{16}O$	*d*-Methylamyl carbinol	116.12		73.5^{20}	0.819	253
2408	$C_7H_{16}O$	Methylisoamyl carbinol	116.12		150	0.819$^{17.5}$	
2409	$C_7H_{16}O$	Methylethylpropyl carbinol	116.12		141	0.823	270
2410	$C_7H_{16}O$	Methylethylisopropyl carbinol	116.12		140	0.833	
2411	$C_7H_{16}O$	Propylisopropyl carbinol	116.12		141	0.821^{17}	215
2412	$C_7H_{16}O$	Triethyl carbinol $(C_2H_5)_3COH$	116.12		142	0.840	334
2413	$C_7H_{16}O$	Ethyl isoamyl ether	116.12		112	0.764^{18}	
2414	$C_7H_{16}O$	Propyl butyl ether $C_4H_9OC_3H_7$	116.12		117.1	0.777^{0}	
2415	$C_7H_{16}O_3$	Ethyl orthoformate $HC(OC_2H_5)_3$	148.12	−76.1	145.9	0.897	
2416	$C_7H_{16}O_4S_2$	Sulfonal $(CH_3)_2C(SO_2C_2H_5)_2$	228.25	128	300 d.		
2417	$C_7H_{16}O_7$	*d*-Mannoheptitol	212.12	188			
2418	$C_7H_{16}O_7$	Volemitol	212.12	155			
2419	$C_7H_{17}N$	*n*-Heptylamine $C_7H_{15}NH_2$	115.14	−23.0	155.1	0.777	278
2420	$C_8Cl_4O_3$	Tetrachloro-*o*-phthalic anhydride	285.83	257			
2421	$C_8H_2Cl_2O_3$	3, 6-Dichloro-*o*-phthalic anhydride	216.93	191	339		
2422	$C_8H_2Cl_4O_4$	Tetrachloro-*o*-phthalic acid	303.85	250			
2422.1	$C_8H_4BrNO_2$	*m*-Bromoisatine	225.96	255			
2422.2	C_8H_4ClNO	Isatine chloride	165.50	180 d.			
2423	$C_8H_4Cl_2O_2$	*o*-Phthalyl dichloride *o*-$C_6H_4(COCl)_2$	202.95	0	276.7	1.408	755
2424	$C_8H_4Cl_2O_2$	Isophthalyl dichloride *m*-$C_6H_4(COCl)_2$	202.95	41	276		
2425	$C_8H_4Cl_2O_2$	Terephthalyl dichloride *p*-$C_6H_4(COCl)_2$	202.95	78	259		
2426	$C_8H_4Cl_2O_4$	3, 6-Dichloro-*o*-phthalic acid	234.95	185			
2427	$C_8H_4Cl_4O$	Trichloromethyl *p*-chlorophenylketone	257.86	28	181^{45}		
2428	$C_8H_4N_2$	Isophthalic nitrile *m*-$C_6H_4(CN)_2$	128.05	161			
2429	$C_8H_4N_2$	Terephthalic nitrile *p*-$C_6H_4(CN)_2$	128.05	222			
2430	$C_8H_4N_2O_4$	Nitroisatine	192.05	230			
2431	$C_8H_4O_3$	*o*-Phthalic anhydride	148.03	130.8	284.5	1.527^{4}	
2432	$C_8H_5Cl_3O$	Dichloromethyl *p*-chlorophenyl ketone	223.41	51	178^{45}		
2433	$C_8H_5Cl_4NO$	2, 3, 4, 6-Tetrachloroacetanilide	272.88	181			
2434	C_8H_5NO	Benzoyl cyanide $C_6H_5.COCN$	131.05	34	208		
2435	$C_8H_5NO_2$	*o*-Cyanobenzoic acid	147.05	190			
2436	$C_8H_5NO_2$	*m*-Cyanobenzoic acid	147.05	217			
2437	$C_8H_5NO_2$	*p*-Cyanobenzoic acid	147.05	214			
2438	$C_8H_5NO_2$	Isatine	147.05	201			
2439	$C_8H_5NO_2$	*o*-Phthalimide *o*-$C_6H_4(CO)_2NH$	147.05	238			
2440	$C_8H_5NO_6$	3-Nitro-*o*-phthalic acid	211.05	220			
2441	$C_8H_5NO_6$	4-Nitro-*o*-phthalic acid	211.05	164			
2442	$C_8H_5NO_6$	2-Nitroisophthalic acid	211.05	300			
2443	$C_8H_5NO_6$	4-Nitroisophthalic acid	211.05	245			

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
2444	$C_8H_5NO_6$	5-Nitroisophthalic acid	211.05	255			
2445	$C_8H_5NO_6$	2-Nitroterephthalic acid	211.05	270			
2446	$C_8H_5NO_6$	Pyridine-2, 3, 4-tricarboxylic acid	211.05	250 d.			
2447	$C_8H_5NO_6$	Pyridine 2, 3, 5-tricarboxylic acid	211.05	323			
2448	$C_8H_5NO_6$	Pyridine-2, 3, 6-tricarboxylic acid	211.05	100			
2449	$C_8H_5NO_6$	Pyridine-2, 4, 5-tricarboxylic acid	211.05	235			
2450	$C_8H_5NO_6$	Pyridine-2, 4, 6-tricarboxylic acid	211.05	227			
2451	$C_8H_5NO_6$	Pyridine-3, 4, 5-tricarboxylic acid	211.05	261			
2452	$C_8H_5N_3O_8$	Picryl acetate	271.06	76	120 d.		
2453	C_8H_6	Phenylacetylene $C_6H_5C{:}CH$	102.05		143	0.930	820
2454	C_8H_6BrN	Bromobenzyl cyanide $C_6H_5CHBrCN$	195.97	> −17	231.7	1.519	1185
2455	$C_8H_6Br_2$	Styrene-1, 2-dibromide	261.88	73.5	134^{15}		
2456	$C_8H_6Br_2O$	*p*-Bromophenacyl bromide	277.88	109.7			
2457	$C_8H_6Cl_2O_2$	Piperonal chloride	204.96		240 s. d.		
2458	$C_8H_6Cl_3NO$	2, 3, 4-Trichloroacetanilide	238.43	122			
2459	$C_8H_6Cl_3NO$	2, 4, 5-Trichloroacetanilide	238.43	190			
2460	$C_8H_6Cl_3NO$	2, 4, 6-Trichloroacetanilide	238.43	204			
2461	$C_8H_6I_2O_3$	Methyl 3, 5-diiodosalicylate	403.91	110.5			
2462	$C_8H_6N_2$	Phthalazine	130.06	91	317		
2463	$C_8H_6N_2$	Quinazoline	130.06	48	243		
2464	$C_8H_6N_2$	Quinoxaline	130.06	30.5	226	1.133^{48}_{4}	1075
2465	$C_8H_6N_2O_2$	Isatoxime (Nitrosooxindol)	162.06	202			
2466	$C_8H_6N_2O_2$	*p*-Nitrobenzyl cyanide	162.06	117			
2467	$C_8H_6N_4O_8$	Alloxantin	286.08	170 d.			
2468	C_8H_6O	Coumarone	118.05	> −18	175	1.091	997
2469	$C_8H_6O_2$	Phenylglyoxal $C_6H_5CO.CHO$	134.05	73	142^{125}		
2470	$C_8H_6O_2$	*o*-Phthalic aldehyde *o*-$C_6H_4(CHO)_2$	134.05	56			
2471	$C_8H_6O_2$	Isophthalic aldehyde *m*-$C_6H_4(CHO)_2$	134.05	89.5			
2472	$C_8H_6O_2$	Terephthalic aldehyde *p*-$C_6H_4(CHO)_2$	134.05	116	248		
2473	$C_8H_6O_2$	Phthalide	134.05	73; 65	290		
2474	$C_8H_6O_3$	Piperonal (Heliotropin)	150.05	37	263		
2475	$C_8H_6O_3$	*o*-Aldehydobenzoic acid	150.05	100.5		1.404	
2476	$C_8H_6O_3$	*m*-Aldehydobenzoic acid	150.05	175			
2477	$C_8H_6O_3$	*p*-Aldehydobenzoic acid	150.05	250			
2478	$C_8H_6O_3$	Phenylglyoxylic acid	150.05	66	148^{6}		
2479	$C_8H_6O_4$	*o*-Phthalic acid *o*-$C_6H_4(CO_2H)_2$	166.05	191 d.		1.593	
2480	$C_8H_6O_4$	Isophthalic acid *m*-$C_6H_4(CO_2H)_2$	166.05	330			
2482	$C_8H_6O_4$	Piperonylic acid $CH_2{:}O_2{:}C_6H_3.CO_2H$	166.05	228			
2483	$C_8H_6O_5$	2-Hydroxy-*o*-phthalic acid	182.05	244			
2485	$C_8H_6O_5$	4-Hydroxy-*o*-phthalic acid	182.05	181 d.			
2486	$C_8H_6O_5$	2-Hydroxyisophthalic acid	182.05	239			
2487	$C_8H_6O_5$	4-Hydroxyisophthalic acid	182.05	306			
2488	$C_8H_6O_5$	5-Hydroxyisophthalic acid	182.05	288			
2489	$C_8H_6O_5$	Noropianic acid	182.05	171			
2490	C_8H_6S	Thionaphthene	134.11	32	221	1.165	1049
2491	C_8H_7Br	α-Bromostyrene $C_6H_5CBr{:}CH_2$	182.97	−43.5	160^{75}	1.4057	770
2492	C_8H_7Br	ω-Bromostyrene (isomer 1)	182.97	7	221	1.4224	786
2493	C_8H_7Br	ω-Bromostyrene (isomer 2)	182.97	−7.5	108^{26}	1.427	992
2493.1	$C_8H_7BrN_2O_3$	α-Bromonitroacetanilide	258.99	131		1.765	
2494	C_8H_7BrO	ω-Bromoacetophenone	198.97	50	119	1.647	
2495	C_8H_7Cl	α-Chlorostyrene $C_6H_5C.Cl{:}CH_2$	138.51		199		
2496	C_8H_7Cl	ω-Chlorostyrene $C_6H_5CH{:}CHCl$	138.51		198.8	1.112^{23}	
2497	C_3H_7ClO	ω-Chloroacetophenone	154.51	59	247	1.324^{15}	
2498	C_8H_7ClO	*p*-Chloroacetophenone	154.51	20	232	1.188	
2499	C_8H_7ClO	Phenylacetyl chloride $C_6H_5CH_2COCl$	154.51		102.5^{17}	1.168	
2500	$C_8H_7ClO_2$	*p*-Anisyl chloride *p*-$CH_3OC_6H_4COCl$	170.51	27			
2501	$C_8H_7ClO_2$	Phenyl chloroacetate $ClCH_2CO_2C_6H_5$	170.51	45	235		
2502	$C_8H_7F_2NO$	2, 5-Difluoroacetanilide	171.06	122.5			
2503	C_8H_7N	Benzyl cyanide $C_6H_5CH_2CN$	117.06	−23.8	233.9	1.015^{18}	679
2504	C_8H_7N	Indole	117.06	52.5	254		1333
2505	C_8H_7N	*o*-Tolunitrile *o*-$CH_3C_6H_4CN$	117.06		204	0.995^{25}_{25}	1004
2506	C_8H_7N	*m*-Tolunitrile *m*-$CH_3C_6H_4CN$	117.06		214	0.984^{25}_{25}	
2507	C_8H_7N	*p*-Tolunitrile *p*-$CH_3C_6H_4CN$	117.06	29.5	217		

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
2508	C_8H_7NO	p-Anisonitrile p-$CH_3OC_6H_4CN$	133.06	60	256		
2509	C_8H_7NO	dl-Mandelonitrile $C_6H_5CH(OH)CN$	133.06	−10	d.	1.124	
2510	C_8H_7NO	Indoxyl	133.06	85	110		
2511	C_8H_7NO	Oxindol	133.06	120			
2512	$C_8H_7NO_2$	Hydrindic acid (Dioxindol)	149.06	180	195 d.		
2513	$C_8H_7NO_2$	o-Nitrostyrene o-$NO_2.C_6H_4.CH:CH_2$	149.06	13.5			
2514	$C_8H_7NO_2$	m-Nitrostyrene m-$NO_2.C_6H_4.CH:CH_2$	149.06	−5			
2515	$C_8H_7NO_2$	p-Nitrostyrene p-$NO_2.C_6H_4.CH:CH_2$	149.06	29			
2516	$C_8H_7NO_3$	Oxanilic acid $CO_2H.CONHC_6H_5$	165.06	150			
2517	$C_8H_7NO_3$	o-Phthalamic acid	165.06	149	155 d.		
2518	$C_8H_7NO_4$	Methyl o-nitrobenzoate	181.06	−8	269	1.284^{25}_{25}	
2519	$C_8H_7NO_4$	Methyl m-nitrobenzoate	181.06	70	279		
2520	$C_8H_7NO_4$	Methyl p-nitrobenzoate	181.06	96			
2521	$C_8H_7NO_4$	Uvitonic acid	181.06	274			
2522	C_8H_7NS	Benzyl isothiocyanate	149.13		243		
2522.1	C_8H_7NS	Benzyl thiocyanate	149.13	41	235		
2523	C_8H_7NS	o-Tolyl isothiocyanate	149.13		239	1.104^{25}_{25}	
2524	C_8H_7NS	m-Tolyl isothiocyanate	149.13		245		
2525	C_8H_7NS	p-Tolyl isothiocyanate	149.13	26	237	1.087^{25}_{25}	
2526	$C_8H_7N_3O_5$	2, 3-Dinitroacetanilide	225.08	186			
2527	$C_8H_7N_3O_5$	2, 4-Dinitroacetanilide	225.08	120			
2528	$C_8H_7N_3O_5$	2, 6-Dinitroacetanilide	225.08	197			
2529	$C_8H_7N_3O_5$	3, 4-Dinitroacetanilide	225.08	144			
2530	$C_8H_7N_3O_5$	3, 6-Dinitroacetanilide	225.08	121			
2531	$C_8H_7N_3O_6$	3, 4, 5-Trinitro-o-xylene	241.08	115			
2532	$C_8H_7N_3O_6$	3, 4, 6-Trinitro-o-xylene	241.08	72			
2533	$C_8H_7N_3O_6$	2, 4, 5-Trinitro-m-xylene	241.08	90			
2534	$C_8H_7N_3O_6$	2, 4, 6-Trinitro-m-xylene	241.08	181.5			
2535	$C_8H_7N_3O_6$	4, 5, 6-Trinitro-m-xylene	241.08	125			
2536	$C_8H_7N_3O_6$	2, 3, 6-Trinitro-p-xylene	241.08	140^{20}			
2537	$C_8H_7N_3O_7$	Ethyl picrate	257.08	78.5			
2538	C_8H_8	Styrene (Phenylethylene)	104.06		146	0.903	907
2539	C_8H_8BrNO	o-Bromoacetanilide	213.99	99			
2540	C_8H_8BrNO	p-Bromoacetanilide	213.99	165			
2540.1	$C_8H_8Br_2$	o-Xylenedibromide o-$C_6H_4(CH_2Br)_2$	263.89	94.5	d.	1.988	
2540.2	$C_8H_8Br_2$	m-Xylenedibromide m-$C_6H_4(CH_2Br)_2$	263.89	77	140	1.959	
2541	$C_8H_8Br_2$	p-Xylenedibromide p-$C_6H_4(CH_2Br)_2$	263.89	144	245	2.102^{0}	
2542	C_8H_8ClNO	o-Chloroacetanilide	169.53	88			
2543	C_8H_8ClNO	m-Chloroacetanilide	169.53	72.5			
2544	C_8H_8ClNO	p-Chloroacetanilide	169.53	172.5			
2544.1	$C_8H_8Cl_2$	o-Xylenedichloride o-$C_6H_4(CH_2Cl)_2$	174.98	55	241	1.393	
2544.2	$C_8H_8Cl_2$	m-Xylenedichloride m-$C_6H_4(CH_2Cl)_2$	174.98	34.2	255	1.302	
2545	$C_8H_8Cl_2$	p-Xylenedichloride p-$C_6H_4(CH_2Cl)_2$	174.98	100.5	120^{20}	1.417^{0}	
2546	C_8H_8INO	p-Iodoacetanilide p-$CH_3CONHC_6H_4I$	261.00	184			
2547	$C_8H_8N_2$	Apoharmine	132.08	183			
2548	$C_8H_8N_2$	1-Methylindazole	132.08		107^{15}	$1.032^{99.2}_{4}$	1129
2549	$C_8H_8N_2OS$	Benzoylthiourea $C_6H_5CONHCSNH_2$	180.14	169			
2550	$C_8H_8N_2O_2$	Benzoylurea $C_6H_5CONHCONH_2$	164.08	200			
2551	$C_8H_8N_2O_2$	o-Phthalic diamide o-$C_6H_4(CONH_2)_2$	164.08	220			
2552	$C_8H_8N_2O_2$	Isophthalic diamide m-$C_6H_4(CONH_2)_2$	164.08	265			
2553	$C_8H_8N_2O_2$	N-Nitrosoacetanilide	164.08	41			
2554	$C_8H_8N_2O_2$	Ricinine	164.08	201			
2555	$C_8H_8N_2O_3$	o-Nitroacetanilide	180.08	93			
2556	$C_8H_8N_2O_3$	m-Nitroacetanilide	180.08	150.5			
2557	$C_8H_8N_2O_3$	p-Nitroacetanilide	180.08	214			
2558	$C_8H_8N_2O_4$	3, 4-Dinitro-o-xylene	196.08	82			
2559	$C_8H_8N_2O_4$	3, 6-Dinitro-o-xylene	196.08	56			
2560	$C_8H_8N_2O_4$	4, 5-Dinitro-o-xylene	196.08	115			
2561	$C_8H_8N_2O_4$	4, 6-Dinitro-o-xylene	196.08	75			
2562	$C_8H_8N_2O_4$	2, 5-Dinitro-m-xylene	196.08	101			
2563	$C_8H_8N_2O_4$	4, 5-Dinitro-m-xylene	196.08	132			
2564	$C_8H_8N_2O_4$	2, 3-Dinitro-p-xylene	196.08	93			
2565	$C_8H_8N_2O_4$	2, 5-Dinitro-p-xylene	196.08	147			

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
2566	$C_8H_8N_2O_4$	2, 6-Dinitro-*p*-xylene	196.08	124			
2566.1	$C_8H_8N_2O_6$	4, 5-Dinitro-1, 2-dimethoxybenzene	228.08	130.5		1.326^{131}	
2566.2	$C_8H_8N_4O$	4-Methoxyphenyltetrazole	128.09	228			1306
2567	C_8H_8O	Phenylacetaldehyde $C_6H_5CH_2CHO$	120.06		194	1.027	
2568	C_8H_8O	*o*-Toluic aldehyde *o*-$CH_3C_6H_4CHO$	120.06		195.5	1.039	960
2569	C_8H_8O	*m*-Toluic aldehyde *m*-$CH_3C_6H_4CHO$	120.06		195.5	1.019	971
2570	C_8H_8O	*p*-Toluic aldehyde *p*-$CH_3C_6H_4CHO$	120.06		204	1.020	814; 906
2571	C_8H_8O	Acetophenone $CH_3COC_6H_5$	120.06	19.7	202.3	1.026	705
2572	C_8H_8O	Coumarane	120.06		189.5	1.074	
2573	$C_8H_8O_2$	Phenacyl alcohol $C_6H_5COCH_2OH$	136.06	86		1.013	
2574	$C_8H_8O_2$	5-Hydroxytoluene-2-aldehyde	136.06	108.9			
2575	$C_8H_8O_2$	4-Hydroxytoluene-3-aldehyde	136.06	55.1	21.8		
2576	$C_8H_8O_2$	6-Hydroxytoluene-3-aldehyde	136.06	117.4			
2577	$C_8H_8O_2$	3-Hydroxytoluene-4-aldehyde	136.06	54	223		
2578	$C_8H_8O_2$	*o*-Methoxybenzaldehyde	136.06	35	242	1.133	745
2579	$C_8H_8O_2$	*m*-Methoxybenzaldehyde	136.06		230	1.118	836
2580	$C_8H_8O_2$	*p*-Methoxybenzaldehyde	136.06	2.5	247	1.123	821
2581	$C_8H_8O_2$	*o*-Hydroxyacetophenone	136.06		213		
2582	$C_8H_8O_2$	*m*-Hydroxyacetophenone	136.06	95			
2583	$C_8H_8O_2$	*p*-Hydroxyacetophenone	136.06	109			
2584	$C_8H_8O_2$	Phenylacetic acid $C_6H_5CH_2CO_2H$	136.06	76.7	265.5	1.078^{83}	
2585	$C_8H_8O_2$	*o*-Toluic acid *o*-$CH_3C_6H_4CO_2H$	136.06	102.4	259.2	$1.062_4^{114.6}$	1157
2586	$C_8H_8O_2$	*m*-Toluic acid *m*-$CH_3C_6H_4CO_2H$	136.06	110.5	263	$1.054_4^{111.6}$	640
2587	$C_8H_8O_2$	*p*-Toluic acid *p*-$CH_3C_6H_4CO_2H$	136.06	176.8	275		
2588	$C_8H_8O_2$	Benzyl formate $HCO_2CH_2C_6H_5$	136.06		203.4	1.081	
2589	$C_8H_8O_2$	Methyl benzoate $C_6H_5CO_2CH_3$	136.06	−12.5	199.6	1.094	656
2590	$C_8H_8O_2$	Phenyl acetate $CH_3CO_2C_6H_5$	136.06		195.5	1.078	610
2591	$C_8H_8O_2$	*o*-Xyloquinone 1, 2-$(CH_3)_2C_6H_2O_2$-3, 6	136.06	55			
2592	$C_8H_8O_2$	*m*-Xyloquinone 1, 3-$(CH_3)_2C_6H_2O_2$-2, 5	136.06	73			
2593	$C_8H_8O_2$	*p*-Xyloquinone 1, 4-$(CH_3)_2.C_6H_2O_2$-2, 5	136.06	125			
2594	$C_8H_8O_3$	Piperonyl alcohol	152.06	51			
2595	$C_8H_8O_3$	Isovanillin 4, 3-$CH_3OC_6H_3(OH)CHO$	152.06	116		1.196	
2596	$C_8H_8O_3$	Vanillin 3, 4-$CH_3OC_6H_3(OH)CHO$	152.06	81	285		
2597	$C_8H_8O_3$	*o*-Hydroxymethylbenzoic acid	152.06	120			
2598	$C_8H_8O_3$	*m*-Hydroxymethylbenzoic acid	152.06	111	190^{11}		
2599	$C_8H_8O_3$	*p*-Hydroxymethylbenzoic acid	152.06	181			
2600	$C_8H_8O_3$	*o*-Hydroxyphenylacetic acid	152.06	137			
2601	$C_8H_8O_3$	*m*-Hydroxyphenylacetic acid	152.06	129			
2602	$C_8H_8O_3$	*p*-Hydroxyphenylacetic acid	152.06	148			
2603	$C_8H_8O_3$	3-Hydroxytoluene-2-carboxylic acid	152.06	167			
2604	$C_8H_8O_3$	4-Hydroxytoluene-2-carboxylic acid	152.06	172.4			
2605	$C_8H_8O_3$	5-Hydroxytoluene-2-carboxylic acid	152.06	178			
2606	$C_8H_8O_3$	6-Hydroxytoluene-2-carboxylic acid	152.06	183			
2607	$C_8H_8O_3$	4-Hydroxytoluene-3-carboxylic acid	152.06	152.5			
2608	$C_8H_8O_3$	5-Hydroxytoluene-3-carboxylic acid	152.06	208			
2609	$C_8H_8O_3$	6-Hydroxytoluene-3-carboxylic acid	152.06	172			
2610	$C_8H_8O_3$	2-Hydroxytoluene-4-carboxylic acid	152.06	207			
2611	$C_8H_8O_3$	3-Hydroxytoluene-4-carboxylic acid	152.06	177.8			
2612	$C_8H_8O_3$	*d*(*l*)-Mandelic acid $C_6H_5CH(OH)CO_2H$	152.06	133			
2613	$C_8H_8O_3$	*dl*-Mandelic acid $C_6H_5CH(OH)CO_2H$	152.06	118		1.361^4	
2614	$C_8H_8O_3$	*o*-Methoxybenzoic acid	152.06	98	200		
2615	$C_8H_8O_3$	*m*-Methoxybenzoic acid	152.06	100			
2616	$C_8H_8O_3$	*p*-Methyoxybenzoic acid	152.06	184.2	280	1.385^4	1333
2617	$C_8H_8O_3$	Phenoxyacetic acid $C_6H_5OCH_2CO_2H$	152.06	99	285 s. d.		
2618	$C_8H_8O_3$	Methyl salicylate $HOC_6H_4CO_2CH_3$	152.06	−8.6	223.3	1.184	708
2619	$C_8H_8O_3$	Resorcinol acetate	152.06		283		
2620	$C_8H_8O_4$	Phloroacetophenone	168.06	285			
2621	$C_8H_8O_4$	Berberonic acid 2, 4, 5-$C_5H_5N(CO_2H)_3$	168.06	165			
2622	$C_8H_8O_4$	Dehydracetic acid	168.06	109	270		
2623	$C_8H_8O_4$	$\Delta^{1,4}$-Dihydro-*o*-phthalic acid	168.06	153			
2624	$C_8H_8O_4$	$\Delta^{2,4}$-Dihydro-*o*-phthalic acid	168.06	215			
2625	$C_8H_8O_4$	$\Delta^{2,6}$-Dihydro-*o*-phthalic acid	168.06	215			

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
2626	$C_8H_8O_4$	Homogentisinic acid	168.06	147			
2627	$C_8H_8O_4$	Isovanillic acid	168.06	250			
2628	$C_8H_8O_4$	Vanillic acid	168.06	207			
2630	$C_8H_8O_5$	Methyl gallate	184.06	192 d.			
2631	$C_8H_8O_8$	Tetramethylene-1, 2, 2-tetracarboxylic acid	232.06	203			
2632	C_8H_9Br	*o*-Xylyl bromide	184.99	21	217.7	1.381^{23}	
2633	C_8H_9Br	4-Bromo-*o*-xylene	184.99	0.2	214.5	1.369	740
2634	C_8H_9Br	*m*-Xylyl bromide	184.99		215.8 s. d.	1.371^{23}	
2635	C_8H_9Br	2-Bromo-*m*-xylene	184.99	> −10	206		
2636	C_8H_9Br	4-Bromo-*m*-xylene	184.99		207		
2637	C_8H_9Br	5-Bromo-*m*-xylene	184.99	> −20	204	1.362	
2638	C_8H_9Br	*p*-Xylyl bromide	184.99	38	220.7	1.324	
2639	C_8H_9Br	2-Bromo-*p*-xylene	184.99	10	205.7	1.356	735
2640	C_8H_9Cl	*o*-Xylyl chloride	140.53		199		
2641	C_8H_9Cl	3-Chloro-*o*-xylene	140.53	> −20	189.5		
2642	C_8H_9Cl	4-Chloro-*o*-xylene	140.53	> −20	191.5	1.0692^{15}_{15}	
2643	C_8H_9Cl	*m*-Xylyl chloride	140.53		196		
2644	C_8H_9Cl	*p*-Xylyl chloride	140.53		202		
2645	C_8H_9N	2-Allylpyridine	119.08		190	0.959^{0}	
2646	C_8H_9NO	*o*-Aminoacetophenone	135.08		252 s. d.		
2647	C_8H_9NO	*m*-Aminoacetophenone	135.08	96.5	290		
2648	C_8H_9NO	*p*-Aminoacetophenone	135.08	106	295		
2649	C_8H_9NO	Acetanilide (Antifebrin)	135.08	114.2	303.8	1.21^{4}	
2650	C_8H_9NO	Acetophenoneoxime $CH_3C(:NOH)C_6H_5$	135.08	58			
2651	C_8H_9NO	Phenylacetamide $C_6H_5CH_2CONH_2$	135.08	155	284		
2652	C_8H_9NO	*o*-Toluic amide *o*-$CH_3C_6H_4CONH_2$	135.08	138			
2653	C_8H_9NO	*m*-Toluic amide *m*-$CH_3C_6H_4CONH_2$	135.08	97			
2654	C_8H_9NO	*p*-Toluic amide *p*-$CH_3C_6H_4CONH_2$	135.08	159			
2655	$C_8H_9NO_2$	*o*-Acetoaminophenol	151.08	203			
2656	$C_8H_9NO_2$	*m*-Acetoaminophenol	151.08	149			
2657	$C_8H_9NO_2$	*p*-Acetoaminophenol	151.08	168			
2658	$C_8H_9NO_2$	*dl*-Aminophenylacetic acid	151.08	256	265		
2659	$C_8H_9NO_2$	Homoanthranilic acid	151.08	177 d.			
2660	$C_8H_9NO_2$	*N*-Methylanthranilic acid	151.08	179			
2661	$C_8H_9NO_2$	*dl*-Phenylaminoacetic acid	151.08	127			
2662	$C_8H_9NO_2$	Benzyl carbamate $C_6H_5CH_2CO_2NH_2$	151.08	86			
2663	$C_8H_9NO_2$	Ethyl nicotinate	151.08		105^{5}		
2664	$C_8H_9NO_2$	Methyl *o*-aminobenzoate	151.08	8.2; 24.3	135.5^{15}	1.168^{15}	
2665	$C_8H_9NO_2$	Methyl *p*-aminobenzoate	151.08	112			
2666	$C_8H_9NO_2$	3-Nitro-*o*-xylene	151.08		250.8	1.147^{15}	
2667	$C_8H_9NO_2$	4-Nitro-*o*-xylene	151.08	30	258	1.139^{30}	
2668	$C_8H_9NO_2$	2-Nitro-*m*-xylene	151.08		225.5	1.112^{15}	
2669	$C_8H_9NO_2$	4-Nitro-*m*-xylene	151.08	2	246	$1.126^{17.5}$	
2670	$C_8H_9NO_2$	5-Nitro-*m*-xylene	151.08	71	273.7		
2671	$C_8H_9NO_2$	2-Nitro-*p*-xylene	151.08		239.9	1.132^{15}	
2672	$C_8H_9NO_2$	α-Anisaldoxime $CH_3OC_6H_4CH:NOH$	151.08	64			
2673	$C_8H_9NO_2$	β-Anisaldoxime $CH_3OC_6H_4CH:NOH$	151.08	133			
2674	$C_8H_9NO_2$	*o*-Methoxybenzamide	151.08	129			
2675	$C_8H_9NO_2$	*p*-Methoxybenzamide	151.08	162.3			
2676	$C_8H_9NO_3$	3-Nitro-4-methoxytoluene	167.08	8.5	274 d.		
2677	$C_8H_9NO_3$	*o*-Nitrophenetol *o*-$C_2H_5OC_6H_4NO_2$	167.08		268	1.190^{15}	718
2678	$C_8H_9NO_3$	*p*-Nitrophenetol *p*-$C_2H_5OC_6H_4NO_2$	167.08	60	283		
2679	$C_8H_9NO_3$	Methyl 3-hydroxy-4-aminobenzoate	167.08	120			
2680	$C_8H_9NO_3$	Methyl 3-amino-4-hydroxybenzoate	167.08	143			
2681	$C_8H_9NO_4$	Biliverdic acid	183.08	114			
2682	C_8H_9NS	Thioacetanilide $CH_3CSNHC_6H_5$	151.14	75	d.		
2682.1	$C_8H_9N_3O_4$	2, 4-Dinitrodimethylaniline	221.09	87		1.476	
2683	C_8H_{10}	Ethylbenzene $C_6H_5CH_2CH_3$	106.08	−92.8	$136.5^{776.7}$	0.868	577
2684	C_8H_{10}	*o*-Xylene *o*-$C_6H_4(CH_3)_2$	106.08	−27.1	144	0.879	626
2685	C_8H_{10}	*m*-Xylene *m*-$C_6H_4(CH_3)_2$	106.08	−53.6	139.0	0.865	584
2686	C_8H_{10}	*p*-Xylene *p*-$C_6H_4(CH_3)_2$	106.08	13.2	137.7	0.861	573
2687	$C_8H_{10}ClN$	*o*-Chlorodimethylaniline	155.54		208.5	1.107	

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
2688	$C_8H_{10}ClN$	*p*-Chlorodimethylaniline	155.54	35.5	231		
2689	$C_8H_{10}N_2O$	*N*-Acetyl-*o*-phenylenediamine	150.09	144.8			
2690	$C_8H_{10}N_2O$	*N*-Acetyl-*m*-phenylenediamine	150.09	279			
2691	$C_8H_{10}N_2O$	*N*-Acetyl-*p*-phenylenediamine	150.09	160.5			
2692	$C_8H_{10}N_2O$	Benzylurea $C_6H_5CH_2NHCONH_2$	150.09	147.5			
2693	$C_8H_{10}N_2O$	Hydracetine $CH_3COHN.NHC_6H_5$	150.09	128			
2694	$C_8H_{10}N_2O$	1-Methyl-1-phenylurea	150.09	82			
2695	$C_8H_{10}N_2O$	*p*-Nitrosodimethylaniline	150.09	85			
2696	$C_8H_{10}N_2O_2$	*o*-Nitrodimethylaniline	166.09		154^{24}	1.179	
2697	$C_8H_{10}N_2O_2$	*m*-Nitrodimethylaniline	166.09	66	285	1.313^{17}	
2698	$C_8H_{10}N_2O_2$	*p*-Nitrodimethylaniline	166.09	163			
2699	$C_8H_{10}N_2O_3$	3-Amino-4-methoxy-6-nitrotoluene	182.09	131.5			
2700	$C_8H_{10}N_2S$	Benzylthiourea $C_6H_5CH_2NHCSNH_2$	166.16	162			
2701	$C_8H_{10}N_4O_2$	Caffeine (Theine)	194.11	237		1.23	
2702	$C_8H_{10}N_4O_3$	1, 3, 9-Trimethyluric acid	210.11	320 d.			
2703	$C_8H_{10}N_4O_3$	1, 7, 9-Trimethyluric acid	210.11	340			
2704	$C_8H_{10}N_4O_3$	2, 7, 9-Trimethyluric acid	210.11	380			
2705	$C_8H_{10}O$	2, 3-Dimethylphenol	122.08	75	218		
2706	$C_8H_{10}O$	2, 4-Dimethylphenol	122.08	26	211.5	1.036	
2707	$C_8H_{10}O$	2, 6-Dimethylphenol	122.08	49	212		
2708	$C_8H_{10}O$	3, 4-Dimethylphenol	122.08	65	225.1		
2709	$C_8H_{10}O$	3, 5-Dimethylphenol	122.08	68	219.5		
2710	$C_8H_{10}O$	*o*-Ethylphenol	122.08	>-18	207.5	1.037^{0}	
2711	$C_8H_{10}O$	*m*-Ethylphenol	122.08	−4	214	1.025^{0}	
2712	$C_8H_{10}O$	*p*-Ethylphenol	122.08	46	219		
2713	$C_8H_{10}O$	Methylphenyl carbinol	122.08		205	1.003^{25}_{25}	
2713.1	$C_8H_{10}O$	*d*-Methylphenyl carbinol	122.08		100^{18}	1.014	668
2714	$C_8H_{10}O$	2-Phenylethyl alcohol $C_6H_5CH_2CH_2OH$	122.08		221	1.024^{15}	677
2715	$C_8H_{10}O$	*o*-Tolyl carbinol *o*-$CH_3C_6H_4CH_2OH$	122.08	34	223.3	1.023^{40}	
2716	$C_8H_{10}O$	*m*-Tolyl carbinol *m*-$CH_3C_6H_4CH_2OH$	122.08	>-20	217	1.036^{0}	
2717	$C_8H_{10}O$	*p*-Tolyl carbinol *p*-$CH_3C_6H_4CH_2OH$	122.08	59.5	217		
2718	$C_8H_{10}O$	Benzyl methyl ether $C_6H_5CH_2OCH_3$	122.08		174	0.987^{20}	
2719	$C_8H_{10}O$	*o*-Cresyl methyl ether *o*-$CH_3C_6H_4OCH_3$	122.08		171.3	0.981	619
2720	$C_8H_{10}O$	*m*-Cresyl methyl ether	122.08		177.2	0.978^{18}_{4}	627
2721	$C_8H_{10}O$	*p*-Cresyl methyl ether	122.08		176.5	0.970	646
2722	$C_8H_{10}O$	Phenetol $C_6H_5OC_2H_5$	122.08	−30.2	172	0.965	633
2723	$C_8H_{10}O_2$	Anis alcohol *p*-$CH_3OC_6H_4CH_2OH$	138.08	45	258.8	1.109^{26}	
2724	$C_8H_{10}O_2$	Caffeol	138.08		197		
2725	$C_8H_{10}O_2$	Creosol 3, 4-$CH_3O(OH)C_6H_3CH_3$	138.08	5.5	221.8	1.092	709
2726	$C_8H_{10}O_2$	3, 5-Dimethyl-*o*-dihydroxybenzene	138.08	74			
2727	$C_8H_{10}O_2$	4, 5-Dimethyl-*o*-dihydroxybenzene	138.08	82			
2728	$C_8H_{10}O_2$	2, 4-Dimethylresorcinol	138.08	150			
2729	$C_8H_{10}O_2$	2, 5-Dimethylresorcinol	138.08	163	280		
2730	$C_8H_{10}O_2$	4, 5-Dimethylresorcinol	138.08	137			
2731	$C_8H_{10}O_2$	4, 6-Dimethylresorcinol	138.08	125	279		
2732	$C_8H_{10}O_2$	2, 3-Dimethylhydroquinone	138.08	221 s. d.			
2733	$C_8H_{10}O_2$	2, 5-Dimethylhydroquinone	138.08	213			
2734	$C_8H_{10}O_2$	2, 6-Dimethylhydroquinone	138.08	151			
2735	$C_8H_{10}O_2$	*p*-Homosaligenin	138.08	105			
2736	$C_8H_{10}O_2$	Styrolene alcohol $HOCH_2CH_2OC_6H_5$	138.08	68	274.2		
2737	$C_8H_{10}O_2$	*o*-Dimethoxybenzene *o*-$C_6H_4(OCH_3)_2$	138.08	22.5	206	1.086^{15}	
2738	$C_8H_{10}O_2$	*o*-Ethoxyphenol *o*-$HOC_6H_4OC_2H_5$	138.08	28	241		
2739	$C_8H_{10}O_2$	Hydroquinone dimethyl ether	138.08	56	212.6	1.053^{55}_{55}	
2740	$C_8H_{10}O_2$	Hydroquinone monoethyl ether	138.08	66	247		
2741	$C_8H_{10}O_2$	Resorcinol dimethyl ether	138.08	−55.3	215	1.080^{0}_{4}	
2742	$C_8H_{10}O_2$	Resorcinol monoethyl ether	138.08		247		
2743	$C_8H_{10}O_2S$	Ethylphenylsulfone $C_2H_5SO_2C_6H_5$	170.14	42	>300	1.010^{22}	
2744	$C_8H_{10}O_3$	3-Methoxy-4-hydroxybenzyl alcohol	154.08	115	d.		
2745	$C_8H_{10}O_3$	Crotonic anhydride	154.08		247.8	1.040	520
2746	$C_8H_{10}O_4$	Δ^1-Tetrahydro-*o*-phthalic acid	170.08	120			
2747	$C_8H_{10}O_4$	Δ^3-Tetrahydro-*o*-phthalic acid	170.08	215			
2748	$C_8H_{10}O_4$	Diallyl oxalate $C_2O_4(C_3H_5)_2$	170.08		217	1.055	
2749	$C_8H_{10}O_4$	Dimethyl muconate $(CH:CH.CO_2CH_3)_2$	170.08	75 u.; 156 st.			

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
2750	$C_8H_{10}O_3$	Succinic peroxide	234.08	127 d.			
2751	$C_8H_{11}BrN_4O_2$	Caffeine hydrobromide	275.03				1333
2752	$C_8H_{11}ClN_2O$	*p*-Nitrosodimethylaniline hydrochloride	186.56	177			
2753	$C_8H_{11}ClN_4O_2$	Caffeine hydrochloride	230.58				1333
2753.1	$C_8H_{11}ClO_4$	Ethyl chloromaleate	206.54		125.5^{19}	1.191^{25}	
2754	$C_8H_{11}Cl_3O_6$	α-Chloralose	309.46	230			
2755	$C_8H_{11}I_3N_4O_2$	Caffeine triiodide	575.91	171			
2756	$C_8H_{11}N$	Dimethylaniline $C_6H_5N(CH_3)_2$	121.09	1.67	193.50	0.956	771
2757	$C_8H_{11}N$	2, 3-Dimethylaniline	121.09	> −15	223.8	0.992	756
2758	$C_8H_{11}N$	2, 4-Dimethylaniline	121.09		216	0.974	744
2759	$C_8H_{11}N$	2, 5-Dimethylaniline	121.09	15.5	217	0.980^{15}	968
2760	$C_8H_{11}N$	2, 6-Dimethylaniline	121.09		216.9	0.979	748
2761	$C_8H_{11}N$	3, 4-Dimethylaniline	121.09	49	226	1.076	
2762	$C_8H_{11}N$	3, 5-Dimethylaniline	121.09		221	0.972	742
2763	$C_8H_{11}N$	*N*-Ethylaniline $C_6H_5NH.C_2H_5$	121.09	−63.5	204.72	0.963	739
2764	$C_8H_{11}N$	*o*-Ethylaniline *o*-$C_2H_5C_6H_4NH_2$	121.09		216	0.983^{22}	
2765	$C_8H_{11}N$	*m*-Ethylaniline *m*-$C_2H_5C_6H_4NH_2$	121.09		215	0.990^{0}	
2766	$C_8H_{11}N$	*p*-Ethylaniline *p*-$C_2H_5C_6H_4NH_2$	121.09	−5	216.5	0.975^{22}	
2767	$C_8H_{11}N$	Methyl-*o*-toluidine $CH_3C_6H_4NCH_3$	121.09		207	0.977	750
2768	$C_8H_{11}N$	Methyl-*m*-toluidine	121.09		206		
2769	$C_8H_{11}N$	Methyl-*p*-toluidine *p*-$CH_3C_6H_4NHCH_3$	121.09		206		
2770	$C_8H_{11}N$	α-Phenylethylamine $C_6H_5CH(NH_2)CH_3$	121.09		187.4	0.940^{15}	
2771	$C_8H_{11}N$	ω-Phenylethylamine $C_6H_5CH_2CH_2NH_2$	121.09		198.2	$0.958^{24.4}$	761
2772	$C_8H_{11}N$	2-Isopropylpyridine	121.09		159	0.934^{0}	
2773	$C_8H_{11}N$	4-Isopropylpyridine	121.09		178	0.944^{0}	
2774	$C_8H_{11}N$	2-Methyl-5-ethylpyridine	121.09		174	0.918^{23}	
2775	$C_8H_{11}N$	Nicotoine	121.09		208	0.955	643
2776	$C_8H_{11}N$	2-Propylpyridine (Conyrine)	121.09		165		
2777	$C_8H_{11}N$	2, 3, 4-Trimethylpyridine	121.09		188	0.913	
2778	$C_8H_{11}N$	2, 4, 5-Trimethylpyridine	121.09		168	0.966	
2779	$C_8H_{11}N$	2, 4, 6-Trinethylpyridine	121.09		172	0.917^{15}	
2780	$C_8H_{11}NO$	Hydroxyethylaniline	137.09		286	1.110^{0}	
2781	$C_8H_{11}NO$	*o*-Dimethylaminophenol	137.09	45	200		
2782	$C_8H_{11}NO$	*o*-Ethylaminophenol *o*-$HOC_6H_4NHC_2H_5$	139.09	107.5			
2783	$C_8H_{11}NO$	*m*-Ethylaminophenol	137.09	62	176^{12}		
2784	$C_8H_{11}NO$	3-Amino-2-methoxytoluene	137.09		223		
2785	$C_8H_{11}NO$	5-Amino-2-methoxytoluene	137.09	53			
2786	$C_8H_{11}NO$	*o*-Phenetidine *o*-$NH_2C_6H_4OC_2H_5$	137.09	> −21	229.2		
2787	$C_8H_{11}NO$	*m*-Phenetidine *m*-$NH_2C_6H_4OC_2H_5$	137.09		248		
2788	$C_8H_{11}NO$	*p*-Phenetidine *p*-$NH_2C_6H_4OC_2H_5$	137.09	2.4	254.2	1.061	
2789	$C_8H_{11}NO$	Dimethylaniline oxide $C_6H_5N(CH_3)_2O$	137.09	153			
2790	$C_8H_{11}NO$	Tyramine *p*-$HOC_6H_4CH_2CH_2NH_2$	137.09	161			
2791	$C_8H_{11}NO_3S$	*m*-Dimethylanilinesulfonic acid	201.16	266 d.			
2792	$C_8H_{11}NO_3S$	*p*-Dimethylanilinesulfonic acid	201.16	257			
2793	$C_5H_{11}NO_3S$	*m*-Ethylaniline sulfonic acid	201.16	294 d.			
2794	$C_8H_{11}N_3O$	Maretin *m*-$CH_3.C_6H_4NH.NHCONH_2$	165.11	184			
2795	C_8H_{12}	Dihydro-*o*-xylene	108.09		135		
2796	C_8H_{12}	$\Delta^{1,5}$-5-Dihydro-*m*-xylene	108.09		130	0.823	497
2797	C_8H_{12}	$\Delta^{1,3}$-3-Dihydro-*p*-xylene	108.09		135.6	0.830	529
2798	$C_8H_{12}ClN$	ω-Phenylethylamine hydrochloride	157.56	217			
2799	$C_8H_{12}N_2$	Dimethylketine	136.11	86	189		
2800	$C_8H_{12}N_2$	1, 1-Dimethyl-*m*-phenylenediamine	136.11		258	0.995^{25}	
2801	$C_8H_{12}N_2$	1, 1-Dimethyl-*p*-phenylenediamine	136.11	41	262.3	1.036	
2802	$C_8H_{12}N_2$	2, 6-Dimethylphenylhydrazine	136.11	46			
2803	$C_8H_{12}N_2$	1-Ethyl-1-phenylhydrazine	136.11		237	1.018^{15}	
2804	$C_8H_{12}N_2$	1-Ethyl-2-phenylhydrazine	136.11		240		
2805	$C_8H_{12}N_2O_2$	Phenylhydrazine acetate	168.11	69			
2806	$C_8H_{12}N_2O_3$	*n*-Butylbarbituric acid	184.11	215			
2807	$C_8H_{12}N_2O_3$	1, 3-Diethylbarbituric acid	184.11	52	167^{19}		
2808	$C_8H_{12}N_2O_3$	5, 5-Diethylbarbituric acid	184.11	191			
2808.1	$C_8H_{12}N_2O_4$	Tetraacetylhydrazine $[(CH_3CO)_2N]_2$	200.11	86			1203
2809	$C_8H_{12}O$	Amylpropiolic aldehyde	124.09		187	0.89^{0}	
2810	$C_8H_{12}O_2$	Ethyl sorbate $CH_3(CH{:}CH)_2CO_2C_2H_5$	140.09		76.5^{12}	0.936	608

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
2811	$C_8H_{12}O_4$	Terpenylic acid	172.09	89			
2812	$C_8H_{12}O_4$	Diethyl fumarate $(:CHCO_2C_2H_5)_2$	172.09	0.6	218.5	1.052	377
2813	$C_8H_{12}O_4$	Diethyl maleate $(:CHCO_2C_2H_5)_2$	172.09		225	1.067	375
2814	$C_8H_{12}O_4$	Ethyl diacetoacetate	172.09		211 s. d.	1.09	492
2815	$C_8H_{12}O_4$	Dimeric diacetyl	172.09	58		$1.560_4^{29.8}$	
2816	$C_8H_{12}O_5$	Ethyl oxalacetate	188.09		132^{24}	1.172	905
2816.1	$C_8H_{13}BrO_4$	Diethyl bromoisosuccinate	253.02		122^{13}	1.3183^{25}	
2817	$C_8H_{13}N$	Granatic acid	123.11	270			
2818	$C_8H_{13}N$	Tropidine	123.11		163	0.946	946
2819	$C_8H_{13}NO$	Tropinone	139.11	41	218.5	$0.987^{99.6}$	1141
2820	$C_8H_{13}NO_2$	Arecolidine	155.11	110			
2821	$C_8H_{13}NO_2$	Arecoline	155.11		220		
2822	$C_8H_{13}NO_2$	Scopoline	155.11	110	243	1.016_4^{105}	
2823	$C_8H_{13}N_3O_2$	Iminodiethylbarbituric acid	183.12	295			
2824	C_8H_{14}	*n*-Hexylacetylene $C_6H_{13}C{:}CH$	110.11		125	0.770^0	818
2825	C_8H_{14}	*d*-Laurolene	110.11		120.5	0.797	397
2826	C_8H_{14}	Methyl-*n*-amylacetylene	110.11		134		
2827	C_8H_{14}	1, 2, 3, 4-Tetrahydro-*m*-xylene	110.11		124	0.801	398
2828	$C_8H_{14}BrNO_2$	Arecoline hydrobromide	236.03	168			
2829	$C_8H_{14}ClNO_2$	Arecolidine hydrochloride	191.57	98	250 d.		
2830	$C_8H_{14}O$	1, 1-Dimethylcyclohexene-3-ol	126.11		75^{15}	0.933	926
2831	$C_8H_{14}O$	2, 2-Dimethylcyclohexanone	126.11		172.5	0.913	426
2832	$C_8H_{14}O$	2, 6-Dimethylcyclohexanone	126.11		55.3^{10}	0.914	813
2833	$C_8H_{14}O$	Crotonyl ether $(CH_3CH{:}CHCH_2)_2O$	126.11		145	0.890^0	
2834	$C_8H_{14}O$	2-Methyl-2-heptene-6-one	126.11	−67.3	174	0.860	
2835	$C_8H_{14}O$	Homomesityl oxide	126.11		160^{625}	0.863	406
2836	$C_8H_{14}O_2$	Allyl isovalerate $C_4H_9CO_2C_3H_5$	142.11		155		
2837	$C_8H_{14}O_2$	Cyclohexyl acetate $CH_3CO_2C_6H_{11}$	142.11		177		
2838	$C_8H_{14}O_2$	Methyl hexahydrobenzoate	142.11		183	0.995_4^{15}	
2839	$C_8H_{14}O_3$	Dialdan	158.11	130			
2840	$C_8H_{14}O_3$	*n*-Butyric anhydride $(C_3H_7CO)_2O$	158.11	−75.0	198.2	0.969	
2841	$C_8H_{14}O_3$	Isobutyric anhydride $[(CH_3)_2CHCO]_2O$	158.11	−53.5	182.5	0.950	
2842	$C_8H_{14}O_3$	1-Ethyl-3-acetylbutyric acid	158.11		158^9		
2843	$C_8H_{14}O_4$	*n*-Amylmalonic acid $C_5H_{11}CH(CO_2H)_2$	174.11	82	140 d.		
2844	$C_8H_{14}O_4$	2, 2′-Dimethyladipic acid	174.11	76	321		
2845	$C_8H_{14}O_4$	Suberic acid $HO_2C(CH_2)_6CO_2H$	174.11	140	279^{100}		
2846	$C_8H_{14}O_4$	Diethyl methylmalonate	174.11		201.4	1.018	203
2847	$C_8H_{14}O_4$	Diethyl succinate $(CH_2CO_2C_2H_5)_2$	174.11	−20.8	216.5	1.042	246
2848	$C_8H_{14}O_4$	Di-*n*-propyl oxalate $(CO_2C_3H_7)_2$	174.11		211	1.018^{22}	
2849	$C_8H_{14}O_4$	Ethyl isopropyl malonate	174.11		217 d.	0.987_{25}^{25}	
2849.1	$C_8H_{14}O_5$	Diethyl malate	190.11		253	1.128	355
2850	$C_8H_{14}O_6$	Diethyl *d*-tartrate $[CH(OH)CO_2C_2H_5]_2$	206.11	17	280	1.202	421
2851	$C_8H_{15}ClO$	Capryl chloride $C_7H_{15}COCl$	162.57		196	0.975^8	
2852	$C_8H_{15}N$	*n*-Caprylonitrile $C_7H_{15}CN$	125.12		200	$0.820^{13.3}$	
2853	$C_8H_{15}N$	α-Coniceine	125.12	−16	158	0.893^{15}	
2854	$C_8H_{15}N$	β-Coniceine	125.12	41	169		
2855	$C_8H_{15}N$	γ-Coniceine	125.12	> −50	172	0.872	945
2856	$C_8H_{15}N$	δ-Coniceine	125.12		161.5	0.901_4^{15}	
2857	$C_8H_{15}N$	Granatinine	125.12	60			
2858	$C_8H_{15}N$	Pseudoconiceine	125.12		172	0.878	
2859	$C_8H_{15}N$	Tropane	125.12		167	0.930	975
2860	$C_8H_{15}NO$	Granatoline	141.12	134			
2861	$C_8H_{15}NO$	Hygrine	141.12		195	0.935	
2862	$C_8H_{15}NO$	Pelletierine	141.12		195 d.	0.988^0	
2863	$C_8H_{15}NO$	Pseudotropine	141.12	108	243		
2864	$C_8H_{15}NO$	Tropine	141.12	63	233	1.016_4^{100}	1146
2865	C_8H_{16}	Cyclooctane $(CH_2)_8$	112.12	14.4	150.6	0.839	
2866	C_8H_{16}	Diisobutylene $(CH_3)_2C{:}CHC(CH_3)_3$	112.12		102.6	0.715^{15}	
2867	C_8H_{16}	*o*-Dimethylcyclohexane	112.12	−57.5	129.4	0.779	317
2868	C_8H_{16}	*m*-Dimethylcyclohexane	112.12	−85	123.7	0.771	288
2869	C_8H_{16}	*p*-Dimethylcyclohexane	112.12	−86	120.5	0.769	257
2870	C_8H_{16}	Ethylcyclohexane $C_2H_5.C_6H_{11}$	112.12		128		
2871	C_8H_{16}	2-Methyl-3-ethyl-2-pentene	112.12		117.1		

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
2872	C_8H_{16}	2-Methyl-2-heptene $(CH_3)_2C{:}CHC_4H_9$	112.12		125.2	0.816	
2873	C_8H_{16}	4-Methyl-3-heptene	112.12		120.4	0.724	219
2874	C_8H_{16}	*n*-Octylene $CH_3(CH_2)_5CH{:}CH_2$	112.12		123	0.722^{17}	
2875	$C_8H_{16}BrNO$	Pelletierine hydrobromide	222.05	140			
2876	$C_8H_{16}ClNO$	Pelletierine hydrochloride	177.59	145			
2877	$C_8H_{16}N_2O_4$	Ethylidene diurethane	204.14	126			
2878	$C_8H_{16}O$	1, 2-Dimethylcyclohexanol	128.12		166	0.926_4^{14}	834
2879	$C_8H_{16}O$	*d*-1, 3-Dimethylcyclohexanol	128.12	72	69^{14}		
2880	$C_8H_{16}O$	*dl*-1, 3-Dimethylcyclohexanol	128.12		169	0.911_4^{14}	832
2881	$C_8H_{16}O$	1, 4-Dimethylcyclohexanol	128.12	50	170		
2882	$C_8H_{16}O$	2, 2-Dimethylcyclohexanol	128.12	8	72.2^{13}	0.923	496
2883	$C_8H_{16}O$	2, 4-Dimethylcyclohexanol	128.12		179	0.912	888
2884	$C_8H_{16}O$	2, 5-Dimethylcyclohexanol	128.12		178.5	0.907	887
2885	$C_8H_{16}O$	2, 6-Dimethylcyclohexanol	128.12		174.7		
2886	$C_8H_{16}O$	3, 3-Dimethylcyclohexanol	128.12	11	99.5^{35}	0.913_4^{14}	468
2887	$C_8H_{16}O$	3, 4-Dimethylcyclohexanol	128.12		189.2	0.907	889
2888	$C_8H_{16}O$	*cis*-3, 5-Dimethylcyclohexanol	128.12		185	0.911	447
2889	$C_8H_{16}O$	*trans*-3, 5-Dimethylcyclohexanol	128.12		187.5	0.902^{16}	463
2890	$C_8H_{16}O$	2-Methyl-2-heptene-6-ol	128.12		176	0.854	434
2891	$C_8H_{16}O$	Isoamyl allyl ether	128.12		120		
2892	$C_8H_{16}O$	*n*-Caprylic aldehyde $C_7H_{15}CHO$	128.12		81^{32}	0.821	261
2893	$C_8H_{16}O$	Ethyl *n*-amyl ketone $C_2H_5COC_5H_{11}$	128.12		168	0.850^0	
2894	$C_8H_{16}O$	Ethyl isoamyl ketone	128.12		163.5		
2895	$C_8H_{16}O$	Methylbutyrone	128.12		180	0.827^{16}	
2896	$C_8H_{16}O$	Methyl hexyl ketone $CH_3COC_6H_{13}$	128.12	−21.6	172.7	0.818	225
2897	$C_8H_{16}O$	Methyl isohexyl ketone	128.12		204	0.817	
2898	$C_8H_{16}O$	Propyl isobutyl ketone	128.12		155	0.813	
2899	$C_8H_{16}O_2$	*n*-Caprylic acid $CH_3(CH_2)_6CO_2H$	144.12	16	237.5	0.910	296
2900	$C_8H_{16}O_2$	Triethylacetic acid $(C_2H_5)_3CCO_2H$	144.12	39.5	202		
2901	$C_8H_{16}O_2$	Isoamyl propionate	144.12		160.2	0.870	163
2901.1	$C_8H_{16}O_2$	*d*-*β*-Amyl propionate	144.12		58^{16}	0.866	133
2902	$C_8H_{16}O_2$	*tert.*-Amyl propionate	144.12		143.5	0.855^{15}	
2903	$C_8H_{16}O_2$	Butyl *n*-butyrate $C_3H_7CO_2C_4H_9$	144.12		166.4	0.872_{20}^{20}	148
2904	$C_8H_{16}O_2$	Isobutyl *n*-butyrate	144.12		156.9	0.866_{16}^{16}	140
2905	$C_8H_{16}O_2$	Isobutyl isobutyrate	144.12	−80.7	148.7	0.875_4^0	120
2906	$C_8H_{16}O_2$	*tert.*-Butylethyl acetate	144.12		157		
2907	$C_8H_{16}O_2$	Ethyl *n*-caproate $C_5H_{11}CO_2C_2H_5$	144.12		166.6	0.875_4^{15}	
2908	$C_8H_{16}O_2$	Heptyl formate $HCO_2(CH_2)_6CH_3$	144.12		176.7	0.894^0	
2909	$C_8H_{16}O_2$	*n*-Hexyl acetate $CH_3CO_2(CH_2)_5CH_3$	144.12		169.2	0.890_0^0	
2909.1	$C_8H_{16}O_2$	*d*-*β*-Hexyl acetate	144.12		57^{20}	0.864	139
2910	$C_8H_{16}O_2$	Methyl *n*-heptylate $C_6H_{13}CO_2CH_3$	144.12		172.1	0.881_5^{15}	187
2911	$C_8H_{16}O_2$	*n*-Propyl *n*-valerate $C_4H_9CO_2C_3H_7$	144.12		167.5	0.889^0	
2912	$C_8H_{16}O_2$	*n*-Propyl isovalerate	144.12		155.9	0.863	141
2913	$C_8H_{16}O_3$	1-Hydroxy-*n*-caprylic acid	160.12	69.5			
2914	$C_8H_{16}O_3$	Amyl *l*-lactate $CH_3CH(OH)CO_2C_5H_{11}$	160.12		$110.5^{21.5}$	0.964^4	
2915	$C_8H_{16}O_4$	Metaldehyde $(C_2H_4O)_4$	176.12		150		1172
2916	$C_8H_{16}O_4$	Paraldol $(C_4H_8O_2)_2$	176.12	82			
2916.1	$C_8H_{16}O_4$	Bismethoxyacetal	176.12	127			1238
2917	$C_8H_{16}O_6$	Dambonite (Inosite dimethyl ether)	208.12	195	210		
2918	$C_8H_{16}O_6$	2, 3-Dimethyl-*α*-glucose	208.12	87			
2919	$C_8H_{16}O_6$	2, 3-Dimethyl-*β*-glucose	208.12	110			
2920	$C_8H_{16}O_6$	*d*, *α*-Ethylglucoside	208.12	114			1197
2921	$C_8H_{16}O_7$	Ethyl *d*-gluconate	224.12	65			
2922	$C_8H_{17}Br$	*n*-Octyl bromide $CH_3(CH_2)_6CH_2Br$	193.05		204	1.116^{16}	
2922.1	$C_8H_{17}Br$	*l*-2-Bromooctane	193.05		71^{14}	1.091^{17}	
2923	$C_8H_{17}BrN_4$	Hexamethylenetetramine bromoethylate (Bromalin)	249.08	200			
2924	$C_8H_{17}Cl$	*n*-Octyl chloride $CH_3(CH_2)_6CHCl$	148.59		184.6	0.879^{15}	
2925	$C_8H_{17}Cl$	2-Chlorooctane $C_6H_{13}CHClCH_3$	148.59		173	0.871^{15}	
2926	$C_8H_{17}F$	*n*-Octyl fluoride $CH_3(CH_2)_6CH_2F$	132.13		142.5	$0.812^{11.1}$	94
2927	$C_8H_{17}I$	*n*-Octyl iodide $CH_3(CH_2)_6CH_2I$	240.06	−45.9	225.5	$1.341_4^{14.5}$	549
2928	$C_8H_{17}N$	*d*-Coniine	127.14	−2.5	166.5	0.845	978
2929	$C_8H_{17}N$	2, 4, 6-Trimethylpiperidine	127.14		147	0.831	954

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
2930	$C_8H_{17}NO$	Conhydrine (Hydroxyconiine)	143.14	118	226		1333
2931	$C_8H_{17}NO$	α-Pseudoconhydrine	143.14	106	236.5		
2932	$C_8H_{17}NO_2$	1-Hydroxy-*n*-caprylic amide	159.14	150			
2933	C_8H_{18}	2, 5-Dimethylhexane	114.14	−91.0	109.2	0.693	87
2934	C_8H_{18}	2, 3-Dimethylhexane	114.14		114.0	0.725^{15}_{15}	178
2935	C_8H_{18}	2, 4-Dimethylhexane	114.14		109.9	0.708^{15}_{15}	138
2936	C_8H_{18}	3, 4-Dimethylhexane	114.14		116.5	0.721	156
2937	C_8H_{18}	Isooctane $(CH_3)_2CH(CH_2)_4CH_3$	114.14		116.0	0.704^{15}_{4}	103
2938	C_8H_{18}	2-Methyl-3-ethylpentane	114.14		114	0.708^{15}	134
2939	C_8H_{18}	3-Methylheptane $C_2H_5CH(CH_3)C_4H_9$	114.14		122.2	0.707	
2940	C_8H_{18}	4-Methylheptane $(C_3H_7)_2CHCH_3$	114.14		118.0	0.722	114
2941	C_8H_{18}	*n*-Octane $CH_3(CH_2)_6CH_3$	114.14	−56.5	124.6	0.707^{15}_{15}	112
2942	C_8H_{18}	2-Ethylhexane $CH_3(C_2H_5)CHC_4H_9$	114.14		118.8	0.717^{15}_{4}	135
2942.1	C_8H_{18}	3-Ethylhexane $(C_2H_5)_2CHC_3H_7$	114.14		115	0.715	
2943	C_8H_{18}	2, 2, 3, 3-Tetramethylbutane	114.14	104	106.8		
2944	C_8H_{18}	2, 2, 3-Trimethylpentane	114.14		110.8	0.722^{15}_{15}	233
2945	$C_8H_{18}BrN$	*d*-Coniine hydrobromide	208.06	211			
2946	$C_8H_{18}ClN$	*d*-Coniine hydrochloride	163.61	217			
2947	$C_8H_{18}ClNO$	Pseudoconhydrine hydrochloride	179.61	213			
2948	$C_8H_{18}IN$	Coniine hydroiodide	255.08	146			
2949	$C_8H_{18}N_2O$	Nitrosodiisobutylamine	158.16	−5	221	0.893^{25}_{25}	
2950	$C_8H_{18}N_2O_3$	Coniine nitrate	190.16	83			
2951	$C_8H_{18}O$	Dibutyl alcohol	130.14		181.2	0.848^{0}	
2952	$C_8H_{18}O$	Diethylpropyl carbinol	130.14		160.5	0.838	339
2953	$C_8H_{18}O$	Dimethyl-*n*-amyl carbinol	130.14		162	0.879	322
2954	$C_8H_{18}O$	Dimethylisoamyl carbinol	130.14		154	0.823	254
2955	$C_8H_{18}O$	Ethylisoamyl carbinol	130.14	−61	166	0.808	247
2956	$C_8H_{18}O$	1-Hydroxy-2, 5-dimethylhexane	130.14		179.5	0.828	
2957	$C_8H_{18}O$	2-Hydroxy-2, 4-dimethylhexane	130.14		151		
2958	$C_8H_{18}O$	4-Hydroxy-3-ethylhexane	130.14		164	0.835^{0}	
2959	$C_8H_{18}O$	2-Hydroxy-4-methylheptane	130.14		168		
2960	$C_8H_{18}O$	*d*-6-Hydroxy-3-methylheptane	130.14		169	0.817	
2961	$C_8H_{18}O$	4-Hydroxy-2, 2, 4-trimethylpentane	130.14	−20	147.5	0.842^{0}	
2962	$C_8H_{18}O$	Methyl dipropyl carbinol	130.14		161.5	0.823	297
2963	$C_8H_{18}O$	Methylethylbutylcarbinol	130.14		160.6	0.827	298
2964	$C_8H_{18}O$	Methylethylisobutyl carbinol	130.14		152.4	0.830^{15}	308
2965	$C_8H_{18}O$	Methylisohexyl carbinol	130.14		172	0.813	274
2966	$C_8H_{18}O$	*n*-Octyl alcohol $CH_3(CH_2)_7OH$	130.14	−16.3	194	0.827	318
2967	$C_8H_{18}O$	*d-sec.*-Octyl alcohol $C_6H_{13}CH(OH)CH_3$	130.14		86^{20}	0.822	279
2968	$C_8H_{18}O$	*dl-sec.*-Octyl alcohol $C_6H_{13}CH(OH)CH_3$	130.14	−38.6	178.5	0.819	357
2969	$C_8H_{18}O$	Propylbutyl carbinol	130.14		71^{10}	0.838^{0}_{4}	
2970	$C_8H_{18}O$	Propylisobutyl carbinol	130.14		164	0.821	248
2971	$C_8H_{18}O$	Isopropylbutyl carbinol	130.14		154	0.825	249
2972	$C_8H_{18}O$	Isopropylisobutyl carbinol	130.14		163	0.820^{15}	
2973	$C_8H_{18}O$	*n*-Butyl ether $C_4H_9OC_4H_9$	130.14		140.9	0.769^{20}_{20}	
2974	$C_8H_{18}O$	Isobutyl ether $[(CH_3)_2CHCH_2]_2O$	130.14		122.5	0.762	
2975	$C_8H_{18}O$	*sec.*-Butyl ether $(C_2H_5CHCH_3)_2O$	130.14		121	0.756^{21}	
2976	$C_8H_{18}O$	Ethyl hexyl ether $C_2H_5OC_6H_{13}$	130.14		137		
2977	$C_8H_{18}O$	Methyl *n*-heptyl ether $CH_3OC_7H_{15}$	130.14		149.8	0.795^{0}_{0}	
2978	$C_8H_{18}O_2S$	*n*-Butylsulfone $(C_4H_9)_2SO_2$	178.20	43.5			
2979	$C_8H_{18}O_3$	Ethyl orthoacetate $CH_3CH(OC_2H_5)_3$	162.14		142	0.94^{22}	
2980	$C_8H_{18}O_4S_2$	Trional $C_2H_5(CH_3)C(SO_2C_2H_5)_2$	242.27	76			
2981	$C_8H_{18}S$	Di-*n*-butyl sulfide $(C_4H_9)_2S$	146.20	−79.7	182	0.852^{0}	
2982	$C_8H_{18}S$	Diisobutyl sulfide $[(CH_3)_2CHCH_2]_2S$	146.20		171	0.836^{10}	
2983	$C_8H_{18}S$	Di-*sec.*-butyl sulfide $[C_2H_5CHCH_3]_2S$	146.20		165	0.832^{23}	
2984	$C_8H_{19}N$	Di-*n*-butylamine $(C_4H_9)_2NH$	129.15		161		
2985	$C_8H_{19}N$	Diisobutylamine $[(CH_3)_2CHCH_2]_2NH$	129.15	−70.0	138.8	0.745	180
2986	$C_8H_{19}N$	*n*-Octylamine $C_8H_{17}NH_2$	129.15		180	0.777^{27}	319
2987	$C_8H_{19}N$	*sec.*-Octylamine $C_6H_{13}CH(CH_3)NH_2$	129.15		164	0.771	292
2988	$C_8H_{20}As_2$	Ethylcacodyl $(C_2H_5)_2As_2(C_2H_5)_2$	266.07		190		
2989	$C_8H_{21}NO$	Tetraethylammonium hydroxide	147.17	190 d.			
2990	$C_9H_4O_4$	Phthalonic anhydride	176.03	186			
2991	$C_9H_5Cl_2N$	2, 3-Dichloroquinoline	197.96	105			
2992	$C_9H_5Cl_2N$	2, 4-Dichloroquinoline	197.96	67			

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
2993	$C_9H_5Cl_2N$	5, 6-Dichloroquinoline	197.96	85			
2994	$C_9H_5Cl_2N$	5, 7-Dichloroquinoline	197.96	117			
2995	$C_9H_5Cl_2N$	5, 8-Dichloroquinoline	197.96	93			
2996	$C_9H_5Cl_2N$	6, 8-Dichloroquinoline	197.96	104			
2997	$C_9H_5Cl_2N$	7, 8-Dichloroquinoline	197.96	85.5			
2998	$C_9H_6Br_2O_2$	*cis*-1, 2-Dibromocinnamic acid	216.96	100	$124^{0.5}$		
2999	$C_9H_6Br_2O_2$	*trans*-2, 2-Dibromocinnamic acid	216.96	136	$138^{0.6}$		
3000	C_9H_6ClN	2-Chloroquinoline	163.51	38	275		
3001	C_9H_6ClN	3-Chloroquinoline	163.51		255.5		
3002	C_9H_6ClN	4-Chloroquinoline	163.51	34	260.4	1.251	
3003	C_9H_6ClN	5-Chloroquinoline	163.51	32	268		
3004	C_9H_6ClN	6-Chloroquinoline	163.51	41	262		
3005	C_9H_6ClN	7-Chloroquinoline	163.51	45	256		
3006	C_9H_6ClN	8-Chloroquinoline	163.51	> -20	288		
3007	$C_9H_6Cl_2O_2$	*cis*-1, 2-Dichlorocinnamic acid	216.96	121			
3008	$C_9H_6Cl_2O_2$	*trans*-1, 2-Dichlorocinnamic acid	216.96	101			
3009	$C_9H_6INO_4S$	Loretin	351.05	d.			
3010	$C_9H_6N_2O_2$	5-Nitroquinoline	174.06	72			
3011	$C_9H_6N_2O_2$	6-Nitroquinoline	174.06	150			
3012	$C_9H_6N_2O_2$	7-Nitroquinoline	174.06	133			
3013	$C_9H_6N_2O_2$	8-Nitroquinoline	174.06	89			
3014	$C_9H_6O_2$	Phenylpropiolic acid $C_6H_5C{:}CCO_2H$	146.04	137			
3015	$C_9H_6O_2$	Chromone	146.04	58			
3016	$C_9H_6O_2$	Coumarine	146.04	67	301.7	0.935	
3017	$C_9H_6O_3$	Umbelliferon	162.04	227			
3018	$C_9H_6O_4$	Daphnetin	178.05	256			
3019	$C_9H_6O_4$	Esculetin	178.05	270 d.			
3020	$C_9H_6O_6$	Hemimellitic acid 1, 2, 3-$C_6H_3(CO_2H)_3$	210.04	190			
3021	$C_9H_6O_6$	Trimellitic acid 1, 2, 4-$C_6H_3(CO_2H)_3$	210.05	216			
3022	$C_9H_6O_6$	Trimesic acid 1, 3, 5-$C_6H_3(CO_2H)_3$	210.05	350			
3023	$C_9H_6O_7$	1, 3, 5-Tricarboxyphenol	226.05	180 d.			
3024	$C_9H_7BrO_2$	*cis*-Allo-1-bromocinnamic acid	226.97	120	$111^{0.6}$		
3025	$C_9H_7BrO_2$	*cis*-Allo-2-bromocinnamic acid	226.97	160	$111^{0.6}$		
3026	$C_9H_7BrO_2$	*trans*-1-Bromocinnamic acid	226.97	131	$121^{0.6}$		
3027	$C_9H_7BrO_2$	*trans*-2-Bromocinnamic acid	226.97	135	$122^{0.6}$		
3028	C_9H_7ClO	Cinnamyl chloride $C_6H_5CH{:}CHCOCl$	166.51	36	257.5		
3029	$C_9H_7ClO_2$	*cis*-Allo-1-chlorocinnamic acid	182.51	111	$99^{0.6}$		
3030	$C_9H_7ClO_2$	*cis*-Allo-2-chlorocinnamic acid	182.51	132	$97^{0.5}$		
3031	$C_9H_7ClO_2$	*trans*-1-Chlorocinnamic acid	182.51	137	$109^{0.5}$		
3032	$C_9H_7ClO_2$	*trans*-2-Chlorocinnamic acid	182.51	142	$113^{0.5}$		
3033	$C_9H_7ClO_2$	*o*-Chlorocinnamic acid	182.51	211			
3034	$C_9H_7Cl_3O_2$	Benzyl trichloroacetate	253.43		178.5^{50}	1.389^{4}_{4}	692
3035	C_9H_7N	Cinnamic nitrile $C_6H_5CH{:}CHCN$	129.06	11	255	1.037^{0}	
3036	C_9H_7N	Isoquinoline	129.06	23	243	1.099	1026
3037	C_9H_7N	Quinoline	129.06	−19.5	237.7	1.093	941
3038	C_9H_7NO	*p*-Cyanoacetophenone $CN.C_6H_4COCH_3$	145.06	61			
3039	C_9H_7NO	2-Hydroxyquinoline	145.06	200			
3040	C_9H_7NO	4-Hydroxyquinoline	145.06	201	300		
3041	C_9H_7NO	5-Hydroxyquinoline	145.06	224			
3042	C_9H_7NO	6-Hydroxyquinoline	145.06	193	360		
3043	C_9H_7NO	7-Hydroxyquinoline	145.06	238 d.			
3044	C_9H_7NO	8-Hydroxyquinoline	145.06	76	266.9		
3045	$C_9H_7NO_2$	3-Aminocoumarine	161.06	130			
3046	$C_9H_7NO_2$	Indole-2-carboxylic acid	161.06	203 d.			
3047	$C_9H_7NO_2$	Indole-3-carboxylic acid	161.06	218 d.			
3048	$C_9H_7NO_3$	Indoxylic acid	177.06		123		
3049	$C_9H_7NO_3$	Kynuric acid	177.06	189			
3050	$C_9H_7NO_4$	*o*-Nitrocinnamic acid	193.06	240			
3051	$C_9H_7NO_4$	*m*-Nitrocinnamic acid	193.06	197			
3052	$C_9H_7NO_4$	*p*-Nitrocinnamic acid	193.06	286			
3053	$C_9H_7NO_4S$	Diaphthol	225.13	295			
3054	C_9H_8	Indene	116.06	−2	182.4	1.006	806
3055	C_9H_8	Phenylallylene $C_6H_5C{:}CCH_3$	116.06		185		
3056	$C_9H_8Cl_2$	Cinnamal chloride $C_6H_5CH{:}CH_2CHCl$	186.98	58.5	143^{30}		

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
3057	$C_9H_8Cl_2O_2$	Benzyl dichloroacetate	218.98		179^{60}	1.313_4^4	684
3058	$C_9H_8I_2O_3$	Ethyl 3, 5-diiodosalicylate	417.93	132			
3059	$C_9H_8N_2$	2-Aminoquinoline	144.08	129			
3060	$C_9H_8N_2$	3-Aminoquinoline	144.08	94			1319
3061	$C_9H_8N_2$	4-Aminoquinoline	144.08	154			
3062	$C_9H_8N_2$	5-Aminoquinoline	144.08	110			
3063	$C_9H_8N_2$	6-Aminoquinoline	144.08	114			
3064	$C_9H_8N_2$	7-Aminoquinoline	144.08	189			
3065	$C_9H_8N_2$	8-Aminoquinoline	144.08	70			
3066	$C_9H_8N_2$	3-Phenylpyrazolone	144.08	240			
3067	$C_9H_8N_2O$	Cyanoacetanilide $CNCH_2CONHC_6H_5$	160.08	200			
3068	$C_9H_8N_2O$	Pyrrone (Dipyrryl ketone)	160.08	160			
3069	C_9H_8O	Cinnamic aldehyde $C_6H_5CH{:}CHCHO$	132.06	−7.5	251.0	1.049	791
3070	C_9H_8O	α-Hydrindone	132.06	41	244	1.101^{45}	
3071	C_9H_8O	β-Hydrindone	132.06	61	225 d.	1.071^{67}	1100
3072	$C_9H_8O_2$	*o*-Coumaric aldehyde	148.06	133			
3073	$C_9H_8O_2$	*p*-Coumaric aldehyde	148.06	134			
3074	$C_9H_8O_2$	Allocinnamic acid	148.06	68	125^{19}		
3075	$C_9H_8O_2$	Cinnamic acid $C_6H_5CH{:}CHCO_2H$	148.06	133	300	1.284^4	
3076	$C_9H_8O_2$	Isocinnamic acid	148.06	57	256 d.		
3077	$C_9H_8O_2$	Atropic acid	148.06	107	267 d.		
3078	$C_9H_8O_2$	Melilotic anhydride	148.06	25	272		
3079	$C_9H_8O_2$	Chromanone	148.06	38.5	160^{50}		
3080	$C_9H_8O_3$	Acetopiperone	164.06	83			
3081	$C_9H_8O_3$	*o*-Acetylsalicylic aldehyde	164.06	37	253		
3082	$C_9H_8O_3$	Benzoylacetic acid $C_6H_5COCH_2CO_2H$	164.06	104			
3083	$C_9H_8O_3$	*o*-Coumaric acid	164.06	208			
3084	$C_9H_8O_3$	*m*-Coumaric acid	164.06	191			
3085	$C_9H_8O_3$	*p*-Coumaric acid	164.06	206			
3086	$C_9H_8O_3$	Phenylpyruvic acid $C_6H_5CH_2COCO_2H$	164.06	157			
3087	$C_9H_8O_4$	*o*-Acetylsalicylic acid (Aspirin)	180.06	133.5			1290
3088	$C_9H_8O_4$	Caffeic acid	180.06	195			
3089	$C_9H_8O_4$	Phenylmalonic acid $C_6H_5CH(CO_2H)_2$	180.06	153			
3090	$C_9H_8O_4$	Uvitic acid 3, $5(CO_2H)_2C_6H_3CH_3$	180.06	290			
3091	$C_9H_8O_4$	Methyl phthalate *o*-$CO_2HC_6H_4CO_2CH_3$	180.06	82.5			
3092	$C_9H_8O_4$	Benzoyl acetyl peroxide	180.06	36.6	130^{19}		
3093	$C_9H_8O_5$	Esculetinic acid	196.06	168			
3094	$C_9H_8O_5$	Myristicinic acid	196.06	210	300		
3095	C_9H_9BrO	Indene oxybromide	212.99	130.5			
3096	$C_9H_9ClO_2$	Benzyl chloroacetate	184.53		147.5^9	1.222_4^4	675
3097	C_9H_9N	Dihydroquinoline	131.08	226			
3098	C_9H_9N	1-Methylindole	131.08		242.4	1.071^0	
3099	C_9H_9N	2-Methylindole	131.08	60	272.3		
3100	C_9H_9N	3-Methylindole (Scatole)	131.08	95	266.2		
3101	C_9H_9N	5-Methylindole	131.08	58.5			
3102	C_9H_9NO	Cinnamamide $C_6H_5CH{:}CHCONH_2$	147.08	141.5			
3103	C_9H_9NO	Hydrocarbostyril	147.08	163			1309
3104	$C_9H_9NO_2$	*o*-Aminocinnamic acid	163.08	159 d.			
3105	$C_9H_9NO_2$	*m*-Aminocinnamic acid	163.08	181			
3106	$C_9H_9NO_2$	*p*-Aminocinnamic acid	163.08	176 d.			
3107	$C_9H_9NO_2$	Benzoylacetaldehydeoxime	163.08	87			
3108	$C_9H_9NO_3$	*o*-Acetylaminobenzoic acid	179.08	185			
3109	$C_9H_9NO_3$	*m*-Acetylaminobenzoic acid	179.08	250			
3110	$C_9H_9NO_3$	*p*-Acetylaminobenzoic acid	179.08	252			
3111	$C_9H_9NO_3$	Hippuric acid $C_6H_5CONHCH_2CO_2H$	179.08	187.5	d.	1.371	1256
3112	$C_9H_9NO_3$	Methyl oxanilate $C_6H_5NHCOCO_2CH_3$	179.08	114			
3113	$C_9H_9NO_3$	Acetylsalicylamide	179.08	144			
3114	$C_9H_9NO_4$	Salicyluric acid	195.08	160			
3115	$C_9H_9NO_4$	Ethyl *m*-nitrobenzoate	195.08	47	298		
3116	$C_9H_9NO_4$	Ethyl *p*-nitrobenzoate	195.08	57			
3117	$C_9H_9N_3$	5, 8-Diaminoquinoline	159.09	156			
3118	$C_9H_9N_3$	6, 8-Diaminoquinoline	159.09	163			
3119	C_9H_{10}	Benzylethylene $C_6H_5CH_2CH{:}CH_2$	118.08		155	0.909	654

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
3120	C_9H_{10}	Isoallylbenzene $C_6H_5CH{:}CHCH_3$	118.08		175	0.924^{16}	
3121	C_9H_{10}	Hydrindene	118.08		176.5	0.965	970
3122	$C_9H_{10}N_2$	1-Ethylindazole	146.09		120^{15}	1.064	878
3123	$C_9H_{10}O_3$	2-Acetamino-4-nitrotoluene	194.09	96			
3124	$C_9H_{10}O$	Anol *p*-$(CH_3CH{:}CH)C_6H_4OH$	134.08	93	250 d.		
3125	$C_9H_{10}O$	Chavicol *p*-$(CH_2{:}CHCH_2)C_6H_4OH$	134.08	> −25	237	1.033^{18}	935
3126	$C_9H_{10}O$	Cinnamyl alcohol $C_6H_5CH{:}CHCH_2OH$	134.08	33	258.5	1.044	1039
3127	$C_9H_{10}O$	Allyl phenyl ether $C_3H_5OC_6H_5$	134.08		192		
3128	$C_9H_{10}O$	Methyl styryl ether	134.08		213	1.001	877
3129	$C_9H_{10}O$	2, 4-Dimethylbenzaldehyde	134.08	−8	216		
3130	$C_9H_{10}O$	Hydrocinnamaldehyde	134.08	47	280		
3131	$C_9H_{10}O$	*o*-Xylene-4-aldehyde	134.08		225		
3132	$C_9H_{10}O$	Ethyl phenyl ketone $C_2H_5COC_6H_5$	134.08	21	218	1.010	689
3133	$C_9H_{10}O$	Methyl benzyl ketone $CH_3COCH_2C_6H_5$	134.08	−15.4	216.7	1.028	
3134	$C_9H_{10}O$	*p*-Methylacetophenone (Melilot)	134.08		222	1.013^{13}	703
3135	$C_9H_{10}O$	Chromane	134.08		95^{12}	1.064	
3135.1	$C_9H_{10}OS$	Ethyl thiobenzoate	166.14		253^{763}	1.094^{25}	
3136	$C_9H_{10}O_2$	*o*-Coumaral alcohol	150.08	119			
3137	$C_9H_{10}O_2$	Hesperetol	150.08	57			
3138	$C_9H_{10}O_2$	2, 3-Dimethylbenzoic acid	150.08	144			
3139	$C_9H_{10}O_2$	2, 4-Dimethylbenzoic acid	150.08	126	268		
3140	$C_9H_{10}O_2$	2, 5-Dimethylbenzoic acid	150.08	132	268	1.069	
3141	$C_9H_{10}O_2$	2, 6-Dimethylbenzoic acid	150.08	116			
3142	$C_9H_{10}O_2$	3, 4-Dimethylbenzoic acid	150.08	165			
3143	$C_9H_{10}O_2$	*o*-Ethylbenzoic acid	150.08	68			
3144	$C_9H_{10}O_2$	*m*-Ethylbenzoic acid	150.08	47		1.042_4^{100}	1148
3145	$C_9H_{10}O_2$	*p*-Ethylbenzoic acid	150.08	113			
3146	$C_9H_{10}O_2$	Hydratropic acid $C_2H_4(C_6H_5)CO_2H$	150.08		265		
3147	$C_9H_{10}O_2$	Hydrocinnamic acid	150.08	48.6	279.8	$1.071_0^{48.7}$	
3148	$C_9H_{10}O_2$	Mesitylinic acid 3, 5-$(CH_3)_2C_6H_3CO_2H$	150.08	166			
3149	$C_9H_{10}O_2$	Benzyl acetate $CH_3CO_2CH_2C_6H_5$	150.08	−51.5	213.5	1.058	673
3150	$C_9H_{10}O_2$	*o*-Cresyl acetate *o*-$CH_3CO_2C_6H_4CH_3$	150.08		208		
3151	$C_9H_{10}O_2$	*m*-Cresyl acetate *m*-$CH_3CO_2C_6H_4CH_3$	150.08		212		
3152	$C_9H_{10}O_2$	*p*-Cresyl acetate *p*-$CH_3CO_2C_6H_4CH_3$	150.08		212.5	1.050	599
3154	$C_9H_{10}O_2$	Ethyl benzoate $C_6H_5CO_2C_2H_5$	150.08	−34.6	213.2	1.047	628
3155	$C_9H_{10}O_2$	Methyl phenylacetate	150.08		220	1.044^{16}	
3156	$C_9H_{10}O_2$	Methyl *p*-toluate *p*-$CH_3C_6H_4CO_2CH_3$	150.08	33	217		
3157	$C_9H_{10}O_2$	Phenyl propionate $C_2H_5CO_2C_6H_5$	150.08	20	211	1.054_{15}^{15}	
3158	$C_9H_{10}O_3$	Acetovanillone	166.08	115	300		
3159	$C_9H_{10}O_3$	Paeonol 4, 2-$CH_3O(OH)C_6H_3COCH_3$	166.08	50			
3160	$C_9H_{10}O_3$	*o*-Ethoxybenzoic acid	166.08	22			
3161	$C_9H_{10}O_3$	*m*-Ethoxybenzoic acid	166.08	137			
3162	$C_9H_{10}O_3$	*p*-Ethoxybenzoic acid	166.08	195			
3163	$C_9H_{10}O_3$	*dl*-Atrolactic acid	166.08	91			
3164	$C_9H_{10}O_3$	*m*-Hydrocoumaric acid	166.08	111			
3165	$C_9H_{10}O_3$	Melilotic acid	166.08	83			
3166	$C_9H_{10}O_3$	*d*(*l*)-2-Phenyllactic acid	166.08	125			
3167	$C_9H_{10}O_3$	Phloretic acid $HOC_6H_4CH(CH_3)CO_2H$	166.08	129			
3168	$C_9H_{10}O_3$	*d*(*l*)-Tropic acid	166.08	128			
3169	$C_9H_{10}O_3$	*dl*-Tropic acid	166.08	123			
3169.1	$C_9H_{10}O_3$	Anisyl acetate *p*-$CH_3OC_6H_4O_2CCH_3$	166.08		139^{12}	1.101	
3170	$C_9H_{10}O_3$	Ethyl salicylate $OHC_6H_4CO_2C_2H_5$	166.08	1.3	231.5	1.131	670
3171	$C_9H_{10}O_3$	Guaiacyl acetate (Eucol)	166.08		240	1.138	
3172	$C_9H_{10}O_3$	Methyl anisate *p*-$CH_3OC_6H_4CO_2CH_3$	166.08	48	256		
3173	$C_9H_{10}O_3$	Methyl *o*-cresotinate	166.08	30	235		
3174	$C_9H_{10}O_3$	Methyl *p*-cresotinate	166.08		242		
3175	$C_9H_{10}O_3$	Methyl *dl*-mandelate	166.08	58	144^{20}		
3176	$C_9H_{10}O_4$	Hydrocaffeic acid	182.08	139			
3177	$C_9H_{10}O_4$	*d*(*l*)-Phenylglyceric acid	182.08	164			
3178	$C_9H_{10}O_4$	*dl*-Phenylglyceric acid	182.08	141		1.451	
3179	$C_9H_{10}O_4$	*d*(*l*)-*p*-Methoxymandelic acid	182.08	105		1.354	
3181	$C_9H_{10}O_4$	Veratric acid 3, 4-$(CH_3O)_2C_6H_3CO_2H$	182.08	181			
3182	$C_9H_{10}O_4$	Methoxymethyl salicylate	182.08		162^{42}	1.200^{15}	

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
3183	$C_9H_{10}O_4$	Methyl vanillate	182.08	63	287		
3184	$C_9H_{10}O_4$	Glycol salicylate (Spirosal)	182.08		170^{12}		
3185	$C_9H_{10}O_5$	Syringic acid	198.08	245			
3186	$C_9H_{10}O_5$	Ethyl gallate	198.08	160			
3187	$C_9H_{10}O_6$	2, 3, 4, 5-Dimethoxydihydroxybenzoic acid	214.08	148			
3187.1	$C_9H_{10}S_2$	Ethyl dithiobenzoate	182.21		180^{28}	1.1439^{25}	
3188	$C_9H_{11}N$	Allyl aniline $C_6H_5NHCH_2CH{:}CH_2$	133.09		209	0.982^{25}	
3189	$C_9H_{11}N$	Benzylideneethylamine	133.09		195.4		
3190	$C_9H_{11}N$	Styrylamine $C_6H_5CH{:}CHCH_2NH_2$	133.09		237		
3191	$C_9H_{11}N$	1, 2, 3, 4-Tetrahydroisoquinoline	133.09		233	1.064	1012
3192	$C_9H_{11}N$	1, 2, 3, 4-Tetrahydroquinoline	133.09	20	251	1.055	1013
3193	$C_9H_{11}NO$	*p*-Dimethylaminobenzaldehyde	149.09	75			
3194	$C_9H_{11}NO$	*o*-Acetotoluide *o*-$CH_3CONHC_6H_4CH_3$	149.09	110	296		1255
3195	$C_9H_{11}NO$	*m*-Acetotoluide *m*-$CH_3CONHC_6H_4CH_3$	149.09	65.5	303		
3196	$C_9H_{11}NO$	*p*-Acetotoluide *p*-$CH_3CONHC_6H_4CH_3$	149.09	153	307		1276
3197	$C_9H_{11}NO$	*N*-Benzylacetamide $CH_3CONHC_7H_7$	149.09	61	300		
3198	$C_9H_{11}NO$	*N*-Ethylbenzamide $C_6H_5CONHC_2H_5$	149.09	71	290		
3199	$C_9H_{11}NO$	*N*-Methylacetanilide (Exalgin)	149.09	102	254.7		1250
3200	$C_9H_{11}NO$	Propionanilide $C_2H_5CONHC_6H_5$	149.09	104			
3201	$C_9H_{11}NOS$	*N*-Phenylthiourethane	181.16	69			
3202	$C_9H_{11}NO_2$	4-Acetylamino-2-hydroxytoluene	165.09	225			
3203	$C_9H_{11}NO_2$	3-Acetylamino-4-hydroxytoluene	165.09	160			
3204	$C_9H_{11}NO_2$	*p*-Acetylmethylaminophenol	165.09	240			
3205	$C_9H_{11}NO_2$	1-Anilinopropionic acid	165.09	162			
3206	$C_9H_{11}NO_2$	*o*-Dimethylanthranilic acid	165.09	175			
3207	$C_9H_{11}NO_2$	*m*-Ethylaminobenzoic acid	165.09	101			
3208	$C_9H_{11}NO_2$	*l*-Phenylalanine	165.09	283 d.			1269
3209	$C_9H_{11}NO_2$	*dl*-Phenylalanine	165.09	265 d.			
3210	$C_9H_{11}NO_2$	*o*-Tolylaminoacetic acid	165.09	150			
3211	$C_9H_{11}NO_2$	*p*-Tolylaminoacetic acid	165.09	118			
3212	$C_9H_{11}NO_2$	2, 4, 6-Trimethylpyridine-3-carboxylic acid	165.09		155		
3213	$C_9H_{11}NO_2$	Ethyl *p*-aminobenzoate	165.09	91			
3214	$C_9H_{11}NO_2$	Ethyl anthranilate	165.09		260		
3216	$C_9H_{11}NO_2$	*o*-Acetaniside *o*-$CH_3OC_6H_4NHCOCH_3$	165.09	84	305		
3217	$C_9H_{11}NO_2$	*p*-Acetaniside $CH_3CONHC_6H_4OCH_3$	165.09	127			
3218	$C_9H_{11}NO_2$	*p*-Formylphenetidine	165.09	60			
3219	$C_9H_{11}NO_2$	Nitrocumene $(CH_3)_2CHC_6H_4NO_2$	165.09	−35	224 d.		
3220	$C_9H_{11}NO_2$	Nitromesitylene	165.09	44	255		
3221	$C_9H_{11}NO_2$	*N*-Phenylurethane $C_2H_5CO_2NHC_6H_5$	165.09	52	238		
3222	$C_9H_{11}NO_3$	*l*-Tyrosine	181.09	295 d.		1.456	1259
3223	C_9H_{12}	Cumene $(CH_3)_2CHC_6H_5$	120.09		153.4	0.864	561
3224	C_9H_{12}	*o*-Ethyltoluene *o*-$C_2H_5C_6H_4CH_3$	120.09	> -17	162	0.882	615
3225	C_9H_{12}	*m*-Ethyltoluene *m*-$C_2H_5C_6H_4CH_3$	120.09		162.5	0.867	585
3226	C_9H_{12}	*p*-Ethyltoluene *p*-$C_2H_5C_6H_4CH_3$	120.09	< -20	162	0.862	568
3227	C_9H_{12}	Hemimellitene 1, 2, 3-$(CH_3)_3C_6H_3$	120.09		176.5	0.895	650
3228	C_9H_{12}	Mesitylene 1, 3, 5-$(CH_3)_3C_6H_3$	120.09	−52.7	164.6	0.863	580
3229	C_9H_{12}	*n*-Propylbenzene $CH_3(CH_2)_2C_6H_5$	120.09	−101.6	157.5	0.862	556
3230	C_9H_{12}	Pseudocumene 1, 2, 4-$(CH_3)_3C_6H_3$	120.09	−61.0	169.8	0.87	622
3231	$C_9H_{12}N_2O$	1-Ethyl-2-phenylurea	164.11	99			
3232	$C_9H_{12}N_2O_2$	*p*-Phenetylurea $C_2H_5OC_6H_4NHCONH_2$	180.11	173			
3233	$C_9H_{12}N_2O_2$	Pilosinine	180.11	79	300^{35}		
3234	$C_9H_{12}N_4O_3$	1, 3, 7, 9-Tetramethyluric acid	224.12	228	d.		1268
3235	$C_9H_{12}O$	Benzylmethyl carbinol	136.09		212	0.994	
3235.1	$C_9H_{12}O$	*d*-Benzylmethyl carbinol	136.09		125^{25}	0.991	660
3236	$C_9H_{12}O$	Ethylphenyl carbinol	136.09		219	0.996	
3237	$C_9H_{12}O$	Hydrocinnamyl alcohol	136.09	< -18	237.4	1.008	706
3238	$C_9H_{12}O$	Mesitol 2, 4, 6-$(CH_3)_3C_6H_2OH$	136.09	69	220		
3239	$C_9H_{12}O$	*o*-*n*-Propylphenol *o*-$C_3H_7C_6H_4OH$	136.09		226.6	1.015^{0}	
3240	$C_9H_{12}O$	*m*-*n*-Propylphenol *m*-$C_3H_7C_6H_4OH$	136.09	26	228		
3241	$C_9H_{12}O$	*p*-*n*-Propylphenol *p*-$C_3H_7C_6H_4OH$	136.09	61	232.6	1.009^{0}	
3242	$C_9H_{12}O$	Pseudocumenol 2, 4, 5-$(CH_2)_3C_6H_2OH$	136.09	72	235		

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
3243	$C_9H_{12}O$	Ethyl benzyl ether $C_2H_5OC_7H_7$	136.09		226	$0.998^{17.5}$	
3244	$C_9H_{12}O$	Ethyl *m*-cresyl ether	136.09		192	0.949	648
3245	$C_9H_{12}O$	Ethyl *p*-cresyl ether *p*-$CH_3C_6H_4OC_2H_5$	136.09		189.9	0.874^{0}	928
3246	$C_9H_{12}O$	Propyl phenyl ether $C_3H_7OC_6H_5$	136.09		190.5	0.968	
3247	$C_9H_{12}O$	Isopropyl phenyl ether	136.09		177.2	0.946^{15}_{15}	
3248	$C_9H_{12}O_2$	Mesorcinol	152.09	150	275.5		
3249	$C_9H_{12}O_2$	Guaiacyl ethyl ether	152.09		213		
3250	$C_9H_{12}O_3$	Phloroglucinol trimethyl ether	168.09	52	255.5		
3251	$C_9H_{12}O_3$	Pyrogallol trimethyl ether	168.09	47	241	1.099^{75}_{75}	
3252	$C_9H_{12}O_3$	Metacrolein $(C_3H_4O)_3$	168.09	46			
3253	$C_9H_{12}O_3$	Caryophyllenic acid	168.09			1.140	
3254	$C_9H_{12}O_3S$	Mesitylenesulfonic acid	200.16	77			
3255	$C_9H_{12}O_3S$	Toluene *p*-ethylsulfonate	200.16	33	173^{15}	1.174^{32}	
3256	$C_9H_{12}O_5$	Anhydrocamphoronic acid	200.09	133			
3257	$C_9H_{13}N$	Cumidine *p*-$(CH_3)_2CHC_6H_4NH_2$	135.11	63	225	0.957	1333
3258	$C_9H_{13}N$	Dimethyl-*o*-toluidine	135.11	−61.0	184.6	0.929	682
3259	$C_9H_{13}N$	Dimethyl-*m*-toluidine	135.11		212.5	0.941	733
3260	$C_9H_{13}N$	Dimethyl-*p*-toluidine	135.11		211.5	0.937	726
3261	$C_9H_{13}N$	Ethyl-*o*-toluidine	135.11		214	$0.953^{15.5}$	
3262	$C_9H_{13}N$	Ethyl-*m*-toluidine	135.11		222		
3263	$C_9H_{13}N$	Ethyl-*p*-toluidine	135.11		217	0.939	
3264	$C_9H_{13}N$	Mesidine 1, 3, 5-$(CH_3)_3C_6H_2NH_2$	135.11		233	0.963	
3265	$C_9H_{13}N$	ω-Mesitylamine	135.11		218.2	0.950	699
3266	$C_9H_{13}N$	Parvoline	135.11		234		
3267	$C_9H_{13}N$	*n*-Propylaniline $C_6H_5NHC_3H_7$	135.11		222	0.949^{18}	
3268	$C_9H_{13}N$	Isopropylaniline $C_6H_5NHCH(CH_3)_2$	135.11		213		
3269	$C_9H_{13}N$	Pseudocumidine	135.11	66	235		
3270	$C_9H_{13}NO_2$	Anhydroecgonine	167.11	235 d.			
3271	$C_9H_{13}NO_3$	Adrenaline	183.11	207 d.			
3272	C_9H_{14}	Apocyclene	122.11	43	138.9	0.871^{40}_{4}	1056
3273	C_9H_{14}	Santene	122.11		142	0.869^{15}	486
3274	$C_9H_{14}ClNO_2$	Anhydroecgonine hydrochloride	203.57	241			
3275	$C_9H_{14}N_2O_3$	Ethylpropylbarbituric acid	198.12	146			
3276	$C_9H_{14}O$	Nopinone	138.11	0	209		
3277	$C_9H_{14}O$	Phorone	138.11	28	198.5	0.885	598
3278	$C_9H_{14}O_2$	Lauronolic acid	154.11		$129^{11.5}$		
3279	$C_9H_{14}O_2$	Methyl amylpropiolate	154.11		111^{18}	0.991^{15}_{15}	
3280	$C_9H_{14}O_3$	Castelamarin	170.11	269			
3281	$C_9H_{14}O_4$	*cis*-Hexahydrohomophthalic acid	186.11	146			
3282	$C_9H_{14}O_4$	*trans*-Hexahydrohomophthalic acid	186.11	157			
3282.1	$C_9H_{14}O_4$	*dl*-Pinic acid	186.11	102.5	216^{10}	$1.093^{109.4}$	1154
3282.2	$C_9H_{14}O_4$	*d*-Pinic acid	186.11	136	216^{10}		
3283	$C_9H_{14}O_4$	Diethyl citraconate	186.11		230.3	1.062	847
3284	$C_9H_{14}O_4$	Diethyl glutaconate	186.11		238	1.050	
3285	$C_9H_{14}O_4$	Diethyl itaconate	186.11		227.9	1.045	369
3286	$C_9H_{14}O_4$	Diethyl mesaconate	186.11		229	1.047	594
3287	$C_9H_{14}O_5$	4-Ketoazelaic acid	202.11	102; 109			
3288	$C_9H_{14}O_6$	*l*-Camphoronic acid	218.11	165			
3289	$C_9H_{14}O_6$	Glycerol triacetate	218.11		259	1.161	326
3290	$C_9H_{14}O_7$	Trimethyl citrate	234.11	79	287 d.		
3291	$C_9H_{15}NO$	Pseudopelletierine	153.12	49	246	$1.001^{99.5}$	1138
3292	$C_9H_{15}NO_3$	*d*-Ecgonine	185.12	257			
3293	$C_9H_{15}NO_3$	*l*-Ecgonine	185.12	198 d.		1.370^{12}_{4}	
3294	$C_9H_{15}NO_3$	*dl*-Ecgonine	185.12	212			
3294.1	$C_9H_{15}N_3O_2S$	Ergothioneine	229.21	290			
3295	C_9H_{16}	Campholene	124.12	> −20	133	0.803	399
3296	C_9H_{16}	Nopinane	124.12		149.5	0.861^{22}_{22}	479
3297	C_9H_{16}	Pulegene	124.12		139	0.791^{22}	979
3298	$C_9H_{16}ClNO_3$	*l*-Ecgonine hydrochloride	221.59	246			
3299	$C_9H_{16}N_2O_5S_3$	Cheiroline	328.33	48	200 d.		
3300	$C_9H_{16}O$	Camphorol	140.12		81^{16}		
3301	$C_9H_{16}O$	α-Nopinol	140.12	102	205		
3302	$C_9H_{16}O$	*dl*-Santenol	140.12	98	196	0.987	

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
3303	$C_9H_{16}O_2$	Amyl *l*-α-crotonate	156.12			0.896	360
3304	$C_9H_{16}O_2$	Ethyl hexahydrobenzoate	156.12		196.5	0.967_{4}^{15}	886
3305	$C_9H_{16}O_2$	Methyl cyclohexylacetate	156.12		202	0.990_{0}^{14}	
3306	$C_9H_{16}O_3$	Ethyl isopropylacetoacetate	172.12		205 d.	0.960_{25}^{25}	
3307	$C_9H_{16}O_4$	Azelaic acid $HO_2C(CH_2)_7CO_2H$	188.12	106.5	360	1.029	1155
3308	$C_9H_{16}O_4$	*n*-Butyl ethyl malonate	188.12		130^{12}	0.976_{25}^{25}	284
3309	$C_9H_{16}O_4$	Isobutyl ethyl malonate	188.12		120^{8}	0.968_{25}^{25}	286
3310	$C_9H_{16}O_4$	*sec.*-Butyl ethyl malonate	188.12		160^{60}	0.986_{25}^{25}	310
3311	$C_9H_{16}O_4$	Diethyl dimethylmalonate	188.12		196	0.995	196
3312	$C_9H_{16}O_4$	Diethyl glutarate $CH_2(CH_2COC_2H_5)_2$	188.12		237	1.025	
3313	$C_9H_{16}O_4$	Dipropyl malonate $CH_2(CO_2C_3H_7)_2$	188.12		228.3	1.027_{0}^{0}	
3314	$C_9H_{16}O_4$	Propyl isopropyl malonate	188.12		143^{42}	0.980_{25}^{25}	293
3314.1	$C_9H_{17}BrO$	*l*-Amyl bromobutyrate	221.05		105^{11}	1.196^{25}	
3315	$C_9H_{17}NO$	Homotropine	155.14	85			
3316	$C_9H_{17}NO$	Methylpelletierine	155.14		215		
3317	$C_9H_{17}NO$	Triacetoneamine	155.14	39.6			
3318	C_9H_{18}	Cyclononane	126.14		172	0.773_{4}^{16}	
3319	C_9H_{18}	Ethylcycloheptane $C_2H_5C_7H_{13}$	126.14	<-30	199	0.952	
3320	C_9H_{18}	Hexahydrocumene $(CH_3)_2CHC_6H_{11}$	126.14		150	0.787	
3321	C_9H_{18}	2-Methyl-1-octene $C_6H_{13}C(CH_3):CH_2$	126.14		143		
3322	C_9H_{18}	Nonylene $C_6H_{13}CH:CHCH_3$	126.14		149.9	0.754_{15}^{15}	
3323	C_9H_{18}	Propylcyclohexane $C_3H_7C_6H_{11}$	126.14		149.5	0.767	
3324	$C_9H_{18}O$	*dl*-Pulenol	142.14		187.5	0.908	902
3325	$C_9H_{18}O$	Pelargonic aldehyde $CH_3(CH_2)_7CHO$	142.14		93.5^{23}	0.828^{15}	280
3326	$C_9H_{18}O$	Diisobutyl ketone $[(CH_3)_2CHCH_2]_2CO$	142.14		182	0.833	
3327	$C_9H_{18}O$	Isopropyl isoamyl ketone	142.14		172		
3328	$C_9H_{18}O_2$	Pelargonic acid $CH_3(CH_2)_7CO_2H$	158.14	12	254	0.907	340
3329	$C_9H_{18}O_2$	Amyl *n*-butyrate $C_4H_9CO_2C_5H_{11}$	158.14		184.8	0.883_{0}^{0}	184
3330	$C_9H_{18}O_2$	Isoamyl *n*-butyrate	158.14		178.6	0.882_{4}^{0}	
3330.1	$C_9H_{18}O_2$	*d*-β-Amyl *n*-butyrate	158.14		71^{16}	0.869	161
3331	$C_9H_{18}O_2$	Amyl isobutyrate $(CH_3)_2CHCO_2C_5H_{11}$	158.14		155	0.859	167
3332	$C_9H_{18}O_2$	Butyl *n*-valerate $C_4H_9CO_2C_4H_9$	158.14		185.8	0.885^{0}	
3333	$C_9H_{18}O_2$	Isobutyl *n*-valerate	158.14		167	0.854	
3333.1	$C_9H_{18}O_2$	*d*-*sec.*-Butyl valerate	158.14		67^{18}	0.860	164
3334	$C_9H_{18}O_2$	Isobutyl isovalerate	158.14		168.5	0.854	162
3335	$C_9H_{18}O_2$	Ethyl *n*-heptylate $C_6H_{13}CO_2C_2H_5$	158.14		187.1	0.872_{4}^{15}	195
3336	$C_9H_{18}O_2$	*n*-Heptyl acetate $CH_3CO_2C_7H_{15}$	158.14		191.5	0.874_{16}^{16}	221
3337	$C_9H_{18}O_2$	Methyl caprylate $C_7H_{15}CO_2CH_3$	158.14	−41	192.9	0.887	
3338	$C_9H_{18}O_2$	*d*-β-Octylformate	158.14		82^{20}	$0.872^{12.5}$	209
3339	$C_9H_{18}O_2$	Propyl caproate $C_5H_{11}CO_2C_3H_7$	158.14		185.5	0.884_{0}^{0}	
3340	$C_9H_{18}O_3$	Parapropionaldehyde $(C_3H_6O)_3$	174.14		170		
3341	$C_9H_{18}O_3$	Di-*n*-butyl carbonate $(C_4H_9O)_2CO$	174.14		207.7	0.924	
3342	$C_9H_{18}O_3$	Diisobutyl carbonate	174.14		190.3	0.919^{15}	
3343	$C_9H_{18}O_4$	1, 2-Dihydroxypelargonic acid	190.14	123			
3344	$C_9H_{18}O_7$	Galactite	238.14		142		1214
3345	$C_9H_{19}N$	*l*-1-Methylconiine	141.15		175.5	0.832^{24}	
3346	$C_9H_{19}NO$	*N*-Diethyl-*n*-valeramide	157.15		210		
3347	C_9H_{20}	2, 4-Dimethylheptane	128.15		133.3	0.716	143
3348	C_9H_{20}	*d*-2, 5-Dimethylheptane	128.15		137	0.715^{16}	
3349	C_9H_{20}	*dl*-2, 5-Dimethylheptane	128.15		135.9	0.719_{15}^{15}	144
3350	C_9H_{20}	2, 6-Dimethylheptane	128.15		132.0	0.712_{15}^{15}	
3351	C_9H_{20}	4-Ethylheptane $(C_3H_7)_2CHC_2H_5$	128.15		139	0.741	170
3352	C_9H_{20}	*d*-3-Methyloctane	128.15		143.4	0.721^{17}	
3353	C_9H_{20}	4-Methyloctane $C_3H_7(CH_3)CHC_4H_9$	128.15		141.6	0.732_{15}^{15}	147
3354	C_9H_{20}	*n*-Nonane $CH_3(CH_2)_7CH_3$	128.15	−51	150.6	0.718	151
3355	$C_9H_{20}O$	Butyl-*sec.*-butyl carbinol	144.15		180	0.834	335
3356	$C_9H_{20}O$	Dibutyl carbinol $(C_4H_9)_2CHOH$	144.15		194	0.823	320
3357	$C_9H_{20}O$	Diisobutyl carbinol	144.15		174.3	0.816_{4}^{12}	271
3358	$C_9H_{20}O$	Di-*sec.*-butyl carbinol	144.15		171	0.836	338
3359	$C_9H_{20}O$	Diethylisobutyl carbinol	144.15		172		
3360	$C_9H_{20}O$	4, 6-Dimethylheptane-2-ol	144.15		195	0.879^{0}	
3361	$C_9H_{20}O$	Methylethylisoamyl carbinol	144.15		175	0.829	329
3362	$C_9H_{20}O$	Methylethyl-*tert.*-amyl carbinol	144.15		166	0.832	348

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
3363	$C_9H_{20}O$	Methylpropylisobutyl carbinol	144.15		171.3	0.826	330
3364	$C_9H_{20}O$	*n*-Nonyl alcohol $CH_3(CH_2)_8OH$	144.15	−5	215	0.828	344
3365	$C_9H_{20}O$	Isobutyl-*d*-amyl ether	144.15		148.2	0.773	125
3366	$C_9H_{20}O$	Ethyl *n*-heptyl ether $C_2H_5OC_7H_{15}$	144.15		166.6	0.790^{16}	
3367	$C_9H_{20}O$	Methyl *n*-octyl ether $CH_3OC_8H_{17}$	144.15		173	0.802_0^5	
3368	$C_9H_{20}O_2$	Propylidene dipropyl ether	136.15		166.2	0.849^0	
3369	$C_9H_{20}O_4$	Ethyl orthocarbonate $C(OC_2H_5)_4$	192.15		159	0.917	90
3370	$C_9H_{20}O_4S_2$	Tetronal $(C_2H_5)_2C(SO_2C_2H_5)_2$	256.28	85			
3371	$C_9H_{21}N$	*n*-Nonylamine $C_9H_{19}NH_2$	143.17		195		
3372	$C_9H_{21}N$	Tri-*n*-propylamine $(C_3H_7)_3N$	143.17	−93.5	156	0.757	230
3373	$C_{10}H_2Cl_6$	Hexachloronaphthalene	334.76	143			
3374	$C_{10}H_4Cl_4$	α-Tetrachloronaphthalene	265.86	130			
3375	$C_{10}H_4Cl_4$	β-Tetrachloronaphthalene	265.86	194			
3376	$C_{10}H_4Cl_4$	γ-Tetrachloronaphthalene	265.86	176			
3377	$C_{10}H_4Cl_4$	δ-Tetrachloronaphthalene	265.86	141			
3378	$C_{10}H_4Cl_4$	ε-Tetrachloronaphthalene	265.86	180			
3379	$C_{10}H_4Cl_4$	ζ-Tetrachloronaphthalene	265.86	160.5			
3380	$C_{10}H_4Cl_4$	*vic.*-Tetrachloronaphthalene	265.86	140			
3381	$C_{10}H_4N_4O_8$	α-Tetranitronaphthalene	308.06	259	exp.		
3382	$C_{10}H_4N_4O_8$	1, 2, 5, 8-Tetranitronaphthalene	308.06	270 d.			
3383	$C_{10}H_4N_4O_8$	1, 2, 6, 8-Tetranitronaphthalene	308.06	<300			
3384	$C_{10}H_4N_4O_8$	1, 3, 5, 8-Tetranitronaphthalene	308.06	195			
3385	$C_{10}H_4N_4O_8$	1, 3, 6, 8-Tetranitronaphthalene	308.06	203	exp.		
3386	$C_{10}H_4N_4O_9$	2, 4, 5, 7-Tetranitro-α-naphthol	324.06	180			
3387	$C_{10}H_5Cl_3$	1, 2, 3-Trichloronaphthalene	231.41	81			
3388	$C_{10}H_5Cl_3$	1, 2, 4-Trichloronaphthalene	231.41	92			
3389	$C_{10}H_5Cl_3$	1, 2, 5-Trichloronaphthalene	231.41	78			
3390	$C_{10}H_5Cl_3$	1, 2, 6-Trichloronaphthalene	231.41	97			
3391	$C_{10}H_5Cl_3$	1, 2, 7-Trichloronaphthalene	231.41	88			
3392	$C_{10}H_5Cl_3$	1, 2, 8-Trichloronaphthalene	231.41	83.5			
3393	$C_{10}H_5Cl_3$	1, 3, 5-Trichloronaphthalene	231.41	103			
3394	$C_{10}H_5Cl_3$	1, 3, 6-Trichloronaphthalene	231.41	80.5			
3395	$C_{10}H_5Cl_3$	1, 3, 7-Trichloronaphthalene	231.41	113			
3396	$C_{10}H_5Cl_3$	1, 3, 8-Trichloronaphthalene	231.41	89.5			
3397	$C_{10}H_5Cl_3$	1, 4, 5-Trichloronaphthalene	231.41	131			
3398	$C_{10}H_5Cl_3$	1, 4, 6-Trichloronaphthalene	231.41	66			
3399	$C_{10}H_5Cl_3$	1, 6, 7-Trichloronaphthalene	231.41	109.5			
3400	$C_{10}H_5Cl_3$	2, 3, 6-Trichloronaphthalene	231.41	91			
3401	$C_{10}H_5Cl_3$	2, 3, 7-Trichloronaphthalene	231.41	90			
3402	$C_{10}H_5NO_{10}$	Pyridinepentacarboxylic acid	299.05	220 d.			
3403	$C_{10}H_5N_3O_6$	1, 2, 5-Trinitronaphthalene	263.06	113			
3404	$C_{10}H_5N_3O_6$	1, 3, 5-Trinitronaphthalene	263.06	123			
3405	$C_{10}H_5N_3O_6$	1, 3, 8-Trinitronaphthalene	263.06	218			
3406	$C_{10}H_5N_3O_6$	1, 4, 5-Trinitronaphthalene	263.06	247			
3407	$C_{10}H_5N_3O_7$	2, 4, 5-Trinitro-α-naphthol	279.06	189.5			
3408	$C_{10}H_5N_3O_7$	2, 4, 7-Trinitro-α-naphthol	279.06	145			
3409	$C_{10}H_5N_3O_7$	2, 4, 8-Trinitro-α-naphthol	279.06	175			
3410	$C_{10}H_6ClNO_2$	4-Chloro-1-nitronaphthalene	207.51	84			
3411	$C_{10}H_6ClNO_2$	7-Chloro-1-nitronaphthalene	207.51	116			
3412	$C_{10}H_6Cl_2$	1, 2-Dichloronaphthalene	196.96	37	282	$1.315_4^{48.5}$	1076
3413	$C_{10}H_6Cl_2$	1, 3-Dichloronaphthalene	196.96	61	289		
3414	$C_{10}H_6Cl_2$	1, 4-Dichloronaphthalene	196.96	68	287.6	1.300_4^{76}	1104
3415	$C_{10}H_6Cl_2$	1, 5-Dichloronaphthalene	196.96	107			
3416	$C_{10}H_6Cl_2$	1, 6-Dichloronaphthalene	196.96	48			
3417	$C_{10}H_6Cl_2$	1, 7-Dichloronaphthalene	196.96	62	286	1.261_4^{100}	1149
3418	$C_{10}H_6Cl_2$	1, 8-Dichloronaphthalene	196.96	88	d.	1.292_4^{100}	1150
3419	$C_{10}H_6Cl_2$	2, 3-Dichloronaphthalene	196.96	120			
3420	$C_{10}H_6Cl_2$	2, 6-Dichloronaphthalene	196.96	135	285		
3421	$C_{10}H_6Cl_2$	2, 7-Dichloronaphthalene	196.96	114			
3422	$C_{10}H_6Cl_2O$	2, 3-Dichloro-α-naphthol	212.96	101			
3423	$C_{10}H_6Cl_2O$	2, 4-Dichloro-α-naphthol	212.96	108			
3424	$C_{10}H_6Cl_2O$	5, 7-Dichloro-α-naphthol	212.96	132			
3425	$C_{10}H_6Cl_2O$	5, 8-Dichloro-α-naphthol	212.96	115			

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
3426	$C_{10}H_6Cl_2O$	6, 7-Dichloro-α-naphthol	212.96	151			
3427	$C_{10}H_6Cl_2O$	7, 8-Dichloro-α-naphthol	212.96	95			
3428	$C_{10}H_6Cl_2O$	1, 3-Dichloro-β-naphthol	212.96	81			
3429	$C_{10}H_6Cl_2O$	1, 4-Dichloro-β-naphthol	212.96	124			
3429.1	$C_{10}H_6Cl_2O$	3, 6-(6, 8)-Dichloro-β-naphthol	212.96	125			
3430	$C_{10}H_6Cl_2O_4S_2$	Naphthalene-1, 5-disulfonechloride	325.09	183			
3431	$C_{10}H_6Cl_2O_4S_2$	Naphthalene-1, 6-disulfonechloride	325.09	129			
3432	$C_{10}H_6Cl_2O_4S_2$	Naphthalene-2, 6-disulfonechloride	325.09	226			
3433	$C_{10}H_6Cl_2O_4S_2$	Naphthalene-2, 7-disulfonechloride	325.09	162			
3434	$C_{10}H_6N_2O_2$	Pyrocoll	186.06	269			
3435	$C_{10}H_6N_2O_4$	1, 2-Dinitronaphthalene	218.06	103			
3436	$C_{10}H_6N_2O_4$	1, 3-Dinitronaphthalene	218.06	145			
3437	$C_{10}H_6N_2O_4$	1, 4-Dinitronaphthalene	218.06	129			
3438	$C_{10}H_6N_2O_4$	1, 5-Dinitronaphthalene	218.06	216			
3439	$C_{10}H_6N_2O_4$	1, 6-Dinitronaphthalene	218.06	162			
3440	$C_{10}H_6N_2O_4$	1, 7-Dinitronaphthalene	218.06	156			
3441	$C_{10}H_6N_2O_4$	1, 8-Dinitronaphthalene	218.06	170			
3442	$C_{10}H_6N_2O_5$	2, 4-Dinitro-α-naphthol	234.06	138			
3443	$C_{10}H_6N_2O_5$	4, 5-Dinitro-α-naphthol	234.06	230 d.			
3444	$C_{10}H_6N_2O_5$	4, 8-Dinitro-α-naphthol	234.06	235 d.			
3445	$C_{10}H_6N_2O_5$	1, 6-Dinitro-β-naphthol	234.06	195			
3446	$C_{10}H_6N_2O_5$	1, 8-Dinitro-β-naphthol	234.06	198			
3447	$C_{10}H_6O_2$	1, 2-Naphthoquinone	158.05	120 d.			
3448	$C_{10}H_6O_2$	1, 4-Naphthoquinone	158.05	125			
3449	$C_{10}H_6O_2$	2, 6-Naphthoquinone	158.05	135			
3450	$C_{10}H_6O_8$	Mellophanic acid	254.05	238			
3451	$C_{10}H_6O_8$	Prehnitic acid	254.05	237 d.			
3452	$C_{10}H_6O_8$	Pyromellitic acid	254.05	264			
3453	$C_{10}H_7Br$	α-Bromonaphthalene	206.97	5	281.1	1.476	799
3454	$C_{10}H_7Br$	β-Bromonaphthalene	206.97	59	282	1.605^{0}	
3455	$C_{10}H_7Cl$	α-Chloronaphthalene	162.51		258	1.191	795
3456	$C_{10}H_7Cl$	β-Chloronaphthalene	162.51	56	264.3	$1.138_4^{70.7}$	1102
3457	$C_{10}H_7ClO$	2-Chloro-α-naphthol	178.51	70			
3458	$C_{10}H_7ClO$	4-Chloro-α-naphthol	178.51	117			
3459	$C_{10}H_7ClO$	5-Chloro-α-naphthol	178.51	131.5			
3460	$C_{10}H_7ClO$	6-Chloro-α-naphthol	178.51	94			
3461	$C_{10}H_7ClO$	7-Chloro-α-naphthol	178.51	123			
3462	$C_{10}H_7ClO$	1-Chloro-β-naphthol	178.51	71			
3463	$C_{10}H_7ClO$	5-Chloro-β-naphthol	178.51	128			
3464	$C_{10}H_7ClO$	6-Chloro-β-naphthol	178.51	115			
3465	$C_{10}H_7ClO$	7-Chloro-β-naphthol	178.51	126.5			
3466	$C_{10}H_7ClO$	8-Chloro-β-naphthol	178.51	101	308		
3467	$C_{10}H_7ClO_2S$	Naphthalene-1-sulfonechloride	226.58	68	195^{13}		
3468	$C_{10}H_7ClO_2S$	Naphthalene-2-sulfonechloride	226.58	76	201^{13}		
3469	$C_{10}H_7F$	α-Fluoronaphthalene	146.05		216.5	1.135^{0}	
3470	$C_{10}H_7F$	β-Fluoronaphthalene	146.05	59	212.5		
3471	$C_{10}H_7IO$	1-Iodo-β-naphthol	269.99	94.5			
3472	$C_{10}H_7NO$	Cinnamyl cyanide $C_6H_5CH{:}CH_2COCN$.	157.06	115			
3473	$C_{10}H_7NO_2$	α-Nitronaphthalene	173.06	58.8	304	1.331^{4}	
3474	$C_{10}H_7NO_2$	β-Nitronaphthalene	173.06	79	165^{15}		
3475	$C_{10}H_7NO_2$	2-Nitroso-α-naphthol	173.06	152			
3476	$C_{10}H_7NO_2$	4-Nitroso-α-naphthol	173.06	194			
3477	$C_{10}H_7NO_2$	1-Nitroso-β-naphthol	173.06	109.5			
3478	$C_{10}H_7NO_2$	Cinchoninic acid	173.06	254			
3479	$C_{10}H_7NO_2$	Quinaldinic acid	173.06	156			
3480	$C_{10}H_7NO_2$	Quinoline-3-carboxylic acid	173.06	275			
3481	$C_{10}H_7NO_2$	Quinoline-6-carboxylic acid	173.06	292			
3482	$C_{10}H_7NO_2$	Quinoline-7-carboxylic acid	173.06	249			
3483	$C_{10}H_7NO_2$	Quinoline-8-carboxylic acid	173.06	187.5			
3484	$C_{10}H_7NO_3$	α-Kynurenic acid	189.06	283			
3485	$C_{10}H_7NO_3$	2-Nitro-α-naphthol	189.06	128			
3486	$C_{10}H_7NO_3$	3-Nitro-α-naphthol	189.06	168			
3487	$C_{10}H_7NO_3$	4-Nitro-α-naphthol	189.06	164			

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
3488	$C_{10}H_7NO_3$	5-Nitro-α-naphthol	189.06	171			
3489	$C_{10}H_7NO_3$	1-Nitro-β-naphthol	189.06	103			
3490	$C_{10}H_7NO_3$	5-Nitro-β-naphthol	189.06	147			
3491	$C_{10}H_7NO_3$	6-Nitro-β-naphthol	189.06	158			
3492	$C_{10}H_7NO_3$	8-Nitro-β-naphthol	189.06	145			
3493	$C_{10}H_7NO_4$	Indoledicarboxylic acid	205.06	>250 d.			
3494	$C_{10}H_8$	Naphthalene $C_{10}H_8$	128.06	80.1	217.9	1.145	1143
3495	$C_{10}H_8Cl_4$	Naphthalenetetrachloride	269.89	182			
3496	$C_{10}H_{10}IN$	Quinoline methiodide $C_9H_7N.CH_3I$	271.02	133			
3497	$C_{10}H_8N_2$	2, 3′-Dipyridyl	156.08		289		
3498	$C_{10}H_8N_2$	3, 3′-Dipyridyl	156.08	68	296.5	1.164	
3499	$C_{10}H_8N_2$	4, 4′-Dipyridyl	156.08	112	304.8		
3500	$C_{10}H_8N_2$	Nicotelline	156.08	148	<300		
3501	$C_{10}H_8N_2O_2$	3-Nitro-α-naphthylamine	188.08	137			
3502	$C_{10}H_8N_2O_2$	6-Nitro-α-naphthylamine	188.08	143			
3503	$C_{10}H_8N_2O_3$	7-Nitro-α-naphthylamine	188.08	122			
3504	$C_{10}H_8N_2O_2$	1-Nitro-β-naphthylamine	188.08	127			
3505	$C_{10}H_8N_2O_2$	5-Nitro-β-naphthylamine	188.08	143			
3506	$C_{10}H_8N_2O_2$	8-Nitro-β-naphthylamine	188.08	105			
3507	$C_{10}H_8O$	α-Naphthol $C_{10}H_7OH$	144.06	96	280	$1.099^{99.3}$	1126
3508	$C_{10}H_8O$	β-Naphthol $C_{10}H_7OH$	144.06	122	286	1.217^{4}	1337
3509	$C_{10}H_8O_2$	1, 2-Dihydroxynaphthalene	160.06	60			
3510	$C_{10}H_8O_2$	1, 3-Dihydroxynaphthalene	160.06	125			
3511	$C_{10}H_8O_2$	1, 4-Dihydroxynaphthalene	160.06	176			
3512	$C_{10}H_8O_2$	1, 5-Dihydroxynaphthalene	160.06	258			
3513	$C_{10}H_8O_2$	1, 6-Dihydroxynaphthalene	160.06	138			
3514	$C_{10}H_8O_2$	1, 7-Dihydroxynaphthalene	160.06	178			
3515	$C_{10}H_8O_2$	1, 8-Dihydroxynaphthalene	160.06	140			
3516	$C_{10}H_8O_2$	2, 3-Dihydroxynaphthalene	160.06	159			
3517	$C_{10}H_8O_2$	2, 6-Dihydroxynaphthalene	160.06	216			
3518	$C_{10}H_8O_2$	2, 7-Dihydroxynaphthalene	160.06	190			
3519	$C_{10}H_8O_2S$	Naphthalene-1-sulfinic acid	192.13	85			
3520	$C_{10}H_8O_2S$	Naphthalene-2-sulfinic acid	192.13	105			
3521	$C_{10}H_8O_3$	1, 4, 5-Trihydroxynaphthalene	176.06	170			
3522	$C_{10}H_8O_3$	1, 3, 6-Trihydroxynaphthalene	176.06	97			
3523	$C_{10}H_8O_3$	2-Benzoylacrylic acid	176.06	99			
3524	$C_{10}H_8O_3S$	Naphthalene-1-sulfonic acid	208.13	90			
3525	$C_{10}H_8O_3S$	Naphthalene-2-sulfonic acid	208.13	102			
3526	$C_{10}H_8O_4$	Anemonin	192.06	189 s. d.	300 d.		
3527	$C_{10}H_8O_4$	*o*-Carboxycinnamic acid	192.06	175			
3528	$C_{10}H_8O_4$	Furoin	192.06	135			
3529	$C_{10}H_8O_4$	β-Methylesculetin	192.06	204			
3530	$C_{10}H_8O_4$	Scopoletin	192.06	204			
3531	$C_{10}H_8O_4$	1, 4, 5, 6-Tetrahydroxynaphthalene	192.06	154			
3532	$C_{10}H_8O_4S$	α-Naphthol-2-sulfonic acid	224.13	<250			
3533	$C_{10}H_8O_4S$	α-Naphthol-4-sulfonic acid	224.13	170 d.			
3534	$C_{10}H_8O_4S$	α-Naphthol-5-sulfonic acid	224.13	120			
3535	$C_{10}H_8O_4S$	α-Naphthol-8-sulfonic acid	224.13	107			
3536	$C_{10}H_8O_4S$	β-Naphthol-6-sulfonic acid	224.13	125			
3537	$C_{10}H_8O_4S$	β-Naphthol-7-sulfonic acid	224.13	89			
3538	$C_{10}H_8O_5$	Fraxetin	208.06	227			
3539	$C_{10}H_8O_6S_2$	Naphthalene-1, 5-disulfonic acid	288.19	d.			1303
3540	$C_{10}H_8O_6S_2$	Naphthalene-1, 6-disulfonic acid	288.19	125 d.			1271
3541	$C_{10}H_8O_7$	Cotarnic acid	240.06	178			
3542	$C_{10}H_8S$	α-Thionaphthol $C_{10}H_7SH$	160.13		285 d.	1.146^{23}	
3543	$C_{10}H_8S$	β-Thionaphthol $C_{10}H_7SH$	160.13	81	288 s. d.	1.550	
3544	$C_{10}H_9Cl_3O_2$	Chloralacetophenone	267.44	77			
3545	$C_{10}H_9N$	3-Methylquinoline	143.08	14	250	1.074	
3546	$C_{10}H_9N$	4-Methylquinoline (Lepidine)	143.08		262	1.086	
3547	$C_{10}H_9N$	6-Methylquinoline	143.08		255	1.066	1003
3548	$C_{10}H_9N$	7-Methylquinoline	143.08		252.5	1.072	788
3549	$C_{10}H_9N$	8-Methylquinoline	143.08		143^{34}	1.073	789
3550	$C_{10}H_9N$	α-Naphthylamine $C_{10}H_7NH_2$	143.08	50	301	1.131	1080

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
3551	$C_{10}H_9N$	β-Naphthylamine $C_{10}H_7NH_2$	143.08	110.2	306.1	1.061_4^{98}	
3552	$C_{10}H_9NO$	3-Amino-β-naphthol	159.08	234			
3553	$C_{10}H_9NO$	7-Amino-β-naphthol	159.08	163			
3554	$C_{10}H_9NO$	2-Hydroxyquinaldine	159.08	205			
3555	$C_{10}H_9NO$	4-Hydroxyquinaldine	159.08	231			
3556	$C_{10}H_9NO$	6-Hydroxyquinaldine	159.08	213			
3557	$C_{10}H_9NO$	7-Hydroxyquinaldine	159.08	234			
3558	$C_{10}H_9NO$	8-Hydroxyquinaldine	159.08	74	267		
3559	$C_{10}H_9NO$	Echinopsine	159.08	152			
3560	$C_{10}H_9NO_2$	α-Scatolecarboxylic acid	175.08	165			
3572	$C_{10}H_9N_3O_4$	Anilalloxan	235.09	248 d.			
3573	$C_{10}H_{10}$	1, 2-Dihydronaphthalene	130.08	−9	84.5^{16}	0.997	
3574	$C_{10}H_{10}$	1, 4-Dihydronaphthalene	130.08	15.5	212	0.998	844
3575	$C_{10}H_{10}$	1-Ethyl-2-phenylacetylene	130.08		203	0.923	
3576	$C_{10}H_{10}$	Phenylcrotonylene $C_6H_5CH{:}CHC_2H_5$	130.08		190		
3578	$C_{10}H_{10}Cl_3NO_3$	Chloral-p-acetaminophenol	298.46	160 d.			
3579	$C_{10}H_{10}NO_4$	Oxycannabin	208.09	182			
3580	$C_{10}H_{10}N_2$	Naphthylene-1, 2-diamine	158.09	96			
3581	$C_{10}H_{16}N_2$	Naphthylene-1, 4-diamine	158.09	120			
3582	$C_{10}H_{10}N_2$	Naphthylene-1, 5-diamine	158.09	189.5			
3583	$C_{10}H_{10}N_2$	1, 6-Naphthylenediamine	158.09	77.5		$1.147_4^{99.4}$	1137
3584	$C_{10}H_{10}N_2$	1, 8-Naphthylenediamine	158.09	66.5		$1.127_4^{99.4}$	1135
3585	$C_{10}H_{10}N_2O$	*N*-Phenyl-3-methylpyrazolone	174.09	127	191^{17}		1287
3586	$C_{10}H_{10}N_2O_4S$	*N*-Sulfophenyl-3-methylpyrazolone	254.16	320 d.			
3587	$C_{10}H_{10}O$	Benzylideneacetone	146.08	42	262	1.008	1068
3588	$C_{10}H_{10}O$	1, 2-Dihydro-β-naphthol	146.08	35	164^{28}		
3589	$C_{10}H_{10}O_2$	*cis*-Isosafrol	162.08	> −18	243	1.117_4^{15}	868
3590	$C_{10}H_{10}O_2$	*trans*-Isosafrol	162.08		248	1.123_4^{15}	869
3591	$C_{10}H_{10}O_2$	Safrol $CH_2{:}O_2{:}C_6H_3C_3H_5$	162.08	11	234.5	1.096	812
3592	$C_{10}H_{10}O_2$	Benzoylpropionaldehyde	162.08		244.4	0.998^{15}	
3593	$C_{10}H_{10}O_2$	Benzoylacetone $C_6H_5COCH_2COCH_3$	162.08	61	262	1.090^{60}	1106
3594	$C_{10}H_{10}O_2$	1-Benzylacrylic acid $CH_2{:}C(C_7H_7)CO_2H$	162.08	69			
3595	$C_{10}H_{10}O_2$	1-Benzylidenepropionic acid	162.08	74	288		
3596	$C_{10}H_{10}O_2$	2-Benzylidenepropionic acid	162.08	86	302		
3597	$C_{10}H_{10}O_2$	3-Phenylcrotonic acid	162.08	65			
3598	$C_{10}H_{10}O_2$	Allyl benzoate $C_6H_5CO_2C_3H_5$	162.08		230	1.058_{15}^{15}	
3599	$C_{10}H_{10}O_2$	Benzyl acrylate $C_2H_3CO_2CH_2C_6H_5$	162.08		110^8	1.069_4^8	
3600	$C_{10}H_{10}O_2$	Methyl cinnamate	162.08	36	259.6	1.042_0^{36}	973
3601	$C_{10}H_{10}O_2$	Phenylvinyl acetate	162.08		121^{10}	1.065	999
3602	$C_{10}H_{10}O_3$	*o*-Coniferylaldehyde	178.08	131			
3603	$C_{10}H_{10}O_3$	*p*-Coniferylaldehyde	178.08	82.5			
3604	$C_{10}H_{10}O_3$	*m*-Methoxycinnamic acid	178.08	115			
3605	$C_{10}H_{10}O_3$	*p*-Methoxycinnamic acid	178.08	169			
3606	$C_{10}H_{10}O_3$	Methyl benzoylacetate	178.08		265 d.	1.158	712
3607	$C_{10}H_{10}O_4$	1-Benzoyllactic acid	194.08	112			
3608	$C_{10}H_{10}O_4$	Benzylmalonic acid	194.08	117			
3609	$C_{10}H_{10}O_4$	Ferulic acid	194.08	169			
3610	$C_{10}H_{10}O_4$	Hesperetinic acid	194.08	228			
3611	$C_{10}H_{10}O_4$	*o*-Phenylenediacetic acid	194.08	150			
3612	$C_{10}H_{10}O_4$	*m*-Phenylenediacetic acid	194.08	170			
3613	$C_{10}H_{10}O_4$	*p*-Phenylenediacetic acid	194.08	241			
3614	$C_{10}H_{10}O_4$	Dimethyl isophthalate	194.08	68			
3615	$C_{10}H_{10}O_4$	Dimethyl *o*-phthalate	194.08		282	1.189_{25}^{25}	
3616	$C_{10}H_{10}O_4$	Dimethyl terephthalate	194.08	140	>300		
3617	$C_{10}H_{10}O_4$	Ethyl hydrogen *o*-phthalate	194.08	48			
3618	$C_{10}H_{10}O_4$	Hydroquinone diacetate	194.08	124			
3619	$C_{10}H_{10}O_4$	Methyl acetylsalicylate	194.08	54			
3620	$C_{10}H_{10}O_4$	Resorcinol diacetate	194.08		278 s. d.		
3621	$C_{10}H_{10}O_4$	Meconin	194.08	101	155		
3622	$C_{10}H_{10}O_4$	Salacetol *o*-$HOC_6H_4CO_2CH_2COCH_3$	194.08	71			
3623	$C_{10}H_{10}O_5$	Larixinic acid	210.08	153			
3624	$C_{10}H_{10}O_5$	Opianic acid	210.08	150			1333
3625	$C_{10}H_{10}O_6$	Apiolic acid	226.08	175			

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
3626	$C_{10}H_{10}O_6$	Hemipinic acid	226.08	186			
3627	$C_{10}H_{11}NO_2$	Acetoacetanilide	177.09	85			
3628	$C_{10}H_{11}NO_2$	Diacetanilide $(CH_3CO)_2N.C_6H_5$	177.09	37	142^{11}		
3629	$C_{10}H_{11}NO_3$	*p*-Diacetylaminophenol	193.09	118			
3630	$C_{10}H_{11}NO_3$	Ethyl oxanilate	193.09	67	300		
3631	$C_{10}H_{11}NO_3$	Methyl hippurate	193.09	80.5			
3632	$C_{10}H_{11}NO_3$	*dl*-Benzoylalanine	193.09	166			
3635	$C_{10}H_{11}NO_4$	Benzacetin	209.09	205			
3636	$C_{10}H_{11}N_3O$	4-Nitro-1, 3-diacetylphenylenediamine	237.11	246			
3637	$C_{10}H_{12}$	1, 2, 3, 4-Tetrahydronaphthalene	132.09		207.2	0.971	931
3638	$C_{10}H_{12}$	5, 6, 7, 8-Tetrahydronaphthalene	132.09	−30	207	0.975	930
3639	$C_{10}H_{12}$	β-Phenyl-β-butylene	132.09		189	0.901^{21}	966
3640	$C_{10}H_{12}Br_2O$	2, 4-Dibromothymol	307.92	4	175^{25}	$1.659^{17.4}_{17.4}$	
3641	$C_{10}H_{12}Br_2O_2$	Isoeugenol-1, 2-dibromide	323.92	102			
3642	$C_{10}H_{12}N_2$	Isonicoteine	160.11		293	1.098	760
3643	$C_{10}H_{12}N_2$	Nicoteine	160.11		267	1.078^{12}	
3643.1	$C_{10}H_{12}N_2O$	1-Allyl-2-phenylurea	176.11	115.5			
3644	$C_{10}H_{12}N_2O_2$	Diacetyl-*o*-phenylenediamine	192.11	186			
3645	$C_{10}H_{12}N_2O_2$	Diacetyl-*m*-phenylenediamine	192.11	191			
3646	$C_{10}H_{12}N_2O_2$	Diacetyl-*p*-phenylenediamine	192.11	160			
3647	$C_{10}H_{12}N_2O_3$	5, 5-Diallylbarbituric acid	208.11	171			
3648	$C_{10}H_{12}O$	*p*-Anethol *p*-$CH_3OC_6H_4CH{:}CHCH_3$	148.09	22.5	235.3	0.986	1044
3649	$C_{10}H_{12}O$	1, 2, 3, 4-Tetrahydro-α-naphthol	148.09		140^{17}	1.090	917
3650	$C_{10}H_{12}O$	5, 6, 7, 8-Tetrahydro-α-naphthol	148.09	68	265.3		
3651	$C_{10}H_{12}O$	1, 2, 3, 4-Tetrahydro-β-naphthol	148.09		265.5	1.071	
3652	$C_{10}H_{12}O$	5, 6, 7, 8-Tetrahydro-β-naphthol	148.09	57.5	276		
3653	$C_{10}H_{12}O$	Benzyl allyl ether $C_6H_5CH_2OC_3H_5$	148.09		204		
3654	$C_{10}H_{12}O$	Ethyl styryl ether $C_6H_5CH{:}CHOC_2H_5$	148.09		226	0.982	893
3655	$C_{10}H_{12}O$	Methyl chavicyl ether	148.09		216	0.965	676
3656	$C_{10}H_{12}O$	Cumic aldehyde $(CH_3)_2CHC_6H_4CHO$	148.09		235	0.978	698
3657	$C_{10}H_{12}O$	Mesitylinic aldehyde	148.09		237		
3658	$C_{10}H_{12}O$	3, 4, 5-Trimethylbenzaldehyde	148.09	52			
3659	$C_{10}H_{12}O$	Benzyl acetone $C_6H_5(CH_2)_2COCH_3$	148.09		236	0.989^{24}_{18}	
3660	$C_{10}H_{12}O$	Ethyl benzyl ketone	148.09		230.2	1.002^{0}_{4}	
3661	$C_{10}H_{12}O$	Phenyl isopropyl ketone	148.09		217	0.984	879
3662	$C_{10}H_{12}O$	Phenyl *n*-propyl ketone	148.09	11	232.3	0.988	
3663	$C_{10}H_{12}O$	*p*-Tolylacetone	148.09	51	233		
3664	$C_{10}H_{12}O$	*p*-Tolyl ethyl ketone	148.09		239^{763}	0.993	690
3665	$C_{10}H_{12}O_2$	3, 5, 6-Trimethyl-2-hydroxybenzaldehyde	164.09	106			
3666	$C_{10}H_{12}O_2$	Eugenol	164.09		253	1.071^{15}	841
3667	$C_{10}H_{12}O_2$	Isoeugenol	164.09	−10	267.5	1.080	936
3668	$C_{10}H_{12}O_2$	Cumic acid $(CH_3)_2CHC_6H_4CO_2H$	164.09	116.5		1.163^{4}	
3669	$C_{10}H_{12}O_2$	*o*-Isopropylbenzoic acid	164.09	51			
3670	$C_{10}H_{12}O_2$	3-Phenylbutyric acid $C_6H_5(CH_2)_3CO_2H$	164.09	47.5	290		
3671	$C_{10}H_{12}O_2$	*o*-Propylbenzoic acid *o*-$C_3H_7C_6H_4CO_2H$	164.09	58	273		
3672	$C_{10}H_{12}O_2$	*p*-Propylbenzoic acid	164.09	141			
3673	$C_{10}H_{12}O_2$	3, 4, 5-Trimethylbenzoic acid	164.06	215			
3674	$C_{10}H_{12}O_2$	2, 4, 5-Trimethylbenzoic acid	164.09	149.5			
3675	$C_{10}H_{12}O_2$	2, 4, 6-Trimethylbenzoic acid	164.09	152			
3676	$C_{10}H_{12}O_2$	Benzyl propionate	164.09		220	$1.036^{17.5}$	
3677	$C_{10}H_{12}O_2$	Ethyl phenylacetate $C_6H_5CH_2CO_2C_2H_5$	164.09		226	1.031	589
3678	$C_{10}H_{12}O_2$	Ethyl *o*-toluate $CH_3C_6H_4CO_2C_2H_5$	164.09		221.3	1.033	629
3679	$C_{10}H_{12}O_2$	Ethyl *m*-toluate $CH_3C_6H_4CO_2C_2H_5$	164.09		226.4	1.028	624
3680	$C_{10}H_{12}O_2$	Ethyl *p*-toluate $CH_3C_6H_4CO_2C_2H_5$	164.09		228	1.026	636
3681	$C_{10}H_{12}O_2$	Isopropyl benzoate	164.09		218.5	1.017^{15}_{15}	
3681.1	$C_{10}H_{12}O_2$	*d*-Methylbenzylcarbinyl formate	164.09		110^{19}	1.027^{22}	595
3682	$C_{10}H_{12}O_2$	Methyl hydrocinnamate	164.09		239	1.018^{49}	
3683	$C_{10}H_{12}O_2$	Phenyl *n*-butyrate $C_3H_7CO_2C_6H_5$	164.09		228	1.027^{15}_{15}	
3684	$C_{10}H_{12}O_2$	*n*-Propyl benzoate $C_6H_5CO_2C_3H_7$	164.09	−51.6	231.2	1.027	
3685	$C_{10}H_{12}O_2$	Thymoquinone	164.09	45.5	232		
3686	$C_{10}H_{12}O_3$	Coniferyl alcohol	180.09	74			
3687	$C_{10}H_{12}O_3$	Benzyl lactate	180.09		130^{6}		1025
3688	$C_{10}H_{12}O_3$	Ethyl anisate *p*-$CH_3OC_6H_4CO_2C_2H_5$	180.09	7.8	263	1.106	680

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
3689	$C_{10}H_{12}O_3$	Ethyl mandelate	180.09	34	255		
3690	$C_{10}H_{12}O_3$	Propyl salicylate o-$HOC_6H_4CO_2C_3H_7$	180.09		240	1.099^{15}	
3691	$C_{10}H_{12}O_4$	Cantharic acid	196.09	278			
3692	$C_{10}H_{12}O_4$	Ethyl vanillate	196.09	44	293		
3693	$C_{10}H_{12}O_4$	Cantharidin	196.09	212			
3694	$C_{10}H_{12}O_4$	Guaiacyl methyl glycollate	196.09		156^{15}	1.180	
3695	$C_{10}H_{12}O_4$	Sparassol	196.09	68			
3696	$C_{10}H_{12}O_5$	Asaronic acid	212.09	144	300		
3697	$C_{10}H_{12}O_5$	Glycerol monosalicylate	212.09	76		1.366	
3698	$C_{10}H_{12}O_6$	β-Anemoninic acid	228.09	189			
3699	$C_{10}H_{13}ClO$	4-Chlorothymol	184.56	64			
3700	$C_{10}H_{13}ClO$	6-Chlorothymol	184.56	64			
3701	$C_{10}H_{13}N$	Kairoline (1-Methyl-1, 2, 3, 4-tetrahydroquinoline)	147.11		245.5	1.021	1005
3702	$C_{10}H_{13}N$	5, 6, 7, 8-Tetrahydro-α-naphthylamine	147.11		276.8	$1.054_4^{23.1}$	1006
3703	$C_{10}H_{13}N$	5, 6, 7, 8-Tetrahydro-β-naphthylamine	147.11	38	278.5	$1.029_4^{22.2}$	986
3704	$C_{10}H_{13}NO$	*o*-Acetylmethyltoluidine	163.11	56			
3705	$C_{10}H_{13}NO$	*p*-Acetylmethyltoluidine	163.11	80			
3706	$C_{10}H_{13}NO$	*N*-Butyranilide $C_6H_5NHOCC_3H_7$	163.11	92	189^{15}		
3707	$C_{10}H_{13}NO$	3, 5-Dimethylacetanilide	163.11	174			
3708	$C_{10}H_{13}NO$	ω-Dimethylaminoacetophenone	163.11	59			
3709	$C_{10}H_{13}NO$	*N*-Ethylacetanilide	163.11	54.5	259	0.994_4^{60}	
3710	$C_{10}H_{13}NO$	Thalline	163.11	43	283.8		
3711	$C_{10}H_{13}NO_2$	1-Anilinobutyric acid	179.11	141			
3712	$C_{10}H_{13}NO_2$	Propyl *p*-aminobenzoate	179.11	76			
3713	$C_{10}H_{13}NO_2$	*o*-Acetphenetidine	179.11	79	<250		
3714	$C_{10}H_{13}NO_2$	*m*-Acetphenetidine	179.11	96			
3715	$C_{10}H_{13}NO_2$	2-Nitrocymene	179.11		152^{15}	1.085^{15}	
3716	$C_{10}H_{13}NO_2$	Phenacetin $C_2H_5OC_6H_4NHCOCH_3$	179.11	135	d.		1246
3717	$C_{10}H_{13}NO_3$	Damascenine	195.11	27	168		
3718	$C_{10}H_{13}NO_3$	2-Nitrothymol	195.11	119			
3719	$C_{10}H_{13}NO_3$	4-Nitrothymol	195.11	142			
3720	$C_{10}H_{13}NO_3$	Ratanhine	195.11	252			
3721	$C_{10}H_{13}NO_3$	Surinamine (*N*-Methyltyrosine)	195.11	280 d.			
3722	$C_{10}H_{13}N_3O_4$	2, 4-Dinitro-*N*-diethylaniline	239.12	80			
3723	$C_{10}H_{13}N_5O_5$	Vernine	283.14	240			
3724	$C_{10}H_{14}$	*n*-Butylbenzene $CH_3(CH_2)_3C_6H_5$	134.11		180	0.862	554
3725	$C_{10}H_{14}$	*sec.*-Butylbenzene $C_2H_5(CH_3)CHC_6H_5$	134.11		175	0.860	550
3726	$C_{10}H_{14}$	*tert.*-Butylbenzene $(CH_3)_3C.C_6H_5$	134.11		168.7	0.867	582
3727	$C_{10}H_{14}$	*o*-Cymene o-$CH_3(CH_2)_2C_6H_4CH_3$	134.11		157	0.858^{18}	601
3728	$C_{10}H_{14}$	*m*-Cymene m-$CH_3(CH_2)_2C_6H_4CH_3$	134.11	> −25	175	0.860	559
3728.1	$C_{10}H_{14}$	*p*-Cymene p-$CH_3(CH_2)_2C_6H_4CH_3$	134.11	−73.5	176	0.857	1022
3729	$C_{10}H_{14}$	*o*-Diethylbenzene o-$(C_2H_5)_2C_6H_4$	134.11	< −20	184.5	0.866	
3730	$C_{10}H_{14}$	*m*-Diethylbenzene m-$(C_2H_5)_2C_6H_4$	134.11	< −20	182	0.860	
3731	$C_{10}H_{14}$	*p*-Diethylbenzene p-$(C_2H_5)_2C_6H_4$	134.11	−35	183	0.865	569.1
3732	$C_{10}H_{14}$	1, 2, 4, 5-Tetramethylbenzene	134.11	80	195	$0.838_4^{81.3}$	1273
3733	$C_{10}H_{14}$	4-Ethyl-*m*-xylene $C_2H_5C_6H_3(CH_3)_2$	134.11	< −20	183	0.878	
3734	$C_{10}H_{14}$	5-Ethyl-*m*-xylene $C_2H_5C_6H_3(CH_3)_2$	134.11	< −20	185	0.861	
3735	$C_{10}H_{14}$	Hexahydronaphthalene	134.11		205.5	0.934	
3736	$C_{10}H_{14}$	Isobutylbenzene $(CH_3)_2CHCH_2C_6H_5$	134.11		171.4	0.858^{15}	562
3739	$C_{10}H_{14}$	1, 2, 3, 5-Tetramethylbenzene	134.11		197	0.896_4^0	
3740	$C_{10}H_{14}$	1, 2, 3, 4-Tetramethylbenzene	134.11	−4	204	0.901	662
3741	$C_{10}H_{14}$	Verbenene	134.11		159	0.886^{15}	593
3742	$C_{10}H_{14}Br_2O$	*d*-α, α′-Dibromocamphor	309.94	61			1209
3743	$C_{10}H_{14}ClN$	Thermin (Tetrahydro-β-naphthylamine hydrochloride)	183.57	237			
3744	$C_{10}H_{14}Cl_2O$	α-Dichlorocamphor	221.02	96	200 d.	4.2	
3745	$C_{10}H_{14}Cl_2O$	β-Dichlorocamphor	221.02	77			
3746	$C_{10}H_{14}N_2$	Isonicotine	162.12	78	260 d.		
3747	$C_{10}H_{14}N_2$	Nicotine	162.12		274.3	1.009	695
3748	$C_{10}H_{14}N_2$	Nicotimine	162.12		250		
3749	$C_{10}H_{14}N_2O_2$	6-Nitroso-3-(diethylamino) phenol	194.12	84			
3750	$C_{10}H_{14}N_2O$	*p*-Nitroso-*N*-diethylaniline	178.12	84			

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
3751	$C_{10}H_{14}N_2O_2$	Phenocoll p-$C_2H_5OC_6H_4NHCOCH_2NH_2$	194.12	100.5			
3752	$C_{10}H_{14}O$	Carvacrol	150.11	0.5	237.9	0.976	678
3753	$C_{10}H_{14}O$	*d*-Carvol	150.11		225	0.960	940
3754	$C_{10}H_{14}O$	Cuminal alcohol	150.11		246.6	0.978^{15}	
3754.1	$C_{10}H_{14}O$	Methyl *d*-methylbenzyl carbinol	150.11		85^{12}	0.927^{27}	
3754.2	$C_{10}H_{14}O$	Methyl *l*-phenylethyl carbinol	150.11		132^{14}	0.9767	658
3755	$C_{10}H_{14}O$	3-Methyl-2-hydroxyisopropylbenzene	150.11		226	$0.987^{15.2}$	669
3756	$C_{10}H_{14}O$	Thymol $(CH_3)_2CHC_6H_3(OH)CH_3$	150.11	51.5	231.8	0.969	1170
3757	$C_{10}H_{14}O$	5-Methyl-2-hydroxyisopropylbenzene	150.11	36	229	$0.982^{17.8}$	674
3758	$C_{10}H_{14}O$	Benzyl propyl ether $C_6H_5CH_2OC_3H_7$	150.11		196		
3759	$C_{10}H_{14}O$	*n*-Butyl phenyl ether $C_6H_5OC_4H_9$	150.11		210.3	0.950^{0}	
3760	$C_{10}H_{14}O$	Isobutyl phenyl ether	150.11		198	0.939^{16}	
3761	$C_{10}H_{14}O$	Myrtenal (Myrtenic aldehyde)	150.11		90^{10}	0.988	616
3762	$C_{10}H_{14}O$	Eucarvol	150.11		106^{20}	0.952	845
3763	$C_{10}H_{14}O$	Pinocarvol	150.11		224	0.984	620
3764	$C_{10}H_{14}O$	*d*(*l*)-Piperitone	150.11		235	$0.934^{vac.}$	542
3765	$C_{10}H_{14}O$	Umbellulone	150.11		220	0.958	551
3766	$C_{10}H_{14}O_2$	*o*-Diethoxybenzene o-$(C_2H_5O)_2C_6H_4$	166.11	45			
3767	$C_{10}H_{14}O_2$	Coërulignol	166.11		246	1.049^{15}	
3768	$C_{10}H_{14}O_2$	Hydroquinone diethyl ether	166.11	72			
3769	$C_{10}H_{14}O_2$	Resorcinol diethyl ether	166.11	12.4	235.2		
3770	$C_{10}H_{14}O_2$	*d*-Camphorquinone	166.11	198			
3771	$C_{10}H_{14}O_2$	Thymohydroquinone	166.11	143	290		
3772	$C_{10}H_{14}O_2$	Crocetin	166.11	104			
3773	$C_{10}H_{14}O_3$	*dl*-Camphoric anhydride	182.11	221	270		
3774	$C_{10}H_{14}O_4$	1, 2, 3, 5-Tetramethoxybenzene	198.11	47	271		
3775	$C_{10}H_{14}O_4$	Guaiamar	198.11	75			
3776	$C_{10}H_{14}O_4$	Diethyl muconate	198.11	13; 62	64	$0.983_{4}^{99.1}$	
3777	$C_{10}H_{14}O_5$	Pinoylformic acid	214.11	80			
3777.1	$C_{10}H_{14}O_6$	Diallyl tartrate	230.11		191^{20}	$1.187^{26.6}$	
3778	$C_{10}H_{15}BrO$	*α*-Bromocamphor	231.03	78	274	1.449	1252
3779	$C_{10}H_{15}BrO$	*β*-Bromocamphor	231.03	61	130^{10}		
3780	$C_{10}H_{15}Cl$	Myrtenyl chloride	170.57		90^{12}	1.015	586
3782	$C_{10}H_{15}ClO$	*α*-Chlorocamphor	186.57	125	220 s. d.		
3783	$C_{10}H_{15}ClO$	*β*-Chlorocamphor	186.57	92.5	247		
3784	$C_{10}H_{15}ClO$	*γ*-Chlorocamphor	186.57	100	237 s. d.		
3785	$C_{10}H_{15}N$	*n*-Butylaniline $C_6H_5NHC_4H_9$	149.12		240.9		
3786	$C_{10}H_{15}N$	2-Dimethylamino-*m*-xylene	149.12		196.2	0.915	649
3787	$C_{10}H_{15}N$	4-Dimethylamino-*m*-xylene	149.12		232.2	0.939	730
3788	$C_{10}H_{15}N$	4-Dimethylamino-*o*-xylene	149.12		205	0.916	663
3789	$C_{10}H_{15}N$	Diethylaniline $C_6H_5N(C_2H_5)_2$	149.12	−34.4	216.27	0.934	717
3790	$C_{10}H_{15}N$	Isobutylaniline $C_6H_5NHCH_2CH(CH_3)_2$	149.12		242	0.940	
3791	$C_{10}H_{15}N$	Prehnidine 1, 2, 3, 4-$C_6H_2(CH_3)_4$	149.12	70	260		
3792	$C_{10}H_{15}NO$	*m*-Diethylaminophenol	165.12	78	278		
3793	$C_{10}H_{15}NO$	Ephedrine	165.12	40	255		
3794	$C_{10}H_{15}NO$	Hordenine	165.12	118	174^{11}		
3795	$C_{10}H_{15}NO$	Pseudoephedrine	165.12	117			
3796	$C_{10}H_{15}NO_3S$	Diethylaniline-*m*-sulfonic acid	229.19	270 d.			
3797	$C_{10}H_{15}N_3O_5$	Pilocarpidine nitrate	257.14	137			1333
3800	$C_{10}H_{16}$	*l*-Bornylene	136.12	111	147		
3801	$C_{10}H_{16}$	*dl*-Camphene	136.12	50	160	0.822	1116
3802	$C_{10}H_{16}$	*d*(*l*)-Camphene	136.12	42.7	159		1074
3803	$C_{10}H_{16}$	Camphilene	136.12		156	0.87^{15}	
3804	$C_{10}H_{16}$	*d*(*l*)-Δ^4-Carene	136.12		167^{707}	0.855_{30}^{30}	1037
3805	$C_{10}H_{16}$	Cyclofenchene	136.12		144	0.861	445
3806	$C_{10}H_{16}$	Dipentene	136.12		176	0.865^{18}	515
3807	$C_{10}H_{16}$	*d*(*l*)-Fenchene	136.12		150	0.869	955
3808	$C_{10}H_{16}$	Fenchylene	136.12		142	0.840	435
3809	$C_{10}H_{16}$	Geraniene	136.12		164	0.843	
3810	$C_{10}H_{16}$	*d*(*l*)-Limonene	136.12	−96.9	177	0.842	510
3811	$C_{10}H_{16}$	Myrcene	136.12		167	0.802	503
3812	$C_{10}H_{16}$	Ocimene	136.12		74^{21}	0.799	835
3813	$C_{10}H_{16}$	*cis*-*β*-Octalin	136.12		73^{15}	0.915	984

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
3814	$C_{10}H_{16}$	*trans*-β-Octalin	136.12		190	0.909^{13}	
3815	$C_{10}H_{16}$	*d*(*l*)-α-Phellandrene	136.12		175	0.843	983
3816	$C_{10}H_{16}$	β-Phellandrene	136.12		171	0.852	527
3817	$C_{10}H_{16}$	*dl*-α-Pinene	136.12	−55	154	0.878	
3818	$C_{10}H_{16}$	*l*-β-Pinene	136.12		164	0.873^{15}	824
3819	$C_{10}H_{16}$	Sabinene	136.12		165	0.842	914
3820	$C_{10}H_{16}$	*d*(*l*)-Sylvestrene	136.12		177	0.863	919
3821	$C_{10}H_{16}$	α-Terpinene	136.12		175	0.834	915
3822	$C_{10}H_{16}$	β-Terpinene	136.12		174	0.840	982
3823	$C_{10}H_{16}$	$\Delta^{1,5}$-Terpinene	136.12		182	0.855	541
3824	$C_{10}H_{16}$	Terpinolene	136.12		185	0.855	537
3825	$C_{10}H_{16}$	Terpinylene	136.12		175		
3826	$C_{10}H_{16}$	α-Thujene	136.12		151	0.830	440
3827	$C_{10}H_{16}$	β-Thujene	136.12		147.7	0.821	420
3828	$C_{10}H_{16}ClNO$	Ephedrine hydrochloride	201.59	210			
3829	$C_{10}H_{16}ClNO$	α-Limonene nitrosylchloride	201.60	104			
3830	$C_{10}H_{16}ClNO$	Pseudoephedrine hydrochloride	201.59	175			
3831	$C_{10}H_{16}Cl_2$	α-Camphordichloride	207.04	148			
3832	$C_{10}H_{16}Cl_2$	β-Camphordichloride	207.04	178			
3833	$C_{10}H_{16}N_2$	*p*-Aminodiethylaniline	164.14		262		
3834	$C_{10}H_{16}N_2$	*o*-Tetramethylphenylenediamine	164.14		218		
3835	$C_{10}H_{16}N_2$	*m*-Tetramethylphenylenediamine	164.14	−2	262	$0.988^{15.8}$	
3836	$C_{10}H_{16}N_2$	*p*-Tetramethylphenylenediamine	164.14	51	260		
3837	$C_{10}H_{16}N_2O_2$	α-Camphordioxime	196.14	182 d.			
3838	$C_{10}H_{16}N_2O_2$	γ-Camphordioxime	196.14	132			
3839	$C_{10}H_{16}N_2O_3$	5, 5-*n*-Butylethylbarbituric acid	212.14	128			
3840	$C_{10}H_{16}N_2O_3$	5, 5-*sec.*-Butylethylbarbituric acid	212.14	157			
3841	$C_{10}H_{16}N_2O_3$	5, 5-Dipropylbarbituric acid	212.14	145			
3842	$C_{10}H_{16}N_2O_3$	5, 5-Isobutylethylbarbituric acid	212.14	176			
3843	$C_{10}H_{16}N_2O_3$	5, 5-*n*-Propylisopropylbarbituric acid	212.14	162			
3844	$C_{10}H_{16}O$	Alantol	152.12		200		
3845	$C_{10}H_{16}O$	*dl*-Camphor	152.12	174			
3846	$C_{10}H_{16}O$	*d*-Camphor	152.12	179	209.1	0.990^{25}	
3847	$C_{10}H_{16}O$	Carvenone	152.12		233	0.926	897
3848	$C_{10}H_{16}O$	Caryophyllin	152.12	295			
3849	$C_{10}H_{16}O$	α-Citral	152.12		229	0.893^{15}	920
3850	$C_{10}H_{16}O$	β-Citral	152.12		104^{12}	0.888	956
3851	$C_{10}H_{16}O$	Cyclocitral	152.12		114^{29}	0.957^{15}_{4}	825
3852	$C_{10}H_{16}O$	*d*-Fenchone	152.12	6	195	0.944	839
3853	$C_{10}H_{16}O$	Hartin	152.12	230		1.120	
3854	$C_{10}H_{16}O$	Isopulegon	152.12		90^{12}	$0.921^{17.5}$	499
3855	$C_{10}H_{16}O$	Myristicol	152.12		218		
3856	$C_{10}H_{16}O$	Myrtenol	152.12		224	0.976	581
3857	$C_{10}H_{16}O$	Phellandral	152.12		230	0.945	553
3858	$C_{10}H_{16}O$	Pinol	152.12		184	0.942	507
3859	$C_{10}H_{16}O$	Pulegon	152.12		224	0.937	861
3860	$C_{10}H_{16}O$	Sabinol	152.12		209	0.943	546
3861	$C_{10}H_{16}O$	α-Thujone	152.12		200	0.913	827
3862	$[C_{10}H_{16}O]_x$	Urson	$[152.12]_x$	264			
3863	$C_{10}H_{16}O_2$	Acetylmethylheptenone	168.12	−6	234	0.945^{15}	860
3864	$C_{10}H_{16}O_2$	Ascaridol	168.12		84^{5}	1.008^{15}	518
3865	$C_{10}H_{16}O_2$	Geranic acid	168.12		119^{20}	0.952	544
3866	$C_{10}H_{16}O_2$	Hydroxycamphor	168.12	205			
3867	$C_{10}H_{16}O_3$	*d*(*l*)-Pinonic acid	184.12	99	180^{12}		
3867.1	$C_{10}H_{16}O_3$	*dl*-Pinonic acid	184.12	105		1.216	
3868	$C_{10}H_{16}O_4$	*dl*-Camphoric acid	200.12	202			
3869	$C_{10}H_{16}O_4$	*d*-Camphoric acid	200.12	187			
3870	$C_{10}H_{16}O_4$	Cyclohexyl acid succinate	200.12	44			
3871	$C_{10}H_{16}O_4$	*dl*-Isocamphoric acid	200.12	191			
3872	$C_{10}H_{16}O_4$	*d*-Methyl pinate	200.12		130^{9}	1.055	
3873	$C_{10}H_{16}O_5$	*l*-Cineolic acid	216.12	196			1325
3874	$C_{10}H_{16}O_5$	Diethyl acetylsuccinate	216.12		256 d.	1.081	884
3875	$C_{10}H_{17}Br$	*d*-Pinene hydrobromide	217.05	80			

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
3876	$C_{10}H_{17}Cl$	Camphene hydrochloride	172.59	156.5			
3877	$C_{10}H_{17}Cl$	*cis*-β-Chlorodecalin	172.59		112^{15}		
3878	$C_{10}H_{17}Cl$	Fenchyl chloride	172.59		85^{14}	0.983	
3879	$C_{10}H_{17}Cl$	Geranyl chloride	172.59		103^{14}	0.918^{25}	517
3880	$C_{10}H_{17}Cl$	Isobornyl chloride	172.59	161.5			
3881	$C_{10}H_{17}Cl$	*d*-Pinene hydrochloride	172.59	128	207.4		
3882	$C_{10}H_{17}N$	Camphenamine	151.14		205.5	0.940	564
3883	$C_{10}H_{17}N$	Pinylamine	151.14		207	0.940	613
3884	$C_{10}H_{17}NO$	Camphoroxime	167.14	119.5	249		
3885	$C_{10}H_{17}NO$	*d*-Fenchoneoxime	167.14	165	240		
3886	$C_{10}H_{17}NO_3$	*l*-Ecgonine methyl ester	199.14			1.147	547
3886.1	$C_{10}H_{17}NO_3$	*dl*-α-Pinone oxime	199.14	150		1.210	
3887	$C_{10}H_{17}NO_6$	Phaseolunatin	247.14	144			
3888	$C_{10}H_{18}$	Camphane	138.14	152	160		
3889	$C_{10}H_{18}$	Carane	138.14		50^{9}	0.838^{20}_{20}	459
3890	$C_{10}H_{18}$	*cis*-Decahydronaphthalene	138.14	−125	193.3	0.898	539
3891	$C_{10}H_{18}$	*trans*-Decahydronaphthalene	138.14		185.3	0.872	504
3892	$C_{10}H_{18}$	*d*-Menthene	138.14		168	1.4481	423
3893	$C_{10}H_{18}$	*d*-Pinane	138.14	−45	169.4	0.839	448
3894	$C_{10}H_{18}$	Pinocamphane	138.14		164.9	0.856	477
3895	$C_{10}H_{18}$	Thujane	138.14		157	0.814	363
3896	$C_{10}H_{18}Cl_2N_2$	*o*-Tetramethylphenylenediamine hydrochloride	237.07	180			
3897	$C_{10}H_{18}O$	Apopinol	154.14		199	0.894^{18}	
3899	$C_{10}H_{18}O$	Aurantiol	154.14		95^{15}	0.869^{20}	
3900	$C_{10}H_{18}O$	*dl*-Borneol	154.14	210.5			
3901	$C_{10}H_{18}O$	*d*(*l*)-Borneol	154.14	208.6	213.5	1.011	
3902	$C_{10}H_{18}O$	Cineol	154.14	−1	176.4	0.901^{18}	474
3903	$C_{10}H_{18}O$	*d*-Citronellal	154.14		208	0.856	
3904	$C_{10}H_{18}O$	*dl*-Fenchyl alcohol	154.14	33	204.6	0.953	
3905	$C_{10}H_{18}O$	*dl*, (*d*)-Fenchyl alcohol	154.14	42	201	0.935^{40}	
3906	$C_{10}H_{18}O$	*dl*, (*l*)-Fenchyl alcohol	154.14	47	201	0.933^{50}	
3907	$C_{10}H_{18}O$	*d*, (*l*)-Fenchyl alcohol	154.14	49	209		
3908	$C_{10}H_{18}O$	Geraniol	154.14	<−15	229	0.881	531
3909	$C_{10}H_{18}O$	*dl*-Isoborneol	154.14	212			
3910	$C_{10}H_{18}O$	*d*(*l*)-Isoborneol	154.14	216			
3911	$C_{10}H_{18}O$	*dl*-Isofenchyl alcohol	154.14		204		
3912	$C_{10}H_{18}O$	*l*-Isofenchyl alcohol	154.14	62	202	0.961^{15}	859
3913	$C_{10}H_{18}O$	Isopulegol	154.14		102^{12}	0.915	513
3913.1	$C_{10}H_{18}O$	*l*-Isopulegol	154.14		94^{14}	0.9110	509
3914	$C_{10}H_{18}O$	Lavendol	154.14		199	0.873^{15}	
3915	$C_{10}H_{18}O$	*d*-Linalool	154.14		198.3	0.875	480
3916	$C_{10}H_{18}O$	*l*-Linalool	154.14		195	0.866^{15}	981
3917	$C_{10}H_{18}O$	*dl*-Menthone	154.14		210	0.897	441
3918	$C_{10}H_{18}O$	*l*-Menthone	154.14		207	0.896	
3919	$C_{10}H_{18}O$	Myrcenol	154.14		101^{10}	$0.901^{14.5}$	840
3920	$C_{10}H_{18}O$	Nerol	154.14		225.2	0.881	
3921	$C_{10}H_{18}O$	Pinen hydrate (Homopinol)	154.14	59	205		
3922	$C_{10}H_{18}O$	*dl*, α-Terpineol	154.14	35	219.8	0.936	538
3923	$C_{10}H_{18}O$	*d*(*l*), α-Terpineol	154.14	40	217.7	0.919	890
3924	$C_{10}H_{18}O$	β-Terpineol	154.14	33	210.3	0.819^{20}_{20}	521
3925	$C_{10}H_{18}O$	γ-Terpineol	154.14	70			
3926	$C_{10}H_{18}O$	*dl*-Terpinen-4-ol	154.14		214	0.929	533
3927	$C_{10}H_{18}O$	*d*-Terpinen-4-ol (Origanol)	154.14		212	0.926	526
3928	$C_{10}H_{18}O$	Thujyl alcohol	154.14		212	0.921	923
3929	$C_{10}H_{18}O_2$	Acetylmethyl hexyl ketone	170.14	−6	237 d.	0.907^{25}_{25}	
3930	$C_{10}H_{18}O_2$	*d*(*l*)-Campholic acid	170.14	107	260		
3931	$C_{10}H_{18}O_2$	*d*-Citronellic acid	170.14		257	0.931	
3932	$C_{10}H_{18}O_2$	9, 10-Decylenic acid	170.14	<0	142^{4}		
3933	$C_{10}H_{18}O_2$	Fencholic acid	170.14	18	255	$0.970^{18.9}$	462
3934	$C_{10}H_{18}O_3$	Pinol glycol	186.14	129			
3935	$C_{10}H_{18}O_3$	*n*-Valeric anhydride $(C_4H_9CO)_2O$	186.14		215	0.929	
3936	$C_{10}H_{18}O_3$	Isovaleric anhydride	186.14		215	0.933	229

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
3937	$C_{10}H_{18}O_3$	Ethyl diethylacetoacetate	186.14		158.2	1.282	327
3938	$C_{10}H_{18}O_4$	Sebacic acid $HO_2C(CH_2)_8CO_2H$	202.14	127	294.5^{100}		1161
3939	$C_{10}H_{18}O_4$	Isoamyl ethyl malonate	202.14		150^{20}	0.954^{25}_{25}	306
3940	$C_{10}H_{18}O_4$	*n*-Butyl isopropylmalonate	202.14		136^{14}	0.974^{25}_{25}	331
3941	$C_{10}H_{18}O_4$	Di-*n*-butyl oxalate $(CO_2C_4H_9)_2$	202.14		243.4	1.0108	
3942	$C_{10}H_{18}O_4$	Diisobutyl oxalate	202.14		229	1.002^{14}	
3943	$C_{10}H_{18}O_4$	Dipropyl succinate	202.14		250.8	1.006^{15}	
3944	$C_{10}H_{18}O_5$	Dipropyl malate	218.14	10.5	151^{10}	1.075	366
3945	$C_{10}H_{18}O_6$	Dipropyl *d*-tartrate $[HOCHCO_2C_3H_7]_2$	234.14		303	1.139	
3945.1	$C_{10}H_{18}O_6$	Di-*sec.*-propyl tartrate	234.14		158^{16}	$1.116^{13.7}$	
3946	$C_{10}H_{18}O_9$	Arabin	282.14	260			
3947	$C_{10}H_{19}Cl$	*sec.*-Menthyl chloride	174.60		215	0.941	485
3948	$C_{10}H_{19}Cl$	*tert.*-Menthyl chloride	174.60		$94^{18.5}$	0.948	488
3949	$C_{10}H_{19}N$	Bornylamine	153.15	163	200		
3950	$C_{10}H_{19}N$	Camphylamine	153.15		198		
3951	$C_{10}H_{19}N$	*l*-Fenchylamine	153.15		195	0.910^{22}	
3952	$C_{10}H_{19}N$	Geranylamine	153.15		105^{19}	0.829^{25}	511
3953	$C_{10}H_{19}NO$	Lupinine	169.15	68	257		
3954	$C_{10}H_{19}NO_3$	Sebamic acid	201.15	170			
3955	$C_{10}H_{20}$	α-Decylene $CH_2{:}CH(CH_2)_7CH_3$	140.15		172	0.763^0	912
3956	$C_{10}H_{20}$	γ-Decylene $C_3H_7CH{:}CHC_5H_{11}$	140.15		161		
3957	$C_{10}H_{20}$	2, 3-Dimethyl-2-octene	140.15		162^{650}	0.748	
3958	$C_{10}H_{20}$	2, 6-Dimethyl-1(2)-octene	140.15		169	0.789^0	993
3959	$C_{10}H_{20}$	*o*-Menthane	140.15		171	0.814	965
3960	$C_{10}H_{20}$	*m*-Menthane	140.15		168.2	0.790	387
3961	$C_{10}H_{20}$	*p*-Menthane	140.15		170	0.793	358
3962	$C_{10}H_{20}$	2-Methyl-5-ethyl-5-heptene	140.15		158.4	0.761^0	302
3963	$C_{10}H_{20}$	3, 3, 5-Trimethyl-4-heptene	140.15		157.5	0.788^0_0	
3964	$C_{10}H_{20}ClNO$	Lupinine hydrochloride	205.62	213			1244
3965	$C_{10}H_{20}N_2O_6$	Lycetol (Dimethylpiperazine tartrate)	264.17	250			
3966	$C_{10}H_{20}O$	α-Carvacromenthol	156.15		219		
3967	$C_{10}H_{20}O$	β-Carvacromenthol	156.15		222	0.918^0	
3968	$C_{10}H_{20}O$	*d*-Citronellol	156.15		221.7	0.857^{15}	410
3969	$C_{10}H_{20}O$	*l*-Citronellol	156.15		114^{15}	0.861	464
3970	$C_{10}H_{20}O$	*d*-Isomenthol	156.15	83			
3971	$C_{10}H_{20}O$	*o*-Menthan-2-ol	156.15		95^{25}		
3972	$C_{10}H_{20}O$	*p*-Menthan-8-ol	156.15	36	207.4		
3973	$C_{10}H_{20}O$	*l*-α-Menthol	156.15	42.5	212	0.890^{15}_{15}	1168
3974	$C_{10}H_{20}O$	*l*-β-Menthol	156.15	35.5	212	0.890^{15}_{15}	
3974.1	$C_{10}H_{20}O$	*l*-Neomenthol	156.15	<-15	105^{21}	0.8995	473
3975	$C_{10}H_{20}O$	*n*-Capric aldehyde $CH_3(CH_2)_8CHO$	156.15		209.2	0.828^{15}	307
3976	$C_{10}H_{20}O$	Isocapric aldehyde	156.15		169.6	0.828^0	
3977	$C_{10}H_{20}O$	Isopropyl *n*-hexyl ketone	156.15		210	0.841^{17}	
3978	$C_{10}H_{20}O$	Methyl *n*-octyl ketone $CH_3COC_8H_{17}$	156.15	3.5	211	0.825	
3978.1	$C_{10}H_{20}O$	Propyl hexyl ketone $C_3H_7COC_6H_{13}$	156.15	−9	207	0.824	
3979	$C_{10}H_{20}O_2$	*cis*-Terpine	172.15	104.7	258		
3980	$C_{10}H_{20}O_2$	*trans*-Terpine	172.15	158	265		
3981	$C_{10}H_{20}O_2$	*n*-Capric acid $CH_3(CH_2)_8CO_2H$	172.15	31	268.4	0.895^{30}	1038
3981.1	$C_{10}H_{20}O_2$	Di-*n*-butylacetic acid	172.15		140^{16}	$0.898^{18.4}$	
3982	$C_{10}H_{20}O_2$	*n*-Amyl valerate $C_4H_9CO_2C_5H_{11}$	172.15		203.7	0.881^0	213
3983	$C_{10}H_{20}O_2$	*n*-Butyl caproate $C_6H_{13}CO_2C_4H_9$	172.15		204.3	0.882^0_0	
3984	$C_{10}H_{20}O_2$	Ethyl *n*-caprylate $C_7H_{15}CO_2C_2H_5$	172.15	−44.8	205.8	0.878^{17}	
3985	$C_{10}H_{20}O_2$	*n*-Heptyl propionate $C_2H_5CO_2C_7H_{15}$	172.15		208	0.885^0	
3986	$C_{10}H_{20}O_2$	Isoamyl isovalerate	172.15		194	0.870^0	198
3987	$C_{10}H_{20}O_2$	Methyl pelargonate $C_8H_{17}CO_2CH_3$	172.15		214	$0.877^{17.5}$	
3988	$C_{10}H_{20}O_2$	*d*-γ-Nonyl formate	172.15		95^{22}	0.869	258
3989	$C_{10}H_{20}O_2$	*n*-Octyl acetate $CH_3CO_2C_8H_{17}$	172.15	−38.5	210	0.885^0_4	250
3991	$C_{10}H_{20}O_3$	1-Hydroxycapric acid	188.15	70.5			
3992	$C_{10}H_{21}N$	*l*-Menthylamine	155.17		208.2	0.860	475
3993	$C_{10}H_{22}$	*n*-Decane $CH_3(CH_2)_8CH_3$	142.17	−32.0	174	0.747	220
3994	$C_{10}H_{22}$	2, 6-Dimethyloctane	142.17		159	0.734	185
3995	$C_{10}H_{22}$	2, 7-Dimethyloctane	142.17	−52.8	160	0.722	171
3996	$C_{10}H_{22}$	*dl*, 3, 6-Dimethyloctane	142.17		162		

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
3997	$C_{10}H_{22}$	*d*, 3, 6-Dimethyloctane	142.17		160.8	0.735^{13}	
3998	$C_{10}H_{22}$	2-Methylnonane $(CH_3)_2CH(CH_2)_6CH_3$	142.17		160	$0.728_4^{15.1}$	174
3999	$C_{10}H_{22}$	3-Methylnonane $C_2H_5(CH_3)CHC_6H_{13}$	142.17		166.9	0.735	197
4000	$C_{10}H_{22}$	5-Methylnonane $(C_4H_9)_2CHCH_3$	142.17		166.2	0.732	189
4001	$C_{10}H_{22}$	Tripropylmethane $(C_3H_7)_3CH$	142.17		161.7	$0.740^{15.2}$	210
4002	$C_{10}H_{22}O$	*n*-Decyl alcohol $CH_3(CH_2)_9OH$	158.17	7	231	0.829	
4003	$C_{10}H_{22}O$	3, 7-Dimethyl-*n*-octyl alcohol	158.17		118^{15}	0.849_4^0	
4004	$C_{10}H_{22}O$	Methylethylisohexyl carbinol	158.17		89^{14}	0.834_4^{16}	851
4005	$C_{10}H_{22}O$	Propyl-*n*-hexyl carbinol	158.17		211	0.826	
4006	$C_{10}H_{22}O$	*n*-Amyl ether $(C_5H_{11})_2O$	158.17		190	0.774	
4007	$C_{10}H_{22}O$	Isoamyl ether $[(CH_3)_2CHCH_2CH_2]_2O$	158.17		172.2	$0.783^{11.8}$	172
4008	$C_{10}H_{22}O_3$	*cis*-Terpine hydrate	190.15	117.1			1210
4009	$C_{10}H_{22}O_5S_2$	*d*-Glucosediethylmercaptal	286.30	128			
4010	$C_{10}H_{22}S$	Diisoamyl sulfide	174.23		216	0.843	443
4011	$C_{10}H_{23}N$	*n*-Decylamine $CH_3(CH_2)_9NH_2$	157.19	17	218		
4012	$C_{10}H_{23}N$	Diisoamylamine	157.19		190	0.767	281
4013	$C_{10}H_{25}Sb$	Pentaethyl stibine $(C_2H_5)_5Sb$	266.96		100		
4014	$C_{10}H_{30}O$	$\alpha(\beta)$-Lactucerol	166.23	181			
4015	$C_{10}H_{30}O_5$	Agaric acid	230.23	142 d.			
4016	$C_{11}H_6O_{10}$	Benzenepentacarboxylic acid	298.05	233 d.			
4017	$C_{11}H_7ClO$	α-Naphthoyl chloride $C_{10}H_7COCl$	190.51		297.5		
4018	$C_{11}H_7ClO$	β-Naphthoyl chloride $C_{10}H_7COCl$	190.51	43	306		
4019	$C_{11}H_7N$	α-Naphthylcyanide	153.06	33.5	296.5	1.117_5^5	
4020	$C_{11}H_7N$	β-Naphthylcyanide	153.06	66.5	305	1.094_{60}^{60}	
4021	$C_{11}H_7NO_4$	Quinoline-2, 3-dicarboxylic acid	217.06	130 d.			
4022	$C_{11}H_7NO_4$	Quinoline-2, 4-dicarboxylic acid	217.06	246			
4023	$C_{11}H_8O$	α-Naphthaldehyde	156.06		291.6	1.148	962
4024	$C_{11}H_8O$	β-Naphthaldehyde	156.06	60.5		$1.078^{99.4}$	1133
4025	$C_{11}H_8N_2O_4$	Benzoylbarbituric acid	232.08	275			
4026	$C_{11}H_8O_2$	2-Hydroxy-α-naphthaldehyde	172.06	81	192^{97}		
4027	$C_{11}H_8O_2$	4-Hydroxy-α-naphthaldehyde	172.06	178			
4028	$C_{11}H_8O_3$	8-Hydroxy-α-naphthoic acid	188.06	169			
4029	$C_{11}H_8O_2$	α-Naphthoic acid	172.06	160	300		
4030	$C_{11}H_8O_2$	β-Naphthoic acid	172.06	185	>300	1.077_4^{100}	
4031	$C_{11}H_8O_3$	3-Hydroxy-β-naphthoic acid	188.06	219			
4032	$C_{11}H_9N$	2-Phenylpyridine	155.08		270	>1	
4033	$C_{11}H_9N$	3-Phenylpyridine	155.08		270.4	>1	
4034	$C_{11}H_9N$	4-Phenylpyridine	155.08	78	275		
4035	$C_{11}H_9NO_2$	Aniluvitonic acid	187.08	241			
4036	$C_{11}H_9NO_3$	Quininic acid	203.08	280			
4037	$C_{11}H_9NO_6$	Hydrastininic acid	251.08	164			
4038	$C_{11}H_{10}$	α-Methylnaphthalene	142.08	−22	243	1.025	790
4039	$C_{11}H_{10}$	β-Methylnaphthalene	142.08	35.1	245	1.029	1062
4040	$C_{11}H_{10}I_3NO_3$	Thyroxin	584.88	250			
4041	$C_{11}H_{10}O$	Methyl α-naphthyl ether	158.08	<−10	258	$1.096_4^{13.9}$	831
4042	$C_{11}H_{10}O$	Methyl β-naphthyl ether	158.08	72	274		
4043	$C_{11}H_{10}O_2$	Ethyl phenylpropiolate	174.08		270 d.		
4043.1	$C_{11}H_{11}BrN_2O$	4-Bromoantipyrine	267.02	117			1181
4044	$C_{11}H_{11}N$	2, 4-Dimethylquinoline	157.09		264		
4045	$C_{11}H_{11}N$	2, 6-Dimethylquinoline	157.09	58	261		
4046	$C_{11}H_{11}N$	2, 7-Dimethylquinoline	157.09	61	265		
4047	$C_{11}H_{11}N$	3, 4-Dimethylquinoline	157.09	65	291		
4048	$C_{11}H_{11}N$	4, 6-Dimethylquinoline	157.09		256		
4049	$C_{11}H_{11}N$	4, 7-Dimethylquinoline	157.09	55	259		
4050	$C_{11}H_{11}N$	Methyl-α-naphthylamine	157.09		293		
4051	$C_{11}H_{11}NO$	Physostigmol	173.09	108			
4052	$C_{11}H_{11}NO_2$	Indole-2-propionic acid	189.09	136			
4053	$C_{11}H_{11}NO_4$	Ethyl *o*-nitrocinnamate	221.09	44			
4054	$C_{11}H_{11}NO_4$	Ethyl *p*-nitrocinnamate	221.09	141			
4055	$C_{11}H_{12}BrNO_3S$	*p*-Bromophenylmercapturic acid	318.08	153			
4056	$C_{11}H_{12}IN$	Quinaldine methiodide	285.03	190			
4057	$C_{11}H_{12}IN$	Quinoline ethiodide	285.03	157	d.		
4058	$C_{11}H_{12}N_2O$	Antipyrine	188.11	109; 113	319^{174}		1307

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
4059	$C_{11}H_{12}N_2O_2$	4, 4-Phenylethylhydantoin	204.11	199			
4060	$C_{11}H_{12}N_2O_2$	*l*-Tryptophane	204.11	289			
4060.1	$C_{11}H_{12}O$	Benzylidene methyl ethyl ketone	160.09	37.5		0.987^{50}	1061
4061	$C_{11}H_{12}O_2$	Ethyl atropate	176.09		124.4^{16}	1.051	
4062	$C_{11}H_{12}O_2$	*trans*-Ethyl cinnamate	176.09	6.5	271	1.049	746
4063	$C_{11}H_{12}O_3$	3-Benzoylbutyric acid	192.09	126			
4064	$C_{11}H_{12}O_3$	Ethyl benzoylacetate	192.09		270 d.	1.122	704
4065	$C_{11}H_{12}O_3$	α-Ethyl phenylpyruvate	192.09	52	154.5^{15}		
4066	$C_{11}H_{12}O_3$	β-Ethyl phenylpyruvate	192.09		152^{15}		
4067	$C_{11}H_{12}O_3$	γ-Ethyl phenylpyruvate	192.09	79			
4068	$C_{11}H_{12}O_3$	Eugenol formate	192.09		150^{20}		
4069	$C_{11}H_{12}O_3$	Isoeugenol formate	192.09		160^{20}		
4071	$C_{11}H_{12}O_4$	Benzylsuccinic acid	208.09	161			
4072	$C_{11}H_{12}O_4$	α-Hydropiperic acid	208.09	76			
4073	$C_{11}H_{12}O_5$	Sinapic acid	224.09	191			
4074	$C_{11}H_{13}BrN_2O$	Antipyrine hydrobromide	269.03	150			
4075	$C_{11}H_{13}ClN_2O$	Antipyrine hydrochloride	224.57	160			
4076	$C_{11}H_{13}N$	Lilolidine	159.11		156^{15}		
4077	$C_{11}H_{13}NO_3$	Hydrastinine	207.11	116			
4077.1	$C_{11}H_{13}NO_3$	Ethyl hippurate	207.11	60.5	180	1.043^{23}	
4078	$C_{11}H_{13}NO_4$	Benzacetin	223.11	190			
4079	$C_{11}H_{13}NO_4$	Neurodin	223.11	87			
4080	$C_{11}H_{13}N_3O$	4-Aminoisoantipyrine	203.12	109			
4081	$C_{11}H_{13}N_3O$	Benzylcreatinine	203.12	225			
4082	$C_{11}H_{13}N_3O_6$	2, 4, 6-Trinitro-*tert.*-butyltoluene	283.12	97			
4083	$C_{11}H_{14}ClNO_3$	Hydrastinine hydrochloride	243.57	210			
4084	$C_{11}H_{14}N_2$	Calycanthine	174.12	243			
4085	$C_{11}H_{14}N_2$	Isocalycanthine	174.12	235			
4086	$C_{11}H_{14}N_2O$	Cytisine	190.12	153			1333
4087	$C_{11}H_{14}N_2O_2$	Antithermine (Acetopropionylphenylhydrazone)	206.12	108			
4088	$C_{11}H_{14}O$	Butyl phenyl ketone $C_6H_5COC_4H_9$	162.11		239.5		
4089	$C_{11}H_{14}O$	Isobutyl phenyl ketone	162.11		225	0.967	
4090	$C_{11}H_{14}O$	Isopropyl benzyl ketone	162.11		237	0.985_4^0	
4090.1	$C_{11}H_{14}O$	*p*-Methylbutyrophenone	162.11		252^{739}	1.026	683
4091	$C_{11}H_{14}O$	Propyl benzyl ketone	162.11		244	0.984_4^0	
4091.1	$C_{11}H_{14}O$	2, 4, 6-Trimethylacetophenone	162.11		240.5^{735}	0.975	661
4092	$C_{11}H_{14}O_2$	Eugenol methyl ether	178.11		249	1.055^{15}	
4093	$C_{11}H_{14}O_2$	Isoeugenol methyl ether	178.11		264	1.055	
4094	$C_{11}H_{14}O_2$	*p*-Isopropylphenylacetic acid	178.11	52			
4095	$C_{11}H_{14}O_2$	*n*-Butyl benzoate $C_6H_5CO_2C_4H_9$	178.11	−22.4	250.3	1.000^{20}	
4096	$C_{11}H_{14}O_2$	Benzyl butyrate $C_3H_7CO_2CH_2C_6H_5$	178.11		240	$1.016^{17.5}$	
4097	$C_{11}H_{14}O_2$	Benzyl isobutyrate	178.11		228	1.016^{18}	557
4097.1	$C_{11}H_{14}O_2$	*d*-β-Butyl benzoate	178.11		120^{20}	1.000	563
4098	$C_{11}H_{14}O_2$	Ethyl hydrocinnamate	178.11		249	1.015	571
4099	$C_{11}H_{14}O_2$	Isobutyl benzoate	178.11		237	1.002^{15}	
4100	$C_{11}H_{14}O_2$	Phenyl isovalerate	178.11		226		
4101	$C_{11}H_{14}O_3$	*n*-Butyl salicylate	194.11		155^{15}		
4102	$C_{11}H_{14}O_3$	Propyl anisate *p*-$CH_3OC_6H_4CO_2C_3H_7$	194.11		176^{45}	1.09	653
4103	$C_{11}H_{14}O_3$	Zingerone	194.11	41	188^{14}		
4104	$C_{11}H_{15}NO$	*p*-Diethylaminobenzaldehyde	177.12	41	174^7		
4105	$C_{11}H_{15}NO$	Isovaleroanilide	177.12	115			
4106	$C_{11}H_{15}NO$	*n*-Valeroanilide	177.12	49	267		
4107	$C_{11}H_{15}NO_2$	*p*-Diethylaminobenzoic acid	193.12	193			
4108	$C_{11}H_{15}NO_2$	Isobutyl *p*-aminobenzoate	193.12	65			
4109	$C_{11}H_{15}NO_2$	Methylacetophenetidine	193.12	40	300		
4110	$C_{11}H_{15}NO_2$	Triphenin	193.12	120			
4111	$C_{11}H_{15}NO_3$	Anhalamine	209.12	188			
4112	$C_{11}H_{15}NO_3$	Lactophenine	209.12	118			
4113	$C_{11}H_{15}NO_3$	Methoxyacetophenetidin	209.12	98			
4114	$C_{11}H_{15}NO_7S$	Hydrastinine bisulfate	305.19	216			
4115	$C_{11}H_{16}$	*n*-Amylbenzene $CH_3(CH_2)_4C_6H_5$	148.12		202.1	0.860	514
4116	$C_{11}H_{16}$	*tert.*-Amylbenzene	148.12		189.3	0.874^{15}	

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
4117	$C_{11}H_{16}$	3, 5-Diethyltoluene	148.12		200	0.879	
4118	$C_{11}H_{16}$	Isoamylbenzene $(CH_3)_2CH(CH_2)_2C_6H_5$	148.12		194	0.885	
4119	$C_{11}H_{16}$	Pentamethylbenzene $(CH_3)_5C_6H$	148.12	53	230	$0.847^{107.2}_{4}$	1152
4120	$C_{11}H_{16}$	4-Propyl-*o*-xylene $C_3H_7C_6H_3(CH_3)_2$	148.12	< −20	209		
4121	$C_{11}H_{16}$	4-Propyl-*m*-xylene $C_3H_7C_6H_3(CH_3)_2$	148.12	< −20	208.5		
4122	$C_{11}H_{16}$	2-Propyl-*p*-xylene $C_3H_7C_6H_3(CH_3)_2$	148.12	< −20	207		
4123	$C_{11}H_{16}Br_2N_2O_3$	*N*-2, 3-Dibromopropyl-5, 5-diethylbarbituric acid	383.97	125			
4124	$C_{11}H_{16}ClNO_3$	Anhalamine hydrochloride	245.59	258			
4125	$C_{11}H_{16}N_2O_2$	Pilocarpine	208.14	34			
4126	$C_{11}H_{16}N_2O_2$	Isopilocarpine	208.14		261^{10}		
4127	$C_{11}H_{16}O$	*p*-Isoamylphenol	164.12	93	255		
4128	$C_{11}H_{16}C$	Pentamethylphenol	164.12	125	267		
4129	$C_{11}H_{16}O$	Benzyl *n*-butyl ether $C_6H_5CH_2OC_4H_9$	164.12		216		
4130	$C_{11}H_{16}O$	Benzyl isobutyl ether	164.12		213	$0.928^{19.3}$	
4131	$C_{11}H_{16}O$	Phenyl isoamyl ether	164.12		225	0.920	545
4132	$C_{11}H_{16}O$	Thymyl methyl ether	164.12		216.2	0.954	
4133	$C_{11}H_{17}BrN_2O_2$	Isopilocarpine hydrobromide	289.06	147			
4134	$C_{11}H_{17}BrN_2O_2$	Pilocarpine hydrobromide	289.06	185			1333
4135	$C_{11}H_{17}ClN_2O_2$	Isopilocarpine hydrochloride	244.61	127			
4136	$C_{11}H_{17}ClN_2O_2$	Pilocarpine hydrochloride	244.61	196.7			1333
4137	$C_{11}H_{17}N$	*o*-Diethyltoluidine	163.14		206		
4138	$C_{11}H_{17}N$	*m*-Diethyltoluidine	163.14		228		
4139	$C_{11}H_{17}N$	*p*-Diethyltoluidine	163.14		229	$0.924^{15.5}$	
4140	$C_{11}H_{17}N$	Isoamylaniline	163.14		254.5	0.928^{15}_{4}	
4141	$C_{11}H_{17}NO_3$	Mescaline	211.14	151			
4142	$C_{11}H_{17}N_3O_5$	Isopilocarpine nitrate	271.16	159			
4143	$C_{11}H_{17}N_3O_5$	Pilocarpine nitrate	271.16	173			1333
4144	$C_{11}H_{17}O_2$	Citronellyl formate	181.13		98^{11}	0.884	453
4145	$C_{11}H_{18}N_2O_3$	5, 5-*n*-Butylisopropylbarbituric acid	226.16	210			
4146	$C_{11}H_{18}N_2O_3$	5, 5-Isoamylethylbarbituric acid	226.16	156			
4147	$C_{11}H_{18}O_2$	*d*-Bornyl formate	182.14		230	1.009	858
4148	$C_{11}H_{18}O_2$	Geranyl formate	182.14		98^{11}	0.909	491
4149	$C_{11}H_{18}O_2$	Isobornyl formate	182.14		100^{14}	1.017^{15}	
4150	$C_{11}H_{18}O_2$	Methyl geranate	182.14		117^{14}	0.922	961
4151	$C_{11}H_{18}O_2$	*d*, α-Terpinyl formate	182.14		136^{40}	0.999^{0}	
4152	$C_{11}H_{18}O_4$	Ethyl camphorate	214.14	87			
4153	$C_{11}H_{18}O_5$	Diethyl ethylacetylmalonate	230.14		137.5^{20}	1.053	316
4154	$C_{11}H_{19}N_3O$	*d*-Camphor semicarbazone	209.17	238			
4155	$C_{11}H_{20}O$	Geranyl methyl ether	168.15		212		
4156	$C_{11}H_{20}O$	Methyl *d*-bornyl ether	168.15		195.3	0.916	1011
4157	$C_{11}H_{20}O_2$	*l*-Menthyl formate	184.15	9	217	0.936	
4158	$C_{11}H_{20}O_2$	Undecylenic acid	184.15	24.5	295	0.907	
4159	$C_{11}H_{20}O_3$	Isoamyl ethylacetoacetate	200.15		236 d.	0.951^{25}_{25}	
4160	$C_{11}H_{20}O_4$	Di-*n*-butyl malonate $CH_2(CO_2C_4H_9)_2$	216.15		251.5	1.005^{0}_{0}	
4161	$C_{11}H_{20}O_4$	Diethyl diethylmalonate	216.15		223	0.990	282
4162	$C_{11}H_{20}O_4$	Isoamyl isopropyl malonate	216.15		140^{25}	0.958^{25}_{25}	314
4163	$C_{11}H_{20}O_5$	Glycerol 1, 2-dibutyrate	232.15		282		
4164	$C_{11}H_{21}NO_2$	Menthyl carbamate	199.17	165	>200 d.		
4165	$C_{11}H_{22}$	α-Undecylene $CH_2{:}CH(CH_2)_8CH_3$	154.17		188	0.763	
4166	$C_{11}H_{22}$	β-Undecylene $CH_3CH{:}CH(CH_2)_7CH_3$	154.17		193	0.774^{15}_{15}	341
4167	$C_{11}H_{22}N_3O_4$	Clavine	260.19	263			
4168	$C_{11}H_{22}O$	Methyl *l*-menthyl ether	170.17			0.861	
4169	$C_{11}H_{22}O$	Undecylic aldehyde	170.17	−4	117^{18}	0.825^{23}	342
4170	$C_{11}H_{22}O$	Diamyl ketone $(C_5H_{11})_2CO$	170.17	14.6	226.3	0.826^{20}	
4171	$C_{11}H_{22}O$	Diisoamyl ketone	170.17		226		
4172	$C_{11}H_{22}O$	Methyl *n*-nonyl ketone	170.17	12.1	228	0.826	312
4173	$C_{11}H_{22}O_2$	Umbellulic acid	186.17	23	280		
4174	$C_{11}H_{22}O_2$	Undecylic acid $CH_3(CH_2)_{11}CO_2H$	186.17	29.3	228^{160}		1066
4175	$C_{11}H_{22}O_2$	Ethyl pelargonate $C_8H_{17}CO_2C_2H_5$	186.17	−44.5	219	$0.866^{17.5}$	
4176	$C_{11}H_{22}O_2$	Methyl caprate $C_9H_{19}CO_2CH_3$	186.17	−18	224		
4177	$C_{11}H_{22}O_3$	Diisoamyl carbonate	202.17		228.7	0.912^{15}	
4178	$C_{11}H_{24}$	*n*-Undecane $CH_3(CH_2)_9CH_3$	156.18	−26.5	197	0.741	234

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
4178.1	$C_{11}H_{24}$	ε-Ethylnonane	156.18		71^{16}	0.751^{19}	
4179	$C_{11}H_{24}O$	n-Undecyl alcohol $CH_3(CH_2)_9CH_2OH$	172.19	19	146^{30}	0.833	374
4179.1	$C_{11}H_{24}O$	n-Undecan-6-ol	172.19	16	235^{754}	0.833	
4180	$C_{11}H_{25}N$	n-Undecylamine $CH_3(CH_2)_9CH_2NH_2$	171.20	16.5	234		
4181	$C_{12}H_5N_7O_{12}$	Dipicrylamine $[2, 4, 6\text{-}(NO_2)_3C_6H_2]_2NH$	439.10	250 d.			
4182	$C_{12}H_6O_{12}$	Mellitic acid $C_6(CO_2H)_6$	342.05	286			
4183	$C_{12}H_7N_3O_7$	Phenyl picrate	305.08	153			
4184	$C_{12}H_8$	Acenaphthylene	152.06	93	275		1192
4185	$C_{12}H_8AsN$	Phenarsazine	241.03	310			
4185.1	$C_{12}H_8Br_2$	p, p′-Di-(bromophenyl)	311.89	164		1.897	
4186	$C_{12}H_8Cl_2$	1, 2-Dichloracenaphthene	222.98	115			
4187	$C_{12}H_8N_2$	Phenanthroline	180.08	78.5	>360		
4188	$C_{12}H_8N_2$	Phenazine	180.08	171	>360		
4189	$C_{12}H_8N_2$	Phenazone	180.08	156	>360		
4190	$C_{12}H_8N_2$	Pseudophenanthroline	180.08	173			
4191	$C_{12}H_8N_2O_4$	Dinitroacenaphthene	244.08	206 d.			
4192	$C_{12}H_8N_2O_4$	o, o′-Dinitrodiphenyl	244.08	124			
4193	$C_{12}H_8N_2O_4$	m, m′-Dinitrodiphenyl	244.08	198			
4194	$C_{12}H_8N_2O_4$	p, p′-Dinitrodiphenyl	244.08	233			
4195	$C_{12}H_8O$	Diphenylene oxide	168.06	87	288		
4196	$C_{12}H_8O_2$	2-Phenylbenzoquinone	184.06	107			
4197	$C_{12}H_8O_4$	1, 8-Naphthalic acid	216.06	270			
4198	$C_{12}H_8O_4$	Bergaptene	216.06	188			
4199	$C_{12}H_8O_4$	Paracotoin	216.06	152			
4200	$C_{12}H_8O_4$	Xanthotoxin	216.06	146			
4201	$C_{12}H_8S_2$	Thianthrene	216.19	160	366		
4202	$C_{12}H_9AsClN$	Phenarsazine chloride	277.50	193			
4203	$C_{12}H_9Br$	3-Bromoacenaphthene	232.99	51.2	336.4	1.437^{55}_{4}	
4204	$C_{12}H_9Cl$	3-Chloroacenaphthene	188.53	69.8	319		
4205	$C_{12}H_9Cl$	o-Chlorodiphenyl $o\text{-}ClC_6H_4C_6H_5$	188.53	34	268		
4206	$C_{12}H_9Cl$	m-Chlorodiphenyl $m\text{-}ClC_6H_4C_6H_5$	188.53	89			
4207	$C_{12}H_9Cl$	p-Chlorodiphenyl $p\text{-}ClC_6H_4C_6H_5$	188.52	75.5	282		
4208	$C_{12}H_9ClN_2$	m-Chloroazobenzene	216.54	67.5			
4209	$C_{12}H_9ClN_2$	p-Chloroazobenzene $p\text{-}ClC_6H_4NNC_6H_5$	216.54	89			
4210	$C_{12}H_9I$	3-Iodoacenaphthene	280.00	65	180 d.	1.674^{62}_{4}	
4211	$C_{12}H_9N$	Carbazole	167.08	244.8	354.8		1333
4212	$C_{12}H_9NO_2$	o-Nitrodiphenyl $o\text{-}NO_2C_6H_4C_6H_5$	199.08	37	320		
4213	$C_{12}H_9NO_2$	m-Nitrodiphenyl $m\text{-}NO_2C_6H_4C_6H_5$	199.08	61			
4214	$C_{12}H_9NO_2$	p-Nitrodiphenyl $p\text{-}NO_2C_6H_4C_6H_5$	199.08	113	340		
4215	$C_{12}H_9NS$	Thiodiphenylamine	199.14	180	371 d.		
4216	$C_{12}H_9N_3O_2$	p-Nitroazobenzene	227.09	129.9			
4217	$C_{12}H_9N_3O_5$	2, 4-Dinitro-4′-hydroxydiphenylamine	275.09	190			
4218	$C_{12}H_{10}$	Acenaphthene	154.08	95	277.5	$1.024^{99.2}$	1127, 1193
4219	$C_{12}H_{10}$	Diphenyl $C_6H_5C_6H_5$	154.08	69.0	254.9	1.041	1105
4220	$C_{12}H_{10}AsCl$	Diphenyl arsine chloride	264.50	42.8	327 d.	1.583^{40}	
4221	$C_{12}H_{10}As_2$	Arsenobenzene $C_6H_5AsAsC_6H_5$	304.00	196			
4221.1	$C_{12}H_{10}ClI$	Diphenyliodonium chloride	316.47	d. 230		1.67	
4222	$C_{12}H_{10}Cl_2N_2$	Dichlorobenzidine $[2, 4\text{-}Cl(NH_2)C_6H_3]_2$	253.01	163			
4223	$C_{12}H_{10}Cl_2N_2$	p, p-Dichlorbenzidine	253.01	60			
4224	$C_{12}H_{10}N_2$	Aribine	182.09	237			
4225	$C_{12}H_{10}N_2$	Azobenzene $C_6H_5NNC_6H_5$	182.09	67	297.4	1.203	
4226	$C_{12}H_{10}N_2O$	Azoxybenzene	198.09	36		1.246	1031
4227	$C_{12}H_{10}N_2O$	p-Hydroxyazobenzene	198.09	152			
4228	$C_{12}H_{10}N_2O$	N-Nitrosodiphenylamine $(C_6H_5)_2NNO$	198.09	66.5			
4229	$C_{12}H_{10}N_2O$	p-Nitrosophenylaniline	198.09	143			
4230	$C_{12}H_{10}N_2O_2$	o, o′-Azophenol	214.09	172			
4231	$C_{12}H_{10}N_2O_2$	m, m′-Azophenol $HOC_6H_4NNC_6H_4OH$	214.09	205			
4232	$C_{12}H_{10}N_2O_2$	p, p′-Azophenol	214.09	215			
4233	$C_{12}H_{10}N_2O_2$	o-Nitrodiphenylamine	214.09	75			
4234	$C_{12}H_{10}N_2O_2$	p-Nitrodiphenylamine	214.09	133			
4235	$C_{12}H_{10}N_2O_2S$	Benzidinesulfone	246.16	>350			
4236	$C_{12}H_{10}N_2O_3$	o, o′-Azoxyphenol	288.17	102			

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
4237	$C_{12}H_{10}N_2O_3$	*p, p′*-Azoxyphenol	288.17	156; 107			
4238	$C_{12}H_{10}O$	*o*-Phenylphenol $C_6H_5C_6H_4OH$	170.08	56	275		
4239	$C_{12}H_{10}O$	*m*-Phenylphenol $C_6H_5C_6H_4OH$	170.08	78	>300		
4240	$C_{12}H_{10}O$	*p*-Phenylphenol $C_6H_5C_6H_4OH$	170.08	165	308		
4241	$C_{12}H_{10}O$	Phenyl ether $C_6H_5OC_6H_5$	170.08	26.9	259	1.072	1019
4242	$C_{12}H_{10}OS$	Diphenyl sulfoxide $(C_6H_5)_2SO$	202.14	70.5	340		
4243	$C_{12}H_{10}O_2$	*o, o′*-Diphenol $OHC_6H_4.C_6H_4OH$	186.08	109	326		
4244	$C_{12}H_{10}O_2$	*o, p′*-Diphenol $OHC_6H_4.C_6H_4OH$	186.08	161	342		
4245	$C_{12}H_{10}O_2$	*m, m′*-Diphenol $OHC_6H_4.C_6H_4OH$	186.08	123.5			
4246	$C_{12}H_{10}O_2$	*p, p′*-Diphenol $OHC_6H_4.C_6H_4OH$	186.08	272			
4247	$C_{12}H_{10}O_2$	*α*-Naphthyl acetate $CH_3CO_2C_{10}H_7$	186.08	44.8			
4248	$C_{12}H_{10}O_2$	*β*-Naphthyl acetate $CH_3CO_2C_{10}H_7$	186.08	68.5			
4249	$C_{12}H_{10}O_2S$	Diphenyl sulfone $(C_6H_5)_2SO_2$	218.14	129	377.8		
4250	$C_{12}H_{10}O_3S$	Phenyl benzenesulfonate	234.14	35			
4251	$C_{12}H_{10}O_4$	2, 2′-Diresorcinol	218.08	268			
4252	$C_{12}H_{10}O_4$	4, 4′-Diresorcinol	218.08	222			
4253	$C_{12}H_{10}O_4$	5, 5′-Diresorcinol	218.08	310			
4254	$C_{12}H_{10}O_4$	Piperic acid	218.08	217	220 d.		
4255	$C_{12}H_{10}O_4$	Quinhydrone	218.08	171			
4256	$C_{12}H_{10}O_4S$	4, 4′-Dihydroxydiphenylsulfone	250.14	239			
4257	$C_{12}H_{10}O_5$	Paracotoic acid	234.08	108			
4258	$C_{12}H_{10}O_5S_2$	Benzenesulfonic anhydride	298.21	90	240^{10} d.		
4259	$C_{12}H_{10}P_2$	Phosphobenzene $C_6H_5P.PC_6H_5$	216.13	149			
4260	$C_{12}H_{10}S$	Diphenyl sulfide $(C_6H_5)_2S$	186.14		293	1.119^{15}_{15}	948
4261	$C_{12}H_{10}S_2$	Diphenyl disulfide $(C_6H_5)_2S_2$	218.21	61	310		
4262	$C_{12}H_{10}Se$	Diphenyl selenide $(C_6H_5)_2Se$	233.28		302	1.356^{15}	
4263	$C_{12}H_{10}Te$	Diphenyl telluride $(C_6H_5)_2Te$	281.58		320	1.556^{15}	800
4264	$C_{12}H_{11}As$	Diphenylarsine $(C_6H_5)_2AsH$	230.05		155^{37}		
4265	$C_{12}H_{11}AsO_2$	Diphenylarsonic acid $(C_6H_5)_2AsOOH$	262.05	178			
4266	$C_{12}H_{11}N$	*o*-Aminodiphenyl $C_6H_5C_6H_4NH_2$	169.09	45.5	299		
4267	$C_{12}H_{11}N$	2-Benzylpyridine	169.09		276		
4268	$C_{12}H_{11}N$	3-Benzylpyridine	169.09	34	286		
4269	$C_{12}H_{11}N$	4-Benzylpyridine	169.09		287		
4270	$C_{12}H_{11}N$	Diphenylamine $(C_6H_5)_2NH$	169.09	53	302	1.159	1333
4271	$C_{12}H_{11}NO$	*m*-Phenylaminophenol	185.09	82	340		
4272	$C_{12}H_{11}NO_2S$	Benzenesulfanilide	233.16	110			1183
4273	$C_{12}H_{11}N_3$	*m*-Aminoazobenzene	197.11	59			
4274	$C_{12}H_{11}N_3$	*p*-Aminoazobenzene $C_6H_5N_2C_6H_4NH_2$	197.11	126	>360		
4275	$C_{12}H_{11}N_3$	Diazoaminobenzene $C_6H_5N_2NHC_6H_5$	197.11	96	exp.		
4276	$C_{12}H_{11}N_3O_2$	*o*-Nitrobenzidine	229.11	143			
4277	$C_{12}H_{11}N_3O_2$	*m*-Nitrobenzidine	229.11	190			
4278	$C_{12}H_{11}P$	Diphenylphosphine $(C_6H_5)_2PH$	186.11		280	1.07^{16}	
4279	$C_{12}H_{12}$	1, 4-Dimethylnaphthalene	156.09	<−18	264.3	1.016	900
4280	$C_{12}H_{12}$	2, 3-Dimethylnaphthalene	156.09		266		
4281	$C_{12}H_{12}$	2, 6-Dimethylnaphthalene	156.09	111			
4282	$C_{12}H_{12}$	*α*-Ethylnaphthalene	156.09	<−14	258 d.	1.064^{15}_{15}	
4283	$C_{12}H_{12}$	*β*-Ethylnaphthalene	156.09	−19	251	1.008^{0}	
4284	$C_{12}H_{12}ClN$	Diphenylamine hydrochloride	205.56				1333
4285	$C_{12}H_{12}N_2$	*p*-Aminodiphenylamine	184.11	75	354		
4286	$C_{12}H_{12}N_2$	Benzidine $(p\text{-}NH_2C_6H_4)_2$	184.11	128.7	401.7		
4287	$C_{12}H_{12}N_2$	*β*-Benzidine	184.11	45	363		
4288	$C_{12}H_{12}N_2$	1, 1-Diphenylhydrazine $(C_6H_5)_2NNH_2$	184.11	36	220^{50}		
4289	$C_{12}H_{12}N_2$	Hydrazobenzene $C_6H_5NHNHC_6H_5$	184.11	131	d.		
4290	$C_{12}H_{12}N_2O$	Harmalol	200.11	212 d.			
4291	$C_{12}H_{12}N_2O_3$	Luminal (5,5-Phenylethylbarbituric acid)	232.11	173			
4292	$C_{12}H_{12}N_2O_6S_2$	Benzene-*o, o′*-disulfonic acid	344.24	>175 d.			
4293	$C_{12}H_{12}N_4$	Chrysoidine	212.12	117.5			1333
4294	$C_{12}H_{12}N_4$	*p, p′*-Diaminoazobenzene	212.12	241			
4295	$C_{12}H_{12}N_4O_4$	Urocanic acid	276.12	213 d.			
4296	$C_{12}H_{12}O$	Ethyl *α*-naphthyl ether	172.09	5.5	276.4	1.061	779
4297	$C_{12}H_{12}O$	Ethyl *β*-naphthyl ether	172.09	37.5	282	1.064	1071
4297.1	$C_{12}H_{12}O$	*l*-Methyl-*α*-naphthyl carbinol	172.09	47	116^{11}	1.115	
4298	$C_{12}H_{12}O_2$	Benzylideneacetylacetone	188.09		188^{15}		

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
4299	$C_{12}H_{12}O_2$	Allyl cinnamate	188.09		286 d.	1.052^{25}_{25}	
4300	$C_{12}H_{12}O_3$	Benzoylacetylacetone	204.09	35	167^{22}	1.152^{15}_{15}	
4301	$C_{12}H_{12}O_6$	Brasilic acid	252.09	129			
4302	$C_{12}H_{12}O_6$	Phloroglucinol triacetate	252.09	106			
4303	$C_{12}H_{12}O_6$	Pyrogallol triacetate	252.09	165			
4304	$C_{12}H_{13}N$	Dimethyl-α-naphthylamine	171.11		276	1.045^{15}_{15}	810
4305	$C_{12}H_{13}N$	Dimethyl-β-naphthylamine	171.11	46	305	$1.028^{53.2}_{4}$	1081
4306	$C_{12}H_{13}N$	Ethyl α-naphthylamine	171.11		176^{15}	1.060	871
4307	$C_{12}H_{13}N$	Ethyl β-naphthylamine	171.11		183^{15}	1.057	969
4308	$C_{12}H_{13}N$	2, 6, 8-Trimethylquinoline	171.11	46	261.4		
4309	$C_{12}H_{13}NO_3$	Pyrantin	219.11	155			
4310	$C_{12}H_{13}N_3$	*p, p′*-Diaminodiphenylamine	199.12	158			
4311	$C_{12}H_{14}As_2Cl_2N_2O_2$	Arsphenamine	438.96	160 d.			
4312	$C_{12}H_{14}IN$	Quinaldine ethiodide	299.05	234			
4313	$C_{12}H_{14}N_2O$	*p*-Tolylantipyrine	202.12	137			
4314	$C_{12}H_{14}N_4O_4S_2$	Benzidine-*o, o′*-disulfoneamide	342.27	278			
4315	$C_{12}H_{14}N_4O_6$	Desoxyamalic acid	310.14	260 s. d.			
4316	$C_{12}H_{14}N_4O_8$	Amalic acid (Tetramethylalloxantine)	342.14	221 d.			
4317	$C_{12}H_{14}O_2$	*n*-Propyl cinnamate	190.11		285.1	1.044^{0}	
4318	$C_{12}H_{14}O_3$	Eugenol acetate	206.11	31	282.4	1.084	665
4318.1	$C_{12}H_{14}O_3$	Ethyl *p*-methoxycinnamate	206.11	52			1232
4319	$C_{12}H_{14}O_3$	Isoeugenol acetate	206.11	80	283		
4322	$C_{12}H_{14}O_4$	Apiol	222.11	29.5	294	1.015	1310
4323	$C_{12}H_{14}O_4$	Isoapiol	222.11	56	304	1.197^{12}	817
4324	$C_{12}H_{14}O_4$	Diethyl *o*-phthalate $o\text{-}C_6H_4(CO_2C_2H_5)_2$	222.11		296.1	1.122	607
4325	$C_{12}H_{15}N$	Carbazoline	173.12	99	297		
4326	$C_{12}H_{15}N$	Diallylaniline $C_6H_5N(CH_2CH{:}CH_2)_2$	173.12		245	0.954	
4327	$C_{12}H_{15}N$	Julolidine	173.12	40	280		
4328	$C_{12}H_{15}NO$	Benzoylpiperidine	189.12	48	184^{17}		
4329	$C_{12}H_{15}NO$	Naphthalanmorpholine	189.12	63	312		
4330	$C_{12}H_{15}NO_2$	Dipropionanilide $C_6H_5N(OCC_2H_5)_2$	205.12	44	179.5^{30}		
4330.1	$C_{12}H_{15}NO_3$	Ethyl phenaceturate	221.12	79			1280
4331	$C_{12}H_{15}NO_3$	Anhalonidine	221.12	160			
4332	$C_{12}H_{15}NO_3$	Anhalonine	221.12	85.5			
4333	$C_{12}H_{15}NO_3$	Hydrocotarnine	221.12	55	100 d.		
4334	$C_{12}H_{15}NO_4$	Cotarnine	237.12	133			
4335	$C_{12}H_{16}N_2O$	Methylcytisine (Caulophylline)	204.14	137			
4336	$C_{12}H_{16}N_2O_4S$	Aniline sulfate $(C_6H_5NH_2)_2H_2SO_4$	284.20			1.377^{4}	
4337	$C_{12}H_{16}O$	Isoamyl phenyl ketone	176.12		242.5		
4338	$C_{12}H_{16}O$	Isobutyl benzyl ketone	176.12		250.5	0.969^{0}_{4}	
4339	$C_{12}H_{16}O_2$	Eugenol ethyl ether	192.12		254	$1.021^{9.5}$	808
4340	$C_{12}H_{16}O_2$	Isoeugenol ethyl ether	192.12	64			
4341	$C_{12}H_{16}O_2$	Pentamethylbenzoic acid	192.12	210.5			
4342	$C_{12}H_{16}O_2$	Amyl benzoate $C_6H_5CO_2C_5H_{11}$	192.12		d.	0.989	566
4343	$C_{12}H_{16}O_2$	Benzyl isovalerate	192.12		136^{25}		
4344	$C_{12}H_{16}O_2$	Benzyl *d*-valerate	192.12		250^{730}	0.982^{22}	558
4345	$C_{12}H_{16}O_2$	Isoamyl benzoate	192.12		262	0.993	
4345.1	$C_{12}H_{16}O_2$	Isopropyl hydrocinnamate	192.12		126^{11}	0.986^{25}	
4346	$C_{12}H_{16}O_2$	Thymyl acetate	192.12		243	1.009^{0}	
4347	$C_{12}H_{16}O_3$	*n*-Amyl salicylate $o\text{-}HOC_6H_4CO_2C_5H_{11}$	208.12		265	1.065^{15}	
4348	$C_{12}H_{16}O_3$	Butyl anisate $p\text{-}CH_3OC_6H_4CO_2C_4H_9$	208.12		183^{40}	1.054	635
4349	$C_{12}H_{16}O_3$	Isoamyl salicylate	208.12		273	1.045^{25}_{25}	
4350	$C_{12}H_{16}O_3$	Isobutyl anisate	208.12		170^{16}	1.052	634
4351	$C_{12}H_{16}O_3$	Guaiacyl valerate $C_4H_9CO_2C_6H_4OMe$	208.12		265		
4352	$C_{12}H_{16}O_3$	Asaron	208.12	67	296	1.165	1333
4353	$C_{12}H_{16}O_3$	Elemicin	208.12		147^{10}	1.063	694
4354	$C_{12}H_{16}O_4$	Aspidinol	224.12	161			
4355	$C_{12}H_{16}O_6$	Diethyl succinylsuccinate	256.12	128			
4356	$C_{12}H_{16}O_6$	*d*, β-Phenylglucoside	256.12	175			
4357	$C_{12}H_{16}O_7$	Arbutin	272.12	195			1333
4358	$C_{12}H_{17}AsN_2O_4$	Aniline arsenate $(C_6H_5NH_2)_2H_3AsO_4$	328.11	140			
4359	$C_{12}H_{17}NO$	*N*-*n*-Butylacetanilide	191.14		276.5		
4360	$C_{12}H_{17}NO$	Caproanilide $CH_3(CH_2)_4CONHC_6H_5$	191.14	95			

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
4361	$C_{12}H_{17}NO$	*C*-Diethylacetanilide	191.14	124			
4362	$C_{12}H_{17}NO_2$	Ethyl-*N*-phenacetine	207.14	38	298		
4363	$C_{12}H_{17}NO_2$	Ethyl-*o*-tolylurethane	207.14		255		
4364	$C_{12}H_{17}N_5O_9$	Lysine picrate	375.17	252 d.			
4365	$C_{12}H_{18}$	Hexamethylbenzene	162.14	166	265		
4365.1	$C_{12}H_{18}$	1-Methyl-3-*tert.*-amylbenzene	162.14		208	0.8673	
4366	$C_{12}H_{18}$	1, 2, 4-Triethylbenzene	162.14		218	0.882	583
4367	$C_{12}H_{18}$	1, 3, 5-Triethylbenzene	162.14		218	0.863	565
4367.1	$C_{12}H_{18}N_2O_4$	Rhamnose phenylhydrazone	254.16	159			
4367.2	$C_{12}H_{18}N_2O_5$	*d*, *α*-Glucosephenylhydrazone	270.16	160			
4367.3	$C_{12}H_{18}N_2O_5$	*d*, *β*-Glucosephenylhydrazone	270.16	141			
4367.4	$C_{12}H_{18}N_4O$	Phenylhydrazine hydrate	234.17	24			
4367.5	$C_{12}H_{18}N_4O_2$	Hexamethylenetetramineresorcinol	250.17	200 d.			
4367.6	$C_{12}H_{18}O$	Benzyl isoamyl ether	178.14		237.5		
4367.7	$C_{12}H_{18}O$	Thymyl ethyl ether	178.14		226.9	0.933_0^0	
4367.8	$C_{12}H_{18}O$	Mellithyl alcohol $(CH_3)_5C_6CH_2OH$	178.14	160.5			
4367.9	$C_{12}H_{18}O_3$	Phloroglucinol triethyl ether	210.14	43	175^{24}		
4368	$C_{12}H_{18}O_3$	Pyrogallol triethyl ether	210.14	39			
4368.1	$C_{12}H_{18}O_4$	Cascarillin	226.14	205			
4368.2	$C_{12}H_{18}O_6$	Trimeric diacetyl	258.14	105	280.1		
4368.3	$C_{12}H_{18}O_6$	Diethyl 1, 1′-diacetylsuccinate	258.14	88		1.209 (st.) 1.176 (met.)	1196, 1201
4368.4	$C_{12}H_{18}O_6$	Triethyl aconitate	258.14		253^{250}	1.106	454
4368.41	$C_{12}H_{18}O_8$	Diethyl diacetyltartrate	290.14	68	170^{15}	1.109^{71}	
4368.5	$C_{12}H_{19}Br_3O_2$	Bromal *d*-borneolate	434.89	109		1.868^0	
4368.6	$C_{12}H_{19}ClO_2$	*d*-Bornyl chloroacetate	230.60		147^{30}		
4368.7	$C_{12}H_{19}Cl_3O_2$	Chloral-*d*-borneolate	301.52	56			
4368.8	$C_{12}H_{19}N$	*n*-Dipropylaniline $C_6H_5N(C_3H_7)_2$	177.15		241	0.910	
4368.9	$C_{12}H_{20}N_2O_3$	Isoamylisopropylbarbituric acid	240.17	175			
4369	$C_{12}H_{20}N_2O_3$	Isoamylpropylbarbituric acid	270.17	132			
4369.1	$C_{12}H_{20}N_4O_7$	Hexamethylenetetraminemethylene citrate	332.19	175			
4369.2	$C_{12}H_{20}O$	Ballanophorin	180.15	56			
4370	$C_{12}H_{20}O$	Homophorone	180.15		210^{625}	0.886	530
4371	$C_{12}H_{20}O_2$	Geranylacetic acid	196.15		179^{19}	0.938	516
4372	$C_{12}H_{20}O_2$	*dl*-Bornyl acetate	196.15		114^{22}	0.985	483
4373	$C_{12}H_{20}O_2$	*d*-Bornyl acetate	196.15	29	226	0.991^{15}	994
4374	$C_{12}H_{20}O_2$	Geranyl acetate	196.15		242	0.917^{15}	493
4375	$C_{12}H_{20}O_2$	Isobornyl acetate	196.15		89^9	0.981	1010
4375.1	$C_{12}H_{20}O_2$	Isopulegyl acetate	196.15		103^{14}	0.935^{18}	934
4376	$C_{12}H_{20}O_2$	*l*-Linalyl acetate	196.15		220	0.895	414
4377	$C_{12}H_{20}O_2$	Neryl acetate	196.15		134^{25}	0.916^{15}	
4378	$C_{12}H_{20}O_2$	*dl*, *α*-Terpinyl acetate	196.15	<-50	220 d.	0.957	
4379	$C_{12}H_{20}O_2$	*d* (*l*), *α*-Terpinyl acetate	196.15		140^{40}	0.983_0^0	
4380	$C_{12}H_{20}O_5$	Diethyl 1-ethyl-1′-acetylsuccinate	244.15		263	$1.064_{17.5}^{16}$	
4381	$C_{12}H_{20}O_7$	Triethyl citrate	276.15		294	1.137	409
4382	$C_{12}H_{20}O_{10}$	Maltosan	324.15	150 (?)			
4383	$C_{12}H_{21}ClO_2$	*l*-Menthyl chloroacetate	232.62	38	137^{12}	1.056	
4384	$C_{12}H_{21}N_3$	Kyanpropine	207.19	116			
4385	$C_{12}H_{22}O$	Ethyl *d*-bornyl ether	182.17		205	0.901	1023
4386	$C_{12}H_{22}O$	Hexenyl ether	182.17		118		
4387	$C_{12}H_{22}O_2$	*d*-Citronellyl acetate	198.17		121^{15}	0.903_4^{15}	402
4388	$C_{12}H_{22}O_2$	*l*-Menthyl acetate $(HOCHCO_2C_4H_9)_2$	198.17		227	0.919	418
4389	$C_{12}H_{22}O_3$	Lanolic acid	214.17	77			
4390	$C_{12}H_{22}O_3$	*l*-Menthyl glycollate	214.17	87			
4391	$C_{12}H_{22}O_4$	Diisoamyl oxalate	230.17		265	0.968^{11}	
4392	$C_{12}H_{22}O_6$	Di-*n*-butyl *d*-tartrate	262.17	22.5	203^{18}	1.098^{15}	
4393	$C_{12}H_{22}O_6$	Diisobutyl *d*-tartrate	262.17	69	325		
4393.1	$C_{12}H_{22}O_6$	Diisobutyl *l*-tartrate	262.17	74	185^{21}	1.029^{79}	
4394	$C_{12}H_{22}O_{11}$	Lactose	342.17	201.6	d.	1.525	1229
4395	$C_{12}H_{22}O_{11}(H_2O)$	Maltose	360.19			1.540	1333
4396	$C_{12}H_{22}O_{11}$	Saccharose	342.17	186		1.588_4^{15}	1242
4397	$C_{12}H_{22}O_{11}$	Trehalose $(2H_2O)$	342.17	210			1195

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
4398	$C_{12}H_{23}ClO$	Lauryl chloride $CH_3(CH_2)_{10}COCl$	218.64	−17	145^{18}		
4399	$C_{12}H_{23}N$	Lauronitrile $CH_3(CH_2)_{10}CN$	181.19	4	198^{100}	0.827^{15}	
4400	$C_{12}H_{24}$	*n*-Dodecylene $CH_2:CH(CH_2)_9CH_3$	168.19	−31.5	96^{16}	0.762^{15}_{4}	
4401	$C_{12}H_{24}N_2O_{10}$	*d*-Glucosealdazine	356.20	100			
4402	$C_{12}H_{24}O$	*n*-Amyl hexyl ketone $C_5H_{11}COC_6H_{13}$	184.19	9	112^{9}		
4403	$C_{12}H_{24}O$	Ethylmenthol	184.19		85^{4}	0.904^{17}	
4404	$C_{12}H_{24}O$	*l*-Ethyl menthyl ether	184.19		212.9	0.854	918
4405	$C_{12}H_{24}O$	Lauric aldehyde $CH_3(CH_2)_{10}CHO$	184.19	44.5	185^{100}		
4406	$C_{12}H_{24}O_2$	Lauric acid $CH_3(CH_2)_{10}CO_2H$	200.19	48.0	225^{100}	0.883	1123
4407	$C_{12}H_{24}O_2$	*n*-Decyl acetate $CH_3CO_2C_{10}H_{21}$	200.19		191.5		1082
4408	$C_{12}H_{24}O_2$	Ethyl *n*-caprate $C_9H_{19}CO_2C_2H_5$	200.19		245	0.862	
4409	$C_{12}H_{24}O_3$	*n*-Parabutyraldehyde	216.19		100^{35}		
4410	$C_{12}H_{25}NO$	Lauramide $CH_3(CH_2)_{10}CONH_2$	199.20	102	$200^{12.5}$		
4411	$C_{12}H_{26}$	*n*-Dodecane $CH_3(CH_2)_{10}CH_3$	170.20	−12	216	0.768	255
4412	$C_{12}H_{26}$	5-Propylnonane $(C_4H_9)_2CHC_3H_7$	170.20		205	0.756	268
4413	$C_{12}H_{26}$	2, 4, 5, 7-Tetramethyloctane	170.20		210		
4414	$C_{12}H_{26}O$	*n*-Amylhexyl carbinol	186.20	30	119^{9}		
4415	$C_{12}H_{26}O$	*n*-Dodecyl alcohol $CH_3(CH_2)_{10}CH_2OH$	186.20	24	259	0.831	
4416	$C_{12}H_{26}O$	*n*-Hexyl ether $(C_6H_{13})_2O$	186.20		208.8		
4417	$C_{12}H_{27}N$	Dodecylamine $C_{12}H_{25}NH_2$	185.22	28	135^{15}		
4418	$C_{12}H_{27}N$	Tri-*n*-butylamine $(C_4H_9)_3N$	185.22		214	0.778^{20}_{20}	
4419	$C_{12}H_{27}N$	Triisobutylamine $[(CH_3)_2CHCH_2]_3N$	185.22	−21.8	191.5	0.766^{25}_{25}	294
4420	$C_{12}H_{28}N_2O_4$	Ethylenediamine isovalerate	264.23	129			
4421	$C_{13}H_7Br_3O_3$	Tribromosalol	450.80	195			
4422	$C_{13}H_8Cl_2O$	*p, p'*-Dichlorobenzophenone	250.98	145			
4423	$C_{13}H_8N_2O_5$	*p, p'*-Dinitrobenzophenone	272.08	190			
4424	$C_{13}H_8N_6O_9$	*o, o', p, p'*-Tetranitrodiphenylurea	392.11	189			
4425	$C_{13}H_8O$	Fluorenone	180.06	84	341.5		
4426	$C_{13}H_8O$	Pyrene ketone	180.06	142			
4427	$C_{13}H_8O_2$	Xanthone	196.06	174	351		
4428	$C_{13}H_8O_3S$	Benzophenonesulfone	244.13	187			
4429	$C_{13}H_8O_4$	Euxanthone	228.06	240			
4430	$C_{13}H_9BrO_2$	*p*-(*p*-Bromophenyl) benzoic acid	276.99	194			
4431	$C_{13}H_9ClO$	*o*-Chlorobenzophenone	216.53	45.5	330		
4432	$C_{13}H_9ClO$	*m*-Chlorobenzophenone	216.53	83			
4433	$C_{13}H_9ClO$	*p*-Chlorobenzophenone	216.53	78	>300		
4434	$C_{13}H_9N$	Acridine	179.08	108	346		
4435	$C_{13}H_9N$	α-Naphthoquinoline	179.08	52	351		
4436	$C_{13}H_9N$	β-Naphthoquinoline	179.08	93	351		
4437	$C_{13}H_9N$	Phenanthradine	179.08	104	360		
4438	$C_{13}H_9NO$	9-Acridone	195.08	354			
4439	$C_{13}H_{10}$	Fluorene	166.08	116	295		
4440	$C_{13}H_{10}AsN$	Diphenylcyanoarsine $(C_6H_5)_2AsCN$	255.05	30			
4441	$C_{13}H_{10}Cl_2$	Benzophenone chloride	236.99		305	$1.235^{18.5}$	
4442	$C_{13}H_{10}Cl_2$	*m, m'*-Dichlorodiphenylmethane	236.99	8	318	1.234^{21}_{21}	
4443	$C_{13}H_{10}Cl_2$	*p, p'*-Dichlorodiphenylmethane	236.99	55	210^{15}		
4444	$C_{13}H_{10}N_2O_3$	Benzeneazosalicylic acid	242.09	218 d.			
4445	$C_{13}H_{10}O$	*p*-Diphenylaldehyde *p*-$C_6H_5C_6H_4CHO$	182.08	60			
4446	$C_{13}H_{10}O$	Fluorenol	182.08	156			
4447	$C_{13}H_{10}O$	α-Benzophenone $(C_6H_5)_2CO$	182.08	48.5	305.4	$1.083^{53.5}$	
4448	$C_{13}H_{10}O$	β-Benzophenone	182.08	26.5	306	1.108^{23}	1014
4449	$C_{13}H_{10}O$	γ-Benzophenone	182.08	45–48			
4450	$C_{13}H_{10}O$	δ-Benzophenone	182.08	−51			
4451	$C_{13}H_{10}O$	Xanthene	182.08	100.5	315		
4452	$C_{13}H_{10}O_2$	*o*-Hydroxybenzophenone	198.08	41	250^{530}		
4453	$C_{13}H_{10}O_2$	*m*-Hydroxybenzophenone	198.08	116			
4454	$C_{13}H_{10}O_2$	*p*-Hydroxybenzophenone	198.08	134			
4455	$C_{13}H_{10}O_2$	*o*-Phenylbenzoic acid	198.08	111	344		
4456	$C_{13}H_{10}O_2$	*m*-Phenylbenzoic acid	198.08	161			
4457	$C_{13}H_{10}O_2$	*p*-Phenylbenzoic acid	198.08	219			
4458	$C_{13}H_{10}O_2$	Phenyl benzoate $C_6H_5CO_2C_6H_5$	198.08	70	314	1.235^{31}	
4459	$C_{13}H_{10}O_3$	2, 5-Dihydroxybenzophenone	214.08	122			
4460	$C_{13}H_{10}O_3$	2, 2'-Dihydroxybenzophenone	214.08	59	340		

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
4461	$C_{13}H_{10}O_3$	2, 3′-Dihydroxybenzophenone	214.08	126			
4462	$C_{13}H_{10}O_3$	2, 4′-Dihydroxybenzophenone	214.08	144			
4463	$C_{13}H_{10}O_3$	3, 4′-Dihydroxybenzophenone	214.08	197			
4464	$C_{13}H_{10}O_3$	4, 4′-Dihydroxybenzophenone	214.08	210			
4465	$C_{13}H_{10}O_3$	*o*-Phenoxybenzoic acid	214.08	114.5	355 d.		
4466	$C_{13}H_{10}O_3$	Diphenyl carbonate $(C_6H_5O)_2CO$	214.08	81	302		
4467	$C_{13}H_{10}O_3$	Salol *o*-$HOC_6H_4CO_2C_6H_5$	214.08	43	173^{12}	1.250	
4468	$C_{13}H_{10}O_4$	2, 6, 2′-Trihydroxybenzophenone	230.08	133			
4469	$C_{13}H_{10}O_5$	Pimpinellin	246.08	119			
4470	$C_{13}H_{10}O_6$	Maclurin	262.08	220 d.			
4471	$C_{13}H_{10}O_8$	Sordidin	294.08	210			
4472	$C_{13}H_{10}S$	Thiobenzophenone $(C_6H_5)_2CS$	198.14	146.5			
4473	$C_{13}H_{11}N$	Benzylideneaniline $C_6H_5N{:}CHC_6H_5$	181.09	54	300		
4474	$C_{13}H_{11}N$	5, 10-Dihydroacridine	181.09	169			
4475	$C_{13}H_{11}NO$	*o*-Aminobenzophenone	197.09	108			
4476	$C_{13}H_{11}NO$	*m*-Aminobenzophenone	197.09	86			
4477	$C_{13}H_{11}NO$	*p*-Aminobenzophenone	197.09	124			
4478	$C_{13}H_{11}NO$	Benzanilide $C_6H_5NHCOC_6H_5$	197.09	161		1.321^4	
4479	$C_{13}H_{11}NO$	Benzophenoneoxime $(C_6H_5)_2C{:}NOH$	197.09	142			
4480	$C_{13}H_{11}NO$	*N*-Phenylformanilide $(C_6H_5)_2NOCH$	197.09	74	220	1.230	
4481	$C_{13}H_{11}NO_2$	*o*-Benzoylaminophenol	213.09	167 d.			
4482	$C_{13}H_{11}NO_2$	*m*-Benzoylaminophenol	213.09	174			
4483	$C_{13}H_{11}NO_2$	*p*-Benzoylaminophenol	213.09	227			
4484	$C_{13}H_{11}NO_2$	*p*-Nitrodiphenylmethane	213.09	31			
4485	$C_{13}H_{11}NO_2$	Salicylanilide *o*-$OHC_6H_4CONHC_6H_5$	213.09	135			
4486	$C_{13}H_{11}NO_3$	*p*-Aminosalol	229.09	152			
4487	$C_{13}H_{11}NO_4$	Gallanilide	245.09	205			
4488	$C_{13}H_{11}N_3$	2, 8-Diaminoacridine	209.11	284			
4489	$C_{13}H_{11}O_6$	Gelsemic acid	247.09	206			
4490	$C_{13}H_{12}$	Diphenylmethane $(C_6H_5)_2CH_2$	168.09	27	262	1.006	1030
4491	$C_{13}H_{12}$	*o*-Phenyltoluene $CH_3C_6H_4C_6H_5$	168.09		260		
4492	$C_{13}H_{12}$	*m*-Phenyltoluene $CH_3C_6H_4C_6H_5$	168.09		277	1.031^0	
4493	$C_{13}H_{12}$	*p*-Phenyltoluene $CH_3C_6H_4C_6H_5$	168.09	−3	267	1.015^{27}	
4494	$C_{13}H_{12}N_2$	Benzaldehyde phenylhydrazone	196.11	156			
4495	$C_{13}H_{12}N_2O$	1-Benzoyl-1-phenylhydrazine	212.11	70			
4496	$C_{13}H_{12}N_2O$	1-Benzoyl-2-phenylhydrazine	212.11	168			
4497	$C_{13}H_{12}N_2O$	*o, o′*-Diaminobenzophenone	212.11	135			
4498	$C_{13}H_{12}N_2O$	*m, m′*-Diaminobenzophenone	212.11	174			
4499	$C_{13}H_{12}N_2O$	*p, p′*-Diaminobenzophenone	212.11	237			
4500	$C_{13}H_{12}N_2O$	1, 2-Diphenylurea $CO(NHC_6H_5)_2$	212.11	235	260		1329
4501	$C_{13}H_{12}N_2O$	1, 1-Diphenylurea $(C_6H_5)_2NCONH_2$	212.11	189			
4502	$C_{13}H_{12}N_2O$	Harmine	212.11	257 d.			
4503	$C_{13}H_{12}N_2O_2$	*o*-Nitrobenzylaniline	228.11	44; 57			
4504	$C_{13}H_{12}N_2S$	1, 2-Diphenylthiourea	228.17	154	d.	1.321^4	
4505	$C_{13}H_{12}O$	*o*-Benzylphenol $C_6H_5CH_2C_6H_4OH$	184.09	21	312		
4506	$C_{13}H_{12}O$	*p*-Benzylphenol $C_6H_5CH_2C_6H_4OH$	184.09	84	322		
4507	$C_{13}H_{12}O$	Diphenyl carbinol $(C_6H_5)_2CHOH$	184.09	68	298.5		
4508	$C_{13}H_{12}O$	Benzyl phenyl ether $C_6H_5OCH_2C_6H_5$	184.09	39	287		
4509	$C_{13}H_{12}O_3S$	Phenyl-*p*-toluenesulfonate	248.16	96			
4512	$C_{13}H_{13}N$	Benzylaniline $C_6H_5NHCH_2C_6H_5$	183.11	37	300	1.038^{55}_{4}	
4513	$C_{13}H_{13}N$	*N*-Methyldiphenylamine $(C_6H_5)_2NCH_3$	183.11	−7.6	293.4	1.047^{25}_{25}	
4514	$C_{13}H_{13}NO$	*m*-(*o*-Tolylamino) phenol	199.11		375		
4515	$C_{13}H_{13}NO$	*p*-(*m*-Tolylamino) phenol	199.11	91	350		
4517	$C_{13}H_{13}NO_2S$	Toluene-*p*-sulfoneanilide	247.17	103			
4518	$C_{13}H_{13}N_3$	Diphenylguanidine	211.12	148			
4519	$C_{13}H_{14}N_2$	*o, p′*-Diaminodiphenylmethane	198.12	88			
4520	$C_{13}H_{14}N_2$	*m, m′*-Diaminodiphenylmethane	198.12	48			
4521	$C_{13}H_{14}N_2$	*m, p′*-Diaminodiphenylmethane	198.12	90			
4522	$C_{13}H_{14}N_2$	*p, p′*-Diaminodiphenylmethane	198.12	89			
4523	$C_{13}H_{14}N_2$	1-Phenyl-2-benzylhydrazine	198.12	26			
4524	$C_{13}H_{14}N_2O$	Harmaline	214.12	238			

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
4525	$C_{13}H_{14}N_2O_2$	Analgen (5-Acetylamino-8-ethoxyquinoline)	230.12	155			
4526	$C_{13}H_{14}N_4S$	1, 2-Di(*p*-aminophenyl) thiourea	258.21	195			
4526.1	$C_{13}H_{14}O_2$	Isobutyl phenylpropiolate	202.11		176^{12}	1.158^{25}	
4527	$C_{13}H_{14}O_4$	Drimine	234.11	256			
4528	$C_{13}H_{15}Cl_3N_2O_3$	Chloralantipyrine	353.51	68			
4529	$C_{13}H_{15}N$	2, 5, 6, 8-Tetramethylquinoline	185.12	20	300		
4530	$C_{13}H_{16}IN$	2, 4-Dimethylquinoline ethiodide	313.06	225			
4530.1	$C_{13}H_{16}N_2O$	4-Ethyl antipyrine	216.14	68			1237
4530.2	$C_{13}H_{16}N_2O$	1-Phenyl-2-propyl-3-methylpyrazolone	216.14	93			1262
4530.3	$C_{13}H_{16}O$	Benzalpinacoline	188.12	39.5		0.939^{60}	1048
4531	$C_{13}H_{16}O_3$	Ethyl benzylacetoacetate	220.12		290 d.	1.036^{15}_{16}	
4532	$C_{13}H_{16}O_3$	Isoeugenol propionate	220.12		292		
4533	$C_{13}H_{16}O_4$	Ethyl phenylmalonate	236.12		285 d.	1.095^{25}_{25}	
4534	$C_{13}H_{16}O_7$	*l*-Helicin	284.12	175			
4535	$C_{13}H_{16}O_7$	Salinigrin	284.12	195			
4536	$C_{13}H_{17}NO_4$	Thermodin	251.14	88			1333
4537	$C_{13}H_{17}N_3O$	Pyramidon	231.16	108			
4538	$C_{13}H_{18}BrNO_2$	Phenoval	300.06	150			
4539	$C_{13}H_{18}N_2O$	Eseroline	218.16	127			
4541	$C_{13}H_{18}N_4O_6S$	Hexamethylenetetramine salicylsulfonic acid (Hexal)	358.24	190 d.			
4542	$C_{13}H_{18}O$	Phenyl hexyl ketone $C_6H_5COC_6H_{13}$	190.14	17	271.5		
4543	$C_{13}H_{18}O_2$	Eugenol propyl ether	206.14		270.5	1.002	
4544	$C_{13}H_{18}O_2$	Phenyl heptylate $C_6H_{13}CO_2C_6H_5$	206.14		282.3	0.982^{15}_{15}	
4545	$C_{13}H_{18}O_3$	Isoamyl anisate	222.14		188^{30}	1.040	638
4546	$C_{13}H_{18}O_7$	Methylarbutin	286.14	175			
4547	$C_{13}H_{18}O_7$	Salicin	286.14	201.5	240	1.434^{26}	
4548	$C_{13}H_{18}O_8$	Calmatambetin	302.14	148			
4549	$C_{13}H_{19}NO$	Heptanilide $CH_3(CH_2)_5CONHC_6H_5$	205.15	71			
4550	$C_{13}H_{19}NO_2$	Benzalaminoacetal	221.15		220^{160}		
4551	$C_{13}H_{19}NO_2$	Dioscorine	221.15	43.5			
4552	$C_{13}H_{19}NO_3$	Pellotine	237.15	111			1333
4553	$C_{13}H_{19}NO_9$	Gynocardine	333.15	162			
4554	$C_{13}H_{19}O_8$	Aucubine	303.15	181			
4555	$C_{13}H_{20}ClNO_2$	Dioscorine hydrochloride	257.62	204			
4556	$C_{13}H_{20}ClNO_3$	Gujasanol (Diethylaminoacetic acid guaiacol hydrochloride)	273.62	184			
4557	$C_{13}H_{20}N_2O_2$	Novocaine	236.17	60			
4558	$C_{13}H_{20}N_2O_2(2H_2O)$	Novocaine	272.19	51			
4559	$C_{13}H_{20}O$	α-Ionone	192.15		147.5^{28}	0.930	988
4560	$C_{13}H_{20}O$	β-Ionone	192.15		140^{18}	0.944	667, 951
4561	$C_{13}H_{20}O$	Irone	192.15		144^{16}	0.939	605
4562	$C_{13}H_{20}O$	Lactucol	192.15	160			
4563	$C_{13}H_{20}O$	Pseudoionone	192.15		170^{28}	0.897	1001
4564	$C_{13}H_{20}O_2$	Galbanic acid	208.15	156			
4565	$C_{13}H_{21}ClN_2O_2$	Novocaine hydrochloride	272.64	156			
4566	$C_{13}H_{21}ClN_2O_2$	Procaine	272.64	155			
4567	$C_{13}H_{21}N$	*N*-Ethyl-isoamylaniline	191.17		262		
4568	$C_{13}H_{21}NO_4$	Meteloidine	255.17	141			
4569	$C_{13}H_{22}BrNO_4$	Meteloidine hydrobromide	336.09	250			
4570	$C_{13}H_{22}N_2O_3$	Ethylheptylbarbituric acid	254.19	119			
4571	$C_{13}H_{22}O$	Zeorin	194.17	251			
4572	$C_{13}H_{22}O_2$	*d*-Bornyl propionate	210.27		110^{11}	0.979^{15}	857
4573	$C_{13}H_{22}O_3$	*l*-Menthyl pyruvate	226.17		140^{22}	0.985	
4574	$C_{13}H_{22}O_7$	Taxicatin	290.17	171			
4575	$C_{13}H_{24}NO_2$	Cuscohygrine	226.19		170^{23}		
4576	$C_{13}H_{24}O$	Allyl *l*-menthyl ether	196.19		104^{13}	0.876	
4577	$C_{13}H_{24}O$	Geranylacetone	196.19		139^{19}		
4578	$C_{13}H_{24}O_2$	*l*-Menthyl propionate	212.19		118^{15}	0.918	
4579	$C_{13}H_{24}O_3$	*l*-Menthyl *dl*-lactate	228.19	32	142^{15}	0.984	
4580	$C_{13}H_{24}O_4$	Brassylic acid	244.19	114			

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
4580.1	$C_{13}H_{24}O_4$	Di-*l*-amyl malonate	244.19		154^{13}	0.962^{25}	
4581	$C_{13}H_{26}$	Tridecylene	182.20		232.7	0.845^{0}	
4582	$C_{13}H_{26}O_2$	Tridecylic acid $CH_3(CH_2)_{11}CO_2H$	214.20	51	236^{100}		
4583	$C_{13}H_{26}O_2$	Isoamyl caprylate	214.20		136^{10}		
4584	$C_{13}H_{26}O_2$	Methyl laurate $C_{11}H_{23}CO_2CH_3$	214.20	5	148^{18}		
4585	$C_{13}H_{28}$	Dipropylhexylmethane $(C_3H_7)_2CHC_6H_{13}$	184.22		221.2	$0.765_4^{14.4}$	299
4586	$C_{13}H_{28}$	Tributylmethane $(C_4H_9)_3CH$	184.22			0.760	300
4587	$C_{13}H_{28}$	*n*-Tridecane $CH_3(CH_2)_{11}CH_3$	184.22	−6.2	234	0.757	908
4588	$C_{13}H_{28}O$	Di-*n*-hexylcarbinol $(C_6H_{13})_2CHOH$	200.22	42			
4589	$C_{13}H_{28}O$	*n*-Tridecyl alcohol $CH_3(CH_2)_{11}CH_2OH$	200.22	30.5	156^{15}	0.822_4^{31}	
4590	$C_{13}H_{29}N$	Tridecylamine $CH_3(CH_2)_{11}CH_2NH_2$	199.23	27	265		
4591	$C_{14}H_2Cl_8$	Octachloroanthracene	453.68	>350			
4592	$C_{14}H_3Cl_7$	Heptachloroanthracene	419.23	>350			
4593	$C_{14}H_4Cl_4O_2$	1, 2, 3, 4-Tetrachloroanthraquinone	345.86	191			
4594	$C_{14}H_4Cl_4O_2$	β-Tetrachloroanthraquinone	345.86	330			
4595	$C_{14}H_4Cl_6$	Hexachloroanthracene	384.78	330			
4596	$C_{14}H_6Cl_2O_2$	α-1, 2-Dichloroanthraquinone	276.96	161			
4597	$C_{14}H_6Cl_2O_2$	β-1, 2-Dichloroanthraquinone	276.96	207			
4598	$C_{14}H_6Cl_2O_2$	1, 4-Dichloroanthraquinone	276.96	187.5			
4599	$C_{14}H_6Cl_2O_2$	1, 5-Dichloroanthraquinone	276.96	232			
4600	$C_{14}H_6Cl_2O_2$	1, 6-Dichloroanthraquinone	276.96	204			
4601	$C_{14}H_6Cl_2O_2$	1, 8-Dichloroanthraquinone	276.96	199			
4602	$C_{14}H_6Cl_2O_2$	2, 3-Dichloroanthraquinone	276.96	267			
4603	$C_{14}H_6Cl_2O_2$	2, 6-Dichloroanthraquinone	276.96	282			
4604	$C_{14}H_6Cl_2O_2$	2, 7-Dichloroanthraquinone	276.96	211			
4605	$C_{14}H_6Cl_4$	1, 2, 3, 4-Tetrachloroanthracene	315.88	149			
4606	$C_{14}H_6Cl_4$	α-Tetrachloroanthracene	315.88	220			
4607	$C_{14}H_6Cl_4$	β-Tetrachloroanthracene	315.88	152			
4608	$C_{14}H_6N_2O_6$	1, 3-Dinitroanthraquinone	298.06	240			
4609	$C_{14}H_6O_8$	Ellagic acid	302.05			1.667^{18}	
4610	$C_{14}H_7ClO_2$	1-Chloroanthraquinone	242.51	162			
4611	$C_{14}H_7ClO_2$	2-Chloroanthraquinone	242.51	208			
4612	$C_{14}H_7ClO_2$	3-Chloroanthraquinone	242.51	204			
4613	$C_{14}H_7NO_4$	1-Nitroanthraquinone	253.06	230			
4614	$C_{14}H_7NO_4$	2-Nitroanthraquinone	253.06	181			
4615	$C_{14}H_7NO_6$	4-Nitro-α-alizarin	285.06	289			
4616	$C_{14}H_7NO_6$	3-Nitro-β-alizarin	285.06	244			
4617	$C_{14}H_8Br_2$	9, 10-Dibromoanthracene	335.89	221			
4618	$C_{14}H_8Cl_2$	1, 2-Dichloroanthracene	246.98	255			
4619	$C_{14}H_8Cl_2$	9, 10-Dichloroanthracene	246.98	209			
4620	$C_{14}H_8O_2$	Anthraquinone $C_6H_4:(CO)_2:C_6H_4$	208.06	285	379.8	1.438	
4621	$C_{14}H_8O_2$	Isoanthraquinone	208.06	212			
4622	$C_{14}H_8O_2$	Phenanthraquinone	208.06	207	360	1.405	
4623	$C_{14}H_8O_2$	3, 4-Phenanthraquinone	208.06	133			
4624	$C_{14}H_8O_3$	2-Hydroxyanthraquinone	224.06	302			
4625	$C_{14}H_8O_3$	Diphenic anhydride	224.06	219			
4626	$C_{14}H_8O_4$	Alizarin	240.06	290	430		
4627	$C_{14}H_8O_4$	Anthraflavic acid	240.06	330			
4628	$C_{14}H_8O_4$	Anthrarufin	240.06	280			
4629	$C_{14}H_8O_4$	1, 6-Dihydroxyanthraquinone	240.06	272			
4630	$C_{14}H_8O_4$	1, 7-Dihydroxyanthraquinone	240.06	292			
4631	$C_{14}H_8O_4$	Chrysazin	240.06	191			
4632	$C_{14}H_8O_4$	Hystazarin (2, 3-Dihydroxyanthraquinone)	240.06	>280			
4633	$C_{14}H_8O_4$	Quinizarin	240.06	195			
4634	$C_{14}H_8O_4$	Xanthopurpurin	240.06	263			
4635	$C_{14}H_8O_5$	Anthragallol	256.06	310	s. 290		
4636	$C_{14}H_8O_5$	Anthrapurpurin	256.06	330	462		
4637	$C_{14}H_8O_5$	Flavopurpurin	256.06	>360	459		
4638	$C_{14}H_8O_5$	Purpurin	256.06	256			
4639	$C_{14}H_8O_5$	1, 4, 6-Trihydroxyanthraquinone	256.06	>300			
4640	$C_{14}H_9Cl$	1-Chloroanthracene	212.53	82		$1.171^{99.5}$	1140
4641	$C_{14}H_9Cl$	9-Chloroanthracene	212.53	103			

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
4642	$C_{14}H_9NO_2$	1-Aminoanthraquinone	223.08	256			
4643	$C_{14}H_9NO_2$	2-Aminoanthraquinone	223.08	302			
4644	$C_{14}H_9NO_2$	9-Nitroanthracene	223.08	146			
4645	$C_{14}H_9NO_2$	2-Nitrophenanthrene	223.08	99			
4646	$C_{14}H_9NO_2$	3-Nitrophenanthrene	223.08	170			
4647	$C_{14}H_9NO_2$	4-Nitrophenanthrene	223.08	80			
4648	$C_{14}H_9NO_2$	9-Nitrophenanthrene	223.08	116			
4649	$C_{14}H_{10}$	Anthracene $C_6H_4:(CH)_2:C_6H_4$	178.08	218	342	1.25_4^{27}	
4650	$C_{14}H_{10}$	Diphenylacetylene $C_6H_5C\vdots C_6H_5$	178.08	60	300		
4651	$C_{14}H_{10}$	Isoanthracene	178.08	134.5			
4652	$C_{14}H_{10}$	Phenanthrene	178.08	99.6	340.2	1.025	1158
4653	$C_{14}H_{10}Cl_2$	Dichlorostilbene	248.99	170			
4654	$C_{14}H_{10}Cl_2$	α-Tolane dichloride	248.99	143	183^{18}		
4655	$C_{14}H_{10}Cl_2$	β-Tolane dichloride	248.99	63	178^{18}		
4656	$C_{14}H_{10}Cl_4$	Tolane tetrachloride	319.91	163			
4656.1	$C_{14}H_{10}N_2O_2$	Phthalylphenylhydrazine	238.09	179		1.356	
4657	$C_{14}H_{10}N_2O_2$	α-Diaminoanthraquinone	238.09	236			
4658	$C_{14}H_{10}N_2O_2$	β-Diaminoanthraquinone	238.09	>300			
4659	$C_{14}H_{10}N_2O_3$	*p, p'*-Azoxybenzaldehyde	254.09	194			
4660	$C_{14}H_{10}N_2O_4$	*o, o'*-Azobenzoic acid	270.09	237			
4661	$C_{14}H_{10}N_2O_4$	*m, m'*-Azobenzoic acid	270.09	340			
4662	$C_{14}H_{10}N_2O_4$	α-*p, p'*-Dinitrostilbene	270.09	285			
4663	$C_{14}H_{10}N_2O_4$	β-*p, p'*-Dinitrostilbene	270.09	216			
4664	$C_{14}H_{10}N_2O_5$	*o, o'*-Azoxybenzoic acid	286.09	240			
4665	$C_{14}H_{10}N_2O_5$	*m, m'*-Azoxybenzoic acid	286.09	320			
4666	$C_{14}H_{10}N_2O_5$	*p, p'*-Azoxybenzoic acid	286.09	240 d.			
4667	$C_{14}H_{10}O$	Anthranol	194.08	170 d.			
4668	$C_{14}H_{10}O$	1-Anthrol (1-Hydroxyanthracene)	194.08	153			
4669	$C_{14}H_{10}O$	2-Anthrol	194.08	200 d.			
4670	$C_{14}H_{10}O$	Diphenylketene $(C_6H_5)_2C:CO$	194.08		146^{12}	1.104	
4671	$C_{14}H_{10}O$	Phenanthrone	194.08	152			
4672	$C_{14}H_{10}O_2$	Benzil $C_6H_5COCOC_6H_5$	210.08	95.2	348	$1.521_4^{18.8}$	1186
4673	$C_{14}H_{10}O_2$	Chrysazol	210.08	220 d.			
4674	$C_{14}H_{10}O_2$	Flavene	210.08	270			
4675	$C_{14}H_{10}O_2$	3, 4-Dihydroxyphenanthrene	210.08	143			
4676	$C_{14}H_{10}O_3$	Benzoic anhydride $(C_6H_5CO)_2O$	226.08	43	360	1.199_4^{15}	
4677	$C_{14}H_{10}O_3$	*o*-Benzoylbenzoic acid	226.08	127			
4678	$C_{14}H_{10}O_3$	*m*-Benzoylbenzoic acid	226.08	162			
4679	$C_{14}H_{10}O_3$	*p*-Benzoylbenzoic acid	226.08	194			
4680	$C_{14}H_{10}O_3$	Desoxyalizarin	226.08	208			
4681	$C_{14}H_{10}O_3$	Disalicylic aldehyde	226.08	128			
4682	$C_{14}H_{10}O_4$	Benzoylsalicylic acid	242.08	207			
4683	$C_{14}H_{10}O_4$	1, 8-Diphenic acid	242.08	252			
4684	$C_{14}H_{10}O_4$	1, 9-Diphenic acid	242.08	216			
4685	$C_{14}H_{10}O_4$	1, 10-Diphenic acid	242.08	228			
4686	$C_{14}H_{10}O_4$	2, 9-Diphenic acid	242.08	340			
4687	$C_{14}H_{10}O_4$	Diphenyl oxalate $(CO_2C_6H_5)_2$	242.08	136 d.	325 s. d.		
4688	$C_{14}H_{10}O_4$	Benzoyl peroxide $(C_6H_5CO_2)_2$	242.08	104	d.		1235
4689	$C_{14}H_{10}O_4S_2$	Dithiosalicylic acid	306.21	290			
4690	$C_{14}H_{10}O_5$	Gentianin	258.08	267	400		
4691	$C_{14}H_{10}O_5$	Gentienin	258.08	225			
4692	$C_{14}H_{10}O_5$	Salicylosalicylic acid	258.08	148			
4693	$C_{14}H_{10}O_6$	Aponic acid	274.08	252 d.			
4694	$C_{14}H_{10}O_9$	Tannin	322.08	200 d.			
4695	$C_{14}H_{11}N$	α-Anthramine $C_6H_4:(CH)_2:C_6H_3NH_2$	193.09	130			
4696	$C_{14}H_{11}N$	β-Anthramine $C_6H_4:(CH)_2:C_6H_3NH_2$	193.09	238			
4697	$C_{14}H_{11}N$	*o*-Benzylbenzonitrile	193.09	19	314		
4698	$C_{14}H_{11}N$	1-Methylacridine	193.09	88			
4699	$C_{14}H_{11}N$	3-Methylacridine	193.09	134			
4700	$C_{14}H_{11}N$	5-Methylacridine	193.09	114	360^{740}		
4701	$C_{14}H_{11}N$	α-Naphthoquinaldine	193.09		>300		
4702	$C_{14}H_{11}N$	β-Naphthoquinaldine	193.09	82	>300		
4703	$C_{14}H_{11}N$	γ-Naphthoquinaldine	193.09	92			

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
4704	$C_{14}H_{11}NO_2$	α-Benziloxime $C_6H_4COC(:NOH)C_6H_5$	225.09	138			
4705	$C_{14}H_{11}NO_3$	Dibenzohydroxamic acid	241.09	161			
4706	$C_{14}H_{11}NO_4$	Disalicylamide	257.09	200 d.			
4707	$C_{14}H_{12}$	1, 1-Diphenylethylene $(C_6H_5)_2C:CH_2$	180.09	9	277	1.038_4^{14}	837
4708	$C_{14}H_{12}$	Stilbene $C_6H_5CH:CHC_6H_5$	180.09	124	307	0.970_{13}^{125}	
4709	$C_{14}H_{12}N_2$	Benzalazine $C_6H_5CH:N.NCH:C_6H_5$	208.11	93			
4710	$C_{14}H_{12}N_2$	Orexine	208.11	95		1.290^4	
4711	$C_{14}H_{12}N_2$	Tolazone	208.11	187	>360		
4712	$C_{14}H_{12}N_2O_2$	α-Benzildioxime $(C_6H_5C:NOH)_2$	240.11		237 d.		
4713	$C_{14}H_{12}N_2O_2$	β-Benzildioxime	240.11	105			
4714	$C_{14}H_{12}N_2O_2$	γ-Benzildioxime	240.11	165			
4715	$C_{14}H_{12}N_2O_2$	Oxanilide $(CONHC_6H_5)_2$	240.11	250	320		
4716	$C_{14}H_{12}N_2O_4$	Di-*o*-aminophenyl oxalate	272.11	167.5 d.			
4717	$C_{14}H_{12}N_2O_4$	Di-*m*-aminophenyl oxalate	272.11	180 d.			
4718	$C_{14}H_{12}N_2O_4$	Di-*p*-aminophenyl oxalate	272.11	220 d.			
4719	$C_{14}H_{12}N_2O_4$	Hydrazo-*o*-benzoic acid	272.11	205			
4722	$C_{14}H_{12}N_2S$	Dehydrothio-*p*-toluidine	240.17	191	434		
4723	$C_{14}H_{12}O$	Diphenylacetaldehyde	196.09		193^{27}	1.100	775
4724	$C_{14}H_{12}O$	Phenyl benzyl ketone	196.09	60	322		
4725	$C_{14}H_{12}O$	Phenyl *o*-tolyl ketone	196.09	> −18	316		
4726	$C_{14}H_{12}O$	Phenyl *m*-tolyl ketone	196.09		316.5	$1.088^{17.5}$	
4727	$C_{14}H_{12}O$	Phenyl *p*-tolyl ketone	196.09	60	326.5		1188
4728	$C_{14}H_{12}O_2$	Benzoin $C_6H_5COCH(OH)C_6H_5$	212.09	133	344		
4729	$C_{14}H_{12}O_2$	*o*-Benzylbenzoic acid	212.09	114			
4730	$C_{14}H_{12}O_2$	*m*-Benzylbenzoic acid	212.09	108			
4731	$C_{14}H_{12}O_2$	*p*-Benzylbenzoic acid	212.09	155			
4732	$C_{14}H_{12}O_2$	Diphenylacetic acid $(C_6H_5)_2CHCO_2H$	212.09	148			
4733	$C_{14}H_{12}O_2$	Benzyl benzoate $C_6H_5CO_2CH_2C_6H_5$	212.09	18.5	324	$1.114^{18.5}$	
4734	$C_{14}H_{12}O_2$	*p*-Cresyl benzoate *p*-$CH_3C_6H_5O_2CC_6H_5$	212.09	71.5	316		
4735	$C_{14}H_{12}O_3$	Benzyl salicylate	228.09		$214^{22.5}$		
4736	$C_{14}H_{12}O_2$	*m*-Cresyl benzoate $C_6H_5CO_2C_6H_4CH_3$	212.09	55			
4737	$C_{14}H_{12}O_3$	Trihydroxydihydroanthracene	228.09	256			
4738	$C_{14}H_{12}O_3$	Benzilic acid $(C_6H_5)_2C(OH)CO_2H$	228.09	150			
4739	$C_{14}H_{12}O_3$	Amyrolin	228.09	124		1.351^{18}	1312
4740	$C_{14}H_{12}O_3$	Benzosol $C_6H_5CO_2C_6H_4(OCH_3)$-*o*	228.09	61			
4741	$C_{14}H_{12}O_3$	*o*-Cresyl salicylate	228.09	35			
4742	$C_{14}H_{12}O_3$	*m*-Cresyl salicylate	228.09	74			
4743	$C_{14}H_{12}O_3$	*p*-Cresyl salicylate	227.09	39			
4744	$C_{14}H_{12}O_4$	Cotoin	224.09	129			
4745	$C_{14}H_{12}O_4$	Isocotoin	244.09	162			
4746	$C_{14}H_{12}O_4$	Guaiacyl salicylate	244.09	65			
4747	$C_{14}H_{12}O_6$	Gardenin	276.09	164			
4748	$C_{14}H_{13}NO$	*N*-Benzoyl-*o*-toluidine	211.11	143			1296
4749	$C_{14}H_{13}NO$	*N*-Benzoyl-*m*-toluidine	211.11	125			1299
4750	$C_{14}H_{13}NO$	*N*-Benzoyl-*p*-toluidine	211.11	158	232		1291
4751	$C_{14}H_{13}NO$	*o*-Benzylbenzamide	211.11	163			
4752	$C_{14}H_{13}NO$	*N*-Diphenylacetamide	211.11	103			1281
4753	$C_{14}H_{13}NO$	Phenylacetanilide	211.11	117			
4754	$C_{14}H_{13}NO_2$	Benzoylanisidine	227.11	154			
4755	$C_{14}H_{13}N_3O$	*m*-Acetylaminoazobenzene	239.12	131			
4756	$C_{14}H_{14}$	Dibenzyl $(C_6H_5CH_2)_2$	182.11	52.5	284	$0.942_4^{80.6}$	1118
4757	$C_{14}H_{14}$	1, 1-Diphenylethane $(C_6H_5)_2CHCH_3$	182.11		272	1.006_0^{21}	763
4758	$C_{14}H_{14}$	*o, o'*-Ditolyl $(CH_3C_6H_4)_2$	182.11	17.8	272	0.955^{10}	
4759	$C_{14}H_{14}$	*o, m'*-Ditolyl $(CH_3C_6H_4)_2$	182.11		287.5		
4760	$C_{14}H_{14}$	*o, p'*-Ditolyl $(CH_3C_6H_4)_2$	182.11		281		
4761	$C_{14}H_{14}$	*m, m'*-Ditolyl $(CH_3C_6H_4)_2$	182.11	7	288	0.999	
4762	$C_{14}H_{14}$	*p, p'*-Ditolyl $(CH_3C_6H_4)_2$	182.11	121	295		
4763	$C_{14}H_{14}N_2$	*o, o'*-Azotoluene (*o*-$CH_3C_6H_4N)_2$	210.12	55			
4764	$C_{14}H_{14}N_2$	*o', p'*-Azotoluene	210.12	71			
4765	$C_{14}H_{14}N_2$	*m, m'*-Azotoluene (*m*-$CH_3C_6H_4)_2N_2$	210.12	55			
4766	$C_{14}H_{14}N_2$	*p, p'*-Azotoluene (*p*-$CH_3C_6H_4)_2N_2$	210.12	144			
4767	$C_{14}H_{14}N_2$	*o, o'*-Diaminostilbene	210.12	170			
4768	$C_{14}H_{14}N_2$	*p, p'*-Diaminostilbene	210.12	231			

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
4769	$C_{14}H_{14}N_2O$	Agathin *o*-$OHC_6H_4CH{:}N.N(CH_3)C_6H_5$.	226.12	74			
4770	$C_{14}H_{14}N_2O$	*o, o'*-Azoxytoluene	226.12	59			
4771	$C_{14}H_{14}N_2O$	*m, m'*-Azoxytoluene	226.12	37			
4772	$C_{14}H_{14}N_2O$	*p, p'*-Azoxytoluene	226.12	70			
4773	$C_{14}H_{14}N_2O_2$	*o, o'*-Azoanisol (*o*-$CH_3OC_6H_4)_2N_2$	242.12	164.0			
4774	$C_{14}H_{14}N_2O_3$	*p, p'*-Azoxyanisol (*p*-$CH_3OC_6H_4)_2N_2$	258.12	117.4			
4775	$C_{14}H_{14}N_4$	"Cyanaline"	238.14	220			
4776	$C_{14}H_{14}N_4O_5$	Theobromine salicylate	318.14				1333
4777	$C_{14}H_{14}O$	Benzyl ether $(C_6H_5CH_2)_2O$	198.11		298	1.036^{16}	
4778	$C_{14}H_{14}O$	*o*-Cresyl ether $(CH_3C_6H_4)_2O$	198.11		278	$1.047^{24.3}$	
4779	$C_{14}H_{14}O$	*m*-Cresyl ether $(CH_3C_6H_4)_2O$	198.11		288		
4780	$C_{14}H_{14}O$	*p*-Cresyl ether (*p*-$CH_3C_6H_4)_2O$	198.11	50			
4781	$C_{14}H_{14}O_2$	*dl*-Hydrobenzoin $[C_6H_5CH(OH)]_2$	214.11	139	>300		
4782	$C_{14}H_{14}O_2$	Guaiacyl benzyl ether	214.11	62			
4783	$C_{14}H_{14}O_2$	Isohydrobenzoin	214.11	121			
4784	$C_{14}H_{14}O_2S$	Dibenzylsulfone $(C_6H_5CH_2)_2SO_2$	246.17	150	290 s. d.		
4785	$C_{14}H_{14}O_2S$	*p*-Ditolylsulfone $(CH_3C_6H_4)_2SO_2$	246.17	158	405^{714}		
4786	$C_{14}H_{14}S_2$	Dibenzyl disulfide $(C_6H_5CH_2)_2S_2$	246.24	72			
4787	$C_{14}H_{14}S$	Dibenzylsulfide $(C_6H_5CH_2)_2S$	214.17	49		1.071_{50}^{50}	
4788	$C_{14}H_{14}Se$	Dibenzyl selenide $(C_6H_5CH_2)_2Se$	261.31	45.5			
4789	$C_{14}H_{15}N$	Dibenzylamine $(C_6H_5CH_2)_2NH$	197.12	−26.0	300	$1.026_4^{21.6}$	976
4790	$C_{14}H_{15}N$	*o*-Ditolylamine (*o*-$CH_3C_6H_4)_2NH$	197.12		313.4		
4791	$C_{14}H_{15}N$	*m*-Ditolylamine (*m*-$CH_3C_6H_4)_2NH$	197.12		320		
4792	$C_{14}H_{15}N$	*p*-Ditolylamine (*p*-$CH_3C_6H_4)_2NH$	197.12	79	330.5		
4793	$C_{14}H_{15}N$	Ethyldiphenylamine $(C_6H_5)_2NC_2H_5$	197.12		297		
4794	$C_{14}H_{15}N$	*N*-Methylbenzylaniline	197.12	9.2	306		
4795	$C_{14}H_{15}NO_2S$	*p*-Toluenesulfonemethylanilide	261.19	95			
4796	$C_{14}H_{15}N_3$	4-Amino-2, 4'-dimethylazobenzene	225.14	127			
4797	$C_{14}H_{15}N_3$	4'-Amino-2, 3'-dimethylazobenzene	225.14	100			
4798	$C_{14}H_{15}N_3$	4-Amino-2, 3'-dimethylazobenzene	225.14	80			
4799	$C_{14}H_{15}N_3$	4-Amino-3, 4'-dimethylazobenzene	225.14	127			
4800	$C_{14}H_{15}N_3$	*o, o'*-Diazoaminotoluene	225.14	51			
4801	$C_{14}H_{15}N_3$	*p, p'*-Diazoaminotoluene	225.14	116			
4802	$C_{14}H_{16}$	Hexahydroanthracene	184.12	63	290		
4803	$C_{14}H_{16}N_2$	*o*-Hydrazotoluene (*o*-$CH_3C_6H_4NH)_2$	212.14	165			
4805	$C_{14}H_{16}N_2$	*p*-Hydrazotoluene $(CH_3C_6H_4NH)_2$	212.14	126	d.	0.957	
4806	$C_{14}H_{16}N_2$	*o*-Tolidine $[4, 3\text{-}H_2N(CH_3)C_6H_3]_2$	212.14	129			
4807	$C_{14}H_{16}N_2$	*m*-Tolidine $[4, 2\text{-}H_2N(CH_3)C_6H_3]_2$	212.14	107			
4808	$C_{14}H_{16}N_2O$	3-Ethoxybenzidine	228.14	139			
4809	$C_{14}H_{16}N_2O_2$	3, 3'-Dimethoxybenzidine	244.14	172			
4810	$C_{14}H_{16}N_4$	2, 2'-Diamino-4, 4'-azotoluene	240.16	203			
4811	$C_{14}H_{16}N_4$	3, 3'-Diamino-2, 2'-azotoluene	240.16	a, 145; b, 133; c, 159			
4812	$C_{14}H_{16}N_4O_9$	Oscine picrate	384.16	238			
4813	$C_{14}H_{17}N$	Diethyl-α-naphthylamine	199.14		160.6^{18}	1.005	937
4814	$C_{14}H_{17}N$	Diethyl-β-naphthylamine	199.14		192^{19}	1.026	977
4815	$C_{14}H_{17}NO$	Etheserolene	215.14	48			
4816	$C_{14}H_{17}NO_6$	Indican	295.14	57			
4817	$C_{14}H_{17}NO_6$	*l*-Mandelonitrile glucoside	295.14	147			
4818	$C_{14}H_{17}NO_6$	Prulaurasin	295.14	122			
4819	$C_{14}H_{17}NO_6$	Sambunigrin	295.14	152			
4820	$C_{14}H_{18}O_3$	Apocynamarin	234.14	175 d.			
4821	$C_{14}H_{18}O_7$	Picein	298.14	194			
4822	$C_{14}H_{20}N_2O_6S$	Methylamino-*p*-phenol sulfate	344.24	260 d.			
4823	$C_{14}H_{20}O_2$	Isanic acid	220.15	41			
4823.1	$C_{14}H_{20}O_2$	*l*-Amyl hydrocinnamate	220.15		172^{28}	0.9721	
4824	$C_{14}H_{20}O_3$	Helleboretin	236.15	>200			
4825	$C_{14}H_{21}ClN_2O_4$	Nirvanin	316.64	185			
4826	$C_{14}H_{21}NO_2$	Thymacetine	235.17	136			
4827	$C_{14}H_{22}$	1, 2, 3, 4-Tetraethylbenzene	190.17		254	0.887	637
4828	$C_{14}H_{22}$	1, 2, 4, 5-Tetraethylbenzene	190.17	13	250	0.888	609
4829	$C_{14}H_{22}ClNO_2$	Stovain	271.64	175			
4830	$C_{14}H_{22}O_2$	Longifolic acid	222.17	153	234^{55}		

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
4831	$C_{14}H_{22}O_4$	Dicyclohexyl oxalate	254.17	45	191^{13}		
4831.1	$C_{14}H_{23}ClO_4$	Di-*l*-amyl chlorofumarate	290.65		185^{13}	1.052^{25}	
4832	$C_{14}H_{23}N$	*N*-Dibutylaniline $C_6H_5N(C_4H_9)_2$	205.19		262.8		
4832.1	$C_{14}H_{23}N$	Diisobutylaniline	205.19		146^{21}	0.909^{26}	
4833	$C_{14}H_{24}O_2$	Kersyl alcohol	224.19	85	156^{11}		
4834	$C_{14}H_{24}O_2$	*d*-Bornyl *n*-butyrate	224.19		121^{11}	0.966^{15}	856
4835	$C_{14}H_{24}O_2$	Geranyl butyrate	224.19		153^{18}	0.901	
4836	$C_{14}H_{24}O_2$	*l*-Menthyl crotonate	224.19		140.5^{11}	0.833	
4837	$C_{14}H_{24}O_3$	*l*-Menthyl acetoacetate	240.19	45	145^{11}	0.986_{15}^{15}	
4837.1	$C_{14}H_{24}O_4$	Di-*l*-amyl maleate	256.19		165^{25}	0.9708^{25}	
4838	$C_{14}H_{24}O_4$	*l*-Menthyl acid succinate	256.19	62	300 d.		
4839	$C_{14}H_{25}NO_2$	Carpaine	239.20	121			1333
4840	$C_{14}H_{26}ClNO_2$	Carpaine hydrochloride	275.67	225			
4841	$C_{14}H_{26}O_2$	*l*-Menthyl *n*-butyrate	226.20		129^{15}	0.911	
4842	$C_{14}H_{26}O_2$	*l*-Menthyl isobutyrate	226.20		117^{12}	0.906	
4843	$C_{14}H_{26}O_3$	*n*-Heptylic anhydride $(C_6H_{13}CO)_2O$	242.20	17	258	0.932	332
4844	$C_{14}H_{26}O_3$	Menthyl ethyl glycollate	242.20		155^{20}		
4845	$C_{14}H_{26}O_4$	Diamyl succinate	258.20		293	0.952_{25}^{25}	
4845.1	$C_{14}H_{26}O_4$	Di-*l*-amyl succinate	258.20		129^{1}	0.957^{25}	
4846	$C_{14}H_{26}O_4$	Diethyl sebacate	258.20	1	308	0.965^{16}	
4846.1	$C_{14}H_{26}O_6$	Diisoamyl tartrate	290.20		195^{16}	1.063^{15}	
4847	$C_{14}H_{27}ClO$	Myristyl chloride $CH_3(CH_2)_{12}COCl$	246.67	−1	168^{15}		
4848	$C_{14}H_{27}N$	Myristic nitrile $CH_3(CH_2)_{12}CN$	209.22	19	226^{100}	0.828	
4849	$C_{14}H_{28}$	*n*-Tetradecylene	196.22	−12	246	0.775	
4850	$C_{14}H_{28}O$	Myristic aldehyde $CH_3(CH_2)_{12}CHO$	212.22	52.5	166^{24}		
4851	$C_{14}H_{28}O_2$	Myristic acid $CH_3(CH_2)_{12}CO_2H$	228.22	58	250.5^{100}	0.858_4^{60}	1088
4852	$C_{14}H_{28}O_2$	Ethyl laurate $C_{11}H_{23}CO_2C_2H_5$	228.22	−10.7	269	0.868_4^{13}	337
4853	$C_{14}H_{28}O_3$	Hydroxymyristic acid	244.22	51			
4854	$C_{14}H_{28}O_4$	Ipurolic acid	260.22	101			
4855	$C_{14}H_{29}NO$	Myristic amide $CH_3(CH_2)_{12}CONH_2$	227.23	103			
4856	$C_{14}H_{30}$	*n*-Tetradecane $CH_3(CH_2)_{12}CH_3$	198.23	5.5	252.5	0.765	412
4857	$C_{14}H_{30}O$	*n*-Heptyl ether $(C_7H_{15})_2O$	214.23		260	0.815^{0}	
4858	$C_{14}H_{30}O$	*n*-Tetradecyl alcohol $C_{13}H_{27}CH_2OH$	214.23	38	167^{15}	0.824_4^{38}	
4859	$C_{14}H_{31}N$	Tetradecyl amine $C_{13}H_{27}CH_2NH_2$	213.25	37	162^{15}		
4860	$C_{15}H_8O_4$	Anthraquinone-α-carboxylic acid	252.06	294			
4861	$C_{15}H_8O_4$	Anthraquinone-β-carboxylic acid	252.06	288			
4862	$C_{15}H_8O_4$	Anthraquinone-γ-carboxylic acid	252.06	285			
4863	$C_{15}H_8O_6$	Alizarin-β-carboxylic acid	284.06	305			
4864	$C_{15}H_8O_7$	Pseudopurpurin	300.06	220			
4865	$C_{15}H_9N$	Thebenidine	203.08	148			
4866	$C_{15}H_{10}$	Fluoranthene	190.08	110	251^{60}		
4867	$C_{15}H_{10}$	Succisterene	190.08	160	300		
4868	$C_{15}H_{10}O_2$	Flavone	222.08	97			
4869	$C_{15}H_{10}O_2$	Anthracene-1-carboxylic acid	222.08	260			
4870	$C_{15}H_{10}O_2$	Anthracene-2-carboxylic acid	222.08	280			
4871	$C_{15}H_{10}O_2$	Anthracene-9-carboxylic acid	222.08	206			
4872	$C_{15}H_{10}O_2$	1-Methylanthraquinone	222.08	171			
4873	$C_{15}H_{10}O_2$	2-Methylanthraquinone	222.08	175			
4874	$C_{15}H_{10}O_4$	Chrysine	254.08	275			
4875	$C_{15}H_{10}O_4$	Chrysophanic acid	254.08	193			
4876	$C_{15}H_{10}O_4$	α-Methylalizarin	254.08	229			
4877	$C_{15}H_{10}O_4$	β-Methylalizarin	254.08	179			
4878	$C_{15}H_{10}O_4$	Rumicin	254.08	182			
4879	$C_{15}H_{10}O_5$	Aloe-emodin	270.08	218			
4880	$C_{15}H_{10}O_5$	Emodin	270.08	250			
4881	$C_{15}H_{10}O_5$	Galangin	270.08	217			
4882	$C_{15}H_{10}O_5$	Morindon	270.08	275			
4883	$C_{15}H_{10}O_6$	Fisetin	286.08	360			
4884	$C_{15}H_{10}O_6$	Kaempferol	286.08	274			
4885	$C_{15}H_{10}O_6$	Luteolin	286.08	320			
4886	$C_{15}H_{10}O_6$	Rhein	286.08	314			
4887	$C_{15}H_{10}O_6$	Scutellarein	286.08	300 d.			
4888	$C_{15}H_{10}O_7$	Morin	302.08	285			

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
4889	$C_{15}H_{10}O_7$	Quercetin	302.08	310			
4890	$C_{15}H_{10}O_8$	Gossypetin	318.08	230			
4891	$C_{15}H_{10}O_8$	Quercetagetin	318.08	318			
4892	$C_{15}H_{11}N$	2-Phenylquinoline	205.09	86	363		
4893	$C_{15}H_{11}N$	4-Phenylquinoline	205.09	62			
4894	$C_{15}H_{11}N$	6-Phenylquinoline	205.09	111	260^{77}	1.195	
4895	$C_{15}H_{11}N$	8-Phenylquinoline	205.09		283^{187}		
4896	$C_{15}H_{11}NO$	Benzoylphenylacetonitrile	221.09	99			
4897	$C_{15}H_{12}$	α-Methylanthracene	192.09	86	200	$1.047^{99.4}$	1134
4898	$C_{15}H_{12}$	2-Methylanthracene	192.09	207			
4899	$C_{15}H_{12}$	9-Methylanthracene	192.09	80		$1.066^{99.4}$	1136
4900	$C_{15}H_{12}N_2O_3$	Furfuramide	268.11	121	250 d.		
4901	$C_{15}H_{12}N_2O_3$	Furfurine	268.11	116			
4902	$C_{15}H_{12}O$	Benzylideneacetophenone	208.09	62	348	1.071_4^{62}	
4903	$C_{15}H_{12}O_2$	Benzoylacetophenone	224.09	81	>200		
4904	$C_{15}H_{12}O_3$	*p*-Toluyl-*o*-benzoic acid	240.09	139			
4905	$C_{15}H_{12}O_3$	Chrysophanol	240.09	204			
4906	$C_{15}H_{12}O_4$	Acetylsalol *o*-$CH_3CO_2C_6H_4CO_2C_6H_5$	256.09	97	198		
4907	$C_{15}H_{12}O_4$	Benzosalin	256.09	85	385		
4908	$C_{15}H_{12}O_4$	Diphenyl malonate $CH_2(CO_2C_6H_5)_2$	256.09	50	210^{15} d.		
4909	$C_{15}H_{12}O_6$	Eriodictyol	288.09	267			
4910	$C_{15}H_{12}O_6$	Methylenedisalicylic acid	288.09	238 d.			
4911	$C_{15}H_{13}NO_4$	Salophen	271.11	188			
4912	$C_{15}H_{14}O$	Benzylacetophenone	210.11	73	360		
4913	$C_{15}H_{14}O$	Benzyl *p*-tolyl ketone	210.11	109	360		
4914	$C_{15}H_{14}O$	Dibenzyl ketone $(C_6H_5CH_2)_2CO$	210.11	33.9	330.5		
4915	$C_{15}H_{14}O$	*p*, *p'*-Dimethylbenzophenone	210.11	92	335.1		
4916	$C_{15}H_{14}O_2$	Benzyl *o*-toluate	226.11		315	1.12^{17}	
4917	$C_{15}H_{14}O_2$	Benzyl phenylacetate	226.11		319	1.101	
4918	$C_{15}H_{14}O_3$	Benzyl mandelate	242.11	93			
4919	$C_{15}H_{14}O_3$	Methyl benzilate	242.11	73			
4920	$C_{15}H_{14}O_3$	Lapachol	242.11	140			
4921	$C_{15}H_{14}O_4$	Hydrocotoin	258.11	95.5			
4922	$C_{15}H_{14}O_4$	Peucedanin	258.11	109			
4923	$C_{15}H_{14}O_4$	*N*-Xanthoxyllin	258.11	132.5			
4924	$C_{15}H_{14}O_5$	Guaiacyl carbonate $(o\text{-}CH_3OC_6H_4O)_2CO$	274.11	86			
4925	$C_{15}H_{14}O_5$	Kavaiin (Methysticin)	274.11	137			
4926	$C_{15}H_{14}O_5$	Phloretin	274.11	255 d.			1333
4927	$C_{15}H_{15}NO$	*p*-Dimethylaminobenzophenone	225.12	90			
4928	$C_{15}H_{15}NO_3$	Malakin	257.12	92			
4929	$C_{15}H_{15}NO_8$	Narceinic acid	337.12	184			
4930	$C_{15}H_{16}$	Dibenzylmethane $(C_6H_5CH_2)_2CH_2$	196.12	<−20	299	1.007	762
4931	$C_{15}H_{16}N_2O$	*sym.*-Di-*o*-tolylurea	240.14	256			
4932	$C_{15}H_{16}N_2O$	*sym.*-Di-*m*-tolylurea	240.14	203			
4933	$C_{15}H_{16}N_2O$	*sym.*-Di-*p*-tolylurea	240.14	263			
4934	$C_{15}H_{16}N_2S$	1, 2-Di-*o*-tolylthiourea	256.20	156	218		
4935	$C_{15}H_{16}N_2S$	*sym.*-Di-*m*-tolylthiourea	256.20	111.5			
4936	$C_{15}H_{16}O_2$	Santinic acid	228.12	132.5			
4936.1	$C_{15}H_{16}O_6$	Picrotoxinin	292.12	206			1265
4937	$C_{15}H_{16}O_9$	Daphnin	340.12	200			
4938	$C_{15}H_{16}O_9$	Esculin	340.12	205			
4939	$C_{15}H_{17}N$	Ethylbenzylaniline	211.14		298	$1.034^{18.5}$	
4940	$C_{15}H_{17}N_3$	Di-*o*-tolylguanidine	239.16	179			
4941	$C_{15}H_{18}$	Azulene	198.14		168.4^{11}	0.988	
4942	$C_{15}H_{18}N_2$	*p*, *p'*-Diamino-*o*, *o'*-ditolylmethane	226.16	149			
4943	$C_{15}H_{18}O_3$	Santonin	246.14	170		1.187	1282
4944	$C_{15}H_{18}O_4$	Artemisin	262.14	202			1333
4944.1	$C_{15}H_{18}O_4$	Coriamyrtin	262.14	225			
4945	$C_{15}H_{18}O_7$	Hyenanchin	310.14	234 d.			
4946	$C_{15}H_{18}O_7$	Picrotin	310.14	250			
4947	$C_{15}H_{19}NO_2$	Tropacocaine	245.15	49	d.	1.043_4^{100}	1147
4948	$C_{15}H_{19}NO_9$	Lithuric acid	357.15	204.5			
4949	$C_{15}H_{20}ClNO_2$	Tropacocaine hydrochloride	281.62	271			

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
4950	$C_{15}H_{20}O_2$	Alantolactone	232.15	76	192^{10}		
4951	$C_{15}H_{20}O_3$	Perezone	248.15	105			
4952	$C_{15}H_{20}O_3$	Pipitzol	248.15	141			
4953	$C_{15}H_{20}O_4$	Absinthiin	264.15	68			
4954	$C_{15}H_{20}O_4$	Isosantonic acid	264.15	155	160^{4}		
4955	$C_{15}H_{20}O_4$	*dl*-Santonic acid	264.15	120 d.			
4956	$C_{15}H_{20}O_4$	*d*(*l*)-Satonic acid	264.15	179	260^{5}	1.251	1333
4957	$C_{15}H_{20}O_8$	Androsin	328.15	220			
4958	$C_{15}H_{21}NO_2$	β-Eucaine	247.17	91			
4959	$C_{15}H_{21}NO_4$	Ajacine	279.17	143			
4960	$C_{15}H_{21}N_3O_2$	Physostigmine	275.19	105			1263
4961	$C_{15}H_{21}N_3O_3$	Geneserine	291.19	129			
4962	$C_{15}H_{22}BrN_3O_2$	Physostigmine hydrobromide	356.11				1333
4963	$C_{15}H_{22}ClNO_2$	β-Eucaine hydrochloride	283.64	268			
4964	$C_{15}H_{22}ClNO_4$	Ajacine hydrochloride	315.64	93			
4965	$C_{15}H_{22}ClN_3O_2$	Physostigmine hydrochloride	311.65				1333
4966	$C_{15}H_{22}O_2$	Santalic acid	234.17		195^{9}		
4967	$C_{15}H_{22}O_2$	Eugenol isoamyl ether	234.17		302.2 d.	0.976	846
4968	$C_{15}H_{22}O_2$	Thymyl isovalerate	234.17		249	0.959^{15}_{15}	
4969	$C_{15}H_{22}O_3$	Alantic (Alantolic) acid	250.17	94			
4970	$C_{15}H_{23}Cl$	Santalyl chloride	238.64		155^{10}	1.040	
4971	$C_{15}H_{24}$	Atractylene	204.19		$141^{14.5}$	0.927	625
4972	$C_{15}H_{24}$	*l*-Cadinene	204.19		275	0.918	631
4973	$C_{15}H_{24}$	Cannibene	204.19		259	0.897^{15}	
4974	$C_{15}H_{24}$	α-Caryophyllene	204.19		260	0.906	596
4975	$C_{15}H_{24}$	Cedrene	204.19		264	0.929	590
4976	$C_{15}H_{24}$	Clovene	204.19		263	0.930	603
4977	$C_{15}H_{24}$	Guajene	204.19		124^{9}	0.908	602
4978	$C_{15}H_{24}$	Patschoulene	204.19		256	0.930	591
4979	$C_{15}H_{24}$	α-Santalene	204.19		252	0.913^{15}	862
4980	$C_{15}H_{24}$	β-Santalene	204.19		126^{7}	0.894	569
4981	$C_{15}H_{24}$	γ-Santalene	204.19		120^{10}	0.936	617
4982	$C_{15}H_{24}$	α-Selinene	204.19		135^{16}	0.914	
4983	$C_{15}H_{24}$	Zingiberene	204.19		270	0.872^{15}	574
4984	$C_{15}H_{24}N_2O$	*d*(*l*)-Lupanine	248.20	44			
4985	$C_{15}H_{24}N_2O$	Oxysparteine	248.20	84	$209^{12.5}$		
4986	$C_{15}H_{24}O$	Betulol	220.19		158^{13}	0.978^{16}	865
4987	$C_{15}H_{24}O$	α-Santalol	220.19		300	0.979^{15}	957
4988	$C_{15}H_{24}O$	β-Santalol	220.19		309	0.973^{15}	958
4989	$C_{15}H_{25}BrO_2$	Bornyl bromoisovalerate	317.11		163^{10}		
4990	$C_{15}H_{25}NO_7$	Senecifolidine	331.20	212			
4991	$C_{15}H_{26}$	Elemone	206.20		119^{10}	0.883	
4992	$C_{15}H_{26}$	Ferulene	206.20		126^{7}	0.870	
4993	$C_{15}H_{26}N_2$	Isosparteine	234.22		$179^{16.5}$	1.028^{17}	916
4994	$C_{15}H_{26}N_2$	Sparteine	234.22		325.2	1.023	959
4995	$C_{15}H_{26}N_2O$	Retamine	250.22	162			
4996	$C_{15}H_{26}O$	Atractylol	222.20	59	292	1.511	
4997	$C_{15}H_{26}O$	Cedrol	222.20	87	294		
4998	$C_{15}H_{26}O$	α-Elemol	222.20	46	143^{10}	$0.941^{21.3}$	967
4999	$C_{15}H_{26}O$	β-Elemol	222.20		144^{10}	0.942^{18}	611
5000	$C_{15}H_{26}O$	Eudesmol	222.20	78	156^{10}	0.988	657
5001	$C_{15}H_{26}O$	Farnesol	222.20		$120^{0.2}$	0.895	548
5002	$C_{15}H_{26}O$	Guajol	222.20	93	289 s. d.		1175
5003	$C_{15}H_{26}O$	Nerolidol	222.20		277	0.880	891
5004	$C_{15}H_{26}O$	Zingiberol	222.20		$157^{14.5}$		
5005	$C_{15}H_{26}O_2$	Bornyl isovalerate	238.20		260	0.949	985
5006	$C_{15}H_{26}O_2$	Isobornyl isovalerate	238.20		138^{12}	0.957^{15}	
5007	$C_{15}H_{26}O_2$	*d*-Bornyl *n*-valerate	238.20		130^{11}	0.956^{15}	855
5008	$C_{15}H_{26}O_2$	*l*-Menthyl angelate	238.20		141^{10}		
5009	$C_{15}H_{26}O_3$	*l*-Menthyl levulinate	254.20		169^{12}	0.977	
5010	$C_{15}H_{26}O_6$	Tributyrin	302.20	< -75	310	1.027	351
5011	$C_{15}H_{27}ClN_2$	Sparteine hydrochloride	270.68				1333
5012	$C_{15}H_{27}IN_2$	Sparteine hydroiodide	362.16				1333

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
5013	$C_{15}H_{28}O_2$	*l*-Menthyl isovalerate	240.22		127^{11}	0.907^{15}	427
5014	$C_{15}H_{28}O_2$	Cimicic acid	240.22	44.2			
5015	$C_{15}H_{28}O_2$	*l*-Menthyl *n*-valerate	240.22		141^{15}	0.907	
5016	$C_{15}H_{30}O_2$	Pentadecylic acid	242.23	54	257^{100}		
5017	$C_{15}H_{30}O_2$	Methyl myristate	242.23	19	295.3		
5018	$C_{15}H_{32}$	*n*-Pentadecane $CH_3(CH_2)_{13}CH_3$	212.25	10	270.5	0.772	
5019	$C_{15}H_{32}O$	*n*-Pentadecyl alcohol $CH_3(CH_2)_{14}OH$	228.25	46			
5020	$C_{15}H_{33}N$	Pentadecylamine	227.26	36.5	301		
5021	$C_{15}H_{33}N$	Triisoamylamine	227.26		237	0.785^{25}_{25}	
5022	$C_{16}H_8O_6$	Anthraquinone-1, 3-dicarboxylic acid	296.06	330			
5023	$C_{16}H_8O_6$	Anthraquinone-1, 4-dicarboxylic acid	296.06	300			
5024	$C_{16}H_8O_6$	Anthraquinone-2, 3-dicarboxylic acid	296.06	340			
5025	$C_{16}H_{10}$	Diphenyldiacetylene	202.08	88			
5026	$C_{16}H_{10}$	Pyrene	202.08	150	>360		
5027	$C_{16}H_{10}N_2$	α, β-Naphthophenazine	230.09	142.5	>360		
5028	$C_{16}H_{10}N_2O_2$	Indigotin	262.09	392 d.		1.35	
5028.1	$C_{16}H_{10}O_3$	Diphenylmaleic anhydride	250.08	155		1.340	1211
5029	$C_{16}H_{10}O_4$	Anthracene-1, 3-dicarboxylic acid	266.08	330			
5030	$C_{16}H_{10}O_4$	Anthracene-1, 4-dicarboxylic acid	266.08	320			
5031	$C_{16}H_{10}O_4$	Anthracene-2, 3-dicarboxylic acid	266.08	345			
5032	$C_{16}H_{10}O_6$	Trifolitin	298.08	275			
5033	$C_{16}H_{11}N$	Amaron	217.09	240			
5034	$C_{16}H_{11}N$	Aminopyrene	217.09	116			
5035	$C_{16}H_{11}NO_2$	Atophan (2-Phenylquinoline-4-carboxylic acid	249.09	209			
5036	$C_{16}H_{11}N_3O_2$	Indigoxime	277.11	205			
5037	$C_{16}H_{12}$	α-Phenylnaphthalene	204.09		325		
5038	$C_{16}H_{12}$	β-Phenylnaphthalene	204.09	102.5	345		
5039	$C_{16}H_{12}$	Pseudophenanthrene	204.09	115			
5040	$C_{16}H_{12}ClNO_2$	Chloroxyl (Phenylcinchoninic acid hydrochloride)	285.56	223			
5041	$C_{16}H_{12}N_2O_4$	Isatid	296.11	237.5			
5042	$C_{16}H_{12}N_4O$	Azoxytolunitrile	276.12	182			
5043	$C_{16}H_{12}O$	Phenyl α-naphthyl ether	220.09	55	340		
5044	$C_{16}H_{12}O$	Phenyl β-naphthyl ether	220.09	45; 93	335.8		
5045	$C_{16}H_{12}O_3S$	Atronylenesulfonic acid	284.16	258			
5046	$C_{16}H_{12}O_4$	α-Ethylalizarin	268.09	189			
5047	$C_{16}H_{12}O_4$	Pratol	268.09	253			
5048	$C_{16}H_{12}O_5$	Physcion (Physcic acid)	284.09	207			
5049	$C_{16}H_{12}O_6$	Chrysoeriol	300.09	>337			
5050	$C_{16}H_{12}O_6$	Emodine methyl ether	300.09	195			
5051	$C_{16}H_{12}O_6$	Hematein	300.09	250 d.			
5052	$C_{16}H_{12}O_8$	Laccainic acid	332.09		180 d.		
5053	$C_{16}H_{13}N$	Flavoline	219.11	65	375		
5054	$C_{16}H_{13}N$	*N*-Phenyl-α-naphthylamine	219.11	62	335^{258}		
5055	$C_{16}H_{13}N$	*N*-Phenyl-β-naphthylamine	219.11	108	399.5		
5056	$C_{16}H_{13}NO_7$	Papaveric acid	331.11	233 d.			
5057	$C_{16}H_{13}N_2$	Galegine	233.12	65			
5058	$C_{16}H_{13}N_3$	Hydrazoindole	247.12	140			
5059	$C_{16}H_{14}$	Atronene	206.11		326		
5060	$C_{16}H_{14}$	2, 3-Dimethylanthracene	206.11	246			
5061	$C_{16}H_{14}$	2, 4-Dimethylanthracene	206.11	71			
5062	$C_{16}H_{14}$	2, 6-Dimethylanthracene	206.11	231			
5062.1	$C_{16}H_{14}$	Distyrene $C_6H_5CH{:}CHCH{:}CHC_6H_5$	206.11	124			
5063	$C_{16}H_{14}$	9-Ethylanthracene	206.11	59		$1.041^{99.2}$	1130
5064	$C_{16}H_{14}Cl_2N_2O_2$	3, 3′-Dichlorodiacetylbenzidine	337.04	302			
5065	$C_{16}H_{14}N_2$	α-Flavaniline	234.12	97			
5066	$C_{16}H_{14}N_2$	Indolin	234.12		245		
5066.1	$C_{16}H_{14}N_2$	1, 5-Diphenyl-3-methylpyrazole	234.12	63			1199
5067	$C_{16}H_{14}O$	Dypnone	222.11		225^{22}		
5067.1	$C_{16}H_{14}O$	Benzylidene-*p*-tolyl ketone	222.11	77			1289
5068	$C_{16}H_{14}O_2$	Benzyl cinnamate	238.11	34	244^{25}		
5069	$C_{16}H_{14}O_2$	Diphenacyl $C_6H_5COCH_2CH_2COC_6H_5$	238.11	145			

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
5070	$C_{16}H_{14}O_3$	Guaiacyl cinnamate	254.11	130			
5071	$C_{16}H_{14}O_3$	Phenylacetic anhydride	254.11	117.5			
5072	$C_{16}H_{14}O_3$	o-Toluic anhydride $(o\text{-}CH_3C_6H_4CO)_2O$	254.11	39	325		
5073	$C_{16}H_{14}O_4$	Dibenzyl oxalate $(CO_2CH_2C_6H_5)_2$	270.11	81	235^{14}		
5074	$C_{16}H_{14}O_4$	Diphenyl succinate $(CH_2CO_2C_6H_5)_2$	270.11	121	330		
5075	$C_{16}H_{14}O_5$	Brasilin	286.11	250			
5076	$C_{16}H_{14}O_5$	Sakuranetin	286.11	150			
5077	$C_{16}H_{14}O_6$	Diphenyl tartrate $(CHOHCO_2C_6H_5)_2$	302.11	102			
5078	$C_{16}H_{14}O_6$	Hematoxylin	302.11	140			1333
5079	$C_{16}H_{14}O_6$	Hesperetin	302.11	226			
5080	$C_{16}H_{14}O_6$	Homoeriodyctiol	302.11	223			
5081	$C_{16}H_{16}NO_2$	Anisaldazine	254.12	169	180	1.031^{185}	
5082	$C_{16}H_{16}N_2O_2$	Diacetylbenzidine $(p\text{-}CH_3CONHC_6H_4)_2$	268.14	331			
5082.1	$C_{16}H_{16}N_2O_6$	o-Aminophenyl tartrate	332.14	211 d.			
5082.2	$C_{16}H_{16}N_2O_6$	m-Aminophenyl tartrate	332.14	175 d.			
5082.3	$C_{16}H_{16}N_2O_6$	p-Aminophenyl tartrate	332.14	220 d.			
5082.4	$C_{16}H_{16}N_2O_2$	Diacetylhydrazobenzene	268.15	105			1293
5083	$C_{16}H_{16}N_2S$	Dehydrothioxylidine	268.20		197		
5084	$C_{16}H_{16}N_4O_{10}$	Damascenine picrate	424.16	159			
5085	$C_{16}H_{16}O_2$	p-Dimethylbenzoin	240.12	89			
5086	$C_{16}H_{16}O_5$	Anisilic acid	288.12	164			
5087	$C_{16}H_{16}O_3$	Ethyl benzilate	256.12	34	201^{21}		
5088	$C_{16}H_{17}NO_3$	Amygdophenine	271.14	141			
5089	$C_{16}H_{17}NO_4$	Lycorine	287.14	235 d.			
5090	$C_{16}H_{17}NO_4$	Phenetidine salicylacetate	287.14	182			
5091	$C_{16}H_{18}ClNO_4$	Lycorine hydrochloride	323.61	208			
5092	$C_{16}H_{18}N_2$	Azo-o-ethylbenzene	238.16	46.5			
5093	$C_{16}H_{18}N_2$	Azo-p-ethylbenzene	238.16	63	>340		
5094	$C_{16}H_{18}N_2$	3, 3′-Azo-o-xylene	238.16	111			
5095	$C_{16}H_{18}N_2$	4, 4′-Azo-o-xylene	238.16	141			
5096	$C_{16}H_{18}N_2$	4, 4′-Azo-m-xylene	238.16	129			
5097	$C_{16}H_{18}N_2$	4, 5′-Azo-m-xylene	238.16	47			
5098	$C_{16}H_{18}N_2$	5, 5′-Azo-m-xylene	238.16	137			
5099	$C_{16}H_{18}N_2$	2, 2′-Azo-p-xylene	238.16	119			
5100	$C_{16}H_{18}N_2$	Diphenylpiperazine	238.16	163.5	242^{20}		
5101	$C_{16}H_{18}N_2O$	Paricine	254.16	130			
5102	$C_{16}H_{18}N_2O_2$	o-Azophenetol $(C_2H_5OC_6H_4N{:})_2$	270.16	131	240		
5103	$C_{16}H_{18}N_2O_2$	p-Azophenetol $(C_2H_5OC_6H_4N{:})_2$	270.16	160.2			
5104	$C_{16}H_{18}N_2O_3$	3, 3′-Azoxy-4-methoxytoluene	286.16	149			
5105	$C_{16}H_{18}N_2O_3$	p-Azoxyphenetol	286.16	136.9			
5106	$(C_{16}H_{18}N_2O_3)_x$	Bilirubin	$[286.16]_x$	192.5			
5107	$C_{16}H_{18}N_2O_3$	Carpiline	286.16	185			
5108	$C_{16}H_{18}N_2O_3$	Hematoporphyrin	286.16	<100 d.			
5109	$C_{16}H_{18}N_2O_3$	Pilosine	286.16	187			
5110	$C_{16}H_{18}O$	Thymyl phenyl ether	226.14		296.8	1.011	
5111	$C_{16}H_{18}O_2S$	Di-m-xylylsulfone	274.20	121			
5112	$C_{16}H_{18}O_7$	Barbaloin	322.14	148			
5113	$C_{16}H_{19}NO_4$	Benzoylecgonine	289.15	195			
5114	$C_{16}H_{20}N_2$	3-Hydrazo-o-xylene	240.17	141			
5115	$C_{16}H_{20}N_2$	4-Hydrazo-o-xylene	240.17	107			
5116	$C_{16}H_{20}N_2$	4-Hydrazo-m-xylene	240.17	122			
5117	$C_{16}H_{20}N_2$	5-Hydrazo-m-xylene	240.17	125			
5118	$C_{16}H_{20}N_2$	2-Hydrazo-p-xylene	240.17	145			
5119	$C_{16}H_{20}N_2O_2$	o-Hydrazophenetol $(o\text{-}C_2H_5OC_6H_4NH)_2$	272.17	89			
5123	$C_{16}H_{20}N_4$	m-Tetramethyldiaminoazobenzene	268.19	118			
5124	$C_{16}H_{20}O_4$	Phenyl acid camphorate	276.15	100			
5125	$C_{16}H_{20}O_9$	Gentiopicrin	356.15	191			
5126	$C_{16}H_{21}N_3$	p-(Tetramethyldiamino)diphenylamine	255.19	119			
5127	$C_{16}H_{21}NO_3$	Camphoranilic acid	275.17	204			
5128	$C_{16}H_{21}NO_3$	Homoatropine	275.17	97.5			1333
5129	$C_{16}H_{21}NO_3$	Noratropine	275.17	114			
5130	$C_{16}H_{21}NO_3$	Norhyoscyamine	275.17	140.5			
5131	$C_{16}H_{22}BrNO_3$	Homoatropine hydrobromide	356.09	212 d.			1333

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
5132	$C_{16}H_{22}ClNO_3$	Homoatropine hydrochloride	311.64	217			1333
5133	$C_{16}H_{22}N_4$	*m*-Hydrazodimethylaniline	270.20	100			
5134	$C_{16}H_{22}N_8O_8S$	Caffeine sulfate	486.30				1333
5135	$C_{16}H_{22}O_4$	Di-*n*-butyl phthalate	278.17		340		
5135.1	$C_{16}H_{22}O_4$	Methyl santoate	278.17		86	1.167	1321
5136	$C_{16}H_{22}O_6$	Bilinic acid	310.17	190			
5137	$C_{16}H_{22}O_8$	Coniferin	342.17	185			
5138	$C_{16}H_{22}O_{11}$	*d*-Glucose pentacetate	390.17	113			
5139	$C_{16}H_{23}NO_8$	Bakankosin	357.19	157			
5140	$C_{16}H_{24}O_2$	Methyl santalate	248.19		164^{10}	1.002	
5141	$C_{16}H_{26}$	Pentaethylbenzene	218.20	<-20	277	0.896	655
5142	$C_{16}H_{26}O$	Patchouli alcohol	234.20	56	271 d.	0.994_4^{70}	
5142.1	$C_{16}H_{26}O$	Guaiol	234.20	91			1176
5143	$C_{16}H_{26}O_2$	Menthyl *l*-sorbinate	250.20		173^{14}		
5143.1	$C_{16}H_{26}O_8$	Diisobutyl *d*-diacetyl tartrate	346.20		$157^{3.5}$	1.0864^{17}	
5144	$C_{16}H_{27}ClN_2O_2$	Alypin hydrochloride	314.68	169			
5145	$C_{16}H_{27}N_3O_5$	Alypin nitrate	341.23	152			
5146	$C_{16}H_{28}N_2$	Genisteine	248.23	60.5	178^{22}		
5147	$C_{16}H_{28}O_2$	Hydrocarpic acid	252.22	60			
5148	$C_{16}H_{28}O_2$	Palmitolic acid	252.22	47	240^{15}		
5149	$C_{16}H_{28}O_4$	Palmitoxylic acid	284.22	67			
5150	$C_{16}H_{30}O_2$	Gaidic acid	254.23	39			
5151	$C_{16}H_{30}O_2$	Hypogaeic acid	254.23	33	236^{15}		
5152	$C_{16}H_{30}O_2$	*l*-Menthyl *n*-capronate	254.23		153^{15}	0.903	
5153	$C_{16}H_{30}O_3$	*n*-Caprylic anhydride $(C_8H_{15}CO)_2O$	270.23	-1	285		
5154	$C_{16}H_{30}O_3$	7-Ketopalmitic acid	270.23	74			
5155	$C_{16}H_{31}N$	Palmitonitrile $CH_3(CH_2)_{13}CH_2CN$	237.25	29	251.5^{100}	0.822_4^{31}	
5156	$C_{16}H_{32}$	α-Hexadecylene $CH_2{:}CH(CH_2)_{13}CH_3$	224.25	4	274	0.789	388
5157	$C_{16}H_{32}N_2O_6S$	Pelletierine sulfate	380.33	133			
5158	$C_{16}H_{32}O$	Palmitic aldehyde $C_{15}H_{31}CHO$	240.25	58.5	202^{29}		
5159	$C_{16}H_{32}O_2$	Palmitic acid $C_{15}H_{31}CO_2H$	256.25	64	215^{15}	0.853_4^{62}	1113
5160	$C_{16}H_{32}O_2$	Ethyl myristate $C_{13}H_{27}CO_2C_2H_5$	256.25	10.5	295		
5161	$C_{16}H_{32}O_3$	Jalapinolic acid	272.25	68			
5162	$C_{16}H_{32}O_3$	Juniperic acid	272.25	95			
5163	$C_{16}H_{32}O_3$	Lanopalmic acid	272.25	88			
5164	$C_{16}H_{33}I$	*n*-Cetyl iodide $C_{15}H_{31}CH_2I$	352.19	22	212.5^{15}	1.123	535
5165	$C_{16}H_{33}NO$	Palmitic amide $C_{15}H_{31}CONH_2$	255.26	106	236^{12}		
5166	$C_{16}H_{34}$	7, 8-Dimethyltetradecane	226.26		267.5	0.792^{14}	
5167	$C_{16}H_{34}$	*n*-Hexadecane	226.26	20	287.5	0.775	
5168	$C_{16}H_{34}O$	Cetyl alcohol $C_{15}H_{31}CH_2OH$	242.26	49.3	344	$0.798_4^{78.9}$	1108
5169	$C_{16}H_{34}O$	*n*-Octyl ether $(C_8H_{17})_2O$	242.26		291.8	0.820	
5171	$C_{17}H_{10}O$	Benzanthrone	230.08	170			
5172	$C_{17}H_{11}N$	α-Anthraquinoline	229.09	170	446		
5173	$C_{17}H_{12}O$	Phenyl α-naphthyl ketone	232.09	75.5	385		
5174	$C_{17}H_{12}O$	Phenyl β-naphthyl ketone	232.09	82			
5175	$C_{17}H_{12}O_2$	Chrysenic acid	248.09	186.5			
5176	$C_{17}H_{12}O_2$	α-Naphthyl benzoate	248.09	56			
5177	$C_{17}H_{12}O_2$	β-Naphthyl benzoate	248.09	110			
5178	$C_{17}H_{12}O_3$	α-Naphthyl salicylate	264.09	83			
5179	$C_{17}H_{12}O_3$	β-Naphthyl salicylate	264.09	95			
5180	$C_{17}H_{12}O_5$	Alpinin	296.09	174			
5181	$C_{17}H_{12}O_5$	Pratonsol	296.09	225			
5182	$C_{17}H_{13}NO_2$	6-Methyl-2-phenylquinoline-4-carboxylic acid	263.11	228			
5183	$C_{17}H_{14}$	α-Benzylnaphthalene	218.11	59	350	1.165[illegible]	
5184	$C_{17}H_{14}$	β-Benzylnaphthalene	218.11	35.5	350	1.173[illegible]	
5185	$C_{17}H_{14}O$	Dibenzylideneacetone	234.11	112			
5186	$C_{17}H_{14}O_2$	Atronic acid	250.11	164			
5187	$C_{17}H_{14}O_2$	Isatronic acid	250.11	157			
5188	$C_{17}H_{14}O_4$	Nepalin	282.11	136			
5189	$C_{17}H_{15}N_5O_9$	Tryptophane picrate	433.16	196 s. d.			
5190	$C_{17}H_{16}$	1, 2, 4-Trimethylanthracene	220.12	243			
5191	$C_{17}H_{16}$	1, 3, 6-Trimethylanthracene	220.12	222			

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
5192	$C_{17}H_{16}$	1, 4, 6-Trimethylanthracene	220.12	227			
5193	$C_{17}H_{16}O_3$	Eugenol benzoate	268.12	70	360		
5194	$C_{17}H_{16}O_3$	Isoeugenol benzoate	268.12	104			
5195	$C_{17}H_{16}O_4$	Dibenzyl malonate	284.12		234.5^{14} d.		
5196	$C_{17}H_{17}NO_2$	Apomorphine	267.14	170 d.			
5197	$C_{17}H_{18}ClNC_2$	Apomorphine hydrochloride	303.61	210			1333
5198	$C_{17}H_{18}N_2O_3$	Antipyrine resorcinate	298.16	115			
5199	$C_{17}H_{18}O$	Dibenzylacetone $CO(CH_2CH_2C_6H_5)_2$	238.14		224^{18}		
5200	$C_{17}H_{18}O_2$	Eugenol benzyl ether	254.14	30	235 d.		
5201	$C_{17}H_{18}O_2$	Isoeugenol benzyl ether	254.14	59			
5202	$C_{17}H_{19}NO_3$	Morphine	285.15	d.	$193^{vac.}$	1.317	1277
5203	$C_{17}H_{19}NO_3$	α-Isomorphine	285.15	247			
5204	$C_{17}H_{19}NO_3$	Piperine	285.15	129.5			
5205	$C_{17}H_{20}BrNO_3$	Morphine hydrobromide	366.08				1333
5206	$C_{17}H_{20}ClNO_3$	Morphine hydrochloride	321.62	250 d.			1333
5207	$C_{17}H_{20}N_2O$	Tetramethyldiaminobenzophenone	268.17	174	>360 s. d.		
5208	$C_{17}H_{20}N_2O_3$	Nicotine salicylate	300.17	117.5			1333
5209	$C_{17}H_{20}N_2O_4$	*l*-Arabinose diphenylhydrazone	316.17	218			
5211	$C_{17}H_{20}N_2S$	3, 3-Tetramethyldiaminothiobenzophenone	284.24	202			
5212	$C_{17}H_{20}N_4O_3$	*l*-Arabinosazone	340.19	166	200 d.		
5213	$C_{17}H_{20}N_4O_3$	*d*-Xylosephenylosazone	328.19	164	167 d.		
5213.1	$C_{17}H_{20}O_2$	Di-(*p*-dianisyl)dimethylmethane	256.15	60.5		1.150	1294
5214	$C_{17}H_{20}O_7$	Tutin	336.15	208			
5215	$C_{17}H_{20}O_{10}$	Patellaric acid	384.15	100			
5216	$C_{17}H_{21}NO_2$	Apoatropine	271.17	62			
5217	$C_{17}H_{21}NO_3$	Dihydromorphine	287.17	157			
5218	$C_{17}H_{21}NO_4$	Atroscine	303.17	50			
5219	$C_{17}H_{21}NO_4$	α-Cocaine	303.17	88			
5220	$C_{17}H_{21}NO_4$	*dl*-Cocaine	303.17	80			
5221	$C_{17}H_{21}NO_4$	*d*(*l*)-Cocaine	303.17	98			1326
5222	$C_{17}H_{21}NO_4$	Hyoscine	303.17	55			1333
5223	$C_{17}H_{21}NO_4$	*dl*-Pseudococaine	303.17	81.5		$1.103^{99.5}$	1139
5224	$C_{17}H_{21}NO_4$	*d*-Pseudococaine	303.17	41		$1.102^{99.6}$	1142
5225	$C_{17}H_{21}N_3$	Auramine	267.19	136			
5226	$C_{17}H_{22}BrNO_4$	Hyoscine hydrobromide	384.09	194			1333
5227	$C_{17}H_{22}ClNO_2$	Apoatropine hydrochloride	307.64	239			1333
5228	$C_{17}H_{22}ClNO_4$	Cocaine hydrochloride	339.64	187			1257
5229	$C_{17}H_{22}ClNO_4$	Hyoscine hydrochloride	339.64				1333
5230	$C_{17}H_{22}N_2$	*p*-(Tetramethyldiamino)-diphenylmethane	254.19	91			
5231	$C_{17}H_{22}N_2O$	*p*-(Tetramethyldiamino)-diphenyl carbinol $[p\text{-}(CH_3)_2NC_6H_4]_2CHOH$	270.19	96			
5232	$C_{17}H_{22}O_3$	Podocarpic acid	274.17	188			
5233	$C_{17}H_{22}O_5$	Guaiacyl acid camphorate	306.17	112			
5234	$C_{17}H_{22}O_9$	Syringin	370.17	192			
5235	$C_{17}H_{23}NO_3$	Atropine	289.19	115.5			1333
5236	$C_{17}H_{23}NO_3$	*d*-Hyoscyamine	289.19	106			
5237	$C_{17}H_{23}NO_3$	Pseudoatropine	289.19	120			
5238	$C_{17}H_{24}BrNO_3$	Atropine hydrobromide	370.11	162			1333
5239	$C_{17}H_{24}BrNO_3$	Hyoscyamine hydrobromide	370.11	152			1333
5240	$C_{17}H_{24}ClNO_3$	Atropine hydrochloride	325.65	165			1333
5241	$C_{17}H_{24}ClNO_3$	Hyoscyamine hydrochloride	325.65				1333
5242	$C_{17}H_{24}N_2O_5S$	Sinapine thiocyanate	368.27	176			
5243	$C_{17}H_{24}N_2O_6$	Atropine nitrate	352.20				1333
5244	$C_{17}H_{24}O_2$	Menthyl benzoate	260.19	54.5	288	0.808	
5244.1	$C_{17}H_{24}O_4$	Ethyl santoate	292.19	89		1.148	1322
5245	$C_{17}H_{24}O_{10}$	Verbenalin	388.19	181.6			
5246	$C_{17}H_{25}NO_3$	Euphthalmine	291.20	113			
5247	$C_{17}H_{25}O_6$	Scillitin	325.19	154			
5248	$C_{17}H_{26}ClNO_3$	Euphthalmine hydrochloride	327.67	183			
5249	$C_{17}H_{26}O$	Benzylmenthol	246.20	111	183^{10}		

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
5250	$C_{17}H_{28}O$	Phellyl alcohol	248.22	100			
5251	$C_{17}H_{29}NO_2$	Ajaconine	279.23	163			
5252	$C_{17}H_{30}O_9$	Jalapic acid	378.23	120			
5253	$C_{17}H_{32}O_2$	*l*-Menthyl heptylate	268.25		165^{15}	0.901	
5254	$C_{17}H_{34}$	8-Heptadecene $C_7H_{15}CH{:}CHC_8H_{17}$	238.26		$160^{9.5}$	0.798^{10}	
5255	$C_{17}H_{34}O$	Margaric aldehyde $C_{16}H_{33}CHO$	254.26	36	204^{26}		
5256	$C_{17}H_{34}O_2$	Daturic acid	270.26	60	227^{100}		
5257	$C_{17}H_{34}O_2$	Margaric acid $C_{16}H_{33}CO_2H$	270.26	59.9	227^{100}	0.853^{60}	
5258	$C_{17}H_{34}O_2$	Methyl palmitate $C_{15}H_{31}CO_2CH_3$	270.26	29.5	196^{15}		1119
5259	$C_{17}H_{35}NO_2$	Sphingosine	285.28	244	250 d.		
5260	$C_{17}H_{36}$	*n*-Heptadecane $CH_3(CH_2)_{15}CH_3$	240.28	22.5	303	0.778	359
5261	$C_{17}H_{36}O$	Heptadecane-9-ol $C_8H_{17}CH(OH)C_8H_{17}$	256.28	61			
5262	$C_{17}H_{37}N$	Heptadecylamine $C_{17}H_{35}NH_2$	255.29	49	340		
5263	$C_{18}H_{12}$	Benzanthrene	228.09	84			
5264	$C_{18}H_{12}$	Chrysene	228.09	251	448		
5265	$C_{18}H_{12}$	Triphenylene	228.09	198.5			
5266	$C_{18}H_{12}$	Truxene	228.09	>360			
5267	$C_{18}H_{12}N_2$	2, 3′-Diquinolyl	256.11	176			
5268	$C_{18}H_{12}N_2$	2, 7′-Diquinolyl	256.11	193			
5269	$C_{18}H_{12}N_2$	6, 6′-Diquinolyl	256.11	178			
5270	$C_{18}H_{12}N_2$	8, 8′-Diquinolyl	256.11	205			
5271	$C_{18}H_{12}O_3$	*o*-(α-Naphthoyl) benzoic acid	276.09	173.5			
5272	$C_{18}H_{12}O_5$	Calycin	308.09	240			
5273	$C_{18}H_{13}N$	Aminochrysene	243.11	203			
5274	$C_{18}H_{14}$	*p*-Diphenylbenzene $C_6H_4(C_6H_5)_2$	230.11	205	427		
5275	$C_{18}H_{14}O_3$	Cinnamic anhydride $(C_6H_5CH{:}CHCO)_2O$	278.11	135			
5276	$C_{18}H_{14}O_4$	Epicarin	294.11	195			
5277	$C_{18}H_{14}O_7$	Xanthoeridol	342.11	258			
5278	$C_{18}H_{14}O_8$	Diaspirin (Succinyldisalicylic acid)	358.11	178			
5279	$C_{18}H_{15}As$	Triphenylarsine $(C_6H_5)_3As$	306.08	60			
5280	$C_{18}H_{15}Bi$	Triphenyl bismuthine $(C_6H_5)_3Bi$	440.16	78		1.585^{20}	
5281	$C_{18}H_{15}N$	Triphenylamine $(C_6H_5)_3N$	245.12	126.5	365	0.774^{0}_{0}	
5282	$C_{18}H_{15}O_3P$	Triphenyl phosphite $(C_6H_5O)_3P$	310.14		220^{11}	1.184^{18}	
5283	$C_{18}H_{15}O_4P$	Triphenyl phosphate $(C_6H_5O)_3PO$	326.14	49.9	245^{11}		
5284	$C_{18}H_{15}P$	Triphenylphosphine $(C_6H_5)_3P$	262.14	79	>360	1.194	
5285	$C_{18}H_{15}Sb$	Triphenylstibine $(C_6H_5)_3Sb$	352.89	48	>360	1.500^{12}	
5286	$C_{18}H_{16}NO_2$	Aporheïne	278.13	89	290 d.		
5287	$C_{18}H_{16}N_2$	Diphenyl-*m*-phenylenediamine	260.14	95			
5288	$C_{18}H_{16}N_2$	Triphenylhydrazine $(C_6H_5)_2NNHC_6H_5$	260.14	142		0.869^{70}_{4}	
5289	$C_{18}H_{16}N_2O_2$	Analgen	292.14	210			
5290	$C_{18}H_{16}N_2O_3$	5, 5′-Dibenzylbarbituric acid	308.14	222			
5291	$C_{18}H_{16}N_2O_6S$	Chinosol	388.20	177.5			
5292	$C_{18}H_{16}O_2$	Cinnamyl cinnamate	264.12	44		$1.085^{16.5}$	
5293	$C_{18}H_{16}O_4$	α-Isatropic acid	296.12	237			
5294	$C_{18}H_{16}O_4$	β-Isatropic acid	296.12	206			
5295	$C_{18}H_{16}O_4$	α-Truxillic acid	296.12	272			
5296	$C_{18}H_{16}O_4$	Isotruxillic acid	296.12	206			
5297	$C_{18}H_{16}O_4$	γ-Truxillic acid	296.12	228			
5298	$C_{18}H_{16}O_4$	δ-Truxillic acid	296.12	174			
5299	$C_{18}H_{16}O_4$	ε-Truxillic acid	296.12	192			
5300	$C_{18}H_{16}O_4$	η-Truxillic acid	296.12	260			
5301	$C_{18}H_{16}O_4$	Dibenzyl fumarate	296.12	59.5	211^{5}		
5302	$C_{18}H_{16}O_4$	Nepodin	296.12	158			
5303	$C_{18}H_{16}O_7$	*dl*-Usnic acid	344.12	193			
5304	$C_{18}H_{16}O_7$	*d*(*l*)-Usnic acid	344.12	203			1295
5305	$C_{18}H_{16}O_{14}$	Igasuric acid (Chlorogenic acid)	456.12	207			
5306	$C_{18}H_{18}$	Retene	234.14	98.5	394	1.13^{16}	
5307	$C_{18}H_{18}$	1, 3, 5, 7-Tetramethylanthracene	234.14	280 d.			
5308	$C_{18}H_{18}N_2O_4$	Antipyrine salicylate	326.16	92			
5308.1	$C_{18}H_{18}N_8$	Vesuvin	346.20	143.5			
5310	$C_{18}H_{18}O_4$	Dibenzyl succinate	298.14	45	238^{14}		
5312	$C_{18}H_{19}NO_3$	Berbamine	297.15	200			
5313	$C_{18}H_{19}N_3O_2$	Dimazon (Diacetylaminoazotoluene)	309.17	75			
5314	$C_{18}H_{20}BrNO_2$	Apomorphine methobromide	362.08	180			

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
5315	$C_{18}H_{20}N_2O_3$	Cinchotenine	312.17	198			
5316	$C_{18}H_{21}NO_3$	Bebeerine	299.17	214			
5317	$C_{18}H_{21}NO_3$	Codeine	299.17	155	179	1.315^{14}	1283, 1286
5318	$C_{18}H_{21}NO_3$	Isobebeerine	299.17	297			
5319	$C_{18}H_{21}NO_3$	Isocodeine	299.17	144	d.		1288
5320	$C_{18}H_{21}NO_3$	Pseudocodeine	299.17	181		1.290^{180}	1264
5321	$C_{18}H_{22}BrNO_3$	Codeine hydrobromide	380.09				1333
5322	$C_{18}H_{22}BrNO_3$	Morphine methylbromide	380.09	265 d.			
5323	$C_{18}H_{22}ClNO_3$	Bebeerine hydrochloride	335.64	260			
5324	$C_{18}H_{22}ClNO_3$	Codeine hydrochloride	335.64	264			1333
5325	$C_{18}H_{22}N_2O_2$	Holocaine	298.19	117			
5325.1	$C_{18}H_{22}N_2O_5$	Pilocarpine salicylate	346.19	120			1333
5326	$C_{18}H_{22}N_4O_4$	Galactosazone	358.20	201	202 d.		
5327	$C_{18}H_{22}N_4O_4$	*d*-Glucosazone	358.20	208 d.			
5328	$C_{18}H_{22}N_4O_4$	*l*-Glucosazone	358.20	205 d.			
5329	$C_{18}H_{22}N_4O_4$	Gulososazone	358.20	168	180 d.		
5330	$C_{18}H_{22}O_{10}$	Murrayin	398.17	170			
5331	$C_{18}H_{23}ClN_2O_2$	Holocaine hydrochloride	334.65	189			
5332	$C_{18}H_{23}NO_6$	Cocaine formate	349.19	42			
5333	$C_{18}H_{24}NO_7P$	Codeine phosphate	397.22	235			1333
5334	$C_{18}H_{26}O_2$	Menthyl phenylacetate	274.20		205.5^{25}	1.002	
5335	$C_{18}H_{26}O_4$	Diamyl phthalate	306.20		344		
5336	$C_{18}H_{27}NO_3$	Capsaicin	305.22	65			1226
5337	$C_{18}H_{27}NO_8$	Senecifoline	385.22	194			
5338	$C_{18}H_{28}ClNO_8$	Senecifoline hydrochloride	421.68	260			
5339	$C_{18}H_{28}O_4$	Embellic acid	308.22	142			
5340	$C_{18}H_{30}$	Hexaethylbenzene $C_6(C_2H_5)_6$	246.23	129	298	$0.831_4^{130.4}$	1159
5341	$C_{18}H_{30}O$	Sycoceryl alcohol	262.23	90			
5342	$C_{18}H_{30}O_2$	Linolenic acid	278.23		232^{17}	0.914	
5343	$C_{18}H_{31}ClN_2O_6$	*dl*-Ecgonine hydrochloride	406.71	247			
5343.1	$C_{18}H_{32}$	Fichtelite	248.25	46		1.010	1247
5344	$C_{18}H_{32}O_2$	Chaulmoogric acid	280.25	69	248^{20}		
5345	$C_{18}H_{32}O_2$	α-Eleostearic acid	280.25	49	235^{12}		
5346	$C_{18}H_{32}O_2$	Linoleic acid	280.25	< -18	230^{16}	0.903	
5347	$C_{18}H_{32}O_2$	Stearolic acid $C_8H_{17}C{:}C(CH_2)_7CO_2H$	280.25	48	260		
5348	$C_{18}H_{32}O_2$	Tariric acid	280.25	50.5			
5349	$C_{18}H_{32}O_4$	Stearoxylic acid	312.25	86			
5350	$C_{18}H_{32}O_{16}$	Raffinose	504.25	119	130 d.	1.465	
5351	$C_{18}H_{32}O_{16}$	Procellose	504.25	210			
5352	$C_{18}H_{33}N_2O_{12}$	Piperazine quinate (Sidonal)	469.27	171			
5353	$C_{18}H_{34}$	Hexadecylacetylene $C_{16}H_{33}C{:}CH$	250.26	26	180^{15}	0.798^{26}	
5354	$C_{18}H_{34}$	1-Methyl-2-pentadecylacetylene	250.26	30	184^{15}	0.802	
5355	$C_{18}H_{34}O$	Chaulmoogryl alcohol	266.26	36			
5356	$C_{18}H_{34}O$	Oleic aldehyde	266.26		169^{4}	0.851^{15}	456
5357	$C_{18}H_{34}O_2$	Elaidic acid	282.26	51.5	288^{100}	$0.851^{79.4}$	
5358	$C_{18}H_{34}O_2$	Gynocardic acid	282.26	67.5			
5359	$C_{18}H_{34}O_2$	Oleic acid $C_8H_{17}CH{:}CH(CH_2)_7CO_2H$	282.26	14	286^{100}	$0.895_4^{17.7}$	929
5360	$C_{18}H_{34}O_2$	Petroselinic acid	282.26	34		0.868^{40}	1057
5361	$C_{18}H_{34}O_2$	Rapic acid	282.26	14		0.897^{15}	
5362	$C_{18}H_{34}O_2$	*l*-Menthyl *n*-caprylate	282.26		175^{15}	0.898	
5363	$C_{18}H_{34}O_3$	3-Ketostearic acid	298.26	97			
5364	$C_{18}H_{34}O_3$	6-Ketostearic acid	298.26	75			
5365	$C_{18}H_{34}O_3$	8-Ketostearic acid	298.26	83			
5366	$C_{18}H_{34}O_3$	9-Ketostearic acid	298.26	76			
5367	$C_{18}H_{34}O_3$	10-Ketostearic acid	298.26	65			
5368	$C_{18}H_{34}O_3$	Ricinelaidic acid	298.26	53	250^{15}		
5369	$C_{18}H_{34}O_3$	Ricinic acid	298.26	81	252^{15}		
5370	$C_{18}H_{34}O_3$	Ricinoleic acid	298.26	17	250^{15}	0.945^{15}	
5371	$C_{18}H_{34}O_5$	Oleic acid ozonide	330.26			1.022	472
5371.1	$C_{18}H_{34}O_6$	Di-*n*-heptyl tartrate	346.26	35	235^{14}	0.999^{41}	
5372	$C_{18}H_{34}O_{16}$	Clavisepsin	506.26	198			
5373	$C_{18}H_{35}ClO$	Stearyl chloride $C_{17}H_{35}COCl$	302.73	23	215^{15}		
5374	$C_{18}H_{35}N$	Stearonitrile $C_{17}H_{35}CN$	265.28	41	214^{13}		

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
5375	$C_{18}H_{35}NO$	Oleicamide	281.28	76			
5376	$C_{18}H_{35}NO_2$	Oleohydroxamic acid	297.28	61			
5377	$C_{18}H_{36}$	*n*-Octodecylene	252.28	18	179^{15}	0.791	
5378	$C_{18}H_{36}O$	Stearic aldehyde $C_{17}H_{35}CHO$	268.28	63.5	261^{100}		
5379	$C_{18}H_{36}O_2$	Stearic acid $C_{17}H_{35}CO_2H$	284.28	69.3	383	$0.847^{69.3}$	1117
5380	$C_{18}H_{36}O_2$	Cetyl acetate $CH_3CO_2C_{16}H_{33}$	284.28	18.5	200.5^{15}	0.858	1041
5381	$C_{18}H_{36}O_2$	Ethyl palmitate $C_{15}H_{31}CO_2C_2H_5$	284.28	24.2	185.5^{10}		1043
5382	$C_{18}H_{36}O_2$	Methyl margarate	284.28	29			
5383	$C_{18}H_{36}O_3$	1-Hydroxystearic acid	300.28	85			
5384	$C_{18}H_{36}O_3$	*dl*-2-Hydroxystearic acid	300.28	85			
5385	$C_{18}H_{36}O_3$	9-Hydroxystearic acid	300.28	81.5			
5386	$C_{18}H_{36}O_3$	10-Hydroxystearic acid	300.28	79			
5387	$C_{18}H_{36}O_3$	11-Hydroxystearic acid	300.28	78			
5388	$C_{18}H_{36}O_4$	4, 9-Dihydroxystearic acid	316.28	136.5			
5389	$C_{18}H_{37}I$	*n*-Octodecyl iodide	380.22	34	$170^{0.5}$		
5390	$C_{18}H_{37}NO$	Stearic amide $C_{15}H_{31}CONH_2$	283.29	109	251^{12}		
5391	$C_{18}H_{38}$	*n*-Octadecane $CH_3(CH_2)_{16}CH_3$	254.29	28	317	0.777	1047
5392	$C_{18}H_{38}O$	*n*-Octadecyl alcohol	270.29	58.5	210.5^{15}	0.812^{59}_{4}	
5394	$C_{19}H_{12}O$	Benzylideneacenaphthenone	256.09	107			
5395	$C_{19}H_{13}N$	9-Phenylacridine	255.11	181	404		
5396	$C_{19}H_{13}N_3O_6$	Tri-*p*-nitrophenylmethane	379.12	207			
5397	$C_{19}H_{14}O_3$	Aurine	290.11	> 220			
5398	$C_{19}H_{14}O_6$	Oroxylin	338.11	225			
5399	$C_{19}H_{15}$	Triphenylmethyl $(C_6H_5)_3C$	243.12	147			
5400	$C_{19}H_{15}Cl$	Triphenylchloromethane $(C_6H_5)_3CCl$	278.57	112	310		
5401	$C_{19}H_{15}N_3$	Chrysaniline	285.14	270			
5402	$C_{19}H_{16}$	Triphenylmethane $(C_6H_5)_3CH$	244.12	92.5	359.2	1.014^{99}_{4}	1128
5403	$C_{19}H_{16}N_2$	Benzophenone phenylhydrazone	272.14	137			
5404	$C_{19}H_{16}O$	Triphenyl carbinol $(C_6H_5)_3COH$	260.12	162.5	> 360	1.188	
5405	$C_{19}H_{16}O_3$	Triphenyl orthoformate $HC(OC_6H_5)_3$	292.12	77	277^{55}		
5406	$C_{19}H_{17}N$	*m*-Aminotriphenylmethane	259.14	120			
5407	$C_{19}H_{17}N$	*p*-Aminotriphenylmethane	259.14	84			
5408	$C_{19}H_{17}N$	Diphenylbenzylamine	259.14	87			
5409	$C_{19}H_{17}N$	Triphenylmethylamine $(C_6H_5)_3C.NH_2$	259.14	105			
5410	$C_{19}H_{17}NO_2$	Novatophan	291.14	76			
5411	$C_{19}H_{17}NO_3$	Cusparidine	307.14	79			
5412	$C_{19}H_{17}NO_3$	Cusparine	307.14	92			
5413	$C_{19}H_{17}NO_3$	Isocusparine	307.14	194			
5414	$C_{19}H_{17}N_3$	α-Triphenylguanidine	287.16	145	d.		
5415	$C_{19}H_{17}N_3$	β-Triphenylguanidine	287.16	131			
5416	$C_{19}H_{18}ClN_3$	α-Triphenylguanidine hydrochloride	323.62	241		0.875^{70}_{4}	
5417	$C_{19}H_{18}N_2$	*p, p'*-Diaminotriphenylmethane	274.16	140			
5418	$C_{19}H_{18}O_3$	Eugenol cinnamate	294.14	90			
5419	$C_{19}H_{18}O_7$	Eriodonol	358.14	199			
5420	$C_{19}H_{18}O_8$	Atranoric acid	374.14	197			
5421	$C_{19}H_{18}O_{11}$	Euxanthic acid	422.14	162	d.		
5422	$C_{19}H_{19}NO_2$	Ditamine	293.15	75			
5423	$C_{19}H_{19}NO_3$	Galipidine	309.15	111			
5424	$C_{19}H_{19}NO_4$	Bulbocapnine	325.15	199			1332
5425	$C_{19}H_{19}NO_5$	Stylopine	341.15	202			
5426	$C_{19}H_{19}N_3$	*o*-Leucaniline $(NH_2C_6H_4)_3CH$	289.17	165			
5427	$C_{19}H_{19}N_3$	*p*-Leucaniline $(NH_2C_6H_4)_3CH$	289.17	148			
5428	$C_{19}H_{19}N_3O$	Pararosaniline $(NH_2C_6H_4)_3C(OH)$	305.17	189			
5428.1	$C_{19}H_{20}N_2O$	Cinchoninone	292.17	127		1.226	1301
5429	$C_{19}H_{20}N_2O_4$	Antipyrine mandelate	340.17	53			
5430	$C_{19}H_{20}N_2O_4$	*dl*-Ornithuric acid	340.17	183			
5431	$C_{19}H_{20}O_4$	Diethyl diphenylmalonate	312.15	59			
5432	$C_{19}H_{20}O_5$	Guaiaconic acid	328.15	100			
5433	$C_{19}H_{21}NO_3$	Isothebaine	311.17	204			
5434	$C_{19}H_{21}NO_3$	Oxyacanthine	311.17	210			
5435	$C_{19}H_{21}NO_3$	Thebaine	311.17	193		1.305	
5436	$C_{19}H_{21}NO_5$	Eupyrin	343.17	88			
5437	$C_{19}H_{22}N_2$	Desoxycinchonidine	278.19	61			

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
5438	$C_{19}H_{22}N_2$	Desoxycinchonine	278.19	92			
5439	$C_{19}H_{22}N_2O$	Apocinchonine	294.19	228			
5440	$C_{19}H_{22}N_2O$	Cinchonicine	294.19	59			
5441	$C_{19}H_{22}N_2O$	Cinchonidine	294.19	210			1278
5442	$C_{19}H_{22}N_2O$	α-Cinchonine	294.19	264.3			1304
5443	$C_{19}H_{22}N_2O$	Homocinchonidine	294.19	207.6			
5444	$C_{19}H_{22}N_2O$	β-Isocinchonine	294.19	126			
5445	$C_{19}H_{22}N_2O_2$	Apoconquinine	310.19	137			
5446	$C_{19}H_{22}N_2O_2$	Apoquinine	310.19	210 d.			
5447	$C_{19}H_{22}N_2O_2$	Cupreine	310.19	202			
5448	$C_{19}H_{22}N_2O_4$	Chitenine	342.19	286 d.			
5451	$C_{19}H_{23}ClN_2O$	Cinchonidine hydrochloride	330.65	242 d.			
5452	$C_{19}H_{23}ClN_2O$	Cinchonine hydrochloride	330.65	218 d.			1333
5453	$C_{19}H_{23}NO_3$	Codethyline	313.19	93			
5454	$C_{19}H_{23}NO_4$	Cinnamylcocaine	329.19	121			
5455	$C_{19}H_{23}NO_4$	Corytuberine	329.19	240			
5456	$C_{19}H_{23}NO_4$	Porphyroxime	329.19	135			
5457	$C_{19}H_{23}NO_4$	Sinomenine	329.19	161			
5458	$C_{19}H_{23}NO_5$	Morphine acetate	345.19	200 d.			
5459	$C_{19}H_{23}N_3O_4$	Cinchonine nitrate	357.20				1333
5460	$C_{19}H_{24}BrNO_3$	Eucodine (Methylcodeine bromide)	394.11	261			
5461	$C_{19}H_{24}ClNO_3$ $(2H_2O)$	Dionine	349.65	123	170 d.		
5462	$C_{19}H_{24}N_2O$	Cinchamidine (Hydrocinchonidine)	296.20	230			
5463	$C_{19}H_{24}N_2O$	Cinchonamine	296.20	185			
5464	$C_{19}H_{24}N_2O$	Cinchotine	296.20	286			
5465	$C_{19}H_{24}N_2O$	Pereirine	296.20	124			
5466	$C_{19}H_{24}N_2O_2$	Conquinamine	312.20	123			
5467	$C_{19}H_{24}N_2O_2$	Geissospermine	312.20	189			
5468	$C_{19}H_{24}N_2O_2$	Hydrocupreine	312.20	230			
5469	$C_{19}H_{24}N_2O_2$	Quinamine	312.20	172			
5473	$C_{19}H_{25}N_4O_4$	Ionidine	373.23	156			
5474	$C_{19}H_{26}N_2O$	Aspidosine	298.22	245			
5475	$C_{19}H_{27}NO_4$	α-Eucaine	333.22	103			
5476	$C_{19}H_{28}ClNO_4$	α-Eucaine hydrochloride	369.68	200			
5477	$C_{19}H_{28}O_2$	Abietic acid	288.22	161			1251
5478	$C_{19}H_{28}O_4$	Convallaretin	320.22	>255			
5479	$C_{19}H_{28}O_{13}$	Calmatambin	464.22	144			
5480	$C_{19}H_{30}O_2$	Benzyl laurate $C_{11}H_{23}CO_2CH_2C_6H_5$	290.23	8.5	211^{12}	0.946^{25}_{25}	540
5481	$C_{19}H_{34}O_2$	Methyl chaulmoograte	294.26	22	227^{20}	0.912^{25}_{25}	
5482	$C_{19}H_{36}O_3$	Methyl ricinolate	312.28		245^{10}	0.924	465
5483	$C_{19}H_{38}O_2$	Nondecylic acid $CH_3(CH_2)_{17}CO_2H$	298.29	66	299^{100}		
5484	$C_{19}H_{38}O_2$	Ethyl margarate $CH_3(CH_2)_{15}CO_2C_2H_5$	298.29	27			
5485	$C_{19}H_{38}O_2$	Methyl stearate $C_{17}H_{35}CO_2CH_3$	298.29	38	215^{15}		
5486	$C_{19}H_{40}$	*n*-Nondecane $CH_3(CH_2)_{17}CH_3$	268.31	32	330	0.777^{32}_{4}	1045
5487	$C_{20}H_{10}I_4O_4$	Nosophen (Tetraiodophenolphthalein)	821.81	225			
5488	$C_{20}H_{12}$	Perylene	252.09	264			
5489	$C_{20}H_{12}O_3$	Fluoran	300.09	175			
5490	$C_{20}H_{12}O_5$	Fluorescein	332.09		290 d.		
5491	$C_{20}H_{14}$	α, α′-Dinaphthyl $C_{10}H_7.C_{10}H_7$	254.11	160.5	360		
5492	$C_{20}H_{14}$	α, β′-Dinaphthyl	254.11	80			
5493	$C_{20}H_{14}$	β, β′-Dinaphthyl $C_{10}H_7.C_{10}H_7$	254.11	187.8	452		
5494	$C_{20}H_{14}$	9-Phenylanthracene	254.11	153	417		
5495	$C_{20}H_{14}N_2$	α, α′-Azonaphthalene	282.12	190			
5496	$C_{20}H_{14}N_2$	β, β′-Azonaphthalene	282.12	204			
5497	$C_{20}H_{14}N_2O$	α, α′-Azoxynaphthalene	298.12	127			
5498	$C_{20}H_{14}N_2O$	β, β′-Azoxynaphthalene	298.12	167			
5499	$C_{20}H_{14}O$	α-Naphthyl ether $(C_{10}H_7)_2O$	270.11	110	>360		
5500	$C_{20}H_{14}O$	β-Naphthyl ether $(C_{10}H_7)_2O$	270.11	105	250^{19}		
5501	$C_{20}H_{14}O$	α, β′-Naphthyl ether	270.11	81	264^{15}		
5502	$C_{20}H_{14}O_2$	α-Dinaphthol	286.11	300			
5503	$C_{20}H_{14}O_2$	β-Dinaphthol	286.11	218			
5504	$C_{20}H_{14}O_4$	Phenolphthalein	318.11	261		1.277^{32}_{4}	

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
5505	$C_{20}H_{14}O_5$	Fluorescein	334.11	127			
5506	$C_{20}H_{14}O_9$	Psoromic acid	398.11	264			
5507	$C_{20}H_{14}S$	α, α'-Dinaphthyl sulfide $(C_{10}H_7)_2S$	286.17	110	290^{15}		
5508	$C_{20}H_{15}N$	β, β'-Dinaphthylamine $(C_{10}H_7)_2NH$	269.12	172.2	471		
5509	$C_{20}H_{15}NO_4$	Sanguinarine	333.12	213			
5510	$C_{20}H_{15}NO_8$	Berilic acid	397.12	200			
5511	$C_{20}H_{15}N_3$	*p*-Amino-α-azonaphthalene	297.14	175			
5512	$C_{20}H_{15}N_3$	Amino-β-azonaphthalene	297.14	156			
5513	$C_{20}H_{16}N_2$	α, α'-Hydrazonaphthalene	284.14	α 271; β 274			
5514	$C_{20}H_{16}N_2$	β, β'-Hydrazonaphthalene	284.14	164			
5515	$C_{20}H_{16}N_2O$	Benzilphenylhydrazone	300.14	134			
5516	$C_{20}H_{16}N_4$	Nitron	312.16	189 d.			
5517	$C_{20}H_{16}O_2$	Triphenylacetic acid $(C_6H_5)_3C.CO_2H$	288.12	265			
5518	$C_{20}H_{16}O_3$	Rosolic acid	304.12	270	d.		
5519	$C_{20}H_{17}N_5O_2$	Rubazonic acid	359.17	181			
5520	$C_{20}H_{18}$	Diphenyl-*m*-tolylmethane	258.14	61.5	356	1.07^{16}	
5521	$C_{20}H_{18}$	1, 1, 2-Triphenylethane	258.14	54	349.4		
5522	$C_{20}H_{18}ClNO_4$	Berberine hydrochloride	371.61			1.397	1333
5523	$C_{20}H_{18}N_2O$	α-Benzoinphenylhydrazone	302.16	155			
5524	$C_{20}H_{18}N_2O$	β-Benzoinphenylhydrazone	302.16	106			
5525	$C_{20}H_{18}N_4S$	Triphenylguanylthiourea	346.24	157			
5526	$C_{20}H_{19}N$	Dibenzylaniline $C_6H_5N(CH_2C_6H_5)_2$	273.15	70			
5527	$C_{20}H_{19}NO_5$	Chelidonine	353.15	136			
5528	$C_{20}H_{19}NO_5$	Papaveraldine	353.15	210			
5529	$C_{20}H_{19}NO_5$	Protopine	353.15	207			
5530	$C_{20}H_{19}NO_9$	Berberilic acid	417.15	182			
5532	$C_{20}H_{20}N_2O_5$	Antipyrine acetylsalicylate	368.17	65			
5533	$C_{20}H_{20}O_5$	Cubebinol	340.15	92			
5534	$C_{20}H_{20}O_6$	Cubebin	356.15	132			
5535	$C_{20}H_{20}O_7$	Coccelic acid	372.15	178			
5536	$C_{20}H_{20}O_{10}$	Scoparin	420.15	219 d.			
5537	$C_{20}H_{20}O_{12}$	Luteic acid	452.15	274			
5538	$C_{20}H_{21}NO_3$	Galipeine	323.17	115			
5539	$C_{20}H_{21}NO_4$	*l*-Canadine	339.17	134			
5540	$C_{20}H_{21}NO_4$	Dicentrine	339.17	169			
5541	$C_{20}H_{21}NO_4$	Papaverine	339.17	147	d.	1.337	1331
5542	$C_{20}H_{21}NO_4$	*dl*-Canadine	339.17	167			
5544	$C_{20}H_{22}ClNO_4$	Papaverine hydrochloride	375.64	221 d.			
5545	$C_{20}H_{22}N_2O$	Quinene	306.19	82			
5546	$C_{20}H_{22}N_2O_2$	Dehydroquinine	322.19	181			
5547	$C_{20}H_{22}N_2O_2$	Jelsemine	322.19	178			
5548	$C_{20}H_{22}N_2O_4$	Lysuric acid	354.19	145			
5549	$C_{20}H_{22}O_8$	Populin	390.17	180			
5550	$C_{20}H_{23}ClN_2O_2$	Jelsemine hydrochloride	358.65	300			
5551	$C_{20}H_{23}NO_4$	Acetylcodeine	341.19	133.5			
5552	$C_{20}H_{23}NO_4$	Corypalmine	341.19	236			
5553	$C_{20}H_{23}N_3O_4$	Pyramidon salicylate	369.20	70			
5554	$C_{20}H_{23}O_4$	Naphthyl acid camphorate	327.18	122			
5555	$C_{20}H_{24}Cl_2N_2O_2$	Quinene dichloride	395.12	97			
5556	$C_{20}H_{24}NO_4$	Staphisagroine	342.19	275			
5557	$C_{20}H_{24}N_2O$	Desoxyquinine	308.20	52			
5558	$C_{20}H_{24}N_2O_2$	Isoconquinine	324.20	142			
5559	$C_{20}H_{24}N_2O_2$	Isoquinine	324.20	185			
5560	$C_{20}H_{24}N_2O_2$	Quinicine	324.20	60			
5561	$C_{20}H_{24}N_2O_2$	Quinidine	324.20	168			1298
5562	$C_{20}H_{24}N_2O_2$	Quinine	324.20	175			1279
5563	$C_{20}H_{24}N_2O_2$	Quinine (isomer A)	324.20	193.5			
5564	$C_{20}H_{24}N_2O_2$	Quinine (isomer B)	324.20	189			
5566	$C_{20}H_{25}BrN_2O_2$	Quinine hydrobromide	405.13	200			
5567	$C_{20}H_{25}ClN_2O_2$	Quinidine hydrochloride	360.67	259 d.			
5568	$C_{20}H_{25}ClN_2O_2$	Quinine hydrochloride	360.67	160	259 d.		
5570	$C_{20}H_{25}NO_2$	Lobelidine	311.20	106			
5571	$C_{20}H_{25}NO_4$	Codamine	343.20	121			

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
5572	$C_{20}H_{25}NO_4$	Laudanidine	343.20	177			
5573	$C_{20}H_{25}NO_4$	Laudanine	343.20	164.5		1.256	
5575	$C_{20}H_{26}N_2O_6S$	Quinine disulfate	422.28	160 d.			
5577	$C_{20}H_{26}N_2O_2$	Hydroquinidine	326.22	167			
5578	$C_{20}H_{26}N_2O_2$	Hydroquinine	326.22	172.3			
5579	$C_{20}H_{27}NO_5$	Diversine	361.22	93			
5580	$C_{20}H_{27}NO_{11}$	Amygdalin	457.22	200			
5581	$C_{20}H_{27}N_2O_4P$	Quinine hypophosphite	390.25	181			
5583	$C_{20}H_{28}O_4$	Thymyl acid camphorate	332.22	89			
5584	$C_{20}H_{28}O_5$	Eugenol acid camphorate	348.22	116			
5585	$C_{20}H_{28}O_6$	Cholanic acid	364.22	285			
5586	$C_{20}H_{28}O_{13}$	Primeverin	476.22	206			
5587	$C_{20}H_{30}N_2O_5$	Quinine hydrate	378.25	57	d.		
5588	$C_{20}H_{30}O_2$	*d*-Pimaric acid	302.23	212	282^{2c}		
5589	$C_{20}H_{30}O_4$	Onoceric acid	334.23	120			
5590	$C_{20}H_{30}O_5$	Andrographolide	350.23	218			
5591	$C_{20}H_{32}O_6$	Andrographolic acid	368.25	188			
5592	$C_{20}H_{33}NO$	Myristic anilide	303.26	84			
5593	$C_{20}H_{33}N_3$	Ormosine	315.28	87			
5594	$C_{20}H_{33}N_3$	Ormosinine	315.28	205			
5595	$C_{20}H_{34}O$	Ambrosterol	290.26	147			
5596	$C_{20}H_{34}O$	Cinchol	290.26	139			
5597	$C_{20}H_{34}O$	Cupreol	290.26	140			
5598	$C_{20}H_{34}O$	Quebrachol	290.26	125			
5599	$C_{20}H_{34}O_{10}$	Cyclamin	434.26	236			1333
5600	$C_{20}H_{36}N_8O_{15}$	Vicine	628.34	242 d.			
5601	$C_{20}H_{36}O$	Excretin	292.28	96			
5602	$C_{20}H_{36}O_2$	Eicosinic acid	308.28	69	270^{15}		
5603	$C_{20}H_{36}O_2$	Ethyl chaulmoograte	308.28		230^{20}	0.906	1036
5604	$C_{20}H_{38}O_2$	Eicosenic acid	310.29	50	267^{15}		
5605	$C_{20}H_{38}O_3$	Ethyl ricinoleate	326.29		258^{13}	0.914	481
5606	$C_{20}H_{40}O$	Phytol	296.31		204^{10}	0.856	484
5607	$C_{20}H_{40}O_2$	Arachidic acid	312.31	77	328		
5608	$C_{20}H_{40}O_2$	Ethyl stearate $C_{17}H_{35}CO_2C_2H_5$	312.31	33.7	224		
5609	$C_{20}H_{41}I$	*n*-Eicosyl iodide	408.25	42	$192^{0.5}$		
5610	$C_{20}H_{42}$	*n*-Eicosane $CH_3(CH_2)_{18}CH_3$	282.32	38	205^{15}	$0.778_4^{36.7}$	1065
5611	$C_{20}H_{42}O$	Eicosyl alcohol $CH_3(CH_2)_{18}CH_2OH$	298.32	71	220^3		
5612	$C_{21}H_{14}O$	α, β′-Dinaphthyl ketone	282.11	135			
5613	$C_{21}H_{14}O$	β, β′-Dinaphthyl ketone	282.11	a 125.5 b 164.5			
5614	$C_{21}H_{14}O_2$	Picenic acid	298.11	201			
5615	$C_{21}H_{15}Bi_2O_9$	Bismuth salicylate	829.12	135 d.			
5616	$C_{21}H_{16}$	α, α′-Dinaphthylmethane	268.12	109	360		
5617	$C_{21}H_{16}$	α, β′-Dinaphthylmethane $(C_{10}H_7)_2CH_2$	268.12	95			
5618	$C_{21}H_{16}$	β, β′-Dinaphthylmethane $(C_{10}H_7)_2CH_2$	268.12	93			
5619	$C_{21}H_{16}N_2$	Lophine	296.14	275			
5620	$C_{21}H_{16}O_{11}$	Methylenecitrylsalicylic acid	444.12	154			
5621	$C_{21}H_{18}N_2$	Amarin	298.16	129			
5622	$C_{21}H_{18}N_2$	Hydrobenzamide	298.16	101			
5623	$C_{21}H_{18}O_{12}$	Scutellarin	462.14	200 d.			
5624	$C_{21}H_{19}NO_4$	Fumarine	349.15	199			
5625	$C_{21}H_{20}$	Phenylditolylmethane	272.15	56			
5626	$C_{21}H_{20}N_2O_4$	Alstonine (Chlorogenine)	364.17	195			
5627	$C_{21}H_{20}O_6$	Curcumin	368.15	183			1333
5628	$C_{21}H_{20}O_9$	Aloin	416.15	147.9			
5629	$C_{21}H_{20}O_9$	1, 2-Dihydro-3, 5-dihydroxy-4-(α, 3, 4-trihydroxybenzylbenzofuran)*	416.15	217			
5630	$C_{21}H_{20}O_9$	Frangulin	416.15	226			
5631	$C_{21}H_{20}O_{11}$	Quercitrin	448.15	185			
5632	$C_{21}H_{20}O_{12}$	Incarnatrin	464.15	245			
5633	$C_{21}H_{21}N$	Tribenzylamine $(C_6H_5CH_2)_3N$	287.17	92		0.991_4^{95}	
5634	$C_{22}H_{21}NO_5$	*d*-Corcycavamine	367.17	149			
5635	$C_{21}H_{21}NO_6$	Hydrastine	383.17	132			

* Also commonly known as Catechol, Pyrocatechol, Catechin, Pyrocatechin. See #1414.

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
5636	$C_{21}H_{21}NO_6$	Rhoeadine	383.17	232 d.			
5637	$C_{21}H_{21}N_3$	Anhydroformaldehydeaniline	315.19	45.5	185		
5638	$C_{21}H_{21}O_4P$	Tri-*p*-cresyl phosphate	368.19	77			
5639	$C_{21}H_{21}O_6P$	Triguaiacyl phosphite	400.19	78			
5640	$C_{21}H_{21}O_7P$	Triguaiacyl phosphate	416.19	98			
5641	$C_{21}H_{22}N_2O_2$	Isostrychnine	334.19	214.5			
5642	$C_{21}H_{22}N_2O_2$	Strychnine	334.19	268	270^{5}	1.359^{18}	
5645	$C_{21}H_{23}Cl_2N_3O_3$	Benzamide hydrochloride	436.12	178			
5646	$C_{21}H_{23}NO_4$	Meconidine	353.19	58			
5647	$C_{21}H_{23}NO_5$	Cryptopine	369.19	218		1.351	
5648	$C_{21}H_{23}NO_5$	Diacetylmorphine	369.19	172			1260
5649	$C_{21}H_{23}NO_5$	α-Homochelidonine	369.19	182			
5650	$C_{21}H_{23}NO_5$	β-Homochelidonine	369.19	159			
5651	$C_{21}H_{23}NO_5$	γ-Homochelidonine	369.19	171			
5652	$C_{21}H_{23}NO_6$	Colchiceine	385.19	172			
5653	$C_{21}H_{23}N_3O_5$	Strychine nitrate	397.20				1333
5654	$C_{21}H_{24}ClNO_4$	Diacetylmorphine hydrochloride	405.65	230			
5655	$C_{21}H_{24}N_2O$	Paytine	320.20	156			
5656	$C_{21}H_{24}N_2O$	Strychnidine	320.20	250.5	295^{14}		
5657	$C_{21}H_{24}N_6O_{10}$	Geneserine picrate	520.23	175			
5658	$C_{21}H_{24}O_9$	Glycyphylline	420.19	180			
5659	$C_{21}H_{24}O_{10}$	Phloridzin	436.19	170 d.		1.430	
5660	$C_{21}H_{24}O_{11}$	Datiscin	452.19	180			
5661	$C_{21}H_{24}O_{12}$	Saponarin	468.19	232			
5663	$C_{21}H_{25}NO_4$	Corybulbine	355.20	239			
5664	$C_{21}H_{25}NO_4$	Corydine	355.20	105			1165
5665	$C_{21}H_{25}NO_4$	Glaucine	355.20	120			
5666	$C_{21}H_{25}NO_4$	Isocorybulbine	355.20	180			
5667	$C_{21}H_{25}N_3O_2$	Porphyrine	351.22	97			
5668	$C_{21}H_{26}N_2O$	Desoxystrychnine	322.22	172			
5669	$C_{21}H_{26}N_2O_3$	Corynanthine	354.22	242			
5670	$C_{21}H_{26}N_2O_3$	Quebrachine	354.22	248			1333
5671	$C_{21}H_{26}N_2O_4$	Quinine formate	370.22	113			
5672	$C_{21}H_{27}ClN_2O_3$	Quebrachine hydrochloride	390.68	290			
5673	$C_{21}H_{27}NO_4$	*d*(*l*)-Laudanosine	357.22	89			
5674	$C_{21}H_{27}NO_{10}$	*d*-Cocaine bitartrate	453.22	112			
5675	$C_{21}H_{28}N_2O$	Tetraethyldiaminobenzophenone	324.23	96			
5676	$C_{21}H_{23}O_4$	Marrubiin	344.22	154.5	297^{15}		
5677	$C_{21}H_{30}N_2O_4$	Struxine	374.25	250 d.			
5678	$C_{21}H_{30}O_2$	Cannabinol	314.23		315^{100}	1.042^{18}	
5679	$C_{21}H_{30}O_4$	Euonymol	346.23	250			
5680	$C_{21}H_{30}O_8$	Antiarin	410.23	215			
5681	$C_{21}H_{34}O$	Pyrethrol	302.27	199	290		
5682	$C_{21}H_{34}O_2$	Benzyl myristate $C_{13}H_{27}CO_2CH_2C_6H_5$	318.26	20.5	231^{11}	0.932^{25}_{25}	536
5683	$C_{21}H_{34}O_3$	Di-*d*-bornyl carbonate	334.26	216			
5684	$C_{21}H_{34}O_4$	Ipurganol	350.26	225			
5685	$C_{21}H_{34}O_{10}$	Helleborein	446.26	230 d.			
5686	$C_{21}H_{36}O_4$	Trifolianol	352.28	300			
5687	$C_{21}H_{33}O_3$	Di-*l*-menthyl carbonate	338.29	106			
5688	$C_{21}H_{38}O_6$	Tricaproin	386.29	−25		0.988	392
5689	$C_{21}H_{40}O_2$	Dimentholformal	324.31	57	337		
5690	$C_{21}H_{42}$	9-Heneicosene $C_8H_{17}CH{:}CHC_{11}H_{23}$	294.32	3	202^{11}	0.805^{15}	
5691	$C_{21}H_{42}O_2$	Cluytinic acid	326.32	69			
5692	$C_{21}H_{42}O_2$	Heneicosonic acid $CH_3(CH_2)_{19}CO_2H$	326.32	74			
5693	$C_{21}H_{43}NO$	Heneicosamide $CH_3(CH_2)_{19}CONH_2$	325.34	110			
5694	$C_{21}H_{44}$	*n*-Heneicosane $CH_3(CH_2)_{19}CH_3$	296.34	40.4	215^{15}	$0.775^{45.3}_{4}$	1037
5695	$C_{22}H_{14}$	Picene	278.11	364	520		
5696	$C_{22}H_{14}N_2O$	Rosindon (Rosindulon)	322.12	262			
5697	$C_{22}H_{15}NO_6$	Colchinine	389.12	146			
5698	$C_{22}H_{15}N_3$	Rosinduline	321.14	199			
5699	$C_{22}H_{18}O_4$	*o*-Cresolphthalein	346.14	216			
5700	$C_{22}H_{20}O_{13}$	Carminic acid	492.15	136 d.			
5701	$C_{22}H_{22}O_{11}$	Isotrifolin	462.17	250			

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
5702	$C_{22}H_{22}O_{11}$	Trifolin	462.17	260			
5703	$C_{22}H_{23}NO_7$	Gnoscopine	413.19	233			
5704	$C_{22}H_{23}NO_7$	Narcotine	413.19	175		1.374	
5705	$C_{22}H_{23}N_3O_7$	Pyrene picrate	431.12	218			
5706	$C_{22}H_{24}O_{10}$	Sakuranin	448.19	212			
5707	$C_{22}H_{25}NO_4$	Corycavidine	367.20	213			
5708	$C_{22}H_{25}NO_6$	*l*-Colchicine	399.20	146			1333
5709	$C_{22}H_{26}N_2O_2$	Apoyohimbine	350.22	252			
5710	$C_{22}H_{26}N_2O_3$	Acetylquinine	366.22	108			
5711	$C_{22}H_{26}N_2O_3$	Gelsemine	366.22	178			
5712	$C_{22}H_{26}N_2O_4$	Chaimaridine	382.22	128			
5713	$C_{22}H_{26}N_2O_4$	Chaimarine	382.22	233			
5714	$C_{22}H_{26}N_2O_4$	Conchaimarine	382.22	120			
5715	$C_{22}H_{26}N_2O_4$	Conchairamidine	382.22	115			
5716	$C_{22}H_{26}N_2O_4$	Mitraversine	382.22	237			
5718	$C_{22}H_{26}O_{12}$	Hesperidin	482.20	171	251 d.		
5719	$C_{22}H_{27}AsNO_5$	Strychnine methylarsinate	460.18	60 d.			
5720	$C_{22}H_{27}BrN_2O_3$	Gelseminine hydrobromide	447.14				1333
5721	$C_{22}H_{27}ClN_2O_2$	Apoyohimbine hydrochloride	386.68	300			
5722	$C_{22}H_{27}ClN_2O_3$	Gelseminine hydrochloride	402.68	330			1333
5723	$C_{22}H_{27}NO_4$	*dl*-Corydaline	369.22	136			
5724	$C_{22}H_{27}N_3O_5$	Physostigmine salicylate	413.23	178.9			1333
5725	$C_{22}H_{28}N_2O_2$	Aspidosamine	352.23	100			
5726	$C_{22}H_{28}N_2O_2$	Aspidospermatine	352.23	162			
5727	$C_{22}H_{28}N_2O_4$	Ditaine (Echitamine)	384.23	206			1333
5728	$C_{22}H_{28}N_2O_4$	Quinine acetate	384.23	126			
5729	$C_{22}H_{28}N_4$	Camphorosazone	348.25	55			
5730	$C_{22}H_{28}O_3$	Santalyl salicylate	340.22		126.6^{20}	1.070^{15}	
5732	$C_{22}H_{29}IO_2$	Europhen (Diisobutyl-*p*-cresol iodide)	452.16	110			
5733	$C_{22}H_{30}N_2O_2$	Aspidospermine	354.25	208	220^{2}		
5734	$C_{22}H_{31}NO_5$ (?)	Mitragynine	389.25	106	240^{5}		
5735	$C_{22}H_{32}O_3$	Anacardic acid	344.25	26			
5736	$C_{22}H_{32}O_4$	Digitoxigenin	360.25	230			
5737	$C_{22}H_{32}O_6$	Genin	392.25	206			
5738	$C_{22}H_{33}NO_5$	Atropine isovalerate	391.26	32			
5739	$C_{22}H_{33}NO_5$	Atropine valerate	391.26	42			1333
5741	$C_{22}H_{34}N_4O_8S$	Pilocarpine sulfate	514.36	132			1333
5742	$C_{22}H_{35}NO_6$	Delphinine	409.28	187.5			
5743	$C_{22}H_{36}O_4$	Bryonol	364.28	212			
5744	$C_{22}H_{36}O_8$	Capsularin	428.28	176			
5745	$C_{22}H_{37}NO$	Palmitic anilide	331.29	90.5	284^{17}		
5746	$C_{22}H_{38}O$	Cholestol	318.29	139	360		
5747	$C_{22}H_{38}O$	Ilicyl alcohol	318.29	175	350		
5748	$C_{22}H_{38}O_4$	Citrullol	366.29	290			
5759	$C_{22}H_{38}O_4$	Di-*l*-menthyl oxalate	366.29	68	225^{12}		
5760	$C_{22}H_{39}ClO$	Behenolyl chloride $C_{21}H_{39}COCl$	354.76	29			
5761	$C_{22}H_{40}O_2$	Behenolic acid $C_{21}H_{39}CO_2H$	336.31	57.5			
5762	$C_{22}H_{41}NO$	Behenolyl amide $C_{21}H_{39}CONH_2$	335.32	90			
5763	$C_{22}H_{42}O_2$	Brassidic acid	338.32	61.5	282^{30}	$0.859^{57.1}$	1085
5764	$C_{22}H_{42}O_2$	Erucic acid	338.32	33.5	281^{30}	$0.860_4^{55.4}$	
5765	$C_{22}H_{42}O_3$	14-Ketobehenic acid	354.32	84			
5765.1	$C_{22}H_{42}O_3$	Isobutyl ricinoleate	354.32		262^{9}	0.903^{22}	980
5766	$C_{22}H_{43}NO$	Erucamide $C_{21}H_{41}CONH_2$	337.34	83			
5767	$C_{22}H_{44}O$	Erucyl alcohol	324.34	34.6	$200^{0.2}$		
5768	$C_{22}H_{44}O_2$	Behenic acid	340.34	84	306^{60}		
5769	$C_{22}H_{44}O_2$	Methyl heneicosate $C_{20}H_{41}CO_2CH_3$	340.34	49			
5770	$C_{22}H_{45}I$	Docosyl iodide $CH_3(CH_2)_{20}CH_2I$	436.28	49			
5771	$C_{22}H_{45}NO$	Behenamide $C_{21}H_{43}CONH_2$	339.36	112			
5772	$C_{22}H_{46}$	*n*-Docosane $CH_3(CH_2)_{20}CH_3$	310.35	44.4	224.5^{15}	$0.778_4^{44.4}$	
5773	$C_{22}H_{46}O$	Docosyl alcohol $CH_3(CH_2)_{20}CH_2OH$	326.35	74			
5774	$C_{23}H_{20}O_2$	Amaric anhydride	328.15	140.5			
5775	$C_{23}H_{23}NO_6$	Corycavine	409.19	216			
5776	$C_{23}H_{24}N_2O_6$	Buphnatine	424.20	240			

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I No.
5777	$C_{23}H_{24}N_4O_2$	Methylenediantipyrine	388.22	177			
5778	$C_{23}H_{24}N_4O_{11}$	Hyoscine picrate	532.22	188			
5779	$C_{23}H_{24}O_3$	*o*-Cresol orthoacetate	348.19	89			
5780	$C_{23}H_{24}O_9$	Picropodophyllin	444.19	227			
5781	$C_{23}H_{24}O_9$	Podophyllotoxin	444.19	94			
5782	$C_{23}H_{25}NO_4$	Lanthopine	379.20	200			
5783	$C_{23}H_{26}ClN_3O_3$	Acoin	427.68	178			
5784	$C_{23}H_{26}N_2O_4$	Aricine	394.22	188 d.			
5785	$C_{23}H_{26}N_2O_4$	Brucine	394.22	178			
5786	$C_{23}H_{26}N_2O_4$	Concusconine	394.22	208			
5787	$C_{23}H_{26}N_2O_4$	Cusconine	394.22	110			
5788	$C_{23}H_{26}N_2O_5$	Allobrucine oxide	410.22	189			
5789	$C_{23}H_{27}NO_6$	Homoatropine salicylate	413.22				1333
5790	$C_{23}H_{27}NO_8$	Narceine	445.22	170			
5791	$C_{23}H_{27}N_3O_7$	Brucine nitrate	457.23	230 d.			
5792	$C_{23}H_{28}ClNO_8$	Narceine hydrochloride	431.68	192			1333
5793	$C_{23}H_{28}N_2O_4$	Vellosine	396.23	189 d.			
5794	$C_{23}H_{29}NO_2$	Lobeline	351.23	131			
5795	$C_{23}H_{30}N_2O_4$	Quinine propionate	398.25	111			
5796	$C_{23}H_{30}N_2O_5$	*dl*-Quinine lactate	414.25	165.5			
5797	$C_{23}H_{30}N_2O_5$	*d*-Quinine lactate	414.25	175			
5798	$C_{23}H_{30}N_2O_5$	*l*-Quinine lactate	414.25	171			
5799	$C_{23}H_{31}NO_2$	Atisine	353.25	85			
5801	$C_{23}H_{33}N_2O_4$	Quinine ethyl carbonate (Equinine)	401.27	91			
5802	$C_{23}H_{33}N_3O_5$	Pyramidon acid camphorate	431.28	94			
5803	$C_{23}H_{36}O_2$	Lactucon (Lactucol acetate)	344.28	184			
5804	$C_{23}H_{36}O_4$	Calabarol	376.23	245			
5804.1	$C_{23}H_{38}N_2$	Conessine	342.31	125			1333
5805	$C_{23}H_{38}O_2$	Benzyl palmitate	346.29	36		0.914^{38}_{25}	1079
5806	$C_{23}H_{38}O_4$	Anonol	378.29	298			
5807	$C_{23}H_{38}O_4$	Grindelol (Phytosterol glucoside)	378.29	257			
5808	$C_{23}H_{40}O$	Ambrein	332.31	82			
5809	$C_{23}H_{40}O$	Xanthosterin	332.31	214			
5810	$C_{23}H_{40}O_4$	Di-*l*-menthyl malonate	380.31	62	170^{1}	0.944^{76}_{4}	
5811	$C_{23}H_{40}O_4$	Ipuranol	330.31	290			
5812	$C_{23}H_{42}O_2$	Methyl behenolate $C_{21}H_{39}CO_2CH_3$	350.32	22			
5813	$C_{23}H_{44}O_2$	Methyl erucate $C_{21}H_{41}CO_2CH_3$	352.34		222^{5}	0.870	457
5814	$C_{23}H_{46}O$	Laurone $(C_{11}H_{23})_2CO$	338.35	69		$0.789^{90.9}_{4}$	1111
5815	$C_{23}H_{46}O_2$	Methyl behenate $C_{21}H_{43}CO_2CH_3$	354.35	54.5	225		
5816	$C_{23}H_{48}$	*n*-Tricosane $CH_3(CH_2)_{21}CH_3$	324.37	47.7	320.7	$0.779^{47.7}_{4}$	1120
5817	$C_{24}H_{16}$	Crackene	306.14	308	500		
5818	$C_{24}H_{18}$	1, 3, 5-Triphenylbenzene	306.14	170		1.206	1317
5819	$C_{24}H_{18}As_2N_2O$	Phenarsazine oxide	500.08	350			
5820	$C_{24}H_{18}N_2$	*p, p'*-Diphenylazobenzene	334.16	250			
5821	$C_{24}H_{18}N_2O$	*p, p'*-Diphenylazoxybenzene	350.16	205			
5822	$C_{24}H_{20}N_2$	*p, p'*-Diphenylhydrazobenzene	336.17	247			
5823	$C_{24}H_{20}O_6$	Glycerol tribenzoate	404.15	76.5			
5824	$C_{24}H_{20}O_9$	Glycerol trisalicylate	452.15	79			
5826	$C_{24}H_{25}N_3O$	Benzoylauramine	371.22	179			
5829	$C_{24}H_{28}O_6$	Diguaiacyl camphorate	412.22	124			
5830	$C_{24}H_{28}O_8$	*α*-Flavaspidic acid	444.22	92			
5831	$C_{24}H_{28}O_8$	*β*-Flavaspidic acid	444.22	156			
5832	$C_{24}H_{29}NO_6$	Atropine salicylate	427.23				1333
5834	$C_{24}H_{30}O_5$	Elaterone	398.23	300			
5835	$C_{24}H_{30}O_7$	Anthamantin	430.23	79			
5836	$C_{24}H_{30}O_{15}$	Scopolin	558.23	218			
5837	$C_{24}H_{32}N_2O_4$	Quinine butyrate	412.26	77.5			
5838	$C_{24}H_{32}N_4O_9$	Maltosazone	520.28	206			
5839	$C_{24}H_{38}N_2O$	Holarrhenine	370.31	198			
5840	$C_{24}H_{38}O_4$	Di-*d*-bornyl succinate	390.29	83.7			
5841	$C_{24}H_{40}N_2$	Conessine	356.32	125			
5842	$C_{24}H_{40}O_4$	Choleic acid	392.31	190			
5843	$C_{24}H_{40}O_4$	Cucurbitol	392.31	260			

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
5844	$C_{24}H_{40}O_5$	Cholic acid	408.31	195			
5845	$C_{24}H_{41}NO$	Stearic anilide $CH_3(CH_2)_{16}CONHC_6H_5$	359.32	93.6			
5846	$C_{24}H_{42}O_4$	Di-*l*-menthyl succinate	394.32	63	220 d.	0.947^{71}_{4}	
5847	$C_{24}H_{42}O_6$	Di-*l*-menthyl *d*-tartrate	426.32	75		1.054	
5848	$C_{24}H_{42}O_6$	Di-*l*-menthyl *l*-tartrate	426.32	42		1.045^{16}	
5849	$C_{24}H_{44}O_5$	Lithofellinic acid	412.34	206			
5850	$C_{24}H_{44}I_2O_2$	Ethyl diiodobrassidate	618.20	37			
5851	$C_{24}H_{44}O_2$	Ethyl behenolate $C_{21}H_{39}CO_2C_2H_5$	364.34	15			
5852	$C_{24}H_{46}O_2$	Ethyl brassidate	366.35	30.5			1046
5853	$C_{24}H_{46}O_2$	Ethyl erucate $C_{21}H_{41}CO_2C_2H_5$	366.35		230	0.865	449
5854	$C_{24}H_{48}O_2$	Carnaubic acid	368.37	72			
5855	$C_{24}H_{48}O_2$	Lignoceric acid $C_{23}H_{47}CO_2H$	368.37	81			
5856	$C_{24}H_{48}O_2$	Paraffinic acid $C_{23}H_{47}CO_2H$	368.37	46			
5857	$C_{24}H_{48}O_2$	Pisangcerylic acid $C_{23}H_{47}CO_2H$	368.37	72			
5858	$C_{24}H_{48}O_2$	Tetraconic acid $CH_3(CH_2)_{22}CO_2H$	368.37	85.5			
5859	$C_{24}H_{48}O_2$	Ethyl behenate $C_{21}H_{43}CO_2C_2H_5$	368.37	50.5	231		
5860	$C_{24}H_{50}$	Isotetracosane	338.39	51	243^{15}		
5861	$C_{24}H_{50}$	*n*-Tetracosane $CH_3(CH_2)_{22}CH_3$	338.39	54	324.1	$0.779^{51.1}_{4}$	
5862	$C_{24}H_{50}O$	Carnaubyl alcohol $C_{24}H_{49}OH$	354.39	69			
5863	$C_{25}H_{20}$	Tetraphenylmethane $C(C_6H_5)_4$	320.15	285	431		
5864	$C_{25}H_{21}N_3$	Tetraphenylguanidine	363.19	131			
5865	$C_{25}H_{26}O_{11}$	Ononin	502.20	210			
5866	$C_{25}H_{28}O_{14}$	Gentiin	552.22	274			
5867	$C_{25}H_{29}NO_8S$	Codeine *o*-guaiacolsulfonate	503.30	165			
5868	$C_{25}H_{32}O_8$	Albaspidin	460.25	147			
5869	$C_{25}H_{32}O_8$	Aspidin	460.25	124			
5871	$C_{25}H_{34}O_{14}$	Loganin	558.26	215			
5872	$C_{25}H_{39}NO_8$	Pseudoaconine	481.31	95			
5873	$C_{25}H_{40}O$	Fungisterin	356.31	144			
5874	$C_{25}H_{40}O$	Homotaraxasterol	356.31	164			
5875	$C_{25}H_{40}O_2$	Benzyl oleate	372.31		237^{7}	0.933^{25}_{25}	1024
5876	$C_{25}H_{42}O_2$	Benzyl stearate $C_{17}H_{35}CO_2CH_2C_6H_5$	374.32	45.8		0.908^{50}_{25}	1078
5877	$C_{25}H_{44}O_4$	Di-*l*-menthyl glutarate	408.34		243^{20}		
5878	$C_{25}H_{50}O_2$	Neocerotic acid	382.39	77.8			
5879	$C_{25}H_{50}O_2$	Hyenic acid	382.39	78			
5880	$C_{25}H_{50}O_3$	Cerebronic acid	398.39	100			
5881	$C_{25}H_{52}$	Pentacosane $CH_3(CH_2)_{23}CH_3$	352.40	54	284^{40}	0.779	
5882	$C_{26}H_{14}$	Rubicene	326.11	306			
5883	$C_{26}H_{20}$	Tetraphenylethylene	332.15	221	425		
5884	$C_{26}H_{20}O$	α-Benzopinacoline	348.15	205			
5885	$C_{26}H_{20}O$	β-Benzopinacoline	348.15	181			
5886	$C_{26}H_{21}NO_{11}$	Aconine	523.17	132			
5887	$C_{26}H_{22}$	1, 1, 2, 2-Tetraphenylethane	334.17	209	383	1.182	
5888	$C_{26}H_{22}N_4$	Benzilosazone	390.20	225			
5889	$C_{26}H_{22}O_2$	Benzopinacone	366.17	186 d.			
5890	$C_{26}H_{23}N_5$	Tetraphenyldiguanidine	405.22	136			
5891	$C_{26}H_{26}N_2O_2$	Benzoylcinchonine	398.22	106			
5892	$C_{26}H_{27}ClN_2O_2$	Benzoylcinchonine hydrochloride	434.68	207			
5893	$C_{26}H_{28}N_2O_4$	Cinchonidine salicylate	432.23	70			
5895	$C_{26}H_{28}O_{14}$	Ruberythric acid	564.22	260			
5896	$C_{26}H_{28}O_{14}$	Morindin	564.22	245	247		
5897	$C_{26}H_{30}N_2O_6S$	Quinine phenolsulfonate	498.31				1333
5898	$C_{26}H_{30}O_4$	Bixin	406.23	189			
5899	$C_{26}H_{32}N_2O_2$	Ibogine	404.26	152			
5900	$C_{26}H_{37}NO_3$	Jervine	411.29	241			
5901	$C_{26}H_{38}$	Carotin	350.29	167.8			
5902	$C_{26}H_{40}O$	Ergosterin	368.31	154	185^{20}	1.040	
5903	$C_{26}H_{40}O_7$	Laserpitin	464.31	117.5	240^{10} d.		
5904	$C_{26}H_{41}NO_{10}$	Japaconine	527.32	97			
5905	$C_{26}H_{42}O_3$	Sarsasapogenin	402.32	183			
5906	$C_{26}H_{42}O_3$	Smilacin	402.32	160 d.			
5907	$C_{26}H_{43}NO_2$	Rubijervine	401.34	236			
5908	$C_{26}H_{43}NO_6$	Glycocholic acid	465.34	134			

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
5909	$C_{26}H_{44}O$	Caulosterol	372.34	159			
5910	$C_{26}H_{44}O_2$	Onocerin	388.34	232			
5911	$C_{26}H_{44}O_4$	Gitogenin	420.34	272			
5912	$C_{26}H_{44}O_{10}$	Parillin	516.34	176.1			
5913	$C_{26}H_{45}NO_8$	Protoveratridine	499.36	265			
5914	$C_{26}H_{46}O$	Mochyl alcohol $C_{26}H_{45}OH$	374.35	234			
5915	$C_{26}H_{46}O_4$	Di-*l*-menthyl adipate	422.35	61			
5916	$C_{26}H_{52}O_2$	Cerotic acid	396.40	82.5		0.836_4^{79}	
5917	$C_{26}H_{52}O_2$	Ethyl lignocerate	396.40	56	310^{20}		
5918	$C_{26}H_{54}$	*n*-Hexacosane $CH_3(CH_2)_{24}CH_3$	366.42	60	296^{40}	0.779	
5919	$C_{26}H_{54}$	Isohexacosane	366.42	61	$207^{0.7}$		
5920	$C_{26}H_{54}O$	Ceryl alcohol $C_{26}H_{53}OH$	382.42	80			
5921	$C_{27}H_{28}Br_2N_2O_5$	Quinine dibromosalicylate	620.06	198			
5922	$C_{27}H_{28}N_6S_3$	Diphenylguanidine trithiocarbonate	532.46	89			
5925	$C_{27}H_{30}N_2O_5$	Quinine salicylate	462.25	187			1333
5926	$C_{27}H_{30}O_{15}$	Apiin	594.23	228			
5927	$C_{27}H_{30}O_{16}$	Sophorin	610.23	166			
5928	$C_{27}H_{32}O_{16}$	Rutin	612.25	183	d.		
5929	$C_{27}H_{38}O_7$	Strophantidin	474.29	195			
5930	$C_{27}H_{39}N_5O_5$	Paucine	513.34	126			
5931	$C_{27}H_{40}O_8$	Cerberin	492.31	192			
5932	$C_{27}H_{42}O$	Ergosterin	382.32	165			
5933	$C_{27}H_{46}O$	Cholesterin	386.35	148	>360	1.067	
5934	$C_{27}H_{46}O$	Phytosterol	386.35	136			
5935	$C_{27}H_{46}O$	Sitosterol	386.35	140			
5936	$C_{27}H_{46}O_2$	Atropurol	402.35	285			
5937	$C_{27}H_{47}N$	Cholesterylamine	385.37	104			
5938	$C_{27}H_{47}NO_9$	Indaconine	529.37	94			
5939	$C_{27}H_{48}O$	Coprosterol	388.37	105			
5940	$C_{27}H_{50}O_6$	Tricaprylin	470.39	8		0.954	425
5941	$C_{27}H_{54}O$	Myristone $(C_{13}H_{27})_2CO$	394.42	76		$0.792_4^{90.9}$	
5942	$C_{27}H_{56}$	*n*-Heptacosane $CH_3(CH_2)_{25}CH_3$	380.43	59.5	270^{15}	$0.779_4^{59.5}$	
5943	$C_{28}H_{18}$	9, 9′-Dianthranyl	354.14	300			
5944	$C_{28}H_{20}N_2$	Amaron (Tetraphenylpyrazine)	384.17	240			
5945	$C_{28}H_{22}N_2O$	Benzoylamarin	402.19	180			
5946	$C_{28}H_{22}O_2$	Anthrapinacone	390.17	182 d.			
5947	$C_{28}H_{24}N_2$	Benzylamarin	388.20	124			
5948	$C_{28}H_{28}N_2O_5$	Strychnine salicylate	472.23				1333
5949	$C_{28}H_{30}O_2$	Columbin	398.23	182			
5950	$C_{28}H_{34}O_{11}$	Phillirin	546.26	160			
5951	$C_{28}H_{36}N_2O_4$	Ipecamine	464.29	90			
5952	$C_{28}H_{36}N_2O_4$	Psychotrine	464.29	138			
5953	$C_{28}H_{36}O_7$	Digitogenic acid	484.28	210			
5954	$C_{28}H_{38}N_2O_4$	Cephaeline	466.31	99			
5955	$C_{28}H_{38}N_2O_4$	Hydroipecamine	466.31	92			
5956	$C_{28}H_{38}O_7$	α-Elaterin	486.29	232			
5957	$C_{28}H_{38}O_7$	β-Elaterin	486.29	195			
5958	$C_{28}H_{44}O_2$	Lactucerin	412.34	210			
5959	$C_{28}H_{45}NO$	Behenolic anilide $C_{21}H_{39}CONHC_6H_5$	411.36	72			
5960	$C_{28}H_{46}NO_9$	Isopyroine	540.36	160			
5961	$C_{28}H_{46}O_2$	Cholesteryl formate	414.35				1216
5962	$C_{28}H_{47}NO$	Brassidic anilide $C_{21}H_{41}CONHC_6H_5$	413.37	78			
5963	$C_{28}H_{47}NO$	Erucic anilide $C_{21}H_{41}CONHC_6H_5$	413.37	66			
5964	$C_{28}H_{48}O_{10}$	Gitalin	544.37	253			
5965	$C_{28}H_{49}NO$	Behenic anilide $CH_3(CH_2)_{20}CONHC_6H_5$	415.39	102			
5966	$C_{28}H_{54}O_2$	*l*-Menthyl stearate	422.42	39			
5967	$C_{28}H_{58}$	Octocosane $CH_3(CH_2)_{26}CH_3$	394.45	65	318^{40}	0.779	
5968	$C_{28}H_{58}O$	Cluytyl alcohol	410.45	82.5			
5969	$C_{29}H_{24}O_8$	Fortoin (Methylenedicotoine)	500.19	213			
5970	$C_{29}H_{26}O_{12}$	Aromadendrin	566.20	216			
5971	$C_{29}H_{32}N_2O_6$	Quinine acetylsalicylate	504.26	157			
5972	$C_{29}H_{35}NO_7$	Paniculatine	509.28	263			
5973	$C_{29}H_{36}N_2O_4$	Emetamine	476.29	156			

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
5974	$C_{29}H_{40}N_2O_4$	Isoemetine	480.32	98			
5975	$C_{29}H_{42}Cl_2N_2O_4$	Isoemetine hydrochloride	553.26	310 d.			
5976	$C_{29}H_{43}NO_7$	Pseudojervine	517.34	307			
5977	$C_{29}H_{43}NO_8$	Sabadenine	533.34	160	197 d.		1333
5978	$C_{29}H_{48}$	Spinacene	396.37	< −20	260^{9}	0.859^{20}_{20}	570
5979	$C_{29}H_{48}O$	Taraxasterol	412.37	222			
5980	$C_{29}H_{49}O_3$	Phytosterol acetate	445.38	122			
5981	$C_{29}H_{50}O_5$	Cluytianol	478.39	300			
5982	$C_{29}H_{51}NO_8$	Sabadine	541.40	240			
5983	$C_{29}H_{52}O_{20}$	Sapotin	720.40	240			
5984	$C_{29}H_{58}O_2$	Montanic acid	438.45	86.8			
5985	$C_{29}H_{60}$	Nonacosane $CH_3(CH_2)_{27}CH_3$	408.46	63.6	348^{40}	0.780	
5986	$C_{30}H_{20}NO_9$	Adlumidine	538.16	234			
5987	$C_{30}H_{28}O_{10}$	Santalin	548.22	226	195^{9}		
5989	$C_{30}H_{34}O_{13}$	Picrotoxin	602.26	200			
5990	$C_{30}H_{38}O_4$	Hellesboresin	462.29	150 d.			
5991	$C_{30}H_{40}N_2O_5$	Emetine	508.32	74			
5993	$C_{30}H_{42}Cl_2N_2O_5$	Emetine dihydrochloride	581.26	53			1333
5994	$C_{30}H_{42}I_2N_2O_5$	Emetine dihydroiodide	764.20	238			
5995	$C_{30}H_{42}N_2O_{15}S_2$	Sinalbin	734.47	138.5			
5996	$C_{30}H_{44}N_6O_8S$	Physostigmine sulfate	648.45	140			
5997	$C_{30}H_{44}O_9$	Cymarin	548.34	138 d.			
5998	$C_{30}H_{46}O_{12}$	Ouabain	598.35	185			
5999	$C_{30}H_{48}O_2$	Echicerin	440.37	157			
6000	$C_{30}H_{48}O_2$	Mycosterol	440.37	160			
6001	$C_{30}H_{48}O_8$	β-Quinovin	536.37	235			
6002	$C_{30}H_{50}O$	α-Amyrin	426.39	185	> 300		
6003	$C_{30}H_{50}O$	β-Amyrin	426.39	195			
6004	$C_{30}H_{50}O$	Androsterol	426.39	208			
6005	$C_{30}H_{50}O$	Stigmasterol	426.39	140			
6006	$C_{30}H_{50}O_2$	Betulin	442.39	252			
6007	$C_{30}H_{50}O_2$	Cholesterol propionate	442.39	98.7			
6008	$C_{30}H_{52}O_4$	Menthyl camphorate	476.40	86			
6009	$C_{30}H_{54}N_4O_4S$	Sparteine sulfate	566.51				1333
6010	$C_{30}H_{60}$	Melene	420.46	63	380	0.890	
6011	$C_{30}H_{60}O_2$	Melissic acid $CH_3(CH_2)_{28}CO_2H$	452.46	91			
6012	$C_{30}H_{60}O_4$	Lanoceric acid	484.46	105			
6013	$C_{30}H_{62}$	Melissane	422.48	74	$222^{0.3}$		
6014	$C_{30}H_{62}$	n-Triacontane $CH_3(CH_2)_{28}CH_3$	422.48	70	$235^{1.0}$	0.780	
6015	$C_{30}H_{62}O$	Melissyl alcohol	438.48	88		0.777^{95}	
6016	$C_{30}H_{62}O_2$	Cocceryl alcohol	454.48	104			
6017	$C_{31}H_{15}NO_4$	Apomorphine dibenzoate	465.12	156			
6018	$C_{31}H_{26}O_{10}$	Tephrosin	558.20	187			
6019	$C_{31}H_{27}NO_5$	Dibenzoylmorphine	493.22	190.5			
6020	$C_{31}H_{38}O_{10}$	Kosin	570.29	142			1333
6021	$C_{31}H_{43}NO_{11}$	Napelline	603.36	165			
6022	$C_{31}H_{43}O$	Lupeon	431.33	170			
6023	$C_{31}H_{50}O$	Lupeol	438.39	215			
6024	$C_{31}H_{52}O_2$	Cholesterol butyrate	456.40	92.8			
6025	$C_{31}H_{52}O_2$	Euonysterol	456.40	138			
6026	$C_{31}H_{62}O$	Palmitone $(C_{15}H_{31})_2CO$	450.48	83		$0.795^{90.9}_{4}$	1125
6027	$C_{13}H_{62}O_3$	Cocceric acid	482.48	93			
6028	$C_{31}H_{64}$	n-Hentriacontane $CH_3(CH_2)_{29}CH_3$	436.49	68.1	302^{15}	$0.781^{68.1}_{4}$	
6029	$C_{32}H_{22}O_{10}$	Heraclin	566.17	185			
6030	$C_{32}H_{26}$	Pentaphenylethane	410.20	173			
6031	$C_{32}H_{27}N_3O$	Benzacine	469.23	150			
6032	$C_{32}H_{41}NO_9$	Pyraconitine	583.32	171			
6032.1	$C_{32}H_{42}N_2O_9$	Lappaconitine	598.34	223			
6033	$C_{32}H_{44}N_2O_{10}S$	Homoatropine sulfate	648.42				1333
6034	$C_{32}H_{44}O_{10}$	Quassiin	588.34	211			
6035	$C_{32}H_{45}NO_9$	Indobenzaconine	587.36	130			
6036	$C_{32}H_{46}BrNO_{10}$	Benzaconine hydrobromide	684.28	282			
6037	$C_{32}H_{46}ClNO_{10}$	Benzaconine hydrochloride	639.82	α 217; β 268			

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
6038	$C_{32}H_{48}N_2O_{14}S$	Sinapine sulfate	716.45	193			
6039	$C_{32}H_{49}NO_9$	Veratrine	591.39	205			
6040	$C_{32}H_{51}NO_{11}$	Protoveratrine	625.40	250			
6041	$C_{32}H_{52}N_2O_3$	Lycopodine	512.42	115			
6042	$C_{32}H_{52}O_2$	Echitin	468.40	170			
6043	$C_{32}H_{54}O_2$	Cholesterol valerate	470.42	89.6			
6044	$C_{32}H_{54}O_2$	Phytosterol valerate	470.42	30			
6045	$C_{32}H_{62}O_3$	Palmitic anhydride $(C_{15}H_{31}CO)_2O$	494.48	64			
6046	$C_{32}H_{62}O_{16}$	Convolvulin (Rhodeoretin)	702.48	158			
6047	$C_{32}H_{64}O_2$	Cetyl palmitate $C_{15}H_{31}CO_2C_{16}H_{33}$	480.49	54		0.832_4^{50}	
6048	$C_{32}H_{66}$	*n*-Dotriacontane $CH_3(CH_2)_{30}CH_3$	450.51	75	310^{15}	$0.775^{79.4}$	1110
6049	$C_{33}H_{40}O_{19}$	Robinin	740.31	195			
6050	$C_{33}H_{43}NO_{11}$	Anhydroaconitine	629.34	186			
6051	$C_{33}H_{46}N_2O_9$	Septentrionaline	614.37	131			
6052	$C_{33}H_{50}O_{10}$	Tormentol	606.39	228			
6053	$C_{33}H_{53}NO_7$	Solangustine	575.42	235 d.			
6054	$C_{33}H_{56}O_2$	Cholesterol capronate	484.43	91.2			
6055	$C_{33}H_{56}O_6$	Phytosteroline	548.43	290			
6056	$C_{33}H_{62}O_6$	Tricaprin	554.48	31.1		0.921_4^{40}	1054
6057	$C_{33}H_{66}O_2$	Psyllostearylic acid	494.51	95			
6058	$C_{33}H_{68}O$	Psyllostearyl alcohol	480.52	69.5			
6059	$C_{34}H_{32}O_6$	Isoeugenol dibenzoate	536.25	161			
6060	$C_{34}H_{36}N_2O_6$	Pseudomorphine	568.29	327 d.			
6061	$C_{34}H_{36}N_2O_9$	Sekisanine	616.29	200			
6062	$C_{34}H_{40}N_2O_{10}S$	Morphine sulfate	668.39	250 d.			1333
6063	$C_{34}H_{40}N_2O_{12}S_2$	Quinine diguaiacolsulfonate	732.45	130 d.			
6064	$C_{34}H_{44}N_2O_8S$	Apoatropine sulfate	640.42				1333
6065	$C_{34}H_{44}O_8$	*d*-Camphor salicylate	580.34	60			
6066	$C_{34}H_{47}NO_{10}$	Indaconitine	629.37	203			
6067	$C_{34}H_{47}NO_{11}$	Aconitine	645.37	195			
6068	$C_{34}H_{48}BrNO_{11}$	Aconitine hydrobromide	726.29	163			1333
6069	$C_{34}H_{48}ClNO_{11}$	Aconitine hydrochloride	681.84	149			1333
6070	$C_{34}H_{48}N_2O_{10}S$	Atropine sulfate	676.45	194			1333
6071	$C_{34}H_{48}N_2O_{10}S$	Hyoscyamine sulfate	676.45	206			1333
6072	$C_{34}H_{48}N_2O_{14}$	Aconitine nitrate	708.39				1333
6073	$C_{34}H_{49}NO_{11}$	Japaconitine	647.39	204.2			
6074	$C_{34}H_{50}ClNO_{11}$	Japaconitine hydrochloride	683.85	149			
6075	$C_{34}H_{50}O_2$	Cholesterol benzoate	490.39	145.5			
6076	$C_{34}H_{50}O_3$	Cholesterol salicylate	506.39	180			1180
6077	$C_{34}H_{54}O_{11}$	Digitoxin	638.42	244			
6078	$C_{34}H_{56}O_{16}$	Jalapin	720.43	150			
6079	$C_{34}H_{57}NO_2$	Solanidine	511.45	215			
6080	$C_{34}H_{70}$	*n*-Tetratriacontane	478.54	76.5	$255^{1.0}$	0.781	
6081	$C_{34}H_{70}O$	Incarnatryl alcohol	494.54	74			
6082	$C_{35}H_{38}O_{12}$	Filixic acid	650.29	184			
6083	$C_{35}H_{39}N_5O_5$	Ergotinine	609.34	229 d.			1333
6084	$C_{35}H_{41}N_5O_6$	Ergotoxine	627.36	164			
6085	$C_{35}H_{44}N_5O_{10}P$	Ergotoxine phosphate	725.40	187			
6086	$C_{35}H_{56}O_2$	Echiretin	508.43	52			
6087	$C_{35}H_{56}O_{14}$	Digitalin	700.43	217			
6088	$C_{35}H_{59}O_8$	Phytosterolene acetate	607.45	160			
6089	$C_{35}H_{60}NO_4$	Imperialine	558.47	254 d.			
6090	$C_{35}H_{70}O$	Stearone $(C_{17}H_{35})_2CO$	506.54	88		0.793_4^{95}	
6091	$C_{35}H_{72}$	*n*-Pentatriacontane	492.55	74.7	331^{15}	$0.782_4^{74.7}$	
6092	$C_{36}H_5O_6$	Lophopetalin	533.04	230			
6093	$C_{36}H_{34}N_2O_8S$	Aporheine sulfate	654.34	75			
6094	$C_{36}H_{34}N_2O_{13}$	Cynoctonine	702.28	137			
6095	$C_{36}H_{42}O_6$	Helleborin	570.32	> 250 d.			
6096	$C_{36}H_{42}O_{13}$	Filicic acid	682.32	125			
6097	$C_{36}H_{44}N_2O_{10}S$	Codeine sulfate	696.42	278			1333
6098	$C_{36}H_{48}O_{10}$	*α*-Picrasmin	640.37	204			
6099	$C_{36}H_{48}O_{10}$	*β*-Picrasmin	640.37	212			
6100	$C_{36}H_{50}N_6O_6$	Pyramidon camphorate	662.43	90			

No.	Formula	Name	Mol. wt.	M. P.	B. P.	d	R. I. No.
6101	$C_{36}H_{51}NO_{11}$	Bikhaconitine	673.40	113			
6102	$C_{36}H_{51}NO_{12}$	Pseudaconitine	689.40	211			
6104	$C_{36}H_{62}O_{31}$	Inulin	990.48	178 d.		1.35	
6105	$C_{36}H_{66}O_3$	Oleic anhydride	546.51	22.2			
6106	$C_{36}H_{70}O_3$	Stearic anhydride $[CH_3(CH_2)_{16}CO]_2O$	550.54	72			
6107	$C_{36}H_{74}$	Hexatriacontane	506.57	76.5	$265^{1.0}$	0.782^{76}	
6108	$C_{37}H_{36}N_2O_9$	Xanthaline	652.29	208			
6109	$C_{37}H_{51}NO_{11}$	Taxine	685.40	82 d.			
6110	$C_{37}H_{64}O_2$	Cholesterol caprinate	540.49	82.2			
6111	$C_{38}H_{44}N_2O_{12}$	Morphine tartrate	720.36				1333
6112	$C_{38}H_{44}N_4O_2$	Dicinchonine	588.37	40			
6113	$C_{38}H_{46}N_2O_8$	α-Truxilline	658.37	80			
6114	$C_{38}H_{46}N_2O_8$	β-Truxilline	658.37	45			
6115	$C_{38}H_{46}N_4O_6S$	Cinchonidine sulfate	686.45	242			
6116	$C_{38}H_{46}N_4O_6S$	Cinchonine sulfate	686.45	198.5			
6117	$C_{38}H_{46}N_4O_8S$	Cupreine sulfate	718.45	257 d.			
6119	$C_{39}H_{41}NO_{12}$	Adlumine	715.32	188			
6120	$C_{39}H_{63}NO_{10}$	Zygadenine	705.49	200			
6120.1	$C_{39}H_{74}O_6$	Trilaurin	638.57	46.5		0.891^{65}	
6122	$C_{40}H_{40}N_2O_{10}S_2$	Quinine-β-naphtholsulfonate	772.45	186			
6124	$C_{40}H_{50}N_4O_8S$	Quinine sulfate	746.48	235.2			
6125	$C_{40}H_{56}O_{15}$	Strophantin	776.43	179			
6126	$C_{40}H_{70}O_2$	Homoeuonysterol	582.54	134			
6127	$C_{41}H_{50}N_4O_7$	Quinine carbonate	710.42	169			
6129	$C_{42}H_{46}N_4O_8S$	Strychnine sulfate	766.45	200			
6131	$C_{42}H_{54}N_2O_7$	Tritopine	698.43	182			
6133	$C_{42}H_{66}O_6$	Caulosapogenin	666.51	315			
6135	$C_{42}H_{70}O_2$	Echitein	606.54	195			
6136	$C_{43}H_{45}N_3O_{24}$	Quinoline tartrate	987.37	125			
6137	$C_{43}H_{57}N_4O_{10}P$	Quinine glycerophosphate	820.50	181			
6138	$C_{44}H_{54}N_4O_8$	Quinine succinate	766.45	192			
6139	$C_{44}H_{54}N_4O_9$	Quinine malate	782.45	177.5			
6141	$C_{44}H_{54}N_4O_{10}$	Quinine tartrate	798.45	202.5			1333
6142	$C_{44}H_{64}NO_{19}$	Glycyrrhizic acid	910.50	220			
6143	$C_{44}H_{76}O_{20}$	Sarsasaponin	924.59	248			
6144	$C_{44}H_{82}O_3$	Brassidic anhydride	658.63	64		0.835_4^{70}	1145
6145	$C_{44}H_{82}O_3$	Erucic anhydride	658.63	48			1144
6147	$C_{45}H_{86}O_6$	Trimyristin	722.66	55		0.885_4^{60}	1089
6148	$C_{46}H_{50}N_4O_{10}$	Strychnine *d*-tartrate	818.42	228		1.429	
6150	$C_{46}H_{56}N_2O_{20}S$	Narceine sulfate	988.51				1333
6151	$C_{47}H_{54}O_{16}$	Filmaron	874.42	60			
6153	$C_{48}H_{93}NO_9$	Phrenosin	827.72	215 s. d.			
6154	$C_{49}H_{80}O_{23}$	Gitonin	1036.6	272 d.			
6155	$C_{50}H_{66}O_{30}$	Hyssopin	1146.5	275			
6156	$C_{50}H_{70}O_8$	Lupulinic acid	798.54	93			
6157	$C_{51}H_{98}O_6$	Tripalmitin	806.76	65.1; 46		0.866_4^{80}	1114
6158	$C_{52}H_{91}NO_{18}$	Solanine	1017.7	254 d.			
6159	$C_{52}H_{92}ClNO_{18}$	Solanine hydrochloride	1054.2	212			
6160	$C_{52}H_{104}O_2$	Ceryl cerotate	760.80	84			
6161	$C_{54}H_{88}O_{17}$	Caulosaponin (Leontin)	1008.7	255			
6163	$C_{56}H_{74}N_4O_{12}S$	Psychotrine sulfate	1026.7	217			
6164	$C_{56}H_{88}O_9$	Caulophyllosapogenin	904.68	315			
6165	$C_{57}H_{104}O_6$	Glycerol trielaidate	884.80	32			
6166	$C_{57}H_{104}O_6$	Glycerol trioleate	884.80	−17	240^{18}	0.915	
6167	$C_{57}H_{104}O_9$	Glycerol triricinoleate	932.80			0.959	
6168	$C_{57}H_{110}N_2O_{15}$	Pyosin	1062.9	238			
6169	$C_{57}H_{110}O_6$	Tristearin	890.85	54.5; [illegible]		0.862_4^{80}	1115
6170	$C_{58}H_{46}O_{23}$	Fustin	1110.4	219			
6172	$C_{66}H_{104}O_{17}$	Caullophyllosaponin	1168.8	260			
6173	$C_{68}H_{96}N_2O_{26}S$	Aconitine sulfate	1388.8				1333
6175	$C_{72}H_{88}N_6O_{20}$	Quinine citrate	1356.7	183.5			

REFRACTIVE INDEX

A. LIQUIDS

Serial No.	Gen. index No.	Refractive index n_D^{20}	Dispersion $H_\beta - H_\alpha$	Serial No.	Gen. index No.	Refractive index n_D^{20}	Dispersion $H_\beta - H_\alpha$	Serial No.	Gen. index No.	Refractive index n_D^{20}	Dispersion $H_\beta - H_\alpha$	Serial No.	Gen. index No.	Refractive index n_D^{20}	Dispersion $H_\beta - H_\alpha$
1	586	1.306	0.0045	86	1005	1.3927	0.0070	171	3995	1.408	0.0072	258	3988	1.421	
2	60	1.329	0.0054	87	2933	1.3929	0.0080	172	4007	1.408	0.0068	259	2407	1.4213	
3	208	1.3316	0.0061	88	724	1.3930	0.0070	173	2344	1.4082		260	569	1.4216	0.0113
4	141	1.3419	0.0051	89	2392	1.393	0.0068	174	3998	1.408	0.0072	261	2892	1.4217	0.0071
5	213	1.344	0.0060	90	3369	1.393	0.0062	175	1012	1.4086	0.0072	262	1067.1	1.4219	
6	168	1.3474	0.0058	91	1654	1.3932	0.0068	176	1100	1.4088	0.0074	263	2301	1.4223	0.0076
7	793	1.3526	0.0061	92	1659	1.3935		177	420	1.4093		264	358	1.4224	
8	513	1.3534	0.0058	93	822	1.394	0.0074	178	2934	1.4095		265	2400	1.4226	0.0070
9	1072	1.355	0.0062	94	2926	1.3947	0.0066	179	1080	1.410	0.0070	266	2405	1.4226	
10	1073	1.3564	0.0040	95	1651	1.3951	0.0068	180	2985	1.410	0.0076	267	658	1.4227	0.0075
11	1049	1.3574	0.0056	96	1639	1.3959	0.0074	181	1044	1.4103		268	4412	1.4228	
12	794.1	1.3576		97	2362	1.3959		182	1570	1.4104	0.0074	269	2351	1.423	0.0075
13	794	1.3579	0.0062	98	747	1.3960		183	1730	1.411		270	2409	1.423	0.0072
14	448	1.3591	0.0068	99	790	1.396	0.0068	184	3329	1.4110		271	3357	1.423	
15	451	1.3597	0.0063	100	2354.1	1.3960		185	3994	1.411		272	2330	1.4235	0.0075
16	489	1.3613	0.0079	101	598	1.3962		186	2331	1.4114		273	28	1.4237	0.0080
17	262	1.361	0.0061	102	686	1.3962		187	2910	1.4114		274	2965	1.4238	
18	452	1.3619	0.0062	103	2937	1.3964		188	1602	1.4115		275	220	1.4239	0.0093
19	396	1.363	0.0070	104	791	1.397	0.0068	189	4000	1.4116		276	711	1.4240	
20	447	1.3636	0.0067	105	495	1.3972	0.0081	190	657	1.4118		277	999	1.4240	
21	233	1.3639	0.0062	106	1085.1	1.3973		191	1043	1.4119	0.0073	278	2419	1.424	0.0078
22	395	1.3664	0.0060	107	228	1.3974	0.0073	192	2326	1.412	0.0090	279	2967	1.424	
23	1716	1.369	0.0064	108	2359	1.3975		194	651	1.4121	0.0081	280	3325	1.424	0.0193
24	1036	1.3695	0.0063	109	723	1.3979	0.0070	195	3335	1.4122		281	4012	1.424	0.0078
25	37	1.3714	0.0072	110	748	1.398		196	3311	1.4123	0.0071	282	4161	1.424	0.0073
26	212	1.3719	0.0066	111	821	1.398	0.0074	197	3999	1.4126		283	1557	1.4242	0.0106
27	1715	1.372	0.0065	112	2941	1.3980	0.0069	198	3986	1.4127	0.0072	284	3308	1.4242	
28	773	1.3723	0.0078	113	624	1.3984	0.0086	199	1619	1.4128		285	657.1	1.4247	
29	725	1.3727	0.0064	114	2940	1.398	0.0070	200	1070	1.4129	0.0118	286	3309	1.4248	
30	718	1.3730	0.0070	115	1640	1.399		201	1645	1.4130	0.0073	287	2403	1.425	0.0074
31	984	1.3758	0.0080	116	789	1.3993	0.0069	202	2343	1.4131	0.0073	288	2868	1.425	
32	1713	1.376	0.0065	117	671	1.3996		203	2846	1.4131	0.0073	289	465	1.4251	0.0093
33	665	1.3767	0.0051	118	1652	1.3997	0.0068	204	446	1.4134	0.0094	290	616	1.4254	0.0071
34	1714	1.377	0.0065	119	356	1.3998	0.0127	205	1730.1	1.4135		291	2406	1.4254	
35	727	1.3771	0.0066	120	2905	1.3999		206	948	1.4136	0.0051	292	2987	1.4254	
36	726	1.3779	0.0065	121	917	1.4004	0.0096	207	1643	1.4138	0.0074	293	3314	1.4259	
37	506	1.378	0.0065	122	2354	1.4005	0.0069	208	2309	1.4138	0.0072	294	4419	1.426	0.0081
38	1712	1.3783	0.0064	123	2361	1.4005	0.0069	209	3338	1.414		295	928	1.4263	
39	823	1.3786	0.0070	124	1636	1.4006	0.0071	210	4001	1.414	0.0072	296	2899	1.4268	0.0076
40	719	1.3791	0.0071	125	3365	1.4008		211	1726.1	1.4141		297	2962	1.427	0.0073
41	1741	1.3807	0.0066	126	2357	1.4009	0.0070	212	587	1.4144		298	2963	1.4270	
42	1746	1.3819	0.0065	127	1534	1.4010	0.0098	213	3982	1.4145		299	4585	1.427	0.0075
43	48	1.382	0.0089	128	1617	1.401	0.0090	214	1733.1	1.4146		300	4586	1.427	0.0074
44	1610	1.3821		129	1764	1.401	0.0081	215	2411	1.4149		301	949	1.4271	
45	2387	1.3825		130	2353	1.4012		216	1571	1.415		302	3962	1.4271	
46	146	1.3828		131	820	1.401	0.0075	217	1644	1.4150	0.0073	303	721	1.4272	
47	667	1.383		132	746	1.4015	0.0071	219	2873	1.415	0.0090	304	1612	1.4273	0.0075
48	1015	1.384		133	2901.1	1.4015		220	3993	1.415	0.0075	305	264	1.4274	0.0072
49	1019	1.3840		134	2938	1.4016		221	3336	1.4153	0.0073	306	3939	1.4275	
50	717	1.3843	0.0071	135	2942	1.402	0.0070	222	375	1.4154	0.0100	307	3975	1.4275	
51	1017	1.3844	0.0066	136	487	1.4022		223	966	1.4156	0.0081	308	2964	1.4278	
52	1020	1.3844	0.0067	137	775	1.4026	0.0080	224	2396	1.4159		309	744	1.428	0.0095
53	1739	1.3849		138	2935	1.4026		225	2896	1.4161	0.0075	310	3310	1.4284	
54	247	1.385		139	2909.1	1.4030		226	66	1.4164	0.0076	311	2386.1	1.4288	
55	2389	1.385	0.0091	140	2904	1.4035		227	189	1.4166	0.0080	312	4172	1.4289	0.0077
56	1063	1.3851		141	2912	1.4036		228	2397	1.4172		313	1027	1.429	
57	1026	1.3852	0.0063	142	1560	1.4038	0.0071	229	3936	1.4174	0.0194	314	4162	1.4293	
58	1016	1.3858	0.0068	143	3347	1.404		230	3372	1.4176	0.0084	315	449	1.4295	
59	505	1.386	0.0066	144	3349	1.4040		231	1736	1.4178		316	4153	1.4299	0.0075
60	749	1.386		145	1013	1.4043	0.0071	232	911	1.4179	0.0044	317	2867	1.430	0.0076
61	2382	1.3861	0.0064	146	937	1.4045	0.0085	233	2944	1.4184		318	2966	1.430	0.0075
62	1007	1.3862	0.0070	147	3353	1.4047		234	4178	1.4184		319	2986	1.430	0.0076
63	450	1.3868	0.0068	148	2903	1.4049		235	968	1.4185	0.0075	320	3356	1.430	0.0074
64	792	1.387	0.0067	149	1760	1.405	0.0075	236	969	1.4185	0.0105	321	1629	1.4302	
65	824	1.387	0.0075	150	1768	1.405		237	479	1.4186	0.0104	322	2953	1.4303	
66	269	1.3874		151	3354	1.405		238	1695	1.4194	0.0073	323	273	1.4306	0.0102
67	1064	1.3874	0.0074	152	378	1.4051	0.0080	239	2302	1.419		324	355	1.4306	0.0094
68	1018	1.3879	0.0066	153	1010	1.4051	0.0071	240	2320	1.4195		325	925	1.4306	0.0094
69	1001	1.3881	0.0131	154	1084.1	1.4053		241	943	1.4196	0.0091	326	3289	1.4306	
70	1004	1.3882	0.0072	155	1045	1.4056	0.0084	242	1734	1.4196	0.0071	327	3937	1.4309	0.0077
71	468	1.3886	0.0065	156	2936	1.4058		243	1561	1.4198	0.0081	329	3361	1.4310	
72	524	1.389	0.0074	157	1046	1.4060		244	1662	1.4198	0.0081	330	3363	1.431	
73	1653	1.389		158	1081	1.406	0.0070	245	1732	1.420		331	3940	1.4311	
74	1014	1.3891	0.0068	159	1603	1.406	0.0069	246	2847	1.420	0.0071	332	4843	1.4312	
75	1006	1.3895	0.0071	160	2275	1.406	0.0087	247	2955	1.4201		333	620	1.4314	0.0114
76	154	1.3898	0.0084	161	3330.1	1.4060		248	2970	1.4203		334	2412	1.4314	0.0073
77	2393	1.390	0.0068	162	3334	1.4060	0.0071	249	2971	1.4204		335	3355	1.4317	
78	809	1.3902	0.0060	163	2901	1.4065		250	3989	1.4204	0.0074	336	736	1.432	
79	1002	1.3902	0.0080	164	3333.1	1.4070		251	2400.1	1.4206		337	4852	1.4321	0.0076
80	1655	1.3903	0.0070	165	1084	1.4072	0.0070	252	896	1.4207	0.0087	338	3358	1.4322	
81	626	1.3904	0.0069	166	1079	1.4075	0.0071	253	2407.1	1.4209		339	2952	1.433	0.0073
82	972	1.3909		167	3331	1.4076		254	2954	1.4209		340	3328	1.4330	0.0076
83	1649	1.391		168	652	1.4079	0.0080	255	4411	1.4209		341	4166	1.4333	
84	242	1.392		169	1767	1.4079	0.0069	256	2399	1.421	0.0073	342	4169	1.4334	
85	625	1.3927	0.0079	170	3351	1.408	0.0071	257	2869	1.421	0.0076	343	712	1.4335	

Serial No.	Gen. index No.	Refractive index n_D^{20}	Dispersion $H_\beta - H_\alpha$
344	3364	1.4338	
345	2318	1.434	
346	464	1.4341	0.0092
347	743	1.4344	
348	3362	1.4345	
349	192	1.4346	
350	158	1.4349	0.0089
351	5010	1.4359	
352	742	1.436	0.0092
353	924	1.436	0.0080
354	471	1.4362	
355	2849.1	1.4362	
356	258	1.4364	0.0126
357	2968	1.437	0.0074
358	3961	1.437	0.0078
359	5260	1.437	0.0076
360	3303	1.4371	
361	614	1.4373	0.0149
362	1253	1.4375	0.0126
363	3895	1.4376	
364	17	1.438	
365	762	1.438	0.0096
366	3944	1.4380	
367	604	1.4386	0.0082
368	811	1.4386	0.0097
369	3285	1.4388	0.0092
370	927	1.4390	0.0131
371	470	1.4392	
372	741	1.4398	0.0089
373	1506	1.4404	
374	4179	1.4404	
375	2813	1.4407	0.0098
376	1089	1.441	
377	2812	1.4410	0.0112
378	1041	1.4412	0.0083
379	1098	1.4412	0.0091
380	1366	1.4413	0.0122
381	457	1.4414	0.0077
382	1500	1.4415	0.0103
383	941	1.4416	0.0082
384	1252	1.4417	0.0131
385	2281	1.4419	
386	655	1.442	0.0084
387	3960	1.4420	
388	5156	1.442	0.0084
389	1042	1.4421	
390	814	1.4425	0.0099
391	1576	1.4425	
392	5688	1.4427	
393	764	1.4428	0.0098
394	2284	1.443	
395	648	1.4433	
396	1096	1.4437	
397	2825	1.4438	
398	2827	1.444	
399	3295	1.4441	
400	190	1.4443	0.0084
401	1040	1.4444	0.0089
402	4387	1.4445	
403	1056	1.4450	0.0094
404	1537	1.4451	0.0095
405	2327	1.4452	
406	2835	1.4453	
407	1055	1.4454	0.0094
408	2283	1.4454	
409	4381	1.4455	0.0083
410	3968	1.4456	
411	619	1.4457	0.0129
412	4856	1.4459	
413	1769	1.446	
414	4376	1.4460	
415	148	1.4462	
416	1699	1.4464	0.0120
417	19	1.4467	0.0089
418	4388	1.4468	
419	963	1.4469	
420	3827	1.4471	
421	2850	1.4476	
422	1692	1.4478	0.0088
423	3892	1.4481	0.0092
424	921.1	1.4482	0.0083
425	5940	1.4482	
426	2831	1.4486	0.0082
427	5013	1.4486	
428	1551	1.449	0.0169
429	1724	1.4490	
430	926	1.4495	
431	2282	1.4496	
432	1090	1.4499	
433	307	1.4500	0.0090

Serial No.	Gen. index No.	Refractive index n_D^{20}	Dispersion $H_\beta - H_\alpha$
434	2890	1.4503	
435	3808	1.4505	
436	648.3	1.4506	
437	585	1.4507	0.0087
438	648.2	1.451	0.0092
439	929	1.4512	0.0176
440	3826	1.4515	
441	3917	1.4521	
442	2294	1.4524	0.0121
443	4010	1.4524	0.0095
444	1054	1.4530	0.0089
445	3805	1.4532	
446	285	1.4539	0.0035
447	2888	1.4540	
448	3893	1.4540	
449	5853	1.4543	
450	648.1	1.4550	
451	1595	1.455	0.0084
452	364	1.4554	
453	4144	1.4556	
454	4368.4	1.4556	0.0107
455	107	1.4557	0.0094
456	5356	1.4557	
457	5813	1.4558	
458	222	1.4562	0.0110
459	3889	1.4567	
460	648.4	1.4570	
461	696	1.457	
462	3933	1.457	0.0081
463	2889	1.4574	
464	3969	1.4579	
465	5482	1.4580	
466	2340	1.4581	
467	2341	1.4590	
468	2886	1.459	0.0082
469	2383	1.4594	
470	11	1.4595	0.0079
471	1478	1.4597	
472	5371	1.4602	0.0084
473	3974.1	1.4603	
474	3902	1.4606	
475	3992	1.4606	
476	12	1.4607	0.0097
477	3894	1.4609	
478	2339	1.461	
479	3296	1.4614	
480	3915	1.4623	
481	5605	1.4626	
482	1105	1.463	0.0088
483	4372	1.4630	
484	5606	1.4636	
485	3947	1.4642	
486	3273	1.4643	
487	1328	1.4646	0.0145
488	3948	1.4649	
489	366	1.4655	0.0132
490	136	1.4659	
491	4148	1.4659	
492	2814	1.4660	0.0151
493	4374	1.4660	
494	403	1.4666	0.0107
495	1756	1.467	
496	2882	1.467	0.0084
497	2796	1.4675	
498	2240	1.4680	
499	3854	1.4690	
500	2058	1.4691	0.0144
501	176	1.4697	0.0112
502	2059	1.470	0.0142
503	3811	1.4700	
504	3891	1.4701	
505	2057	1.4704	0.0153
506	159	1.4711	0.0094
507	3858	1.4715	
508	863	1.4717	0.0141
509	3913.1	1.4723	
510	3810	1.4727	0.0114
511	3952	1.4727	
512	515	1.4729	0.0078
513	3913	1.4729	
514	4115	1.473	
515	3806	1.473	0.0118
516	4371	1.4739	
517	3879	1.4741	
518	3864	1.4743	
519	1466	1.4744	0.0131
520	2745	1.4745	
521	3924	1.4747	
522	368	1.4753	0.0105
523	582	1.4755	0.0094

Serial No.	Gen. index No.	Refractive index n_D^{20}	Dispersion $H_\beta - H_\alpha$
524	2239	1.4763	
525	106	1.4777	
526	3927	1.4785	
527	3816	1.4788	
528	139	1.479	
529	2797	1.4792	0.0116
530	4370	1.4792	
531	3908	1.4798	
532	422	1.4801	0.0110
533	3926	1.4803	
534	887	1.4805	
535	5164	1.4806	0.0102
536	5682	1.482	
537	3824	1.4823	
538	3922	1.4827	0.0096
539	3890	1.4828	
540	5480	1.483	
541	3823	1.4846	
542	3764	1.4848	
543	1596	1.4867	
544	3865	1.4870	0.0147
545	4131	1.4872	0.0140
546	3860	1.488	
547	3886	1.488	
548	5001	1.4881	
549	2927	1.489	0.0120
550	3725	1.4890	
551	3765	1.4895	
552	2262	1.4903	0.0132
553	3857	1.4911	
554	3724	1.4914	
555	221	1.4915	
556	3229	1.4920	0.0147
557	4097	1.4922	
558	4344	1.4922	
559	3728	1.4925	0.0144
560	1697	1.4929	0.0125
561	3223	1.4930	0.0146
562	3736	1.493	0.0140
563	4097.1	1.4930	
564	3882	1.4935	
565	4367	1.4939	
566	4342	1.494	
567	140	1.4942	
568	3226	1.4943	0.0160
569	4980	1.4946	
569.1	3731	1.495	0.0144
570	5978	1.4951	
571	4098	1.4954	0.0133
572	1051	1.4955	0.0131
573	2688	1.4956	0.0158
574	4983	1.4956	
575	1588	1.4959	0.0104
577	2683	1.4959	0.0152
578	755	1.4960	0.0137
579	2112	1.4962	0.0160
580	3228	1.4967	0.0113
581	3856	1.4967	
582	3726	1.4969	
583	4366	1.4972	
584	2685	1.4973	0.0158
585	3225	1.4975	0.0152
586	3780	1.4976	
588	600	1.498	0.0117
589	3677	1.498	0.0137
590	4975	1.4981	
591	4978	1.4984	
593	3741	1.4986	
594	3286	1.4993	0.0116
595	3681.1	1.4995	
596	4974	1.4996	
597	476	1.4997	0.0056
598	3277	1.4998	0.0213
599	3152	1.500	
600	754	1.5001	0.0140
601	3727	1.5003	0.0146
602	4977	1.5005	
603	4976	1.5007	
604	1443	1.501	0.0160
605	4561	1.5011	
606	1365	1.5014	0.0167
607	4324	1.5019	0.0147
608	2810	1.5023	0.0245
609	4828	1.5025	
610	2590	1.503	0.0149
611	4999	1.5030	
612	589	1.5035	0.0154
613	3883	1.5036	
614	111	1.504	0.0104
615	3224	1.5042	0.0153

Serial No.	Gen. index No.	Refractive index n_D^{20}	Dispersion $H_\beta - H_\alpha$
616	3761	1.5042	
617	4981	1.5042	
618	666	1.5046	
619	2719	1.505	0.0159
620	3763	1.5050	
621	475	1.5051	0.0148
622	3230	1.5051	0.0158
623	90	1.5055	0.0137
624	3679	1.5057	0.0163
625	4971	1.5057	
626	2684	1.5058	0.0161
627	2720	1.506	0.0161
628	3154	1.506	0.0161
629	3678	1.506	0.0162
630	815	1.5063	0.0130
631	4972	1.5065	
632	689	1.507	
633	2722	1.507	0.0164
634	4350	1.507	
635	4348	1.508	
636	3680	1.5081	0.0169
637	4827	1.5083	0.0140
638	4545	1.5085	
639	693	1.509	0.0127
640	2586	1.509	0.0188
641	870	1.509	0.0163
643	2775	1.5105	
644	234	1.512	0.0163
645	331	1.512	
646	2721	1.512	0.0169
647	183	1.5128	0.0132
648	3244	1.513	0.0171
649	3786	1.5131	0.0163
650	3227	1.5132	0.0157
651	404	1.5134	0.0168
652	1330	1.514	0.0169
653	4102	1.514	
654	3119	1.5143	
655	5141	1.516	0.0143
656	2589	1.5164	0.0132
657	5000	1.5164	
658	3754.2	1.5168	
659	2163	1.517	0.0173
660	3235.1	1.5174	
661	4091.1	1.5175	
662	3740	1.5187	0.0157
663	3788	1.5201	0.0117
664	412	1.5203	0.0131
665	4318	1.5207	
666	2041	1.521	0.0164
667	4560	1.521	
668	2713.1	1.5211	
669	3755	1.5218	
670	3170	1.5226	0.0206
671	413	1.523	0.0124
672	2040	1.523	0.0165
673	3149	1.5232	
674	3757	1.5234	
675	3096	1.523	
676	3655	1.5236	
677	2714	1.5240	
678	3752	1.524	0.0157
679	2503	1.5242	
680	3688	1.5249	0.0196
681	1307	1.525	0.0172
682	3258	1.525	
683	4090.1	1.5250	
684	3057	1.526	
685	859	1.5261	0.0270
686	2111	1.5261	0.0198
687	594	1.5266	0.0173
688	1250	1.5267	0.0232
689	3132	1.527	0.0183
690	3664	1.5271	0.0189
691	2039	1.528	0.0166
692	3034	1.5282	
693	576	1.5285	0.0173
694	4353	1.5285	
695	3747	1.5286	0.0160
696	45	1.5297	0.0221
697	2	1.5300	0.0117
698	3656	1.5301	0.0204
699	3265	1.5305	
700	1249	1.5311	0.0232
701	699	1.5313	0.0122
702	2084	1.5323	
703	3134	1.5335	
704	4061	1.5338	0.0202
705	2571	1.5339	0.0217

Serial No.	Gen. index No.	Refractive index n_D^{20}	Dispersion $H_\beta - H_\alpha$
706	3237	1.5357	0.0168
707	1390	1.536	0.0216
708	2618	1.5369	0.0222
709	2725	1.537	0.0180
710	184	1.5379	0.0140
711	2038	1.539	0.0175
712	3606	1.5394	0.0210
713	2159	1.5399	0.0173
714	2161	1.540	0.0181
715	2162	1.540	0.0184
716	1388	1.5407	0.0213
716.1	1944	1.541	
717	3789	1.5421	0.0220
718	2677	1.5425	
719	123	1.5437	0.0165
720	2195	1.5440	0.0175
721	10	1.5442	0.0219
722	1389	1.5455	0.0202
723	1230	1.546	0.0178
724	2081	1.5462	
725	2001	1.5464	0.0232
726	3260	1.5469	
727	2160	1.547	0.0185
728	236	1.5472	0.0204
729	2082	1.5475	
730	3787	1.5481	0.0224

Serial No.	Gen. index No.	Refractive index n_D^{20}	Dispersion $H_\beta - H_\alpha$
731	1229	1.549	0.0176
732	2032	1.5490	
733	3259	1.5492	0.0229
734	2031	1.551	
735	2639	1.551	0.0189
736	1347	1.5529	0.0252
737	1859	1.5537	0.0221
738	2030	1.555	
739	2763	1.5559	0.0225
740	2633	1.556	0.0182
741	1441	1.5562	0.0375
742	2762	1.558	0.0214
743	964	1.559	
744	2758	1.559	0.0217
745	2578	1.5597	0.0270
746	4062	1.5598	0.0283
747	1294	1.560	0.0193
748	2760	1.561	0.0214
749	2098	1.5620	0.0227
750	2767	1.5649	0.0230
751	1857	1.5650	0.0209
752	649	1.567	
753	1856	1.567	0.0230
754	1176	1.5671	0.0207
755	2423	1.5692	0.0214

Serial No.	Gen. index No.	Refractive index n_D^{20}	Dispersion $H_\beta - H_\alpha$
756	2757	1.570	0.0217
757	2203	1.5714	0.0249
758	2204	1.5728	0.0230
759	2004	1.5735	0.0315
760	3642	1.5749	
761	2771	1.575	0.0162
762	4930	1.576	
763	4757	1.5761	
764	1200.2	1.577	
765	1200.1	1.5814	
766	2255	1.583	0.0248
767	372	1.584	
768	1887	1.5861	0.0286
769	1442	1.5863	0.0249
770	2491	1.588	
771	2756	1.5887	0.0248
772	18	1.589	0.0176
773	151	1.5890	0.0162
774	1375	1.5895	0.0240
775	4723	1.5921	0.0195
776	1376	1.5931	0.0243
777	1202	1.5979	0.0161
778	101	1.5992	0.0193
779	4296	1.602	0.0290
780	126	1.603	0.0162

Serial No.	Gen. index No.	Refractive index n_D^{20}	Dispersion $H_\beta - H_\alpha$
781	102	1.6062	
782	601	1.6077	
783	1205	1.608	0.0217
784	1483	1.6081	0.0256
785	2061	1.609	0.0234
786	2492	1.6094	
787	1204	1.611	
788	3548	1.6149	0.0296
789	3549	1.616	0.0296
790	4038	1.618	0.0303
791	3069	1.6195	0.0424
792	1333	1.621	0.0253
793	1369	1.6260	0.0265
794	127	1.6277	0.0189
795	3455	1.633	0.0309
796	128	1.638	0.0183
797	428	1.642	
798	1918	1.6509	0.0349
799	3453	1.658	0.0325
800	4263	1.6913	0.0356

Serial No.	Gen. index No.	Temperature t°C	Refractive index $n_D^{t°}$	Dispersion $H_\beta - H_\alpha$
801	683	0	1.3752	
802	310	0	1.4538	
803	209	7	1.3597	0.0058
804	1327	7	1.6053	
805	930	7.5	1.4341	0.0094
806	3054	8.2	1.571	0.0234
807	969.1	8.4	1.417	
808	4339	9.5	1.5301	0.0171
809	22	10	1.2675	0.0052
810	4304	10.8	1.6265	0.0337
811	807	11	1.4198	0.0077
812	3591	11	1.5425	0.0188
813	2832	11.9	1.4519	0.0084
814	2570	11.9	1.5503	0.0229
815	2276	12	1.4468	
816	2337	12	1.467	
817	4323	12	1.5703	0.0253
818	2824	12.5	1.4208	0.0089
819	1535	12.5	1.4559	0.0167
820	2453	12.5	1.5524	0.0338
821	2580	12.7	1.5764	0.0298
822	89	12.9	1.4340	0.0101
823	1078	13	1.414	
824	3818	13	1.479	
825	3851	13	1.4971	0.0135
826	5	13	1.5831	
827	3861	13.6	1.4540	0.0083
828	608	13.7	1.4786	0.0128
829	1518	13.7	1.4993	0.0141
831	4041	13 9	1.6232	0.0312
832	2880	14	1.458	
833	2342	14	1.462	
834	2878	14	1.463	
835	3812	14	1.4883	0.0172
836	2579	14	1.5566	0.0248
837	4707	14	1.610	
838	2336	14.4	1.4397	0.0092
839	3852	14.5	1.4647	0.0084
840	3919	14.5	1.4787	
841	3666	14.5	1.5439	0.0189
842	2289.1	14.6	1.4505	0.0083
843	979	14.7	1.4098	0.0071
844	3574	14.7	1.5740	0.0222
845	3762	14.8	1.5104	0.0201
846	4967	14.8	1.5128	0.0153
847	3283	14.9	1.4463	0.0103
848	1616	15	1.4065	0.0090
849	622	15	1.4257	
850	713	15	1.4313	
851	4004	15	1.4372	
852	1533	15	1.4421	
853	132	15	1.4490	0.0116
854	133	15	1.4519	0.0101
855	5007	15	1.4628	
856	4834	15	1.4638	

Serial No.	Gen. index No.	Temperature t°C	Refractive index $n_D^{t°}$	Dispersion $H_\beta - H_\alpha$
857	4572	15	1.4644	
858	4147	15	1.4708	
859	3912	15	1.4801	
860	3863	15	1.4849	
861	3859	15	1.4871	0.0130
862	4979	15	1.4921	
863	117	15	1.4982	0.0233
864	118	15	1.4998	0.0227
865	4986	15	1.5018	
866	988	15	1.5094	0.0071
867	100	15	1.5219	0.0148
868	3589	15	1.5632	
869	3590	15	1.5736	
870	29	15	1.7425	
871	4306	15.1	1.6477	0.0404
872	558	15.2	1.4735	0.0103
873	359	15.3	1.4302	
874	1541	15.3	1.4526	0.0084
875	525	15.4	1.3770	0.0071
876	1546	15.4	1.4213	0.0092
877	3128	15.5	1.5647	
878	3122	15.7	1.5747	0.0236
879	3661	15.8	1.5196	0.0274
880	983	16	1.378	
881	1613	16	1.4013	0.0090
882	942	16	1.4083	0.0076
883	737	16	1.4156	
884	3874	16	1.438	
885	1555	16	1.4506	0.0123
886	3304	16	1.452	
887	2884	16	1.455	
888	2883	16	1.458	
889	2887	16	1.458	
890	3923	16	1.4762	
891	5003	16	1.480	
892	908	16	1.4888	0.0149
893	3654	16	1.5514	
894	84	16	1.580	
895	379	16.1	1.4397	0.0079
896	2279	16.3	1.4554	0.0159
897	3847	16.3	1.4846	0.0126
898	608.1	16.3	1.4971	0.0133
899	1548	16.4	1.4458	0.0136
900	4279	16.4	1.6157	0.0296
901	918	16.5	1.4402	
902	3324	16.5	1.4632	0.0090
903	880	16.6	1.4470	0.0129
904	934	16.6	1.4527	0.0127
905	2816	16.6	1.4561	0.0104
906	2570	16.6	1.5469	0.0230
907	2538	16.6	1.5485	0.0240
908	4587	16.8	1.4419	
909	1519	16.8	1.5077	0.0147
910	2328	16.9	1.425	0.0076
911	313	17	1.3870	0.0104

Serial No.	Gen. index No.	Temperature t°C	Refractive index $n_D^{t°}$	Dispersion $H_\beta - H_\alpha$
912	3955	17	1.4385	0.0090
913	568	17	1.4467	
914	3819	17	1.4674	0.0109
915	3821	17	1.4784	
916	4993	17	1.5332	
917	3649	17	1.5671	
918	4404	17.1	1.4435	0.0072
919	3820	17.1	1.4774	0.0116
920	3849	17.1	1.4895	0.0157
921	982	17.2	1.3817	0.0085
922	2267	17.2	1.4511	0.0111
923	3928	17.2	1.4638	0.0085
924	339	17.4	1.5337	
925	340	17.4	1.5369	
926	2830	17.5	1.4771	0.0104
927	609	17.6	1.4588	0.0157
928	3245	17.6	1.5058	0.0157
929	5359	17.7	1.463	0.0092
930	3638	17.8	1.4804	0.0085
931	3637	17.8	1.5451	0.0169
932	920	18	1.4079	
933	1000	18	1.4282	0.0094
934	4375.1	18	1.4565	
935	3125	18	1.5441	0.0180
936	3667	18	1.5680	0.0251
937	4813	18	1.5933	0.0280
938	545	18.1	1.5004	0.0168
939	1022	18.2	1.4513	
940	3753	18.2	1.4999	0.0136
941	3037	18.2	1.6283	0.0312
942	1568	18.3	1.4198	
943	916	18.3	1.4221	0.0148
944	400	18.4	1.4058	0.0070
945	2855	18.4	1.4607	0.0090
946	2818	18.4	1.4904	0.0124
947	1341	18.5	1.5389	0.0211
948	4260	18.5	1.635	
949	935	18.8	1.4357	0.0096
950	773.1	18.9	1.4200	
951	4560	18.9	1.5198	0.0195
952	170	19	1.4117	
953	1554	19	1.4375	
954	2929	19	1.4435	0.0087
955	3807	19	1.4724	
956	3850	19	1.4900	
957	4987	19	1.4992	
958	4988	19	1.5092	
959	4994	19	1.5289	0.0111
960	2568	19	1.5485	0.0227
961	4150	19.1	1.4714	0.0131
962	4023	19.3	1.6546	0.0403
963	2298	19.5	1.4310	0.0102
964	2299	19.5	1.4355	0.0105
965	3959	21	1.447	
966	3639	21	1.5390	

Serial No.	Gen. index No.	Temperature t°C	Refractive index $n_D^{t°}$	Dispersion $H_\beta - H_\alpha$
967	4998	21.3	1.4979	
968	2759	21.3	1.5591	
969	4307	21.3	1.6544	0.0408
970	3121	21.4	1.5370	0.0168
971	2569	21.4	1.5407	0.0223
972	2071	21.4	1.5637	0.0247
973	3600	21.4	1.5766	0.0311
974	1496	21.6	1.4351	0.0114
975	2859	21.6	1.4766	0.0089
976	4789	21.6	1.5743	0.0193
977	4814	21.6	1.6321	0.0400
978	2928	21.9	1.4512	
979	3297	22	1.4380	
980	5765.1	22	1.4538	
981	3916	22	1.4604	
982	3822	22	1.4754	
983	3815	22	1.4770	0.0085
984	3813	22	1.4959	
985	5005	22.2	1.4600	0.0081
986	3703	22.2	1.5604	
987	301	22.3	1.4075	0.0093
988	4559	22.3	1.4984	0.0140
989	2205	22.4	1.5711	
990	2199	22.5	1.5021	
991	1357	22.5	1.5642	0 0242
992	2493	22.5	1.5990	
993	3958	22.6	1.4484	
994	4373	22.6	1.4623	0.0083
995	46	22.7	1.4453	0.0113
996	893	22.7	1.4852	0.0166
997	2468	22.7	1.5645	0.0231
998	2134	22.7	1.5760	
999	3601	22.9	1.5494	0.0268
1000	2384	23	1.4531	
1001	4563	23	1.5300	0.0264
1002	1430	23	1.5861	0.0231
1003	3547	23	1.6141	0.0298
1004	2505	23.1	1.5272	
1005	3701	23.1	1.5802	0.0244
1006	3702	23.1	1.5898	
1007	886	23.2	1.4365	0.0147
1008	1628	23.3	1.4329	0.0094
1009	314	23.4	1.4597	0.0102
1010	4375	23.4	1.4619	0.0082
1011	4156	23.4	1.4624	
1012	3191	23.4	1.5798	
1013	3192	23.4	1.5933	0.0302
1014	4448	23.4	1.6060	0.0278
1015	561	23.5	1.5231	0.0170
1016	1700	23.6	1.4464	
1017	1482	23.6	1.4992	0.0175
1018	1444	24	1.5043	
1019	4241	24	1.5826	
1020	1701	24.3	1.4463	
1021	2289.3	24.4	1.4432	0.0083
1022	3728.1	24.5	1.4877	0.0139
1023	4385	25	1.4555	0.0080
1024	5875	25	1.4875	
1025	3687	25	1.5252	
1026	3036	25.1	1.6223	0.0302
1027	2289.2	25.2	1.4431	0.0082
1028	1885	25.5	1.5257	0.0191
1029	2338	26	1.4558	
1030	4490	26	1.575	0.0205
1031	4226	26	1.6644	

Serial No.	Gen. index No.	Temperature t°C	Refractive index $n_D^{t°}$	Dispersion $H_\beta - H_\alpha$
1032	300	26.1	1.4540	0.0095
1033	994	26.4	1.4954	0.0137
1034	1587	26.8	1.4877	0.0140
1035	816	27.5	1.4769	0.0126
1036	5603	30	1.4559	
1037	3804	30	1.474	
1038	3981	31	1.4308	
1039	3126	33	1.5758	0.0295
1040	2293	33.8	1.4561	0.0082
1041	5380	33.9	1.4358	0.0077
1042	316	34.2	1.4146	
1043	5381	34.3	1.4347	0.0076
1044	3648	34.4	1.5537	0.0249
1045	5486	34.6	1.436	0.0076
1046	5852	35	1.4587	
1047	5391	35.2	1.4349	0.0075
1048	4530.3	35.2	1.5526	0.0292
1049	2490	36	1.6332	0.0293
1050	1011	36.5	1.3931	0.0070
1051	1627	37	1.4606	0.0078
1052	177	37.2	1.5258	0.0181
1053	2096	38.6	1.5763	
1054	6056	40	1.4446	
1055	1553	40	1.4467	0.0118
1056	3272	40	1.4514	0.0150
1057	5360	40	1.4533	
1058	1314	40	1.5473	
1059	1315	40	1.5565	
1060	1316	40	1.5579	
1061	4060.1	40	1.5726	0.0327
1062	4039	40	1.6026	0.0289
1063	860	40.3	1.5238	
1064	1413	41	1.5425	0.0189
1065	5610	42.9	1.434	0.0075
1066	4174	45.2	1.4294	0.0076
1067	5694	45.3	1.4344	0.0076
1068	3587	46	1.5836	
1069	931	46.7	1.4434	0.0123
1070	239	47	1.415	0.0098
1071	4297	47.3	1.5932	0.0281
1072	993	48	1.4126	0.0079
1073	30	48	1.4418	0.0085
1074	3802	48	1.4621	
1075	2464	48	1.6231	0.0343
1076	3412	48.5	1.6338	0.0305
1077	56	48.6	1.4616	0.0149
1078	5876	50	1.4663	
1079	5805	50	1.4689	
1080	3550	51.2	1.6703	0.0424
1081	4305	53.2	1.6443	0.0439
1082	4447	53.5	1.5975	0.0268
1083	1331	56	1.5010	0.0173
1084	1251	56	1.5150	0.0225
1085	5763	57.1	1.448	0.0084
1086	1480	57.7	1.6339	0.0305
1087	2206	59.1	1.5532	
1088	4851	60	1.4308	
1089	6147	60	1.4429	
1090	2263	60	1.4787	0.0228
1091	563	61	1.4953	
1092	1858	61	1.5553	0.0246
1093	1961	61.5	1.5557	
1094	1962	61.5	1.5577	
1095	1963	61.5	1.5647	
1096	2083	62.5	1.5346	

Serial No.	Gen. index No.	Temperature t°C	Refractive index $n_D^{t°}$	Dispersion $H_\beta - H_\alpha$
1097	560	63.1	1.4165	
1098	288	63.9	1.4152	
1099	156	65	1.4297	
1100	3071	66	1.5377	0.0169
1101	1231	69.9	1.5266	0.0171
1102	3456	70.7	1.6079	0.0295
1103	2172	74	1.5425	0.0187
1104	3414	76	1.6228	0.0303
1105	4219	77.1	1.588	0.0265
1106	3593	77.8	1.5678	0.0375
1107	238	78.3	1.4274	0.0098
1108	5168	78.9	1.4283	0.0075
1109	2356	79	1.3732	0.0064
1110	6048	79.4	1.4331	0.0077
1111	5814	79.5	1.4283	0.0076
1112	617	79.7	1.4228	0.0126
1113	5159	79.8	1.4273	0.0075
1114	6157	80	1.4381	
1115	6169	80	1.4399	
1116	3801	80	1.4402	0.0089
1117	5379	80.2	1.4299	0.0076
1118	4756	80.6	1.539	0.0187
1119	5258	80.7	1.4175	0.0073
1120	5816	80.8	1.4236	0.0075
1121	936	81	1.4342	0.0123
1122	631	82.1	1.379	0.0067
1123	4406	82.1	1.4183	0.0074
1124	2386	83.9	1.421	0.0083
1125	6026	93.5	1.4297	0.0076
1126	3507	98.7	1.6206	0.0324
1127	4218	98.8	1.6048	0.0293
1128	5402	99	1.5839	0.0219
1129	2548	99.2	1.5522	0.0242
1130	5063	99.2	1.6762	0.0556
1131	921.2	99.3	1.4657	0.0121
1132	1206	99.3	1.5743	0.0204
1133	4024	99.4	1.6211	0.0387
1134	4897	99.4	1.6803	0.0541
1135	3584	99.4	1.6828	
1136	4899	99.4	1.6959	0.0591
1137	3583	99.4	1.7083	0.0515
1138	3291	99.5	1.4760	0.0094
1139	5223	99.5	1.5021	0.0133
1140	4640	99.5	1.6959	0.0561
1141	2819	99.6	1.4621	0.0094
1142	5224	99.6	1.5022	0.0134
1143	3494	99.6	1.5827	0.0287
1144	6145	100	1.4347	
1145	6144	100	1.4366	
1146	2864	100	1.4811	0.0085
1147	4947	100	1.5080	0.0060
1148	3144	100	1.5345	0.0177
1149	3417	100	1.6092	0.0291
1150	3418	100	1.6235	0.0313
1151	946	106.4	1.4188	0.0065
1152	4119	107.2	1.489	0.0145
1153	482	107.8	1.4161	0.0090
1154	3282.1	109.4	1.4482	0.0085
1155	3307	110.6	1.4303	0.0077
1156	782	113	1.446	0.0097
1157	2585	114.6	1.512	0.0187
1158	4652	129	1.6567	
1159	5340	130.4	1.480	0.0133
1160	2007	131.9	1.504	0.0191
1161	3938	133.3	1.422	0.0073

B. SOLIDS

I. Mean Values

Serial No.	Gen. index No.	Refractive index n_D^{20}	Serial No.	Gen. index No.	Refractive index n_D^{20}	Serial No.	Gen. index No.	Refractive index n_D^{20}	Serial No.	Gen. index No.	Refractive index n_D^{20}
1162	481	1.4156	1164	1578.1	1.53	1165	5664	1.635	1166	444	1.755
1163	1070.1	1.525									

II. Uniaxial Group

Serial No.	Gen. index No.	Refractive index ω	ε	Serial No.	Gen. index No.	Refractive index ω	ε	Serial No.	Gen. index No.	Refractive index ω	ε	Serial No.	Gen. index No.	Refractive index ω	ε
1167	55	1.484	1.602	1173	238*	1.54	1.46	1179	2174	1.569	1.666	1184	1416	1.633	1.626
1168	3973	1.497	1.476	1174	808	1.544	1.521	1180	6075	1.579	1.540	1185	2454	1.646	1.642
1169	535	1.499	1.49	1175	5002	1.545	1.548	1181	4043.1	1.581	1.493	1186	4672	1.6588	1.6784
1170	3756	1.525	1.609	1176	5142.1	1.545	1.548	1182	1769.1	1.590	1.650	1187	1625	1.700	1.640
1171	2373	1.529	1.513	1177	697.1	1.554	1.515	1183	4272	1.600	1.649	1188	4727	1.717	1.563
1172	2915	1.530	1.430	1178	1093	1.559	1.548					1189	21	1.800	1.750

* Stable modification

III. Biaxial Group

Serial No.	Gen. index No.	Refractive index α	β	γ
1190	679.1	1.367	1.409	1.536
1191	361	1.4162	1.4603	1.5502
1192	4184	1.402	1.463	1.617
1193	4218	1.407	1.468	1.620
1194	147	1.440	1.475	1.625
1195	4397*		1.478	
1196	4368.3†	1.471	1.479	1.519
1197	2920		1.484	
1198	238†	1.370	1.485	1.585
1199	5066.1		1.488	
1200	2234.1		1.496	
1201	4368.3‡	1.479	1.496	1.524
1202	1507*	1.493	1.498	1.509
1203	2808.1	1.487	1.499	1.566
1204	2260.1	1.488	1.501	1.527
1205	776		1.503	
1206	270	1.445	1.505	1.540
1207	996		1.509	
1208	994.1		1.510	1.607
1209	3742		1.512	
1210	4008	1.505	1.512	1.524
1211	5028.1	1.511	1.512	1.836
1212	2260.2	1.495	1.513	1.672
1213	947.1	1.500	1.515	1.535
1214	3344		1.520	
1215	975.1	1.413	1.520	1.589
1216	5961		1.524	1.566
1217	2373.1	1.528	1.529	1.537
1218	1070.2	1.510	1.530	1.566
1219	1672	1.523	1.531	1.534
1220	629	1.450	1.534	1.610
1221	1705	1.525	1.535	1.560
1222	639	1.4955	1.5352	1.6045
1223	67.1	1.4227	1.5358	1.5545
1224	638	1.495	1.536	1.605
1225	484	1.515	1.540	1.575
1226	5336	1.520	1.540	1.580
1227	2367.1	1.536	1.540	1.541
1228	1035	1.532	1.541	1.549
1229	4394*	1.517	1.542	1.555
1230	2372		1.543	
1231	1037	1.517	1.544	1.546
1232	4318.1		1.545	
1233	303	1.4386	1.5457	1.5942
1234	64.1	1.507	1.546	1.546

Serial No.	Gen. index No.	Refractive index α	β	γ
1235	4688	1.545	1.546	1.837
1236	786		1.547	
1237	4530.1		1.548	
1238	2916.1		1.550	
1239	853.1	1.459	1.555	1.582
1240	988.1	1.546	1.559	
1241	778	1.519	1.561	1.591
1242	4396	1.5376	1.5651	1.5705
1243	1032	1.551	1.567	1.571
1244	3964		1.570	
1245	1472	1.56	1.57	1.60
1246	3716	1.54	1.571	1.59
1247	5343.1	1.544	1.572	
1248	1033	1.555	1.573	1.577
1249	493.1	1.515	1.575	1.586
1250	3199	1.560	1.576	1.647
1251	5477	1.510	1.578	1.618
1252	3778	1.5535	1.5787	1.5912
1253	835	1.55	1.581	
1254	708	1.549	1.583	1.625
1255	3194	1.556	1.587	1.700
1256	3111	1.535	1.592	1.760
1257	5228	1.522	1.594	1.616
1258	161	1.538	1.600	1.602
1259	3222	1.550	1.600	1.680
1260	5648	1.560	1.600	1.610
1261	976		1.6015	1.6187
1262	4530.2		1.602	
1263	4960		1.602	
1264	5320	1.574	1.602	1 647
1265	4936.1	1.526	1.603	
1266	977	1.490	1.605	1.620
1267	609.1	1.530	1.605	1.658
1268	3234	1.538	1.609	1.754
1269	3208	1.600	1.610	1.675
1270	1977	1.609	1.612	1.616
1271	3540	1.460	1.614	1.697
1272	1414	1.604	1.614	1.734
1273	3732		1.615	
1274	241	1.495	1.615	1.650
1275	1415	1.578	1.620	1.627
1276	3196	1.495	1.625	1.807
1277	5202	1.580	1.625	1.645
1278	5441	1.610	1.625	1.675
1279	5562	1.620	1.625	1.630

Serial No.	Gen. index No.	Refractive index α	β	γ
1280	4330.1	1.564	1.6[illegible]8	
1281	4752	1.621	1.6[illegible]9	1.661
1282	4943	1.590	1.630	1.640
1283	5317	1.620	1.630	1.650
1284	306		1.633	
1285	788		1.635	
1286	5317*	1.543	1.636	1.684
1287	3585		1.637	
1288	5319	1.607	1.642	1.675
1289	5067.1	1.621	1.643	1.648
1290	3087	1.505	1.645	1.655
1291	4750	1.587	1.646	1.769
1292	1111.1	1.626	1.646	1.712
1293	5082.4	1.612	1.647	1.662
1294	5213.1		1.650	
1295	5304	1.463	1.653	1.780
1296	4748	1.621	1.654	1.691
1297	1985	1.442	1.662	1.756
1298	5561	1.580	1.665	1.690
1299	4749	1.586	1.668	1.680
1300	1987	1.479	1.669	1.734
1301	5428.1	1.529	1.670	1.716
1302	1149	1.640	1.670	1.810
1303	3539	1.493	1.675	1.739
1304	5442	1.570	1.685	1.690
1305	1111.2	1.619	1.688	1.696
1306	2566.2	1.597	1.692	1.806
1307	4058	1.5697	1.6935	1.7324
1308	84.1	1.631	1.698	1.713
1309	3103	1.479	1.710	1.810
1310	4322	1.583	1.73	
1311	445	1.490	1.743	1.872
1312	4739	1.464	1.748	1.946
1313	1197	>1.56	1.75	>1.95
1314	1200	1.650	1.760	1.870
1315	1142	1.763	1.787	1.857
1316	87	1.740	1.847	1.863
1317	5818	1.524	1.867	1.873
1318	1412	1.508	1.870	1.907
1319	3060	1.535	1.873	1.893
1320	1364	1.54	>1.95	1.505

Miscellaneous

Serial No.	Gen. index No.	α	β	γ
1321	5135.1		1.524 (red)	
1322	5244.1	1.529	1.533 (red)	
1323	835.1		1.564 (red)	
1324	868	1.385		1.530
1325	3873*	1.480		1.522
1326	5221	1.49		1.58
1327	1069.1	1.495		1.565
1328	610	1.579		1.660
1329	4500	1.583		1.74?
1330	2135	1.602		1.627
1331	5541	1.625		1.690
1332	5424	1.652		1.768
1333	Bolland, *57*, **31:** 390; 10, approximate data only.			

*Hydrated form. †Metastable modification. ‡Stable modification.

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PROPERTY-SUBSTANCE TABLES

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𝔅866, 𝔅1626, 𝔅2044, 𝔅2848, 455, 584, 738, 842, 1371, 1806, 1919, 2561, 2682, 2705, 2749, 3193, 3775, 4233, 4285, 5313, 5364, 5422, 5847, 6048, 6093, 1151, 𝔅679, 𝔅1796, 784, 4207, 5173. **76:** 𝔅270, 𝔅3204, 292, 441, 907, 957, 1665, 2306, 2452, 2844, 2980, 3044, 3468, 3697, 3712, 4072, 4950, 5366, 5375, 5410, 5941, 𝔅2055, 570, 1210, 5823, 6080, 6107, 2584. **77:** 𝔅932, 𝔅2033, 2540.2, 3254, 3544, 3745, 4389, 5067.1, 5405, 5607, 5638, 𝔅2231, 1247, 2147, 3583, 5837, 5878, 𝔅2498. **78:** 𝔅2757, 𝔅2976, 664, 673, 975, 2055, 2425, 3389, 3746, 3778, 3792, 4034, 4239, 4433, 5000, 5280, 5387, 5639, 5879, 5962, 710, 79, 2537, 4187, 2117. **79:** 𝔅293, 𝔅909, 𝔅2733, 214, 482, 731, 1269, 1522, 2131, 2212, 3233, 3290, 3474, 3713, 4067, 4330.1, 4792, 5284, 5386, 5411, 5824, 5835, 1302. **80:** 𝔅139, 𝔅144, 𝔅181, 𝔅655, 𝔅683, 𝔅827, 𝔅1535, 𝔅1857, 𝔅3071, 152, 1209, 2129, 2179, 3705, 3722, 3732, 3777, 3875, 4319, 4647, 4798, 4899, 5220, 5492, 5920, 6113, 3494, 1305, 𝔅2240, 3394, 3631, 1924. **81:** 𝔅2020, 238, 1257, 1664, 1690, 2596, 3387, 3428, 3543, 4026, 4466, 4903, 5073, 5369, 5501, 5855, 5223, 5385. **82:** 𝔅245, 𝔅249, 93, 167, 197, 394, 1450, 1513, 1621, 1872, 1967, 2207, 2558, 2694, 2727, 2843, 2916, 4271, 4640, 4702, 5174, 5545, 5808, 6109, 6110, 3091, 3603, 5968, 5916. **83:** 1127, 1181, 1263, 1286, 1600, 2056, 2125, 2950, 3080, 3165, 3970, 4432, 5178, 5365, 5766, 6026, 𝔅2057, 1217, 3392, 𝔅2000, 5840. **84:** 1187, 1304, 1418, 3216, 3410, 3749, 3750, 4425, 4506, 4985, 5263, 5407, 5592, 5765, 5768, 6160, 𝔅649. **85:** 325, 398, 1153, 1352, 1580, 1766, 2510, 2695, 2993, 3315, 3370, 3519, 3627, 4833, 4907, 5383, 5384, 5799, 𝔅458, 2997, 4332, 5858, 1996. **86:** 𝔅1449, 𝔅3269, 217, 1024, 1119, 1438, 1753, 2045, 2166, 2573, 2662, 2799, 2808.1, 3596, 4476, 4892, 4897, 4924, 5135.1, 5349, 6008, 𝔅2735, 1162, 1206, 5984. **87:** 864, 1036, 1164, 1218, 1378, 1567, 1574, 2682.1, 2918, 3107, 4079, 4152, 4195, 4390, 4997, 5408, 5593, 𝔅1974, 1156. **88:** 201, 240, 290, 1184, 1301, 2065, 2542, 3391, 3418, 4368.3, 4519, 4536, 4698, 5025, 5163, 5219, 5436, 6015, 6090, 𝔅2032, 2253. **89:** 𝔅133, 𝔅375, 175, 677, 1039, 1111.2, 1132, 1855, 2811, 3013, 3537, 4206, 4209, 4522, 5085, 5119, 5244.1, 5286, 5583, 5673, 5779, 5922, 𝔅2078, 2471, 3396, 6043, 1272. **90:** 𝔅157, 𝔅983, 𝔅1002, 𝔅1627, 𝔅1708, 129, 350,

4483, 5192, 5780, 𝔅638. **228**: 𝔅1190, 𝔅1212, 1896, 1909, 2244, 2482, 2566.2, 3234, 3610, 4685, 5182, 5297, 5439, 5926, 6052, 6148, 1474, 1493, 4876, 6083. **230**: 𝔅165, 𝔅299, 𝔅316, 𝔅895, 𝔅1060, 𝔅3296, 527, 878, 1800, 1828, 1912, 2430, 2754, 3443, 3853, 4613, 4890, 5462, 5468, 5654, 5685, 5736, 5791, 6092. **231**: 59, 3555, 4768, 5062, 𝔅1680, 1139, 1140, 1345, 4599, 5636, 5661, 5910, 5956. **233**: 𝔅424, 241, 1492, 4016, 4194, 5056, 5703, 5713, 1670, 3552, 3557, 4312, 4945, 5914, 5986. **235**: 𝔅1211, 𝔅2502, 𝔅2763, 𝔅3299, 260, 610, 1076, 1598, 1782, 1908, 2449, 3270, 3444, 4085, 4500, 5089, 5333, 6001, 6053, 6124. **236**: 𝔅1214, 𝔅2608, 4657, 5552, 5599, 5907, 𝔅804, 𝔅894, 𝔅1200, 1075, 1902, 2701, 3451, 3743, 4224, 4499, 4660, 4712, 5293, 5716, 𝔅254, 5041. **238**: 𝔅758, 1338, 2107, 2439, 3043, 3450, 4154, 4524, 4696, 4812, 4910, 5994, 6168, 2245, 2486, 4256, 5227, 5663. **240**: 𝔅1033, 𝔅1804, 839, 1399, 1578, 3050, 3066, 3204, 3723, 4429, 4608, 4664, 4666, 5033, 5272, 5455, 5776, 5944, 5982, 5983. **241**: 3274, 3613, 4035, 4294, 5416, 5900, 1862, 𝔅2984, 494, 5451, 5600, 5669, 6115, 1899, 706, 1514, 4084, 5190. **244**: 2483, 4616, 5259, 6077, 4211, 𝔅184, 𝔅1187, 565, 2443, 3185, 5474, 5632, 5804, 5896. **246**: 493, 705, 3298, 3636, 4022, 5060, 𝔅487, 1679, 3406, 5203, 5343, 5822. **248**: 𝔅1674, 𝔅2674, 𝔅3297, 904.3, 1901, 3572, 5670, 6143, 3482. **250**: 𝔅380, 𝔅884, 𝔅916.1, 𝔅1130, 𝔅1202, 𝔅1207, 𝔅1210, 𝔅1711, 𝔅3059, 𝔅3102, 541, 2422, 2446, 2477, 2627, 3109, 3965, 4040, 4181, 4569, 4715, 4880, 4946, 5051, 5075, 5206, 5677, 5679, 5701, 5820, 6040, 6062, 5656. **251**: 𝔅2134, 1539, 1847, 4571, 5264, 𝔅1073, 𝔅2689, 𝔅1199, 𝔅2935, 3110, 3720, 4364, 4683, 4693, 5709, 6006. **253**: 𝔅2754, 1093, 1374, 1529, 5047, 5964, 𝔅173, 𝔅1129, 1146, 1771, 3478, 6089, 6158. **255**: 𝔅2621, 557, 1408, 2422.1, 2444, 4618, 4926, 6161, 𝔅872, 𝔅1203, 547, 995, 1523, 2658, 3018, 4527, 4638, 4642, 4737, 4931. **257**: 2420, 2792, 3292, 4502, 5807, 6117, 609.1, 1625, 1904, 3512, 4124, 5045, 5277. **259**: 𝔅93, 𝔅898, 𝔅1204, 1920, 3381, 5567, 𝔅891, 𝔅1486, 𝔅3311, 682, 1575, 3946, 4315, 4822, 4869, 5300, 5323, 5338, 5702, 5843, 5895, 6172. **261**: 2451, 5460, 5504, 5696, 4167, 4634, 4933, 5972, 3452, 3862, 5324, 5488, 5506, 5442. **265**: 𝔅1896, 875, 2552, 3209, 5322, 5517, 5913, 𝔅1193, 1883, 2791, 4602, 4690, 4909. **268**: 4251, 4963, 5642, 6037, 3280, 3434. **270**: 𝔅722, 𝔅904.1, 𝔅982, 𝔅1173, 𝔅2761, 679, 2445, 2817, 3019, 3382, 3796, 4197, 4674, 5401, 5518. **271**: 𝔅2704, 4949, 5513, 2151, 4246, 4629, 5295, 5911, 6154, 𝔅3282. **273**: 𝔅1475, 1068, 2521, 4884, 5513, 5537, 5866. **275**: 𝔅1675, 𝔅1729, 𝔅2687, 532, 1708, 3480, 4025, 4874, 4882, 5032, 5556, 5619, 6155. **276**: 𝔅224, 𝔅1678, 𝔅883, 𝔅1679, 𝔅1191, 3691, 4314, 6097, 2690. **280**: 𝔅91, 𝔅642, 𝔅828, 𝔅1880, 𝔅2532, 𝔅2906, 𝔅3193, 1380, 1707, 2102, 2108, 3721, 4036, 4628, 4870, 5307. **282**: 𝔅1342, 4603, 6036, 3208, 3484, 𝔅2115, 4488. **285**: 766, 1521, 2620, 4620, 4662, 4862, 4888, 5585, 5863, 5936. **286**: 1471.1, 1491, 3052, 4182, 5448, 5464, 𝔅319, 573, 𝔅2971, 1455, 1494, 1773, 2488, 4861, 4060, 4615, 𝔅1128. **290**: 𝔅223, 𝔅228, 𝔅896, 𝔅954, 𝔅2590, 1109, 1706, 2158, 3090, 3294.1, 4626, 4689, 5672, 5748, 5811, 6055, 1059. **292**: 𝔅283, 𝔅2983, 3481, 4630, 1113, 2793, 4860, 485, 552, 780, 1705, 2823, 3053, 3222, 3848. **297**: 𝔅2958, 5318, 𝔅225, 1069, 1980, 5806, 2152. **300**: 𝔅25, 𝔅229, 𝔅272, 𝔅549, 𝔅550, 𝔅691, 𝔅794, 𝔅823, 𝔅1056, 𝔅1749, 𝔅1915, 𝔅2682, 𝔅2706, 𝔅3194, 𝔅3195, 1106, 1407, 2442, 4887, 5023, 5502, 5550, 5686, 5721, 5834, 5943, 5981. **302**: 𝔅882, 4624, 4643, 5064, 𝔅1879, 1289, 4863, 1107, 1475, 2487, 5882, 𝔅271, 5976, 𝔅1993, 𝔅2705, 5817. **310**: 𝔅227, 𝔅1818, 𝔅3221, 1385, 4185, 4253, 4635, 4889, 5975, 𝔅2952, 4886. **315**: 𝔅617, 𝔅3309, 1069.1, 6133, 6164, 1346, 4891, 𝔅2668. **320**: 𝔅315, 𝔅495, 𝔅1111, 𝔅2815, 1427, 2702, 3586, 4665, 4885, 5030. **321**: 𝔅1474, 𝔅2170, 1905, 2447, 𝔅2756, 𝔅1746, 6060. **330**: 2480, 4594, 4595, 4627, 4636, 5022, 5029, 5722, 5082, 𝔅715, 888, 2153, 𝔅711, 𝔅2960, 564. **340**: 𝔅66, 𝔅710, 𝔅869, 2157, 2703, 4661, 4686, 5024, 5031. **350**: 𝔅561, 𝔅844, 𝔅1245, 𝔅2790, 𝔅3106, 1112, 3022, 5819, 𝔅684, 4438, 𝔅3359, 𝔅182, 𝔅3051. **360**: 𝔅1859, 4883, 5695, 𝔅749, 879, 𝔅1836, 𝔅2922, 𝔅2925, 1411, 𝔅543. **380**: 𝔅92, 𝔅2917, 2704, 𝔅2679, 𝔅1785, 𝔅832, 𝔅2623, 2155, 𝔅2811, 5028, 𝔅752, 𝔅3101. **400**: 𝔅657, 𝔅2923, 𝔅2939, 𝔅2959, 𝔅3015, 𝔅3190, 𝔅3279, 1409, 2156, 𝔅548, 𝔅2446, 2154, 𝔅713, 𝔅2503, 𝔅3310, 𝔅310, 199. **420**: 𝔅3289, 𝔅939, 𝔅3238, 𝔅1777, 𝔅696, 𝔅3202, 𝔅1062, 𝔅1837, 𝔅742, 𝔅1058, 𝔅322, 𝔅703, 𝔅2103, 𝔅3022, 𝔅3237, 𝔅1075, 𝔅2685, 𝔅753, 𝔅2615, 𝔅704. **450**: 𝔅82, 𝔅2602, 𝔅1779, 𝔅867, 𝔅1059, 𝔅2947, 𝔅700, 𝔅3300, 𝔅2744, 𝔅562, 𝔅2933, 𝔅1140, 𝔅1835, 𝔅1036. **480**: 𝔅1757, 𝔅1086, 𝔅2675, 𝔅1061, 𝔅2104, 𝔅948, 𝔅940. **500**: 𝔅94, 𝔅529, 𝔅616, 𝔅1244, 𝔅1710, 𝔅3130, 𝔅699, 𝔅2505, 𝔅2105, 𝔅174, 𝔅3175, 𝔅535, 𝔅300, 𝔅2610. **550**: 𝔅296, 𝔅859, 𝔅2788, 𝔅1064, 𝔅3117, 𝔅2928, 𝔅2257, 𝔅2836, 𝔅2773, 𝔅193, 𝔅1778, 𝔅825, 𝔅880, 𝔅2458, 𝔅328. **575**: 𝔅2244, 𝔅1163, 𝔅2929, 𝔅829, 𝔅1088, 𝔅2077, 𝔅303, 𝔅2531, 𝔅3168. **600**: 𝔅861, 𝔅3280, 𝔅542, 𝔅3006, 𝔅302, 𝔅951, 𝔅2973, 𝔅301, 𝔅2821, 𝔅2605, 𝔅2711, 𝔅2634, 𝔅3292. **625**: 𝔅326, 𝔅2063, 𝔅304, 𝔅1984, 𝔅707, 𝔅3287, 𝔅2373, 𝔅3167, 𝔅3205, 𝔅2442, 𝔅881, 𝔅3284. **650**: 𝔅1268, 𝔅1963, 𝔅2680, 𝔅1068, 𝔅2841, 𝔅279, 𝔅2911. **675**: 𝔅2233, 𝔅2496, 𝔅2080, 𝔅2601, 𝔅2831, 𝔅3200, 𝔅2833, 𝔅324, 𝔅2039, 𝔅1017, 𝔅2820, 𝔅536, 𝔅2824. **700**: 𝔅1275, 𝔅2136, 𝔅2822, 𝔅2832, 𝔅2829, 𝔅327, 𝔅2131, 𝔅2162, 𝔅3197, 𝔅665, 𝔅2908, 𝔅1773. **725**: 𝔅2599, 𝔅2924, 𝔅2238, 𝔅757, 𝔅2513, 𝔅2909, 𝔅2847, 𝔅664. **750**: 𝔅2907, 𝔅3158, 𝔅2677, 𝔅3172, 𝔅692, 𝔅1154, 𝔅3196, 𝔅2239, 𝔅663, 𝔅2921, 𝔅1873, 𝔅788, 𝔅2236, 𝔅1153, 𝔅2926. **775**: 𝔅1042, 𝔅2748, 𝔅503, 𝔅2849, 𝔅2024, 𝔅3161, 𝔅1543, 𝔅1775, 𝔅1642, 𝔅1541. **800**: 𝔅567, 𝔅810, 𝔅1247, 𝔅1440, 𝔅1744, 𝔅2837, 𝔅3171, 𝔅576, 𝔅2671, 𝔅2965, 𝔅2974, 𝔅2893, 𝔅2008, 𝔅307, 𝔅669, 𝔅3349, 𝔅568. **825**: 𝔅1066, 𝔅1004, 𝔅1018, 𝔅2628, 𝔅3224, 𝔅2654, 𝔅1631, 𝔅2509, 𝔅1979, 𝔅1087, 𝔅1772. **850**: 𝔅1041, 𝔅528, 𝔅1265, 𝔅2745, 𝔅309, 𝔅572, 𝔅2616, 𝔅501, 𝔅579, 𝔅2584, 𝔅2838, 𝔅2604, 𝔅747, 𝔅3131, 𝔅2438, 𝔅2777. **875**: 𝔅1838, 𝔅1839, 𝔅1243, 𝔅499, 𝔅1070, 𝔅2918, 𝔅2692, 𝔅524, 𝔅2975. **900**: 𝔅780, 𝔅857, 𝔅2253, 𝔅2656, 𝔅1959, 𝔅937, 𝔅560, 𝔅3115, 𝔅3116, 𝔅2487, 𝔅1939, 𝔅571, 𝔅3129. **950**: 𝔅1246, 𝔅1669, 𝔅1774, 𝔅1072, 𝔅2161, 𝔅2441, 𝔅2500, 𝔅2846, 𝔅1564, 𝔅2002.1, 𝔅2262, 𝔅3100, 𝔅3013, 𝔅557, 𝔅2670, 𝔅3017, 𝔅570, 𝔅3267, 𝔅2716, 𝔅1385, 𝔅1567. **1000**: 𝔅836, 𝔅2598, 𝔅2852, 𝔅2588, 𝔅2507, 𝔅3305, 𝔅569, 𝔅789, 𝔅1384, 𝔅2645, 𝔅3132, 𝔅1862, 𝔅843, 𝔅3014, 𝔅577. **1050**: 𝔅2863, 𝔅2587, 𝔅3215, 𝔅558, 𝔅2938, 𝔅1668, 𝔅2776, 𝔅2003, 𝔅2967. **1100**: 𝔅824, 𝔅956, 𝔅1223, 𝔅1593, 𝔅1870, 𝔅2360, 𝔅2379, 𝔅2486, 𝔅2865, 𝔅2174, 𝔅1374, 𝔅1561, 𝔅970, 𝔅552, 𝔅1694, 𝔅957, 𝔅2488, 𝔅587, 𝔅2334. **1150**: 𝔅3138, 𝔅573, 𝔅1571, 𝔅1851, 𝔅553, 𝔅1572, 𝔅3139, 𝔅2035.1, 𝔅1976,1. 𝔅1651, 𝔅2141, 𝔅2437, 𝔅1348. **1200**: 𝔅2313, 𝔅2644, 𝔅2354, 𝔅1850, 𝔅2263, 𝔅765, 𝔅876, 𝔅877, 𝔅3283, 𝔅1407, 𝔅2646, 𝔅2275, 𝔅1317, 𝔅1518, 𝔅1314, 𝔅2499, 𝔅1372. **1300**: 𝔅1319, 𝔅2380, 𝔅1519, 𝔅1581, 𝔅2589, 𝔅1316, 𝔅2597, 𝔅1318, 𝔅1978, 𝔅1520, 𝔅1845, 𝔅2712, 𝔅2966, 𝔅947, 𝔅1957.1. **1351**: 𝔅1846, 𝔅2235, 𝔅2431, 𝔅2663, 𝔅2659, 𝔅2427, 𝔅1517, 𝔅2130. **1400**: 𝔅2660, 𝔅1325, 𝔅2125, 𝔅1333, 𝔅2559, 𝔅2355, 𝔅811, 𝔅2248, 𝔅2561, 𝔅2394, 𝔅1424, 𝔅2430, 𝔅1801, 𝔅1671, 𝔅2323, 𝔅2426. **1500**: 𝔅858, 𝔅812, 𝔅1795, 𝔅2860, 𝔅2274, 𝔅2392, 𝔅1337, 𝔅2270, 𝔅2315, 𝔅1406, 𝔅2404, 𝔅2400, 𝔅2175, 𝔅1334, 𝔅2451, 𝔅2472, 𝔅2521, 𝔅2538, 𝔅2410. **1600**: 𝔅2391, 𝔅2557, 𝔅2267, 𝔅2273, 𝔅447, 𝔅1258, 𝔅2850, 𝔅1621, 𝔅343, 𝔅2266, 𝔅2537. **1700**: 𝔅2600, 𝔅340, 𝔅2393, 𝔅2544, 𝔅2328. **1800**: 𝔅1904, 𝔅1393, 𝔅755, 𝔅1619, 𝔅2177. **1900**: 𝔅1590, 𝔅2494, 𝔅1743, 𝔅1977, 𝔅1763, 𝔅1858, 𝔅2318, 𝔅2222, 𝔅1877. **2200**: 𝔅2109, 𝔅1724, 𝔅2283, 𝔅1821, 𝔅1663. **2400**: 𝔅1725, 𝔅2100, 𝔅1945, 𝔅2434, 𝔅1662, 𝔅483, 𝔅2232. **2700**: 𝔅473, 𝔅1689, 𝔅1767, 𝔅2099, 𝔅2128, 𝔅456, 𝔅1690. **3000**: 𝔅461.

II. BOILING POINTS

−192: 𝔅337, 54, 𝔅95, 𝔅345, 180, 𝔅1813. **−95**: 𝔅204, 𝔅465, 𝔅97, 252, 𝔅195, 𝔅9, 115, 𝔅351, 44. **−75**: 𝔅205, 𝔅17, 𝔅350, 𝔅126, 𝔅41, 𝔅125, 145, 𝔅263, 𝔅265, 𝔅485.5, 112. **−48:** 17.1, 409, 500, 𝔅68, 𝔅67, 𝔅206, 𝔅73, 𝔅26, 𝔅87, 408, 𝔅102, 232, 337. **−30:** 𝔅53, 𝔅364, 338, 263, 41, 31, 35, 95. **−18:** 686, 𝔅282, 𝔅349, 𝔅346, 13, 153, 73, 49, 781.2. **−10:** 𝔅38, 𝔅213, 65, 684, 𝔅130, 596, 𝔅141, 99, 𝔅84. **0.6:** 781.1, 685, 𝔅371, 64, 474, 𝔅98, 526, 40. **5:** 𝔅131, 687, 𝔅339, 310, 282, 63, 508, 𝔅365, 9, 1074. **10:** 𝔅40, 209, 224, 𝔅1814, 683, 42, 7, 𝔅149, 148, 283, 𝔅1811, 243, 598, 595, 𝔅4, 𝔅1672. **20.1:** 985, 208, 162, 52, 980, 𝔅96, 374, 1.1, 294, 295, 22, 1072, 597, 𝔅466, 921. **31:** 𝔅404, 569, 213, 𝔅142, 113, 983, 𝔅366, 525, 916, 615, 793, 273. **35:** 𝔅1646, 716, 278, 279, 373, 272, 1073, 982, 469, 𝔅105, 220, 986, 794, 613. **40:** 920, 28, 984, 539, 915, 530, 981, 1611, 286, 𝔅101, 313, 880, 45, 172, 913, 823. **44:** 402, 513, 918, 𝔅39, 375, 490, 𝔅797, 461, 715, 468. **47:** 𝔅99, 𝔅1149, 132, 365, 524, 447, 979, 1716. **50:** 881, 146, 749, 914, 𝔅1509, 154, 356, 520. **53:** 𝔅347, 479, 276, 529, 1050, 1087, 451. **55:** 218, 164, 237, 824, 917, 448, 𝔅111. **57:** 489, 452, 189, 𝔅352, 1712, 𝔅55, 1618, 228, 169, 465. **60:** 397, 519, 1534, 1715, 364, 133, 318, 718, 19, 1086, 3, 586. **62:** 27, 612, 1049, 357, 822, 89, 301, 1714, 3776, 1610, 891, 801, 4, 60. **65:** 50, 323, 800, 1616, 𝔅372, 517, 773, 813, 1613, 1001. **68:** 287, 518, 748, 821, 1742, 747, 1713, 𝔅59, 1533, 420. **70:** 2277, 1617, 1088, 464, 366, 728, 155, 1532, 𝔅469, 234, 112.1, 1615, 1619, 744, 𝔅207, 10. **74:** 231, 158, 𝔅42, 772, 1003, 118, 717, 83, 323.1, 820, 1048, 149, 12, 725. **78:** 𝔅513, 746, 1102, 262, 1468, 𝔅1515, 2394, 𝔅58, 332, 396, 719, 1365, 726. **80:** 𝔅348, 𝔅376, 165, 378, 752, 925, 1738, 2333, 624, 1466, 1469, 531, 2393. **81:** 130, 758, 727, 1612, 𝔅8, 168, 277, 1535, 506, 792. **83:** 623, 1252, 1537, 190, 2387, 47, 1536, 1761, 2325, 1632, 798, 117. **85:** 576, 812, 825, 1366, 1470, 1045, 𝔅109, 1328, 𝔅468. **87:** 222, 417, 669, 1008, 2388, 𝔅1810, 77, 106, 625, 811, 759, 1739, 247, 1253. **89:** 226, 1021, 1091, 1741, 462, 476, 1547, 1764, 458, 2390, 134, 𝔅1815. **91:** 670, 1101, 1740, 743, 1737, 742, 814, 17.4, 68, 122, 290.1, 652, 2391, 1002, 1019. **93:** 171, 210, 332.1, 837, 1007, 1065, 2276, 2392, 1496, 1631, 1544. **95:** 383, 1100, 2334, 𝔅390, 𝔅918, 418, 𝔅34, 𝔅35, 446, 1015, 395, 505, 2331, 26. **98:** 161, 203, 751, 810, 2326, 107, 1016, 2389, 173, 2329. **99:** 643, 1064, 2332, 1017, 1044, 791, 938. **100:** 𝔅1, 𝔅72, 𝔅455, 𝔅2010, 𝔅2044, 33, 195, 1261, 1418, 1690, 4013, 4333, 37, 2330. **101:** 642, 302, 741, 1020, 1005, 1006, 1081, 48. **102:** 496, 651, 1656, 1746, 2281, 1018, 475, 2866. **103:** 390, 2284, 2328, 391, 233, 1004, 181, 𝔅377, 614, 1099, 121, 85. **105:** 𝔅128, 𝔅530, 𝔅870, 135, 937, 1046, 1047, 2283, 1043, 1054. **106:** 𝔅215, 192, 588, 2240, 2278, 1630, 254, 1014, 2943, 568, 1699, 2279, 𝔅210, 790. **108:** 108, 137, 166, 668, 695, 816, 2238, 965, 735, 1042, 2933, 2935. **110:** 𝔅619, 𝔅1822, 183, 284, 522, 2510, 2239, 123, 𝔅467, 495, 2112, 2275, 1760, 2944. **111:** 2282, 1660, 1655, 1629, 2413, 1694, 1653, 11, 967, 1650, 2280, 𝔅103, 𝔅382, 159, 100. **114:** 714, 1082, 1085, 2057, 2241, 2934, 2938, 𝔅488, 414, 1637, 999, 242. **115:** 239, 355, 663, 1193, 2942.1, 870, 908, 1080. **116:** 𝔅37, 67, 110, 205, 590, 660, 2058, 2937, 587, 998, 926, 2936, 1658, 334. **117:** 300, 379, 2059, 2414, 2871, 756, 789, 1640. **118:** 𝔅233, 𝔅798, 𝔅1714, 274, 563, 667, 307, 711, 1084.1, 1097, 2111, 2940, 4386, 212, 2327, 1652, 2942. **119:** 177, 533, 1639, 1700, 2494, 2382, 895, 1084. **120:** 𝔅1825, 347, 488, 827, 1733.1, 2452, 2891, 1755, 2873, 755, 2825, 2869, 939, 90, 2364. **121:** 377, 1041, 1635, 1733, 2237, 2975, 1654, 1634. **122:** 𝔅266, 𝔅426, 1725, 2974, 1734, 775. **123:** 387, 2874, 3048, 1659, 1649, 2345, 2868, 1763. **124:** 562, 927, 1636, 1662, 2827, 712, 713, 512, 2941, 2355. **125:** 𝔅232, 𝔅436, 236, 419, 578, 896, 1053, 2824, 2872, 17, 1026. **126:** 340, 470, 1096, 1701, 266, 1651. **127:** 𝔅250, 367, 608, 754, 1638, 1657, 91, 1040. **128:** 966, 1083, 1443, 1727, 1762, 1769, 2363, 2384, 2870, 745, 227. **129:** 1556, 1633, 1702, 973, 2867, 1098, 1546. **130:** 𝔅1893, 78, 253, 411, 970, 1212, 2397, 2796, 5350, 1648, 139, 924. **131:** 589, 1028.1, 1520, 2354.1, 1558, 1079, 384, 487, 184, 1730. **132:** 𝔅845, 404, 1691, 2359.1, 2398, 3350, 1307, 176, 3295, 3347, 𝔅1147, 2296, 471, 1695, 1732, 2826. **135:** 𝔅23, 𝔅164, 119, 574, 1548, 1723, 1726, 2357, 2795, 339, 799, 2362, 534, 2797, 3349. **136:** 38, 774, 2347, 481, 𝔅450, 𝔅1552. **137:** 𝔅360, 385, 628, 929, 1509, 1604, 2976, 3348, 1545, 1511, 2683, 𝔅218, 2686, 1078. **138:** 𝔅57, 𝔅460, 410, 817, 1510, 1730.1, 2359, 1587, 2985, 969.1, 3272. **139:** 𝔅353, 𝔅693, 992, 1557, 2685, 3297, 3351, 626. **140:** 𝔅120, 𝔅177, 𝔅378, 𝔅459, 304, 412, 635, 803, 2400, 2410, 2843, 2973. **141:** 972, 997, 1756, 2409, 2411, 450, 3353, 358. **142:** 721, 1754, 2298, 2412, 2979, 3273, 3808, 2396, 341, 1595, 2354, 2926. **143:** 910, 2197, 2295, 2453, 3321, 1445, 3352, 1444, 2344, 2902, 2361. **144:** 319, 431, 942, 2349, 2684, 3805, 658, 403, 737. **145:** 657.1, 697, 989, 2833, 2356, 2415. **146:** 191, 275, 449, 644, 782, 968, 1512, 2538, 140. **147:** 2929, 3800, 2961, 2353, 3827, 421, 1736. **148:** 386, 429, 466, 659, 850, 909, 1052, 1070, 1434, 2401, 3365, 849, 2346, 𝔅1752, 2905, 2199. **149:** 327, 693, 𝔅284, 2360, 3296, 3323, 2977, 3322. **150:** 𝔅237, 𝔅915, 124, 636, 2304, 2348, 2402, 2408, 2915, 3320, 3807, 221, 18, 2865, 3354, 594. **151:** 1667, 2288, 2957, 3826, 460, 𝔅62. **152:** 764, 2299, 2404, 𝔅2, 1735, 160, 2964, 258. **153:** 𝔅60, 1596, 3223, 815, 𝔅362, 𝔅367, 681, 2358, 329. **154:** 𝔅452, 406, 1028, 2954, 2971, 3817, 724. **155:** 186, 757, 1482, 2343, 2517, 2836, 2898, 3119, 3212, 3331, 3621, 2419, 2399, 1603, 1728, 2163, 2912. **156:** 388, 1051, 1597, 1692, 3372, 3803, 1294, 1767, 2202, 1541, 2904. **157:** 753, 2196, 2906, 3727, 3895, 3229, 3963. **158:** 691, 833, 2407, 2853, 604, 3937, 3962. **159:** 𝔅919, 648.2, 2772, 3369, 3741, 3802, 3994, 2039, 1770, 2381. **160:** 𝔅799, 43, 256, 433, 497, 498, 545, 733, 945, 963, 1465, 1687, 3801, 3888, 3995, 3998, 2901, 2952, 2963, 3997. **161:** 593, 2289, 2984, 3956, 389, 807, 1627, 2856, 2962, 859, 4001. **162:** 𝔅208, 111, 453, 978, 1022, 1718, 1876, 2953, 3224, 3226, 3996, 2040, 142, 969, 2041, 2297, 2405, 3225. **163:** 620, 622, 1602, 1765, 2818, 2972, 361, 631, 𝔅472, 723, 2894, 1011. **164:** 101, 1593, 2958, 2970, 2987, 3809, 3818, 5213, 2198, 3228, 3894. **165:** 𝔅219, 163, 359, 1517, 1563, 1724, 2776, 2983, 3819, 2200, 582, 1588, 1889, 762. **166:** 424, 688, 1542, 1543, 1550, 1641, 1757, 1886, 2201, 2878, 2955, 3362, 3368, 4000, 662, 2903, 2928, 2907, 3366, 3999. **167:** 𝔅47, 413, 2859, 3333, 3811, 2406, 848, 2911. **168:** 585, 1056, 2778, 2893, 2959, 3717, 3892, 2365, 3960, 1055, 2338, 3334, 3726. **169:** 779, 1519, 1572, 2339, 2366, 2854, 2880, 2960, 3958, 2909, 3893, 1430, 3976, 3230. **170:** 𝔅974, 𝔅1658, 661, 773.1, 826, 943, 951, 1693, 2881, 3340, 3961, 893, 1029. **171:** 285, 1518, 2982, 3358, 3816, 3959, 2719, 3363, 2164, 619. **172:** 𝔅383, 2, 84, 328, 1572.1, 2722, 2779, 2855, 2858, 2965, 3318, 3327, 3369, 3955, 2910, 4007, 2831, 2896, 1743, 𝔅214. **173:** 847, 1230, 1231, 1314, 1559, 2008, 2925, 3367, 346, 950. **174:** 103, 422, 689, 1010, 2303, 2342, 2379, 2718, 2774, 2834, 3822, 3993, 3357, 3736, 2885. **175:** 𝔅1610, 988, 2341, 2468, 3120, 3361, 3725, 3728, 3815, 3821, 3825, 783, 3345, 2403. **176:** 𝔅1597, 1067.1, 2340, 2890, 3728.1, 3806, 𝔅76, 3902, 2721, 3121, 3227, 1013, 2908. **177:** 235, 244, 797, 2837, 3810, 3820, 2720, 3247, 230. **178:** 696, 991, 1105, 2773, 2884, 2968, 3330, 2380. **179:** 196, 1229, 1569, 1592, 2883, 5317, 2038, 2001, 2290, 2956. **180:** 𝔅209, 𝔅508, 𝔅1648, 𝔅2932, 29, 492, 666, 933, 1561, 1697, 2066, 2895, 2986, 3355, 3724, 4210, 4516, 5052, 5081, 5329. **181:** 𝔅515, 185, 1341, 2337, 2951, 948, 2030. **182:** 734, 1413, 1608, 2981, 3326, 3730, 3823, 3054, 621, 1888, 2841, 𝔅1864. **183:** 𝔅81, 170, 423, 2320, 2838, 3731, 3733, 1431, 2032, 2031. **184:** 400, 796, 921.1, 1622, 2195, 3858, 1442, 3729, 2924, 3258, 3329. **185:** 92, 617, 931, 2888, 3055, 3734, 3824, 5637, 2335, 3891, 3339, 3332, 𝔅470. **186:** 202, 381, 674, 1704.1, 2317, 1570, 1389, 2302. **187:** 𝔅1673, 993, 1012, 1417, 1646, 1933, 2809, 3335, 2770, 2889, 3324. **188:** 𝔅2112, 351, 928, 1331, 2777, 4165, 151, 1333, 269. **189:** 480, 510, 930, 1390, 1804, 2799, 3639, 2887, 4116, 6, 156, 2572, 2641, 605, 3245. **190:** 116, 348, 1265, 1489, 1642, 2645, 2988, 3576, 3814, 4006, 4012, 3342, 1571, 3246, 1885, 2160. **191:** 371, 2642, 3336, 4407, 4419. **192:** 𝔅385, 558, 1499, 1601, 2316, 2318, 2319, 3127, 3244, 3303, 1568, 3337. **193:** 𝔅216, 46, 528, 1805, 4166, 3890, 136, 1647, 246.

194: 𝔅1894, 600, 1551, 2567, 2756, 2966, 3356, 3986, 4118, 2190. **195**: 932, 1296, 2189, 2192, 2386, 2512, 2861, 2862, 3360, 3371, 3732, 3852, 3916, 3961, 109, 4156, 2191, 3189, 2568, 2569, 2590. **196**: 1200.2, 1560, 1772, 2050, 2643, 2851, 3302, 3311, 3758, 2203, 3786, 1200.3, 720, 2004, 3304. **197**: 806, 1599, 1645, 2724, 3739, 4178, 5083, 5977, 1859, 264. **198**: 331, 690, 702, 858, 2310, 3760, 3950, 4906, 2771, 2840, 3915, 936, 3277, 2496, 2309. **199**: 606, 2029, 2495, 2640, 3319, 3897, 3914, 2589. **200**: 𝔅361, 𝔅1812, 556, 591, 740, 771, 1515, 2003, 2314, 2614, 2781, 2852, 3299, 3744, 3844, 3861, 3949, 4117, 5212, 4897, 2206, 2204. **201**: 370, 3905, 3906, 2162, 2846, 𝔅491, 548, 971, 1643, 2644, 2900, 3305, 3912, 5326, 4115, 2571, 2161. **203**: 𝔅1148, 570, 1500, 3575, 2205, 2588, 368, 3982, 2383, 382, 608.2, 882, 1857, 2062, 2505, 2570, 2637, 2897, 2922, 3653, 3740, 3911, 3983, 3904. **205**: 𝔅235, 763, 1250, 1251, 1681, 1720, 1856, 2713, 3301, 3306, 3788, 3921, 4385, 4412, 2174, 2301, 1606, 3735, 2639, 3882, 2159, 3984. **206**: 729, 911, 1067, 1283, 1803, 2635, 2737, 2768, 2769, 4137, 2763. **207**: 892, 2636, 2767, 3638, 3883, 3918, 3978.1, 4122, 3637, 3881, 3972, 2710, 1644, 3341. **208**: 150, 561, 809, 1554, 2434, 2775, 3150, 3903, 3985, 4365.1, 2311, 3992, 1177, 2687, 4121, 4416, **209**: 1009, 1552, 3188, 3276, 3860, 3907, 3975, 4120, 3846. **210**: 𝔅1817, 87, 1233, 2185, 2917, 3346, 3917, 3924, 3977, 3989, 4413, 3759, 1375, 2267, 1347. **211**: 828, 2061, 2814, 2848, 3157, 3978, 4005, 2063, 2706, 3260, 120, 1234, 1089. **212**: 𝔅211, 𝔅1827, 731, 2261, 2707, 3151, 3235, 3574, 3927, 3928, 3973, 3974, 4155, 3152, 3259, 3470, 2739, 4404. **213**: 𝔅356, 473, 482, 1176, 2581, 3128, 3249, 3268, 4130, 3154, 3149, 3901. **214**: 511, 1315, 1858, 1964, 1965, 1966, 2035, 2506, 2711, 3261, 3926, 3987, 4418, 1349, 2633, 1249. **215**: 𝔅2931, 975, 1703, 1887, 2741, 2765, 3316, 3364, 3935, 3936, 3947, 2634. **216**: 760, 852, 1768, 2758, 2764, 3129, 3655, 4010, 4129, 4411, 4132, 2350, 2766, 2847, 3469, 3789, 3133, 2760. **217**: 𝔅679, 405, 1205, 1316, 1553, 2507, 2716, 2717, 2748, 2759, 2849, 3156, 3263, 3661, 4157, 860, 2632, 3923, 3494. **218**: 2292, 2575, 2705, 3132, 3834, 3855, 4011, 4366, 4367, 4934, 3265, 1918, 2812, 2819, 3681. **219**: 𝔅1796, 415, 416, 1175, 1206, 1844, 2127, 2165, 2712, 3236, 3922, 3966, 4175, 2709. **220**: 𝔅381, 𝔅800, 97, 126, 315, 316, 761, 922, 1235, 1449, 1704, 2047, 2269, 2821, 3155, 3238, 3676, 3765, 3782, 4254, 4376, 4378, 4480, 5846, 𝔅286, 1870, 2638. **221**: 𝔅268, 342, 399, 1204, 2490, 2492, 2714, 2762, 2949, 4585, 3678, 3968, 2725. **222**: 238, 372, 2081, 3134, 3262, 3267, 3967, 311, 2577, 2784, 4161, 2618, 2715, 673, 2351, 2757. **224**: 428, 987, 2216, 2257, 3219, 3763, 3856, 3859, 4176, 5608, 1327. **225**: 553, 1794, 2045, 2046, 2134, 2813, 3071, 3131, 3257, 3753, 4089, 4131, 5815, 2708, 3920, 478, 2668, 2927, 188. **226**: 2464, 2761, 2930, 3243, 3654, 3677, 3755, 4100, 4171, 4373, 4170, 3679, 3239, 4367.7. **227**: 86, 2084, 2294, 4388, 𝔅1677, 2255, 3285, 863, 866. **228**: 1498, 2051, 3240, 3680, 3683, 4097, 4138, 4172, 3313, 1868, 4177. **229**: 2122, 2178, 3286, 3757, 3849, 3908, 3942, 4139, 2786, 𝔅1802, 1376. **230**: 𝔅451, 344, 345, 555, 603, 795, 1092, 1600, 1916, 2042, 2123, 2322, 2579, 3857, 4119, 4147, 5853, 3660, 3283, 𝔅386. **231**: 1377, 2082, 2688, 3170, 4002, 3598, 5859, 3684, 2454, 3756. **232**: 125, 1058, 1872, 1917, 2498, 3685, 4750, 3787, 3662, 784, 3241, 4581. **233**: 1744, 1810, 2293, 2864, 3191, 3264, 3663, 3847, 1237, 2503. **234**: 1458, 1869, 1871, 2043, 3266, 3863, 4180, 4587, 3591, 157. **235**: 𝔅384, 629, 708, 2011, 2033, 2044, 2048, 2049, 2271, 2501, 2522.1, 3173, 3242, 3269, 3656, 3764, 5200, 3769, 3648, 1216. **236**: 3659, 4159, 1297, 2931, 1200, 1795, 2525, 2803, 3125, 3190, 3312, 3657, 3784, 3929, 4090, 4099, 5021, 3237, 2899, 4367.6, 3037, 3752. **238**: 265, 583, 1298, 1758, 1812, 1957, 2083, 3221, 3284, 2120, 1207, 1791, 2523, 3682, 2120.1, 1090, 4088, 2671. **240**: 𝔅368, 𝔅519, 𝔅1032, 𝔅1180, 𝔅1513, 138, 1919, 1924, 2005, 2064, 2115, 2117, 2119, 2457, 2804, 3171, 3690, 3885, 4096, 4547, 5033, 5102, 𝔅1797, 1875, 3785. **241**: 2125, 2544.1, 2738, 3251, 4368.8, 2052, 1217, 1576, 1955, 2243, 2578, 3174, 3790, 4374, 3098, 4337. **243**: 1432, 1790, 2124, 2176, 2463, 2522, 2822, 2863, 3036, 3589, 4038, 4346, 5860, 3941, 1483. **244**: 1477, 3070, 4091, 2175, 3592, 1179, 𝔅2113, 104, 994, 1321, 1414, 1472, 2121, 2126, 2218, 2524, 2541, 4039, 4326, 4408, 5066, 3701. **246**: 941, 1136, 1137, 1949, 2669, 3291, 3767, 4849, 3754, 1318, 1688, 1792, 1873, 2497, 2580, 2740, 2742, 3783, 5896, 2745. **248**: 312, 802, 1811, 2472, 2787, 3590, 3884, 4092, 4098, 4968, 2007, 2244. **250**: 805, 901, 1464, 1745, 1956, 2829, 3124, 3748, 4828, 4900, 5259, 4095, 4338, 672, 2666, 3943. **251**: 1322, 1368, 1369, 2217, 3069, 3192, 4283, 5718, 4160, 883, 1320, 1479, 2172, 2646, 4856, 4979, 3548. **253**: 1178, 1291, 1793, 2849.1, 3081, 3135.1, 3666, 1236, 1135, 2504, 3328, 4339, 4827, 2788, 4140, 3199, 4219. **255**: 𝔅387, 𝔅1828, 1502, 2249, 2544.2, 3035, 3220, 3547, 3689, 3793, 3933, 4127, 4363, 3001, 3250. **256**: 350, 974, 1173, 1203, 2508, 3005, 3172, 3874, 4048, 4978, 1202, 𝔅254, 1527, 2118, 3931, 3953, 2245, 3028. **258**: 1169, 1326, 2099, 2667, 2890, 3455, 3979, 4041, 4282, 4843, 3126, 2723, 2425, 3289, 3709, 4049, 4241, 4415, 4973, 5568, 2585, 2247, 3600. **260**: 178, 565, 730, 861, 1325, 1367, 1822, 2100, 2116, 3214, 3746, 3791, 3836, 3930, 4491, 4500, 4974, 4857, 5005, 5347, 3002, 1959. **261**: 571, 1201, 4045, 4308, 𝔅253, 3004, 3546, 3587, 3593, 3833, 3835, 4345, 4490, 4567, 2801, 1247, 4832, 607. **263**: 1077, 1317, 1626, 1958, 2474, 2586, 3688, 4380, 4976, 1304, 4044, 4093, 4975, 3456, 4279. **265**: 𝔅1129, 2253, 2658, 3076, 3146, 3606, 3980, 4046, 4347, 4351, 4365, 4391, 4590, 3650, 2584, 3651. **266**: 𝔅1676, 1171, 1506, 4280, 3100, 3044, 560, 1481, 3077, 3558, 3643, 4128, 4106, 4493, 3667, 5166. **268**: 𝔅1649, 𝔅1865, 2677, 3003, 3139, 3140, 4205, 3981, 309, 2518, 4852. **270**: 𝔅2114, 𝔅2606, 502, 765, 1246, 1970, 2078, 2622, 3773, 4032, 4043, 4064, 4983, 4033, 4543, 5018, 1979. **271**: 𝔅770, 2073, 2367, 3774, 4062, 4542, 5142, 1324, 3078, 4757, 4758, 3099. **273**: 3671, 4349, 2670, 1574, 2251, 2676, 3778, 4042, 5156, 2736, 3747. **275**: 2587, 3000, 4034, 4184, 4238, 4972, 3248, 𝔅1674, 1157, 2424, 3652, 4267, 4304, 4296, 1415, 4359, 2423, 3702. **277**: 889, 1119, 2098, 4492, 4707, 5003, 5141, 4218, 1158, 1807, 3620, 3792, 4778, 3703, 2519, 2731, 3147. **280**: 769, 1255, 1581, 2207, 2250, 2616, 2729, 2850, 3130, 3507, 4173, 4278, 4327, 4368.2. **281**: 871, 4760, 3453, 1580, 3412, 3454, 3615, 4163, 4207, 4297, 4544, 4318. **283**: 2619, 2678, 3710, 4319, 2651, 4756, 2431, 1259, 1260, 2254, 2596, 2617, 2697, 3420, 3542, 4533, 5153, 4317. **286**: 1397, 2780, 3417, 3508, 4268, 4299, 1416, 1258, 897, 1480, 3183, 3290, 4269, 4508, 886, 4759, 5167, 3414. **288**: 𝔅74, 592, 1133, 3006, 4779, 1384, 3543, 3595, 4195, 4761, 5244, 1256, 3413, 3497, 5002. **290**: 𝔅46, 𝔅379, 515, 573, 1254, 2072, 2173, 2473, 2647, 3198, 3670, 3771, 4531, 4635, 4784, 4802, 5286, 5490, 5681. **291**: 𝔅255, 1926, 4047, 1245, 4023, 5169, 4532, 4996, 3642, 3692, 4050, 4260, 4845, 4513. **294**: 4322, 4381, 4997, 𝔅230, 1478, 2648, 4158, 4439, 4762, 5160, 5017. **296**: 1154, 3194, 4352, 4324, 3498, 4019, 5110, 4325, 4793, 4225, 4017, 3115, 4362, 4777, 4939, 5340, 4507, 1273, 4266, 4930. **300**: 𝔅363, 𝔅695, 1213, 1985, 2167, 2416, 3040, 3075, 3094, 3158, 3197, 3526, 3630, 3696, 4029, 4109, 4473, 4512, 4529, 4650, 4789, 4838, 4867, 4987. **301**: 1817, 3550, 5020, 3016, 1272, 1921, 3596, 4262, 4270, 4466, 4967, 3195, 3945, 5260, 2649. **304**: 𝔅883, 946, 3473, 4323, 3499, 3216, 4020, 4305, 4441, 4447. **306**: 4018, 4448, 4794, 3551, 3196, 4708, 3466, 4240, 4846, 1419, 4988. **310**: 𝔅896, 4261, 5010, 5400, 1120, 4329, 4505, 1925, 4790, 𝔅444, 4458, 4697. **315**: 𝔅1342, 𝔅1895, 1163, 1165, 1166, 1982, 4451, 4916, 4725, 4734, 4726. **317**: 𝔅66, 1573, 1981, 2462, 5391, 4442, 1271, 4204, 4917. **320**: 𝔅1804, 1149, 4212, 4263, 4715, 4791, 5816, 2844, 𝔅894, 4506, 4724, 𝔅88, 5861. **325**: 4393, 4687, 5037, 5072, 4994, 1110, 4243, 5059, 4727, 𝔅1679, 4220, 5607, 𝔅251, 1123. **330**: 𝔅2116, 831, 4431, 5074, 5486, 4792, 4914, 𝔅2115, 𝔅1678, 808, 1923. **335**: 1922, 4915, 5044, 1525, 4203, 5689, 𝔅91, 2421. **340**: 𝔅496, 𝔅1624, 1526, 4214, 4242, 4271, 4460, 5043, 5135, 5262, 4652, 𝔅2117, 4425, 4244, 4649, 4455, 4728, 5168, 5335. **345**: 2212, 5038, 4434, 𝔅1675, 4672, 4902, 5521. **350**: 4515, 5183, 5184, 5747, 4427, 4435, 4436, 𝔅898, 4285, 4211, 4465, 5520, 5402. **360**: 1991, 3042, 3307, 4437, 4622, 4676, 4912, 4913, 5193, 5491, 5746, 5616, 4287, 4892, 5281, 4012. **371**: 4215, 𝔅471, 4514, 5053, 4249, 4620, 6010, 𝔅1869, 5379, 5887, 𝔅882, 4907, 5173, 5306, 5055. **400**: 𝔅958, 𝔅1798, 𝔅2959, 4690, 𝔅292, 4286, 5395, 𝔅226, 𝔅2608, 𝔅89, 𝔅480, 5494. **421**: 𝔅92, 5883, 5274, 𝔅716, 4626, 5863, 4722, 𝔅1075, 5172, 𝔅316, 5264. **452**: 5493, 𝔅320, 4637, 4636, 5508, 𝔅1749, 𝔅170, 𝔅223. **500**: 𝔅322, 𝔅769, 5817, 𝔅224, 𝔅228, 5695, 𝔅227, 𝔅678, 𝔅271, 𝔅2105. **600**: 𝔅193, 𝔅1879, 𝔅490, 𝔅487, 𝔅753, 𝔅752, 𝔅881. **707**: 𝔅272, 𝔅832, 𝔅495, 𝔅749, 𝔅696, 𝔅700, 𝔅703, 𝔅2936. **916**: 𝔅543, 𝔅548, 𝔅529, 𝔅829, 𝔅825, 𝔅940, 𝔅779, 𝔅1268, 𝔅2613. **1230**: 𝔅499, 𝔅3283, 𝔅2610, 𝔅528, 𝔅951, 𝔅3284, 𝔅2680, 𝔅3205, 𝔅3287, 𝔅2917, 𝔅2926, 𝔅3200, 𝔅947, 𝔅2605, 𝔅939, 𝔅2924, 𝔅2668, 𝔅2677, 𝔅3197. **1400**: 𝔅2499, 𝔅3196, 𝔅2131, 𝔅2671, 𝔅2921, 𝔅2769, 𝔅2918, 𝔅1337, 𝔅1059, 𝔅1870, 𝔅1334, 𝔅2500. **1670**: 𝔅2604, 𝔅2670, 𝔅1858, 𝔅341. **3800**: 𝔅1619, 𝔅1724, 𝔅1799, 𝔅481, 𝔅1805, 𝔅1689, 𝔅1690.

III. DENSITY

A. Liquids

0.415: 54, 409, 𝔅102, 1072, 1073, 𝔅406, 1716, 1715, 980, 1713, 1714. **0.670**: 2392, 2394, 915, 916, 2387, 1610, 𝔅407, 2389, 917, 2391, 1534. **0.692**: 1613, 2933, 525, 823, 918, 1617, 22, 𝔅410, 914, 2939, 824. **0.712**: 1619, 𝔅409, 𝔅414, 822, 1535, 2331, 3354, 524, 2334, 2936, 1761, 2940, 3995. **0.724**: 2873, 𝔅425, 1764, 2279, 𝔅412, 1086, 4000, 3994, 794.1, 3999, 821, 794, 1760. **0.740**: 820, 𝔅415, 3351, 4178, 396, 𝔅416, 2985, 1741, 3993, 3957, 1101. **0.750**: 1615, 1100, 1738, 1737, 979, 1739, 2975, 4412, 3372, 4587. **0.760**: 669, 4586, 479, 2974, 4165, 2241, 2328, 2330, 2413, 1001, 4856, 𝔅418, 1099, 1762.1, 3323, 4012, 4411, 2869, 2973. **0.771**: 2868, 2987, 5018, 3365, 𝔅420, 4006, 4849, 5167, 913, 1632, 2419, 4418, 5260, 𝔅421, 1612, 2867. **0.781**: 𝔅422, 208, 𝔅423, 168, 395, 506, 3320, 1049, 262, 792, 5156. **0.790**: 3960, 3297, 5377, 60, 1003, 3961, 301, 667, 718, 448, 2825, 2284, 3812. **0.800**: 790, 1769, 2281, 972, 1603, 2827, 973, 3811, 1639, 3295, 505, 𝔅411, 2382. **0.805**: 719, 880, 1366, 1544, 2283, 2345, 447, 791, 2955, 1081, 1084, 1602, 2282. **0.810**: 789, 1537, 1084.1, 1630, 2327, 2898, 2965, 1754, 3895, 3959, 1640, 1730.1, 2320, 2347, 313, 1083, 2396, 2397, 2872. **0.817**: 717, 1078, 2403, 2897, 2960, 1005, 1085.1, 1636, 1699, 2896, 1085, 1726, 1733.1, 2407, 2407.1, 2408, 2968. **0.820**: 1728, 2399, 5169, 2892, 2970, 3827, 2967, 1725, 2400.1, 2409, 2796, 2954, 2962, 3356, 1727, 1734, 3978.1. **0.825**: 2971, 3978, 4005, 4170, 4172, 4848, 800, 2240, 2963, 2966, 2956, 3364, 1736, 2400, 3361, 4002. **0.830**: 1469, 2797, 3826, 1547, 1732, 1746, 2929, 4415, 237, 587, 3362, 925, 2410, 3326, 4179, 4836, 998, 1633, 3355, 3821. **0.835**: 1098, 1629, 2239, 810, 811, 3358, 517, 814, 837, 999, 1628, 1000, 2952, 3889, 2865, 3893. **0.840**: 273, 749, 2412, 3808, 3822, 356, 1466, 3810, 3809, 3815, 4010, 2928, 1546, 1468, 1470, 272. **0.850**: 2343, 1572, 3816, 1063, 711, 993, 2890, 3333, 3334, 446, 1048, 3823, 3824. **0.856**: 927, 3894, 3903, 5606, 1096, 2288, 3728.1, 1545, 3727, 5380, 3331, 5978. **0.860**: 469, 1054, 2834, 3333.1, 3725, 3728, 3730, 3992, 4115, 2686, 3734, 3805, 3969, 4168, 513, 3226, 3228, 3724, 4408, 3229.1. **0.863**: 1548, 2835, 2912, 3820, 4367, 2909.1, 3223, 2685, 3731, 3806, 5853, 2359.1. **0.866**: 801, 2112, 2357, 2901.1, 3729, 4175, 3225, 3726, 4365.1, 2354.1, 3229, 3740.1, 3330.1, 3807, 3899, 3988, 2359. **0.870**: 926, 1046, 1653, 4992, 5813, 2901, 748, 1649, 1652, 1655, 1064, 1695, 2855, 2903, 3891, 798, 2355, 2683, 747. **0.875**: 2354, 3915, 3230, 4576, 2356, 3987, 533, 2858, 3733, 3817, 1654, 2353, 2684, 2953, 4117. **0.880**: 1365, 5003, 1658, 3908, 3920, 1015, 1651, 3224, 4366, 1016, 1043, 1659, 3329, 4991. **0.884**: 746, 4144, 4118, 4370, 1020, 3337, 4827, 1496, 2111, 3850, 4828. **0.890**: 468, 1017, 1019, 3119, 1044, 3897, 4980, 1047, 3227, 4376, 5001, 3303, 3918, 5141, 2415, 3917, 397, 1018, 3890, 5362, 713, 725, 3974.1. **0.901**: 727, 3639, 3740, 3902, 4385, 4835, 5253, 2538, 5152, 5346, 451, 4842, 4974, 2884, 3328, 4158, 5015, 3324, 4977, 1056, 4148. **0.910**: 670, 2899, 3961, 4368.8, 908, 2888, 3913.1, 4841, 642, 2883, 2777, 3861, 1055, 2340, 4982, 5342, 5605. **0.915**: 𝔅429, 𝔅1824, 2831, 3786, 3813, 3913, 6166, 891, 2337, 3788, 4156, 726, 3369, 2298, 4578, 4972, 1557, 3923, 3924, 4388. **0.920**: 4131, 3854, 3928, 2351, 764, 2339, 2341, 3575, 938, 2299, 3341, 5482. **0.925**: 1558, 1644, 2289, 3847, 3927, 4971, 452, 937, 1647, 4130, 1643, 2882, 3258, 3926, 3935, 4975. **0.930**: 2453, 2859, 4976, 4978, 3931, 671, 4843, 965, 2830, 3936, 3735, 3764, 3789. **0.935**: 489, 799, 1519, 2861, 2201, 2810, 3922, 4157, 4981, 569, 3260, 3787, 3859, 375, 4371, 3263, 4561. **0.94**: 2979, 3790, 3882, 3883, 1010, 3259, 3947, 4999, 763, 1012, 2294, 3858, 762, 978, 2386.1, 3860, 3852, 4560. **0.945**: 909, 3857, 997, 2818, 589, 623, 3948, 724, 1541, 3244, 3267, 5005. **0.950**: 1443, 2199, 2841, 3265, 783, 924, 1478, 1444, 3319, 3762, 3865, 3904, 4132, 4326, 5940. **0.955**: 2775, 624, 1445, 2756, 4378, 752, 2335, 3765, 723, 1555, 2200, 6167. **0.960**: 3753, 1554, 307, 2763, 3264, 2914, 1553, 2722, 3121, 3655, 2778, 4089, 2365, 3246, 2840. **0.970**: 1551, 2721, 3933, 3637, 355, 2762, 4823.1, 1595, 2758, 213, 625, 2766, 3638, 4091.1. **0.976**: 929, 1511, 3752, 3856, 4967, 𝔅432, 2767, 3754.2, 5009, 3656, 1026, 2760. **0.980**: 1089, 2195, 1067.1, 2719, 870, 3654, 4344, 2764, 3878, 930, 3661, 3763, 4579. **0.985**: 4372, 4573, 2203, 3648, 935, 2718, 3662, 3761, 4941, 5000, 5688, 4342. **0.990**: 934, 1482, 4161, 681, 3235.1, 400, 450, 2757, 162, 815, 3664, 4345, 1090, 1509, 1662, 2163, 3235. **0.995**: 3311, 403, 1070, 1510, 3236, 3573, 2204, 3243, 3574, 𝔅1, 2058, 4761. **1.000**: 4095, 4097.1, 66, 3128, 4543, 5140, 5334, 258, 797, 896, 3134, 3054, 4490, 4757, 4930, 3237, 773.1, 3747, 4147. **1.010**: 594, 2743, 3132, 5110, 𝔅197, 1560, 590, 2713.1, 620, 2503, 4098, 3780, 4096, 4097, 4279, 652, 928, 2846, 2848, 2302, 2569. **1.020**: 608.1, 795, 2570, 3701, 285, 608.2, 1442, 5371, 2322, 4994, 1328, 1561, 3312, 4038, 4789. **1.026**: 2571, 3680, 4090.1, 619, 2567, 3681.1, 3684, 5010, 𝔅426, 651, 1022, 3133, 3679, 3703. **1.03**: 𝔅104, 1028, 3677, 3125, 3678, 218, 4939, 2161, 496, 2706, 3676, 2568. **1.040**: 2255, 2745, 4545, 4970, 𝔅440, 2847, 5678, 3285, 266, 274, 2001, 2159, 720, 3154, 3286, 212, 3069, 4062. **1.050**: 593, 3152, 3284, 358, 2812, 4350, 511, 4153, 2309, 4348, 2318, 2748, 3192, 3872, 4093, 4383, 2189, 3149, 399. **1.061**: 2788, 4296, 1029, 3283, 911, 4353, 616, 3135, 3191, 378, 576, 989, 1441, 3601, 3547, 2813, 176, 1606, 458. **1.071**: 2041, 2040, 3548, 3549, 1430, 2572, 3944, 807, 943, 969.1, 2310, 2590. **1.080**: 737, 1570, 2039, 3667, 2588, 449, 626, 609, 3546, 968, 621, 2008, 4726, 1572.1. **1.090**: 3649, 4102, 578, 1092, 1559, 2468, 2725, 420, 665, 2814, 3037, 2589, 1889, 3591, 1357, 1483, 3642, 3036. **1.100**: 4723, 3169.1, 4917, 471, 722, 2038, 154, 170, 1571, 4670, 247, 3688, 4368.4, 561, 1307, 2687, 1417. **1.11**: 492, 2267, 2071, 657, 233, 969, 4733, 264, 470, 4297.1, 672, 736, 2579, 2269. **1.121**: 1568, 2134, 4064, 4324, 275, 2580, 5164, 520, 2509, 1341, 2669, 2849.1. **1.131**: 3170, 805, 2578, 893, 4381, 3171, 46, 48, 383, 3945, 146, 3253, 3886, 4023. **1.150**: 1756, 1388, 2127, 1390, 𝔅439, 948, 1917, 994, 2284.1, 3606, 658, 859. **1.160**: 2084, 3289, 𝔅438, 1253, 453, 2004, 460, 2499, 1252, 1692, 189, 949, 2696. **1.180**: 3694, 887, 𝔅798, 379, 2618, 5282, 655, 659, 2498, 1042, 3455, 334. **1.200**: 1031, 2850, 1347, 1859, 227, 696, 1375, 858, 1041, 1376, 279, 632, 710. **1.220**: 37, 384, 744, 1040, 2316, 𝔅514, 1576, 4442, 4441, 𝔅435, 803, 1314, 1857, 863, 921.1, 1916. **1.252**: 190, 1856, 515, 742, 67, 359, 2098, 741, 604, 3937, 1230, 𝔅442, 1959, 1229. **1.310**: 𝔅1575, 465, 192, 1327, 1506, 472, 473, 𝔅441, 1251, 1250, 604.1, 1540, 421, 1588, 158, 28, 1249, 2053. **1.340**: 𝔅366, 464, 423, 2639, 230, 365, 2637, 422, 2633, 1326, 𝔅42, 585, 963, 276, 558, 582, 366. **1.400**: 497, 2491, 2423, 545, 2031, 605, 2030, 2492, 2493, 364, 𝔅634, 2029, 1697, 𝔅2, 159, 𝔅96, 𝔅635, 220, 𝔅1397. **1.460**: 𝔅11, 648, 5350, 1672, 225, 3453, 106, 𝔅10, 61, 𝔅636, 𝔅352, 19, 329, 648.3, 1053, 1294, 2119. **1.500**: 1578.1, 𝔅632, 𝔅637, 43, 1052, 1822, 107, 648.1, 137, 1051, 2454, 648.4, 𝔅629. **1.526**: 141, 𝔅633, 467, 136, 1844, 1367, 𝔅207, 645, 139, 𝔅630, 12, 756. **1.600**: 140, 367, 755, 754, 90, 1601, 𝔅521, 𝔅232.

𝔅58, 2494, 𝔅129, 𝔅512, 𝔅628, 𝔅59, 757, 𝔅210, 𝔅57, 𝔅100, 221, 2061, 2062. **1.700**: 368, 555, 476, 987, 694, 475, 𝔅62, 693, 𝔅13, 414, 𝔅622, 690. **1.800**: 2064, 689, 1949, 688, 1759, 1333, 𝔅523, 𝔅45, 390, 𝔅1597, 𝔅60, 38, 𝔅1808, 116, 𝔅621. **1.901**: 𝔅163, 600, 𝔅39, 412, 341, 234, 1205, 413, 𝔅619, 83, 339, 340, 183, 𝔅218, 𝔅522. **2.110**: 415, 122, 184, 649, 186, 𝔅488, 123, 𝔅236, 45, 522, 370, 𝔅378, 𝔅76, 𝔅919, 4, 427. **2.529**: 601, 20, 151, 𝔅1815, 𝔅63, 𝔅142, 345, 𝔅64, 101, 5, 127, 18, 235, 128. **3.022**: 𝔅204, 𝔅918, 𝔅497, 𝔅381, 29, 𝔅34, 𝔅206, 87, 𝔅205. **4.49.**

B. Solids

0.760: 846, 5881, 5918, 5967, 5985, 6014, 6080, 𝔅2916, 5244, 2266, 𝔅2601, 1502, 936, 4406, 6010. **0.919**: 𝔅2667, 548, 3016, 𝔅1812, 3257, 4805, 1058, 239, 3756, 481, 3302. **1.008**: 607, 5343.1, 3901, 𝔅2791, 761, 2573, 4322, 1057, 4652, 3307, 760, 2801, 5902, 482, 1077, 2206, 831. **1.051**: 2160, 5847, 5933, 1771, 3140, 289, 571, 𝔅2643, 3853, 3550, 502, 2116, 3494, 5244.1. **1.150**: 5213.1, 238, 4270, 2166, 3498, 4352, 832, 𝔅431, 𝔅430, 𝔅2623, 5887, 4943, 5404, 5284, 4894, 2595. **1.203**: 4225, 𝔅2626, 259, 5818, 3886.1, 𝔅2998, 504, 298, 3867.1, 5428.1, 𝔅5, 𝔅1896, 2701, 4480, 2308.1, 4226. **1.250**: 4467, 4956, 503, 5573, 1705, 𝔅2624, 5435, 2032, 5202, 𝔅2306, 1287, 1992, 308.1, 1581, 55, 5541, 5028.1, 1990, 1414. **1.35**: 6104, 4739, 5647, 𝔅111, 5028, 4656.1, 802, 3697, 𝔅173, 3111, 5704, 𝔅2655, 5522. **1.40**: 498, 2475, 58, 4622, 1929, 947, 𝔅134, 𝔅2170, 𝔅2347, 1398, 6148, 1397, 5659, 𝔅2300, 4620, 2013, 1349, 𝔅3086, 3778. **1.45**: 𝔅2757, 808, 3178, 1419, 𝔅2171, 630, 𝔅2807, 1231, 𝔅2636, 976, 𝔅2149, 𝔅2693, 1351. **1.47**: 𝔅2990, 204, 1464, 1991, 2682.1, 𝔅2814, 1172, 1350, 𝔅1400, 𝔅1809, 𝔅201, 𝔅2855. **5.0**: 𝔅502, 𝔅1328, 𝔅1350, 𝔅1426, 𝔅1428, 𝔅1844, 𝔅1994, 𝔅289, 𝔅1969, 𝔅1260, 𝔅1375, 𝔅2282, 𝔅1712, 𝔅2202, 𝔅1539, 𝔅499. **5.10**: 𝔅311, 𝔅1130, 𝔅2017, 𝔅734, 𝔅1334, 𝔅994, 𝔅2035.1, 𝔅3329, 𝔅1021, 𝔅2030, 𝔅2513, 𝔅456, 𝔅507, 𝔅554, 𝔅1258, 𝔅1441, 𝔅3061, 𝔅829. **5.2**: 𝔅280, 𝔅1096, 𝔅1337, 𝔅1682, 𝔅1711, 𝔅1063, 𝔅1371, 𝔅1590, 𝔅1686, 𝔅2518, 𝔅1990, 𝔅1992, 𝔅2516, 𝔅618, 𝔅462. **5.3**: 𝔅600, 𝔅677, 𝔅716, 𝔅724, 𝔅1154, 𝔅1634, 𝔅313, 𝔅595, 𝔅1423, 𝔅593, 𝔅1049, 𝔅1236, 𝔅1403, 𝔅1767, 𝔅883, 𝔅1457, 𝔅862, 𝔅608, 𝔅745, 𝔅864, 𝔅473, 𝔅1095. **5.50**: 𝔅592, 𝔅1630, 𝔅1671, 𝔅1852, 𝔅1542, 𝔅1065, 𝔅544, 𝔅723, 𝔅956, 𝔅1059, 𝔅708. **5.6**: 𝔅306, 𝔅306.1, 𝔅1304, 𝔅1710, 𝔅1726, 𝔅744, 𝔅601, 𝔅603, 𝔅951, 𝔅971, 𝔅1636, 𝔅1763, 𝔅1123, 𝔅279, 𝔅670, 𝔅1064, 𝔅1996, 𝔅1440, 𝔅1455. **5.7**: 𝔅320, 𝔅322, 𝔅1372, 𝔅1418, 𝔅1614, 𝔅2339, 𝔅714, 𝔅2494, 𝔅473.1, 𝔅1421, 𝔅546, 𝔅2338, 𝔅1632, 𝔅1098, 𝔅1723, 𝔅957, 𝔅582, 𝔅2599. **5.8**: 𝔅568, 𝔅596, 𝔅1117, 𝔅1685, 𝔅1978, 𝔅1391, 𝔅2048, 𝔅529, 𝔅574, 𝔅2571, 𝔅2049, 𝔅1163, 𝔅541. **5.9**: 𝔅602, 𝔅1118, 𝔅1652, 𝔅1703, 𝔅907, 𝔅1071, 𝔅565, 𝔅2507, 𝔅597, 𝔅2538, 𝔅1736, 𝔅1562. **6.0**: 𝔅401, 𝔅936, 𝔅1050, 𝔅1506, 𝔅1781, 𝔅1227, 𝔅540, 𝔅2059, 𝔅894, 𝔅2366, 𝔅1442, 𝔅1105. **6.1**: 𝔅594, 𝔅1022, 𝔅1101, 𝔅1402, 𝔅1666, 𝔅1784, 𝔅402, 𝔅658, 𝔅657, 𝔅548, 𝔅1655, 𝔅501, 𝔅606, 𝔅2483, 𝔅1327. **6.2**: 𝔅553, 𝔅614, 𝔅1124, 𝔅1390, 𝔅1617, 𝔅863, 𝔅539, 𝔅1800, 𝔅898, 𝔅1116, 𝔅897, 𝔅1055. **6.3**: 𝔅604, 𝔅607, 𝔅1100, 𝔅1119, 𝔅1517, 𝔅1570, 𝔅1631, 𝔅1366, 𝔅2580, 𝔅1722, 𝔅559, 𝔅1086. **6.4**: 𝔅335, 𝔅605, 𝔅667, 𝔅934, 𝔅935, 𝔅995, 𝔅1834, 𝔅1025, 𝔅905, 𝔅575, 𝔅616, 𝔅889, 𝔅834, 𝔅672, 𝔅1051, 𝔅1062, 𝔅503, 𝔅833, 𝔅663, 𝔅1121. **6.5**: 𝔅609, 𝔅660, 𝔅1102, 𝔅1501, 𝔅1958, 𝔅1629, 𝔅3118, 𝔅659, 𝔅509, 𝔅598. **6.6**: 𝔅611, 𝔅617, 𝔅1573, 𝔅2827, 𝔅1285, 𝔅824, 𝔅1698, 𝔅543, 𝔅996, 𝔅1143, 𝔅1619. **6.7**: 𝔅1405, 𝔅2007, 𝔅2006, 𝔅545, 𝔅666, 𝔅1374, 𝔅1620, 𝔅1024, 𝔅719, 𝔅1502. **6.8**: 𝔅573, 𝔅671, 𝔅327, 𝔅336, 𝔅551, 𝔅576, 𝔅581, 𝔅1776, 𝔅2005, 𝔅712, 𝔅1700, 𝔅1306. **6.9**: 𝔅610, 𝔅661, 𝔅1040, 𝔅1103, 𝔅1681, 𝔅1688, 𝔅1840, 𝔅2834, 𝔅557, 𝔅612, 𝔅1621, 𝔅484, 𝔅1235. **7.0**: 𝔅485, 𝔅578, 𝔅588, 𝔅613, 𝔅696, 𝔅1386, 𝔅1404, 𝔅1854, 𝔅599, 𝔅2041, 𝔅1807, 𝔅536, 𝔅584. **7.1**: 𝔅586, 𝔅589, 𝔅1565, 𝔅585, 𝔅725, 𝔅3188, 𝔅587, 𝔅334, 𝔅590, 𝔅882, 𝔅1171, 𝔅1842, 𝔅681, 𝔅1734, 𝔅2828. **7.2**: 𝔅1233, 𝔅1697, 𝔅535, 𝔅2023, 𝔅1847, 𝔅615, 𝔅2826, 𝔅2830, 𝔅577, 𝔅1247, 𝔅1977, 𝔅893, 𝔅1705, 𝔅1067, 𝔅1066, 𝔅910, 𝔅325. **7.4**: 𝔅1128, 𝔅1385, 𝔅1393, 𝔅1843, 𝔅1849, 𝔅2062, 𝔅2060, 𝔅2037, 𝔅1057, 𝔅1528. **7.5**: 𝔅305, 𝔅314, 𝔅330, 𝔅552, 𝔅900, 𝔅1833, 𝔅1041, 𝔅700, 𝔅904, 𝔅538, 𝔅1170, 𝔅1464, 𝔅324. **7.7**: 𝔅328, 𝔅896, 𝔅318, 𝔅902, 𝔅2079, 𝔅1384, 𝔅1848, 𝔅1146, 𝔅323, 𝔅891, 𝔅676. **8.0**: 𝔅525, 𝔅704, 𝔅1004, 𝔅1070, 𝔅1732, 𝔅1850, 𝔅580, 𝔅321, 𝔅558, 𝔅901, 𝔅821, 𝔅560, 𝔅822. **8.2**: 𝔅308, 𝔅1695, 𝔅528, 𝔅1326, 𝔅888, 𝔅890, 𝔅1662, 𝔅1701, 𝔅1550, 𝔅888, 𝔅1017, 𝔅309, 𝔅1072, 𝔅1684, 𝔅1780. **8.64**: 𝔅2082, 𝔅887, 𝔅880, 𝔅895, 𝔅1137, 𝔅1806, 𝔅1169, 𝔅307, 𝔅1663, 𝔅881, 𝔅675. **9.04**: 𝔅1139, 𝔅527, 𝔅892, 𝔅2087, 𝔅526, 𝔅524, 𝔅2099, 𝔅668, 𝔅879, 𝔅1152, 𝔅1702, 𝔅1179, 𝔅1855, 𝔅1693. **11.1**: 𝔅878, 𝔅1725, 𝔅1724, 𝔅1224, 𝔅1225, 𝔅1689, 𝔅1690. **16.06.**

LIQUID CRYSTALS

H. W. Foote

The term "transition temperature" refers in the tables to the temperature at which the solid and crystalline-liquid phases are in equilibrium at a pressure of one atmosphere; by "melting point," is meant the corresponding temperature at which the crystalline-liquid and isotropic liquid phases are in equilibrium. In some cases, more than one stable liquid crystal phase exists, giving an additional transition temperature for each additional liquid crystal phase. These transition temperatures between two liquid crystal phases are indicated by *. In most cases, they are only approximate. Melting points which are quite uncertain, usually due to partial decomposition, have "d." written after the value. No attempt has been made to estimate the accuracy of values obtained by a single investigator, as the methods of determination are the same in nearly every case and the result obviously depends on the skill of the investigator and the purity of the compounds.

A series of apparently good determinations by different observers is apt to vary by considerably more than one degree, and it seems unlikely that any transition temperature or melting point of liquid crystals is known with an accuracy much better than one degree. For this reason, the weighted average of a number of different determinations is usually given to the nearest whole degree. When the number of determinations is sufficient, the weighted average deviation, usually to the nearest whole degree, is given also.

The melting points of unstable liquid crystals, in monotropic systems, are not included in the tables, and transition temperatures, in the ordinary sense, do not exist in this case. Many observations on monotropic compounds will be found in nearly all the Halle dissertations and in the publications by Vorländer, which are listed at the end of the tables.

For the effect of pressure on the transition temperature and melting point of liquid crystals, see G. Hulett, *7*, **28**: 629; 99. For approximate data on liquid crystals of alkali salts of higher fatty acids (chiefly) see Vorländer, *25*, **43**: 3120; 10. For similar data regarding compounds which are optically active, see H. Stoltzenberg, Diss., Halle (1911). For qualitative data regarding liquid crystals, see E. Wolferts, Diss., Halle (09), R. Wilke, Diss., Halle (09); K. Mattenklodt, Diss., Halle (11); and Vorländer, *25*, **40**: 1415, 1966; 07.

Index formula	Formula	Name	Trans. temp.	M. P.	Lit.
$C_{10}H_{10}O_3$	$CH_3OC_6H_4CH:CHCOOH$	*p*-Methoxycinnamic acid	170 ± 1	186 ± 1	(7, 11, 30, 33, 34, 42, 43, 45)
$C_{11}H_{12}O_3$	$C_2H_5OC_6H_4CH:CHCOOH$	*p*-Ethoxycinnamic acid	192	197	(43)
$C_{12}H_{14}O_3$	$C_2H_5OC_6H_4CCH_3:CHCOOH$	*p*-Ethoxy-β-methylcinnamic acid	122.5	159	(37)
$C_{14}H_{10}BrNO_2$	$BrC_6H_4CH:NC_6H_4COOH$	*p*-Bromobenzal-*p*-aminobenzoic acid	272	274	(12)
$C_{14}H_{10}ClNO_2$	$ClC_6H_4CH:NC_6H_4COOH$	*p*-Chlorobenzal-*p*-aminobenzoic acid	260	263	(12)
$C_{14}H_{10}INO_2$	$IC_6H_4CH:NC_6H_4COOH$	*p*-Iodobenzal-*p*-aminobenzoic acid	279	287	(12)
$C_{14}H_{10}O_5$	$HOC_6H_4COOC_6H_4COOH$	*p*-(*p*-Hydroxybenzoxy)-benzoic acid	258	266 ±	(45)
$C_{14}H_{11}NO_2$	$C_6H_5CH:NC_6H_4COOH$	Benzal-*p*-aminobenzoic acid	183	191	(26)
$C_{14}H_{12}N_2O_3$	$O_2NC_6H_4CH:NC_6H_4OCH_3$	*p*-Nitrobenzalanisidine	135		(26)
$C_{14}H_{14}N_2O_3$	$CH_3OC_6H_4NONC_6H_4OCH_3$	*p*-Azoxyanisol	116 ± 1	135 ± 1	(1, 3, 6, 7, 9, 11, 14, 19, 23, 30, 32, 35, 36, 42, 45)
$C_{14}H_{15}N_3$	$CH_3NHC_6H_4CH:NNHC_6H_5$	*p*-Methylaminobenzalphenylhydrazone	170	190	(34)
$C_{15}H_{10}N_2O_2$	$CNC_6H_4CH:NC_6H_4COOH$	*p*-(*p*-Cyanobenzalamino)-benzoic acid	247	>320	(17)
$C_{15}H_{12}N_2O$	$CNC_6H_4CH:NC_6H_4OCH_3$	*p*-Cyanobenzalanisidine	115	125	(17)
$C_{15}H_{12}N_2O$	$CH_3OC_6H_4CH:NC_6H_4CN$	Anisal-*p*-cyanoaniline	103	113.5	(12)
$C_{15}H_{12}N_2O_4$	$CH_3COOC_6H_4N:NC_6H_4COOH$	*p*-Acetoxyazobenzoic acid	254	d.	(31)
$C_{15}H_{12}O_2$	$C_6H_5C_6H_4CH:CHCOOH$	*p*-Phenylcinnamic acid	221	236	(2)
$C_{15}H_{12}O_5$	$CH_3OC_6H_4COOC_6H_4COOH$	*p*-(*p*-Methoxybenzoxy)-benzoic acid	223	272	(45)
$C_{15}H_{13}NO_2$	$CH_3C_6H_4CH:NC_6H_4COOH$	*p*-(*p*-Methylbenzalamino)-benzoic acid	220	243	(26)
$C_{15}H_{13}NO_3$	$CH_3OC_6H_4CH:NC_6H_4COOH$	*p*-(Anisalamino)-benzoic acid	197	298 d.	(15, 46)
$C_{15}H_{14}N_2O_3$	$O_2NC_6H_4CH:NC_6H_4OC_2H_5$	*p*-Nitrobenzalphenetidine	124		(26)
$C_{15}H_{16}N_2O_5$	$CH_3OC_6H_4NONC_6H_4OC_2H_5$	*p*-Anisylazoxyphenetol	94 ± 1	149 ± 1	(4, 7, 32)
$C_{15}H_{17}N_3$	$C_2H_5NHC_6H_4CH:NNHC_6H_5$	*p*-Ethylaminobenzalphenylhydrazone	160	182	(34)
$C_{16}H_{12}O_6$	$CH_3COOC_6H_4COOC_6H_4COOH$	*p*-Hydroxybenzoic acid *p*-acetoxybenzoate	228 d.	>250	(45)
$C_{16}H_{12}O_7$	$CH_3OCOOC_6H_4COOC_6H_4COOH$	*p*-Hydroxybenzoic acid *p*-carbomethoxyoxybenzoate	218 d.	d.	(45)
$C_{16}H_{14}N_2O$	$CNC_6H_4CH:NC_6H_4OC_2H_5$	*p*-Cyanobenzalphenetidine	115	132	(17)
$C_{16}H_{14}N_2O$	$C_2H_5OC_6H_4CH:NC_6H_4CN$	*p*-Ethoxybenzal-*p*-cyanoaniline	105	124	(12)
$C_{16}H_{14}N_2O_2$	$O_2NC_6H_4CH:CHCH:NC_6H_4CH_3$	*p*-Nitrocinnamal-*p*-toluidine	130	141	(26)
$C_{16}H_{14}N_2O_3$	$O_2NC_6H_4CH:CHCH:NC_6H_4OCH_3$	*p*-Nitrocinnamalanisidine	155	160	(26)
$C_{16}H_{15}NO_2$	$CH_3OC_6H_4CH:NC_6H_4COCH_3$	Anisal-*p*-aminoacetophenone	121.5	135	(15)
$C_{16}H_{15}NO_3$	$CH_3COOC_6H_4CH:NC_6H_4OCH_3$	*p*-Acetoxybenzalanisidine	112	128	(15)
$C_{16}H_{15}NO_3$	$CH_3OC_6H_4CH:NC_6H_4OCOCH_3$	*p*-(Anisalamino)-phenol acetate	81.5	108	(15)
$C_{16}H_{16}N_2O_2$	$CH_3COC_6H_4N:NC_6H_4OC_2H_5$	*p*-Acetophenoneazophenetol	130		(47)
$C_{16}H_{16}N_2O_2$	$CH_3OC_6H_4CH:NN:CHC_6H_4OCH_3$	Anisaldazine	165 ± 3	180 ± 1	(5, 6, 7, 19)
$C_{16}H_{16}N_2O_3$	$C_2H_5OC_6H_4N:NC_6H_4OCOCH_3$	*p*-Phenetolazophenol acetate	121	138	(46, 47)
$C_{16}H_{16}N_2O_4$	$CH_3OC_6H_4N:NC_6H_4OCOOC_2H_5$	*p*-Anisylazocarbethoxyphenol	90	114	(46, 47)
$C_{16}H_{18}N_2O_3$	$C_2H_5OC_6H_4NONC_6H_4OC_2H_5$	*p*-Azoxyphenetol	137 ± 1	167 ± 1	(3, 14, 19, 23, 30, 32, 35, 42, 45)
$C_{16}H_{20}N_2$	$C_2H_5NHC_6H_4C_6H_4NHC_2H_5$	Diethylbenzidine	115.5	120.5	(34)
$C_{17}H_{15}NO_3$	$CH_3OC_6H_4CH:NC_6H_4CH:CHCOOH$	*p*-(Anisalamino)-cinnamic acid	208	d.	(15)
$C_{17}H_{16}N_2O_3$	$O_2NC_6H_4CH:CHCH:NC_6H_4OC_2H_5$	*p*-Nitrocinnamalphenetidine	134	137	(26)
$C_{17}H_{16}N_2O_4$	$CH_3COC_6H_4N:NC_6H_4OCOOC_2H_5$	*p*-Acetophenoneazocarbethoxyphenol	120	126	(47)
$C_{17}H_{16}N_2O_4$	$CH_3COOC_6H_4N:NC_6H_4COOC_2H_5$	Ethyl *p*-acetoxyazobenzoate	99	102	(31)
$C_{17}H_{17}NO_3$	$CH_3OC_6H_4CH:NC_6H_4CH_2CH_2COOH$	*p*-(Anisalamino)-hydrocinnamic acid	136	162	(45)
$C_{17}H_{18}N_2O_4$	$C_2H_5OC_6H_4N:NC_6H_4OCOOC_2H_5$	*p*-Phenetolazocarbethoxyphenol	96	137	(47)
$C_{18}H_{15}ClO_4$	$CH_3COOC_6H_4CH:CClC_6H_4OCOCH_3$	*p*-Dihydroxychlorostilbene diacetate	125	138	(11, 29)
$C_{18}H_{16}N_2O_4$	$CH_3COOC_6H_4CH:NN:CHC_6H_4OCOCH_3$	Di-(*p*-acetoxybenzalazine)	185	192	(16, 40)
$C_{18}H_{17}NO_3$	$CH_3OC_6H_4CH:NC_6H_4CH:CHCOOCH_3$	Methyl anisal-*p*-aminocinnamate	156	176	(43, 47)
$C_{17}H_{17}N_2O_3$	$CH_3OC_6H_4N:NC_6H_4CH:CHCOOC_2H_5$	Ethyl *p*-anisylazocinnamate	116, 123*	143	(46, 47)
$C_{18}H_{18}N_2O_5$	$C_2H_5OCOC_6H_4NONC_6H_4COOC_2H_5$	*p*-Azoxyethyl benzoate	114 ± 0.6	121 ± 0.5	(7, 11, 19, 27, 40, 42, 45)
$C_{18}H_{18}N_2O_6$	$C_2H_5OCOOC_6H_4N:NC_6H_4OCOOC_2H_5$	*p*-Azocarbethoxyphenol	97	118	(15)

Index formula	Formula	Name	Trans. temp.	M. P.	Lit.
$C_{18}H_{18}N_2O_7$	$C_2H_5OCOOC_6H_4NONC_6H_4OCOOC_2H_5$	*p*-Azoxycarbethoxyphenol	95	130	(15)
$C_{18}H_{18}O_2$	$CH_3OC_6H_4CH{:}CHCH{:}CHC_6H_4OCH_3$	Di-(*p*-anisylbutadiene)	225	238	(34)
$C_{18}H_{20}N_2O_2$	$C_2H_5OC_6H_4CH{:}NN{:}CHC_6H_4OC_2H_5$	Di-(*p*-ethoxybenzalazine)	172	195	(13, 24, 45)
$C_{18}H_{20}N_2O_2$	$CH_3OC_6H_4C(CH_3){:}NN{:}C(CH_3)C_6H_4$-$OCH_3$	Di-(*p*-methoxyacetophenoneazine)	195	202	(16)
$C_{18}H_{20}N_2O_4$	$HOC_2H_4OC_6H_4CH{:}NN{:}CHC_6H_4$-$OC_2H_4OH$	Di-(hydroxyethoxybenzalazine)	184	207	(13)
$C_{18}H_{22}N_2O_3$	$C_3H_7OC_6H_4NONC_6H_4OC_3H_7$	Di-(*p*-*n*-propoxyazoxybenzene)	116	122	(4, 40)
$C_{19}H_{16}N_2O_2$	$CNC_6H_4CH{:}NC_6H_4CH{:}CHCOOC_2H_5$	Ethyl *p*-cyanobenzal-*p*-aminocinnamate	131	179	(17)
$C_{19}H_{18}N_2O_4$	$CH_3COOC_6H_4N{:}NC_6H_4CH{:}CHCOO$-$C_2H_5$	Ethyl *p*-acetoxyphenylazocinnamate	132	152	(47)
$C_{19}H_{19}NO_2$	$CH_3C_6H_4CH{:}NC_6H_4CH{:}CHCOOC_2H_5$	Ethyl *p*-(*p*-methylbenzalamino)-cinnamate	96, 107*	118	(46, 47)
$C_{19}H_{19}NO_3$	$C_2H_5OC_6H_4CH{:}NC_6H_4CH{:}CCH_3$-$COOH$	*p*-(*p*-Ethoxybenzalamino)-α-methylcinnamic acid	180	265	(20)
$C_{19}H_{19}NO_3$	$CH_3OC_6H_4CH{:}NC_6H_4CH{:}CH$-$COOC_2H_5$	Ethyl (*p*-anisalamino)-cinnamate	100, 108*, 117*	138	(9, 43, 46, 47)
$C_{19}H_{19}NO_3$	$C_2H_5OC_6H_4CH{:}NC_6H_4CH{:}CH$-$COOCH_3$	Methyl *p*-(*p*-ethoxybenzalamino)-cinnamate	132	187	(43, 47)
$C_{19}H_{22}N_2O_3$	$C_2H_5OC_6H_4N{:}NC_6H_4OCOC_4H_9$	*p*-Phenetolazophenol *n*-valerate	78-83	125	(47)
$C_{20}H_{13}N_3O_2$	$CNC_6H_4N{:}NC_6H_4OCOC_6H_5$	*p*-Cyanobenzeneazophenol benzoate	181	226	(12)
$C_{20}H_{14}Br_2N_2$	$BrC_6H_4N{:}CHC_6H_4CH{:}NC_6H_4Br$	*p*-Phthalal-di-(*p*-bromoaniline)	208	288	(17)
$C_{20}H_{14}Cl_2N_2$	$ClC_6H_4N{:}CHC_6H_4CH{:}NC_6H_4Cl$	*p*-Phthalal-di-(*p*-chloroaniline)	176	282	(17)
$C_{20}H_{14}I_2N_2$	$IC_6H_4N{:}CHC_6H_4CH{:}NC_6H_4I$	*p*-Phthalal-di-(*p*-iodoaniline)	262	268	(12)
$C_{20}H_{14}N_4O_4$	$O_2NC_6H_4CH{:}NC_6H_4N{:}CHC_6H_4NO_2$	(Di-*p*-nitrobenzal)-*p*-phenylenediamine	242	315	(46)
$C_{20}H_{16}N_2O_3$	$CH_3OC_6H_4N{:}NC_6H_4OCOC_6H_5$	*p*-Anisylazophenol benzoate	159-163	178	(47)
$C_{20}H_{17}NO$	$CH_3OC_6H_4CH{:}NC_6H_4C_6H_5$	Anisal-*p*-aminodiphenyl	161	177	(12, 46)
$C_{20}H_{17}N_3O$	$CH_3OC_6H_4CH{:}NC_6H_4N{:}NC_6H_5$	Anisal-*p*-aminoazobenzene	151	182	(15, 39, 46)
$C_{20}H_{18}N_2O_5$	$CH_3OCOCH{:}CHC_6H_4NONC_6H_4CH{:}$-$CHCOOCH_3$	Methyl azoxycinnamate	221	257	(40)
$C_{20}H_{20}N_2O_2$	$CH_3OC_6H_4CH{:}CHCH{:}NN{:}CHCH{:}$-$CHC_6H_4OCH_3$	Di-*p*-methoxycinnamicaldazine	210	218	(34)
$C_{20}H_{20}N_2O_4$	$C_2H_5COOC_6H_4CH{:}NN{:}CHC_6H_4OCO$-$C_2H_5$	Di-*p*-propionylhydroxybenzalazine	160	187	(16)
$C_{20}H_{20}N_2O_5$	$C_2H_5OCOOC_6H_4N{:}NC_6H_4CH{:}CHCO$-$OC_2H_5$	Ethyl *p*-carbethoxyphenolazocinnamate	114	152	(47)
$C_{20}H_{21}NO_3$	$C_2H_5OC_6H_4CH{:}NC_6H_4CH{:}CHCOO$-$C_2H_5$	Ethyl *p*-(*p*-ethoxybenzalamino)-cinnamate	69, 113,* 152*	159	(43, 45, 46, 47)
$C_{20}H_{21}NO_3$	$CH_3OC_6H_4CH{:}H_4CH{:}NC_6CCH_3COO$-$C_2H_5$	Ethyl *p*-(anisalamino)-α-methylcinnamate	90	93	(20, 43)
$C_{20}H_{21}NO_3$	$C_2H_5OC_6H_4CH{:}NC_6H_4CH{:}CCH_3CO$-$OCH_3$	Methyl *p*-(*p*-ethoxybenzalamino)-α-methylcinnamate	105	147	(20, 43)
$C_{20}H_{24}N_2O_2$	$C_2H_5OC_6H_4CCH_3{:}NN{:}CCH_3C_6H_4O$-$C_2H_5$	Di-*p*-ethoxyacetophenoneazine	142	163	(16)
$C_{21}H_{14}O_7$	$HOC_6H_4COOC_6H_4COOC_6H_4COOH$	*p*-Hydroxybenzoic acid *p*-(*p*-hydroxybenzoxy) benzoate	283	d.	(45)
$C_{21}H_{16}N_2O_3$	$CH_3COC_6H_4N{:}NC_6H_4OCOC_6H_5$	*p*-Acetophenoneazophenol benzoate	211 d.		(47)
$C_{21}H_{17}NO$	$C_6H_5C_6H_4CH{:}NC_6H_4COCH_3$	*p*-(*p*-Phenylbenzalamino)-acetophenone	187.5		(2)
$C_{21}H_{18}N_2O_3$	$C_2H_5OC_6H_4N{:}NC_6H_4H_4OCOC_6H_5$	*p*-Phenetolazophenol benzoate	173	193	(46, 47)
$C_{21}H_{19}NO$	$C_2H_5OC_6H_4CH{:}NC_6H_4C_6H_5$	*p*-(*p*-Ethoxybenzalamino) diphenyl	145	184	(12)
$C_{21}H_{19}NO$	$C_6H_5C_6H_4CH{:}NC_6H_4OC_2H_5$	*p*-Phenylbenzal-*p*-phenetidine	164	189.5	(2)
$C_{21}H_{19}N_3O$	$C_2H_5OC_6H_4CH{:}NC_6H_4N{:}NC_6H_5$	*p*-(*p*-Ethoxybenzalamino)-azobenzene	131.5	199	(2)
$C_{21}H_{21}NO_5$	$C_2H_5OCOOC_6H_4CH{:}NC_6H_4CH{:}CH$-$COOC_2H_5$	Ethyl *p*-[(*p*-carbethoxyoxybenzal)-amino] cinnamate	80	151	(47)
$C_{21}H_{23}NO_3$	$CH_3OC_6H_4CH{:}NC_6H_4CH{:}CH$-$COOC_4H_9$	*n*-Butyl anisal-*p*-aminocinnamate	58	76	(43)
$C_{21}H_{23}NO_3$	$C_2H_5OC_6H_4CH{:}NC_6H_4CH{:}CCH_3CO$-$OC_2H_5$	Ethyl *p*-(*p*-ethoxybenzalamino)-α-methylcinnamate.	95	122 ± 2	(9, 19, 20, 39, 43, 46)

Index formula	Formula	Name	Trans. temp.	M. P.	Lit.
$C_{21}H_{23}NO_3$	$CH_3OC_6H_4CH{:}NC_6H_4CH{:}CCH_3$-$COOC_3H_7$	*n*-Propyl *p*-(anisalamino)-α-methylcinnamate	50	85	(20, 43)
$C_{22}H_{14}H_4$	$CNC_6H_4N{:}CHC_6H_4CH{:}NC_6H_4CN$	*p*-Phthalal-di-(*p*-cyanoaniline)	164	209	(12)
$C_{22}H_{17}NO_4$	$C_6H_5CH{:}NC_6H_4COOC_6H_4COOCH_3$	Methyl benzal-*p*-aminobenzoyl-*p*-hydroxybenzoate	174	177	(45)
$C_{22}H_{19}NO_2$	$C_6H_5C_6H_4CH{:}NC_6H_4COOC_2H_5$	Ethyl *p*-(*p*-phenylbenzalamino)-benzoate	121.5	128.5	(2)
$C_{22}H_{20}N_2$	$CH_3C_6H_4CH{:}NC_6H_4N{:}CHC_6H_4CH_3$	Di-(*p*-tolual)-*p*-phenylenediamine	194	266	(46)
$C_{22}H_{20}N_2$	$CH_3C_6H_4N{:}CHC_6H_4CH{:}NC_6H_4CH_3$	*p*-Phthalal-di-(*p*-toluidine)	186	238	(17)
$C_{22}H_{20}N_{22}$	$CH_3OC_6H_4CH{:}NC_6H_4N{:}CHC_6H_4OCH_3$	Dianisal-*p*-phenylenediamine	210	338	(46)
$C_{22}H_{22}N_2O_2$	$CNC_6H_4C{:}HNC_6H_4CH{:}CHCOOC_5H_{11}$	*act*-Amyl *p*-(*p*-cyanobenzalamino)-cinnamate	95	107	(17, 38, 46)
$C_{22}H_{22}N_2O_4$	$C_2H_5OCOCH{:}CHC_6H_4N{:}NC_6H_4CH{:}$-$CHCOOC_2H_5$	Ethyl *p*-azocinnamate	155	230	(15, 43)
$C_{22}H_{22}N_2O_5$	$C_2H_5OCOCH{:}CHC_6H_4NONC_6H_4$-$CH{:}CHCOOC_2H_5$	Ethyl *p*-azoxycinnamate	140 ± 1	249 ± 1	(7, 15, 25, 40, 43, 45)
$C_{22}H_{22}O_3$	$CH_3OC_6H_4CH{:}C_6H_6O{:}CHC_6H_4OCH_3$	Dianisalcyclohexanone	159	170	(2, 28, 44)
$C_{22}H_{24}N_2O_4$	$C_3H_7COOC_6H_4CH{:}NN{:}CHC_6H_4O$-$COC_3H_7$	Di-*p*-butyryloxybenzalazine	146	181	(16)
$C_{22}H_{25}NO_3$	$CH_3OC_6H_4CH{:}NC_6H_4CH{:}CH$-$COOC_5H_{11}$	*act*-Amyl anisal-*p*-aminocinnamate	49	90	(43)
$C_{22}H_{25}NO_3$	$CH_3OC_6H_4CH{:}NC_6H_4CH{:}CH$-$COOC_5H_{11}$	*iso*-Amyl anisal-*p*-aminocinnamate	52	90	(43)
$C_{22}H_{25}NO_3$	$C_2H_5OC_6H_4CH{:}NC_6H_4CH{:}CHCOO$-$C_4H_9$	*n*-Butyl *p*-(*p*-ethoxybenzalamino)-cinnamate	68, 88*	125	(43)
$C_{22}H_{25}NO_3$	$C_2H_5OC_6H_4CH{:}NC_6H_4CHCOH_3COO$-$C_3H_7$	*n*-Propyl *p*-(*p*-ethoxybenzalamino)-α-methylcinnamate	88	121	(20, 43)
$C_{23}H_{16}O_8$	$CH_3COOC_6H_4COOC_6H_4COO$-$C_6H_4COOH$	*p*-Hydroxybenzoic acid *p*-(*p*-acetoxybenzoxy)-benzoate	248	d.	(45)
$C_{23}H_{19}NO_2$	$C_6H_5C_6H_4CH{:}NC_6H_4CH{:}CHCOOCH_3$	Methyl *p*-(*p*-phenylbenzalamino)-cinnamate	208, 216*	247	(2)
$C_{23}H_{19}NO_5$	$CH_3OC_6H_4CH{:}NC_6H_4COOC_6H_4COO$-$CH_3$	Methyl *p*-(anisalamino)-benzoyl-*p*-hydroxybenzoate	217	300	(45)
$C_{23}H_{21}NO_4$	$CH_3OC_6H_4CH{:}NC_6H_4CH_2OC_6H_4CO$-$OCH_3$	Methyl *p*-(anisalamino)benzyl-*p*-hydroxybenzoate	157	165	(45)
$C_{23}H_{24}O_3$	$C_2H_5OC_6H_4CH{:}C_5H_4O{:}CHC_6H_4OC_2H_5$	Di-(*p*-ethoxybenzal)-cyclopentanone	189, 194*	200	(44)
$C_{23}H_{27}NO_3$	$C_2H_5OC_6H_4CH{:}NC_6H_4CH{:}CHCOO$-$C_5H_{11}$	*act*-Amyl *p*-(*p*-ethoxybenzalamino)-cinnamate	68, 114*	121	(43)
$C_{23}H_{27}NO_3$	$C_2H_5OC_6H_4CH{:}NC_6H_4CH{:}CHCOO$-$C_5H_{11}$	*iso*-Amyl *p*-(*p*-ethoxybenzalamino)-cinnamate	81	137	(43)
$C_{23}H_{27}NO_3$	$C_2H_5OC_6H_4CH{:}NC_6H_4CH{:}CCH_3CO$-$OC_4H_9$	*n*-Butyl *p*-(*p*-ethoxybenzalamino)-α-methylcinnamate	55, 65*	82	(20, 43)
$C_{23}H_{27}NO_3$	$CH_3OC_6H_4CH{:}NC_6H_6CH{:}CCH_3COO$ C_5H_{11}	*act*-Amyl *p*-(anisalamino)-α-methylcinnamate	62	69	(46)
$C_{24}H_{18}O_6$	$C_2H_5OCOOC_6H_4COOC_6H_4COOC_6H_4$-$COOH$	*p*-Hydroxybenzoic acid *p*-(*p*-carbethoxyoxybenzoxy) benzoate	215	d.	(45)
$C_{24}H_{20}N_2O_4$	$C_6H_5COOC_6H_4N{:}NC_6H_4CH{:}CHCOO$-$C_2H_5$	Ethyl *p*-benzoyloxyphenylazocinnamate	135	212	(47)
$C_{24}H_{21}NO_2$	$C_6H_5C_6H_4CH{:}NC_6H_4CH{:}CH$-$COOC_2H_5$	Ethyl *p*-(*p*-phenylbenzalamino)-cinnamate.	145, 180,* 205,* 210*	219	(2, 39, 43 46)
$C_{24}H_{22}N_2O_4$	$CH_3OC_6H_4CH{:}NC_6H_4CONHC_6H_4$-$COOC_2H_5$	Ethyl *p*-(anisalamino)-benzoyl-*p*-aminobenzoate	212, 220*	247	(45, 46)
$C_{24}H_{24}Br_2N_2O_5$	$C_2H_5OCOCCH_3{:}CBrC_6H_4NONC_6H_4$-$CBr{:}CCH_3COOC_2H_5$	Ethyl *p*-azoxy-α-methyl-β-bromcinnamate	110, 132*	138	(20)
$C_{24}H_{24}N_2O_2$	$C_2H_5OC_6H_4CH{:}NC_6H_4N{:}CHC_6H_4O$-$C_2H_5$	Di-(*p*-ethoxybenzal)-*p*-phenylenediamine	200		(2)
$C_{24}H_{24}N_2O$	$C_2H_5OC_6H_4N{:}CHC_6H_4CH{:}NC_6H_4O$-$C_2H_5$	*p*-Phthalal-di-(*p*-phenetidine)	197	324	(17)
$C_{24}H_{24}N_2O_5$	$C_3H_5OCOCH{:}CHC_6H_4NONC_6H_4$-$CH{:}CHCOOC_3H_5$	Allyl *p*-azoxycinnamate	124	235	(40)
$C_{24}H_{26}N_2O_5$	$C_2H_5OCOCCH_3{:}CHC_6H_4NONC_6H_4$-$CH{:}CCH_3COOC_2H_5$	Ethyl *p*-azoxy-α-methylcinnamate	109, 134*	140	(20, 21)

Index formula	Formula	Name	Trans. temp.	M. P.	Lit.
$C_{24}H_{26}N_2O_5$	$C_3H_7OCOCH:CHC_6H_4NONC_6H_4$-$CH:CHCOOC_3H_7$	*iso*-Propyl *p*-azoxycinnamate	150	184	(40)
$C_{24}H_{26}N_2O_5$	$C_3H_7OCOCH:CHC_6H_4NONC_6H_4$-$CH:CHCOOC_3H_7$	*n*-Propyl *p*-azoxycinnamate	123	243	(40)
$C_{24}H_{26}O_3$	$C_2H_5OC_6H_4CH:C_6H_6O:CHC_6H_4$-$OC_2H_5$	Di-(*p*-ethoxybenzal)-cyclohexanone	146	176	(44)
$C_{24}H_{28}N_2O_4$	$C_4H_9COOC_6H_4CH:NN:CHC_6H_4$-$OCOC_4H_9$	Di-(*p*-valerylhydroxy)-benzalazine	145	160	(16)
$C_{24}H_{28}N_2O_4$	$C_4H_9COOC_6H_4CH:NN:CHC_6H_4$-$OCOC_4H_9$	Di-(*p*-isovalerylhydroxy)-benzalazine	131	156	(16)
$C_{24}H_{29}NO_3$	$C_2H_5OC_6H_4CH:NC_6H_4CH:CCH_3$-$COOC_5H_{11}$	*act*-Amyl *p*-(*p*-ethoxybenzalamino)-α-methylcinnamate	86	100	(20, 43)
$C_{24}H_{29}NO_3$	$C_2H_5OC_6H_4CH:NC_6H_4CH:CCH_3$-$COOC_5H_{11}$	*iso*-Amyl *p*-(*p*-ethoxybenzalamino)-α-methylcinnamate	83	90	(20, 43)
$C_{25}H_{18}N_2O_2$	$C_6H_5C_6H_4N:NC_6H_4OCOC_6H_5$	*p*-Diphenylazophenol benzoate	194	240	(12)
$C_{25}H_{19}N_3$	$C_6H_5C_6H_4CH:NC_6H_4N:NC_6H_5$	*p*-(*p*-Phenylbenzalamino)-azobenzene	207	252	(2)
$C_{25}H_{20}O_8$	$CH_3COOC_6H_4COOC_6H_4COOC_6H_4$-$COOC_2H_5$	Ethyl *p*-hydroxybenzoate *p*-(*p*-acetoxybenzoxy) benzoate	142	282	(45)
$C_{25}H_{21}NO_4$	$C_6H_5COOC_6H_4CH:NC_6H_4CH$:-$CHCOOC_2H_5$	Ethyl *p*-(*p*-benzoxybenzalamino)-cinnamate	125	217	(47)
$C_{25}H_{23}NO_2$	$C_6H_5C_6H_4CH:NC_6H_4CH:CCH_3$-$COOC_2H_5$	Ethyl *p*-(*p*-phenylbenzalamino)-α-methylcinnamate	120, 148*	175	(20, 43)
$C_{25}H_{28}N_2O_5$	$C_3H_7OCOCCH_3:CHC_6H_4NONC_6H_4$-$CH:CHCOOC_3H_7$	*n*-Propyl *p*-azoxy-α-methylcinnamate	70, 125*?	128	(20)
$C_{26}H_{18}Br_2N_2$	$BrC_6H_4CH:NC_6H_4C_6H_4N:CHC_6H_4Br$	Di-(*p*-bromobenzal)-benzidine	285	312	(12)
$C_{26}H_{18}Cl_2N_2$	$ClC_6H_4CH:NC_6H_4C_6H_4N:CHC_6H_4Cl$	Di-(*p*-chlorobenzal)-benzidine	265	318	(12)
$C_{26}H_{18}Cl_2N_4O$	$ClC_6H_4N:CHC_6H_4NONC_6H_4CH$:$NC_6H_4Cl$	*p*-Azoxybenzaldi-*m*-chloraniline	174, 181,* 198*	213	(46)
$C_{26}H_{18}I_2N_2$	$IC_6H_4CH:NC_6H_4C_6H_4N:CHC_6H_4I$	Di-(*p*-iodobenzal)-benzidine	>300		(12)
$C_{26}H_{18}N_2O_4$	$C_6H_5COOC_6H_4N:NC_6H_4OCOC_6H_5$	*p*-Dibenzoylazophenol	208	250	(15, 39)
$C_{26}H_{18}N_2O_5$	$C_6H_5COOC_6H_4NONC_6H_4OCOC_6H_5$	*p*-Dibenzoylazoxyphenol	192	280	(15)
$C_{26}H_{18}N_4O_6$	$O_2NC_6H_4CONHC_6H_4C_6H_4NHCO$-$C_6H_4NO_2$	Di-(*p*-nitrobenzoyl)-benzidine	365	d.	(45)
$C_{26}H_{18}O_4$	$C_6H_5OCOC_6H_4C_6H_4COOC_6H_5$	Diphenyl *p*, *p*′-diphenylcarboxylate	213	245	(45)
$C_{26}H_{20}N_2$	$C_6H_5CH:NC_6H_4C_6H_4N:CHC_6H_5$	Dibenzalbenzidene	234	260	(6, 24)
$C_{26}H_{20}N_2$	$C_6H_5C_6H_4CH:NN:CHC_6H_4C_6H_5$	Di-*p*-phenylbenzalazine	245	271	(2)
$C_{26}H_{22}N_2$	$CH_3C_6H_4CH:NC_{10}H_6N:CHC_6H_4CH_3$	Di-*p*-tolual-1, 5-naphthylenediamine	210	230	(46)
$C_{26}H_{22}N_2O_2$	$CH_3OC_6H_4CH:NC_{10}H_6N$:-$CHC_6H_4OCH_3$	Dianisal-1, 5-naphthylenediamine	206	313	(46)
$C_{26}H_{22}N_4O_2$	$H_2NC_6H_4CONHC_6H_4C_6H_4NHCO$-$C_6H_4NH_2$	Di-(*p*-aminobenzoyl)-benzidine	312	d.	(45)
$C_{26}H_{24}N_2O_4$	$C_6H_4(CH:NC_6H_4COOC_2H_5)_2$	Ethyl *p*-phthalal-di-(*p*-aminobenzoate)	189	230	(17)
$C_{26}H_{25}NO_2$	$C_6H_5C_6H_4CH:NC_6H_4CH$:-$CHCOOC_4H_9$	*n*-Butyl *p*-phenylbenzal-*p*-aminocinnamate	167	203	(43)
$C_{26}H_{26}N_2O_5$	$C_3H_5OCOCCH_3:CHC_6H_4NONC_6H_4$-$CH:CCH_3COOC_3H_5$	Allyl *p*-azoxy-α-methylcinnamate	75	115	(20)
$C_{26}H_{26}N_2O_9$	$C_2H_5OCOCH_2OCOCH:CHC_6H_4$-$NONC_6H_4CH:CHCOOCH_2$-$COOC_2H_5$	*p*-Azoxycinnamic acid ethyl glycolate ester	148	235	(40)
$C_{26}H_{30}N_2O_5$	$C_4H_9OCOCH:CHC_6H_4NONC_6H_4$-$CH:CHCOOC_4H_9$	*n*-Butyl *p*-azoxycinnamate	111	214	(40)
$C_{27}H_{27}NO_2$	$C_6H_5C_6H_4CH:NC_6H_4CH$:-$CHCOOC_5H_{11}$	*act*-Amyl *p*-(*p*-phenylbenzalamino)-cinnamate	115, 153*	180	(43)
$C_{27}H_{27}NO_2$	$C_6H_5C_6H_4CH:NC_6H_4CH$:-$CHCOOC_5H_{11}$	*iso*-Amyl *p*-(*p*-phenylbenzalamino)-cinnamate	164, 188*	197	(43)
$C_{27}H_{27}NO_2$	$C_6H_5C_6H_4CH:NC_6H_4CH$:-$CCH_3COC_4H_9$	*n*-Butyl *p*-(*p*-phenylbenzalamino)-α-methylcinnamate	99, 137*	149	(20, 43, 46)
$C_{27}H_{27}NO_2$	$C_6H_5C_6O_4CH:NC_6H_4CH$:-$CC_2H_5COOC_3H_7$	*n*-Propyl *p*-(*p*-phenylbenzalamino)-α-ethylcinnamate	119	135	(20, 21, 43)
$C_{28}H_{18}O_4$	$C_6H_5COOC_6H_4C:CC_6H_4OCOC_6H_5$	Di-*p*-oxytolanedibenzoate	214	254	(41)
$C_{28}H_{20}N_2O_4$	$C_6H_5COOC_6H_4CH:NN:CHC_6H_4$-$OCOC_6H_5$	Di-*p*-benzoxybenzalazine	227	290	(16, 40)

Index formula	Formula	Name	Trans. temp.	M. P.	Lit.
$C_{28}H_{20}O_4$	$C_6H_5COOC_6H_4CH:CHC_6H_4OCOC_6H_5$	Di-*p*-hydroxystilbene dibenzoate	224	285 d.	(41)
$C_{28}H_{24}N_2$	$(C_6H_4N:CHC_6H_4CH_3)_2$	Di-(*p*-tolual)-benzidene	231	>300	(6, 24)
$C_{28}H_{24}N_2O_2$	$(C_6H_4N:CHC_6H_4OCH_3)_2$	Dianisalbenzidene	258		(46)
$C_{28}H_{28}N_2O_4$	$C_6H_5COOC_6H_4N:NC_6H_4CH:CCH_3$-$COOC_5H_{11}$	*act*-Amyl *p*-benzoylazophenol-α-methylcinnamate	88	120	(20)
$C_{28}H_{34}N_2O_5$	$C_5H_{11}OCOCH:CHC_6H_4NONC_6H_4$-$CH:CHCOOC_5H_{11}$	*iso*-Amyl *p*-azoxycinnamate	144	186	(40)
$C_{28}H_{34}N_2O_5$	$C_4H_9OCOCCH_3:CHC_6H_4NONC_6H_4$-$CH:CCH_3COOC_4H_9$	*iso*-Butyl *p*-azoxy-α-methylcinnamate	86, 110*	125.5	(20)
$C_{28}H_{34}N_2O_5$	$C_4H_9OCOCCH_3:CHC_6H_4NONC_6H_4$-$CH:CCH_3COOC_4H_9$	*n*-Butyl *p*-azoxy-α-methylcinnamate	60	100	(20)
$C_{30}H_{22}N_2O_3$	$C_6H_5COCH:CHC_6H_4NONC_6H_4CH$:-$CHCOC_6H_5$	*p*-Azoxybenzalacetophenone	213		(47)
$C_{30}H_{28}N_2O_2$	$(C_6H_4N:CHC_6H_4OC_2H_5)_2$	Di-(*p*-ethoxybenzal)-benzidine	248	>300	(13)
$C_{30}H_{28}N_2O_2$	$(C_6H_4N:CHC_6H_3CH_3OCH_3)_2$	Di-(*p*-methoxy-*o*-methylbenzal)-benzidine	171	>300	(13)
$C_{30}H_{28}N_2O_4$	$C_6H_4(CH:NC_6H_4CH:CHCOOC_2H_5)_2$	Ethyl *p*-phthalal-di-(*p*-aminocinnamate)	174, 270*	310	(17)
$C_{30}H_{50}O_2$	$C_2H_5COOC_{27}H_{45}$	Cholesterol propionate	97 ± 2	112 ± 2	(6, 10, 18, 30)
$C_{30}H_{50}O_3$	$C_2H_5OCOOC_{27}H_{45}$	Cholesterol ethyl carbonate	83	103.5	(8)
$C_{31}H_{52}O_2$	$C_3H_7COOC_{27}H_{45}$	Cholesterol *n*-butyrate	96.4	107.3	(18)
$C_{31}H_{52}O_3$	$C_3H_7OCOOC_{27}H_{45}$	Cholesterol *n*-propyl carbonate	99	101	(8)
$C_{32}H_{24}N_2$	$C_6H_4(N:CHC_6H_4C_6H_5)_2$	Di-(*p*-phenylbenzal)-*p*-phenylenediamine	284	>300	(2)
$C_{32}H_{24}N_2O_4$	$C_6H_5CH:CHCOOC_6H_4CH:NN:CH$-$C_6H_4OCOCH:CHC_6H_5$	Di-(*p*-cinnamylhydroxy)-benzalazine	206	245	(16)
$C_{32}H_{24}O_{10}$	$CH_3COOC_6H_4COOC_6H_4COOC_6H_4$-$COOC_6H_4COOC_2H_5$	Ethyl *p*-hydroxybenzoate *p*-[*p*-(*p*-acetoxybenzoxy)benzoxy]benzoate	187 d.	d.	(45)
$C_{32}H_{26}O$	$C_6H_5C_6H_4CH:C_6H_6O:CHC_6H_4C_6H_5$	Di-(*p*-phenylbenzal)-cyclohexanone	236.5	237.5	(2)
$C_{32}H_{32}N_2O_2$	$C_2H_5OCH_3C_6H_3CH:NC_6H_4C_6H_4N:C$-$HC_6H_3CH_3OC_2H_5$	Di(-*p*-ethoxy-*o*-methylbenzal)-benzidine	167	>300	(13)
$C_{32}H_{54}O_2$	$C_4H_9COOC_{27}H_{45}$	Cholesterol valerate	91.8	99.2	(18)
$C_{32}H_{54}O_3$	$C_4H_9OCOOC_{27}H_{45}$	Cholesterol *n*-butyl carbonate	78	90	(8)
$C_{33}H_{24}O_5$	$C_6H_5COOC_6H_4CH:C_5H_4O:CHC_6H_4O$-$COC_6H_5$	Di-(*p*-benzoxybenzal)-cyclopentanone	234	236	(44)
$C_{33}H_{56}O_2$	$C_5H_{11}COOC_{27}H_{45}$	Cholesterol capronate	91.2	100	(18)
$C_{34}H_{26}N_2O_7$	$C_6H_5COCH_2OCOCH:CHC_6H_4NON$-$C_6H_4CH:CHCOOCH_2COC_6H_5$	Phenacyl *p*-azoxycinnamate	231	238	(40)
$C_{34}H_{46}N_2O_5$	$C_8H_{17}OCOCH:CHC_6H_4NONC_6H_4$-$CH:CHCOOC_8H_{17}$	*n*-Octyl *p*-azoxycinnamate	94	175	(40)
$C_{34}H_{50}O_2$	$C_6H_5COOC_{27}H_{45}$	Cholesterol benzoate	146 ± 1	178.5 ± 0.3	(18, 22, 30, 35, 42, 45)
$C_{36}H_{40}N_2O_4$	$C_6H_4(CH:NC_6H_4CH:CHCOOC_5H_{11})_2$	*act*-Amyl *p*-phthalal-di-(*p*-aminocinnamate)	133, 195*	268	(17)
$C_{36}H_{50}N_2O_5$	$C_8H_{17}OCOCCH_3:CHC_6H_4NONC_6H_4$-$CH:CCH_3COOC_8H_{17}$	*n*-Octyl *p*-azoxy-α-methylcinnamate	41, 62*	85	(20)
$C_{37}H_{64}O_2$	$C_9H_{19}COOC_{27}H_{45}$	Cholesterol caprinate	82.2	90.6	(18)
$C_{38}H_{44}N_2O_4$	$C_6H_4(CH:NC_6H_4CH:CCH_3COO$-$C_5H_{11})_2$	*act*-Amyl *p*-phthalal-di-(*p*-amino-α-methylcinnamate)	144, 211*	248	(17)
$C_{40}H_{28}N_6O_6$	$(C_6H_4NHCOC_6H_4N:CHC_6H_4NO_2)_2$	Di-(*m*-nitrobenzal-*p*-aminobenzoyl)-benzidine	>370	d.	(45)
$C_{40}H_{34}N_4$	$C_6H_5CH:NC_6H_4CH_2NHC_6H_4C_6H_4N$-$HCH_2C_6H_4N:CHC_6H_5$	Di-*p*-(benzalaminobenzyl)-benzidine	217	246 d.	(46)
$C_{42}H_{38}N_4O_2$	$(C_6H_4NHCH_2C_4H_4N:CHC_6H_4OCH_3)_2$	Di-*p*-(anisalaminobenzyl)-benzidine	202 d.	d.	(45)
$C_{50}H_{78}N_2O_5$	$C_{16}H_{33}OCOCH:CHC_6H_4NONC_6H_4$-$CH:CHCOOC_{16}H_{33}$	*n*-Cetyl *p*-azoxycinnamate	105	141	(40)
$C_{52}H_{82}N_2O_5$	$C_{16}H_{33}OCOCCH_3:CHC_6H_4NONC_6H_4$-$CH:CCH_3COOC_{16}H_{33}$	*n*-Cetyl *p*-azoxy-α-methylcinnamate	77	84	(20)
$C_{55}H_{90}O_3$	$C_{27}H_{45}OCOOC_{27}H_{45}$	Cholesterol carbonate	177	235	(8)
$C_{14}H_{12}ClHgNO$	$CH_3OC_6H_4CH:NC_6H_4HgCl$	*p*-Anisalaminophenylmercury chloride	274	d.	(46)

Index formula	Formula	Name	Trans. temp.	M. P.	Lit.
$C_{15}H_{12}ClHgN$	$C_6H_5CH:CHCH:NC_6H_4HgCl$	p-Cinnamalaminophenylmercury chloride	255	265	(46)
$C_{16}H_{15}HgNO_3$	$CH_3OC_6H_4CH:NC_6H_4HgOCOCH_3$	p-Anisalaminophenylmercury acetate	177	180	(46)
$C_{26}H_{18}HgN_4O_4$	$O_2NC_6H_4CH:NC_6H_4HgC_6H_4N:CHC_6H_4NO_2$	Mercury di-(p-nitrobenzalaminophenyl)	236	241	(46)
$C_{26}H_{20}HgN_2$	$C_6H_5CH:NC_6H_4HgC_6H_4N:CHC_6H_5$	Mercury di-(benzalaminophenyl)	180	184	(46)
$C_{28}H_{24}HgN_2$	$Hg(C_6H_4N:CHC_6H_4CH_3)_2$	Mercury di-(p-tolualaminophenyl)	217	229	(46)
$C_{28}H_{24}HgN_2O_2$	$Hg(C_6H_4N:CHC_6H_4OCH_3)_2$	Mercury di-(anisalaminophenyl)	209	285	(46)
$C_{30}H_{24}HgN_2$	$Hg(C_6H_4N:CHCH:CHC_6H_5)_2$	Mercury di-(cinnamalaminophenyl)	208	269	(46)
$C_{30}H_{28}HgN_2O_2$	$Hg(C_6H_4N:CHC_6H_4OC_2H_5)_2$	Mercury di-(p-ethoxybenzalaminophenyl)	204	272	(46)

LITERATURE

(For a key to the periodicals see end of volume)

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(10) Dorn, *63*, **11**: 777; 10. (11) Eichwald, *Diss.*, *Marburg*, 05. (12) Fröhlich, *Diss.*, *Halle*, 10. (13) Gatterman, *13*, **357**: 313; 07. (14) Gatterman and Ritschke, *25*, **23**: 1738; 90. (15) Hansen, *Diss. Halle*, 07. (16) Hulme, *Diss.*, *Halle*, 07. (17) Huth, *Diss.*, *Halle*, 10. (18) Jaeger, *64P*, **9**: 78; 06. *70*, **25**: 334; 06. (19) Jaeger, *93*, **101**: 1; 17.

(20) Kasten, *Diss.*, *Halle*, 09. (21) E. Lehmann, *Diss.*, *Halle*, 10. (22) Lehmann, *7*, **4**: 462; 89. (23) Lehmann, *8*, **40**: 401; 90. (24) Lehmann, *8*, **2**: 649; 00. (25) Lehmann, *8*, **19**: 22; 06. (26) Meye, *Diss.*, *Halle*, 08. (27) Meyer and Dahlem, *13*, **326**: 331; 03. (28) Müller, *25*, **54**: 1481; 21. (29) Münch, *Diss.*, *Marburg*, 03.

(30) Prins, *7*, **67**: 689; 09. (31) Reichardt, *Diss.*, *Halle*, 09. (32) Rising, *25*, **37**: 43; 04. (33) v. Romburgh, *64V*, **9**: 9; 01. (34) Rotarski, *25*, **41**: 1994; 08. (35) Schenk, *7*, **25**: 337; 98. (36) Schenk, *7*, **28**: 280; 99. (37) Schroeter, *25*, **41**: 5; 08. (38) Stumpf, *63*, **11**: 780; 10. (39) Sultze, *Diss.*, *Halle*, 08.

(40) Vorländer, *25*, **39**: 803; 06. (41) Vorländer, *25*, **40**: 4527; 07. (42) Vorländer, *196*, **12**: 321; 07. (43) Vorländer, *25*, **41**: 2033; 08. (44) Vorländer, *25*, **54**: 2261; 21. (45) Vorländer, *7*, **105**: 211; 23. (46) D. Vorländer, *Chem. Kristallog. der Flüssigkeiten*, 1924. (47) Wilke, *Diss.*, *Halle*, 09.

CRYSTALLOGRAPHY OF COMPOUNDS OF CARBON

George L. Keenan and Raymond M. Hann

Standard arrangement. For abbreviations, *see* p. 100. Literature, p. 338

B-TABLE

Formula	Name	System	Class	Sign	2V	2E	Orientation	Lit.
16 *See* C-Table								
18 $SiC_{24}H_{24}N_4$	Silico tetraphenylamide	M.	Bi.	−	17° 40′		Ax. pl. b (010); X∧c = 27½° in obtuse ∠β	(G)
$SiC_{28}H_{28}$	Tetra-p-tolylsilicane	M.	Bi.	−		83° 30′	Ax. pl. ⊥b(010)	(G)
$SnC_{14}H_{20}N_2Cl_6$	p-Toluidine tin chloride	M.	Bi.	+	77°		Ax. pl. ⊥b(010); Z∧c = 19° in obtuse ∠β	(G)
23 $PbC_2H_2O_4$	Lead formate	R.	Bi.	−	70° 34′		Ax. pl. b(010); X‖c	(G)
$PbC_4H_6O_4.3H_2O$	Lead acetate	M.	Bi.	+	83° 55′		Ax. pl. b(010); Z∧c = 55° 18′ in obtuse ∠β	(G)
$PbC_{18}H_{26}O_{10}S_2.6H_2O$	Lead sulfocamphylate	R.	Bi.	−		78° 17′	Ax. pl. b(010); X‖c	(G)
27 TlC_2HO_4	Thallium acid oxalate	M.	Bi.	+		74° 5′ (red)	Ax. pl. ⊥b(010)	(G)
$TlC_2HO_4.\frac{1}{2}H_2O$	Thallium acid oxalate	M.	Bi.	+		106° 5′ (red)	Ax. pl. b(010); Z∧c = 79° 36′ (red) in obtuse ∠β	(G)
$Tl_2C_4H_4O_6$	Thallium mesotartrate	Tri.	Bi.	+	73° 54′			(G)
$Tl_2C_4H_4O_6.\frac{1}{2}H_2O$	Thallium tartrate	R. (?)	Bi.	−		69°	Ax. pl. b(010); X‖c	(G)
$TlC_6H_2O_7N_3$	Thallium picrate	M.	Bi.				Ax. pl. b(010)	(G)
$Tl_2C_4H_4O_6$	Thallium dl-tartrate	M.	Bi.	+	88° 22′		Ax. pl. b(010); Z∧c = 84° 44′ in obtuse ∠β	(G)
$Tl_2C_4H_4O_6$	Thallium tartrate	Trig.	Un.	+				(G)
$TlC_4H_4O_7Sb.H_2O$	Thallium antimonyl tartrate	R.	Bi.	−		20°–25°		(G)
28 $ZnC_4H_6O_4.3H_2O$	Zinc acetate	M.	Bi.	+	84° 30′		Ax. pl. b(010); Z∧c = 54.75° in acute ∠β	(G)
$ZnC_8H_{14}O_4$	Zinc butyrate	M.	Bi.	+		Large		(37)
$ZnC_{20}H_{36}O_8$	Zinc methylethylvalerate	?	Bi.					(37)
$ZnC_5H_3O_4Br.8H_2O$	Zinc bromomesaconate	M.	Bi.	−	71° 21′	118° 15′	Ax. pl. ⊥b(010); X∧c = 14° in obtuse ∠β	(G)
$ZnC_{10}H_6O_6S_2.6H_2O$	Zinc naphthalene-1, 5-disulfonate	M.	Bi.		58° 16′		Ax. pl.‖(010); η_α∧c = 74°	(41)
$ZnC_{20}H_{32}N_2I_4$	Phenyldimethylethylammonium zinc iodide.	M.	Bi.	+	86° 52′		Ax. pl. ⊥b(010); Z∧c = 43° in acute ∠β	(G)
$ZnC_9H_{22}ON_2Cl_4.3H_2O$	Triacetonediamine hydrochloride zinc chloride	M.	Bi.	+	36° 14′	58° 20′	Ax. pl. ⊥b(001); Z∧c = 49° in obtuse ∠β	(G)
30 $HgC_2H_8NI_3$	1, 1-Dimethylammonium mercuric iodide	M.	Bi.	−	Large			(16)
$HgC_3H_9NI_2$	1, 1-Trimethylammonium mercuric iodide	R.	Bi.	−	Large			(16)
$HgC_4H_{12}NI_3$	1, 1-Diethylammonium mercuric chloride	R.	Bi.	+	Very large			(16)
$CuC_2H_2O_4.4H_2O$	Cupric formate	M.	Bi.	−	34° 54′	55° 6′	Ax. pl. b(010); X∧c = 23° 35′ in obtuse ∠β	(G)
$CuC_{10}H_6O_6S_2.6H_2O$	Copper naphthalene-1, 5-disulfonate	M.	Bi.				Ax. pl.‖(010); η_α∧c = 75°	(14)

	Formula	Name	System	Class	Sign	2V	2E	Orientation	Lit.
32	$AgC_4H_4O_3N_4$	Ethylene dicyanide silver nitrate	R.	Bi.	−	42° 36.5′		Ax. pl. c(001); X‖b	(G)
	$AgC_4H_4O_{12}N_6$	Ethylene dicyanide silver nitrate	R.	Bi.	−	42° 41′		Ax. pl. c(001); X‖a	(G)
	$AuC_{14}H_{14}SCl$	Gold dibenzylsulfine chloride (metastable form)	Tet.	Un.					(G)
	$AuC_5H_{12}NCl_4$	Piperidine chloroaurate	R.	Bi.	+		70° 40′	Ax. pl. b(010); Z‖c	(G)
	$AuC_5H_{12}O_2NCl_4.H_2O$	δ-Aminovaleric acid chloroaurate	M.	Bi.	−		70° (apprx.)	Ax. pl. ⊥b(010); X∧c = 91.5° in obtuse ∠β	(G)
	$AuC_9H_{16}NCl_4$	3, 4, 5, 6-Tetramethyl-1, 2-dihydropyridine hydrochloride chloroaurate	M.	Bi.	+		91° (apprx.)	Ax. pl. ⊥b(010)	(G)
	$K_3IrC_2O_4Cl_4.H_2O$	Iridium tetrachloro tripotassium oxalate	R.	Bi.	−		94° 40′	Ax. pl. (010); Bx_a ⊥(001)	(32)
37	$PtC_2H_{12}N_2Cl_6$	Methylammonium chloroplatinate	C.						(21)
	$PtC_{10}H_{12}N_2Cl_6$	Pyridine chloroplatinate	Tri.	Bi.	−		59° 54′	Ax. pl. nearly ⊥c-axis	(G)
	$PtC_{10}H_{28}O_2N_2Cl_6$	Choline chloroplatinate	M.	Bi.	+		25° 52′	Ax. pl. ⊥b(010); Z∧c = 75° 12′ in acute ∠β	(G)
	$PtC_{12}H_{16}N_2Cl_6$	α-Picoline chloroplatinate	M.	Bi.	−		93° 13.5′	Ax. pl. b(010)	(G)
	$PtC_{12}H_{22}N_8Cl_6$	1-Phenyl-3-imino-5-methyl triazoline chloroplatinate	M.	Bi.				Ax. pl. b(010); Z nearly ⊥c(001)	(G)
	$PtC_{12}H_{24}O_4N_2Cl_6.2H_2O$	Pipecolinic acid chloroplatinate	M.	Bi.	−		66° 56′	Ax. pl. b (010)	(G)
	$PtC_{12}H_{28}O_4N_2Cl_6$	α-Homobetaine chloroplatinate	M.	Bi.	+	88° 12′		Ax. pl. b(010); Z∧c = 99° in obtuse ∠β	(G)
	$PtC_{14}H_{20}N_2Cl_6$	Ethyl pyridine chloride chloroplatinate	R.	Bi.	−		44°	Ax. pl. a(100); X‖c	(G)
	$PtC_{14}H_{36}N_2Cl_6$	Dipropyl carbinol amine chloroplatinate	M.	Bi.	−		72° 40′	Ax. pl. ⊥b(010); X nearly ⊥c (001)	(G)
	$PtC_{16}H_{32}O_2N_2Cl_6$	Tropanine chloroplatinate	M.	Bi.		52° 12′		Ax. pl. ⊥b(010)	(G)
	$PtC_{18}H_{32}N_2Cl_6$	Tropidine chloromethylate chloroplatinate	R.	Bi.	+		70°	Ax. pl. b(010); Z‖c	(G)
	$PtC_{18}H_{40}N_2Cl_6$	Ethyldipropyl ammonium chloroplatinate	R.	Bi.			61° 26′	Ax. pl. c(001); Z‖a	(G)
	$PtC_{20}H_{36}N_2Cl_6$	Anhydrolupinin chloroplatinate (stable mod.)	M.	Bi.			38° (apprx.)	Ax. pl. ⊥b(010)	(G)
	$PtC_{22}H_{36}N_2Cl_6$	Diethyl-*p*-toluidine chloroplatinate	R.	Bi.	+	63° 0′		Ax. pl. a(100); Z‖b	(G)
39	$RuN_5H_{16}O_3Cl_3$	Ruthenium ammonium chloral hydrate	M.	Bi.		56° 20′			(L-B)
	$MnC_{12}H_4O_{14}N_6.5H_2O$	Manganese picrate	R.	Bi.	−		15° 30′	Ax. pl. b(010); X‖c	(G)
43	$FeC_{12}H_4O_{14}N_6.5H_2O$	Ferrous picrate	R.	Bi.	−		24° 48′	Ax. pl. a(100); X‖c	(G)
	$FeC_{15}H_{21}O_6$	Ferriacetylacetone	R.	Bi.	−		50° (apprx.)	Ax. pl. a(100); X‖c	(G)
	$FeC_{20}H_{14}O_6S_2.6H_2O$	Ferrous naphthalene-β-sulfonate		Bi.	+				(1)
44	$CoC_4H_6O_4.4H_2O$	Cobalt acetate	M.	Bi.	−	30° 43′	48° 12′	Ax. pl. b(010); X∧c = 53.5° in acute ∠β	(G)
	$CoC_6H_{24}N_6I_3.H_2O$	*d*-Luteo triethylenediamine cobalt iodide	R.	Bi.	+		Small	Ax. pl. (001); Bxa = b-axis	(15)
	$CoC_6H_{24}N_6I_3.H_2O$	*dl*-Luteo triethylenediamine cobalt iodide	R.	Bi.			Small	Ax. pl.(010); Bx_a = c-axis	(15)
	$CoC_{10}H_6O_6S_2.6H_2O$	Cobalt naphthalene-1, 5-disulfonate	M.	Bi.		61° 40′		Ax. pl.‖(010); η_α∧c = 72° 0.5′	(41)
	$NiC_{10}H_6O_6S_2.6H_2O$	Nickel naphthalene-1, 5-disulfonate	M.	Bi.		59° 56′		Ax. pl.‖(010); η_α∧c = 74°	(41)
49	$UC_6H_{13}O_8N$	Ammonium uranyl acetate	Tet.	Un.					(G)
	$UCdC_8H_{12}O_{10}.6H_2O$	Cadmium uranylacetate	R.	Bi.	−		57° 54′ (red)	Ax. pl. a(100)	(G)
	$UMnC_8H_{12}O_{10}.6H_2O$	Manganese uranyl acetate	R.	Bi.	−		31°	Ax. pl. a(100)	(G)
	$(UO_2)_2CoC_{12}H_{18}O_{12}.7H_2O$	Cobalt diuranyl acetate	R.	Bi.	−		103° 30′	Ax. pl. c(001)	(G)
55	$Al_2C_{12}O_{12}.18H_2O$	Mellite	Tet.	Un.					(35)
	$YtC_{12}H_{30}O_{24}S_6.18H_2O$	Yttrium ethyl sulfate	H.	Un.					(34)
	$YC_{18}H_{12}O_{15}N_3S_3.7H_2O$	Yttrium *m*-nitrobenzenesulfonate	M.	Bi.	+			Ax. pl. b(010); Z∧c = 85° in obtuse ∠β	(G)
58	$LaC_{12}H_{30}O_{24}S_6.18H_2O$	Lanthanum ethyl sulfate	H.	Un.					(34)
	$CeC_{12}H_{30}O_{24}S_6.18H_2O$	Cerium ethyl sulfate	H.	Un.					(34)
60	$PrC_{12}H_{30}O_{24}S_6.18H_2O$	Praseodymium ethyl sulfate	H.	Un.					(34)
	$NdC_{12}H_{30}O_{24}S_6.18H_2O$	Neodymium ethyl sulfate	H.	Un.					(34)
63	$SaC_{12}H_{30}O_{24}S_6.18H_2O$	Samarium ethyl sulfate	H.	Un.					(34)
	$EuC_{12}H_{30}O_{24}S_6.18H_2O$	Europium ethyl sulfate	H.	Un.					(34)
	$GdC_{12}H_{30}O_{24}S_6.18H_2O$	Gadolinium ethyl sulfate	H.	Un.					(34)
67	$DyC_{12}H_{30}O_{24}S_6.18H_2O$	Dysprosium ethyl sulfate	H.	Un.					(34)
	$ErC_{12}H_{30}O_{24}S_6.18H_2O$	Erbium ethyl sulfate	H.	Un.					(34)
	$TmC_{12}H_{30}O_{24}S_6.18H_2O$	Thulium ethyl sulfate	H.	Un.					(34)
	$YbC_{12}H_{30}O_{24}S_6.18H_2O$	Neoytterbium ethyl sulfate	H.	Un.					(34)
75	$BeC_4H_8O_8N_2$	Ammonium beryllium oxalate	M.	Bi.			27° 47′	Ax. pl. b(010); Z∧c = 37.5° in obtuse ∠β	(G)
	$Be_2C_4H_{10}O_9S_2.4H_2O$	Diethyl beryllium sulfate (basic)	Tet.	Un.					(34)
	$MgC_4H_6O_4.4H_2O$	Magnesium acetate	M.	Bi.	−	56° 34′	89° 54′	Ax. pl. b(010); X∧c = 48.25° in acute ∠β	(G)
	$MgC_6H_8O_5.2.5H_2O$	Magnesium dilactate	M.	Bi.	+		79° (apprx.)	Ax. pl. b(010)	(G)
	$MgC_6H_8O_5.6H_2O$	Magnesium *dl*-tartrate	M.	Bi.	−		102°	Bxa∧c = 30° in acute ∠β	(17)
	$MgC_{10}H_6O_6S_2.6H_2O$	Magnesium naphthalene-1, 5-disulfonate	M.	Bi.		52° 20′		Ax. pl.‖(010); η_α∧c = 73° 0.5′	(41)
77	$CaC_2O_4.H_2O$	Calcium oxalate	M.	Bi.	+	89°		Ax. pl. b(010); Z∧c = 64.25° in acute ∠β	(G)
	$CaC_2H_2O_4$	Calcium formate	R.	Bi.	+	26° 47′	41° 2′	Ax. pl. b(010); Z‖a	(G)
	$CaC_3H_2O_4.2H_2O(?)$	Calcium malonate	?	Bi.	+		moderate		(37)
	$CaC_4H_2O_4.2H_2O$	Calcium fumarate	R.	Bi.	−	22° 24′	37° (apprx.)	X = a, Y = b, Z = c	(38)
	$CaC_4H_2O_4.H_2O$	Calcium maleate	R.	Bi.	−	77° 36′ (calc.)	164° (calc.)	X = c, Y = a, Z = b	(38)

Mg	Mn	Mo	N	Na	Nb	Nd	Ni	O	Os	P	Pb	Pd	Pr	Pt	Ra	Rb	Rh	Ru	S	Sa	Sb	Sc	Se	Si	Sn	Sr	Ta	Tb	Te	Th	Ti	Tl	Tm	U	V	W	Y	Yb	Zn	Zr
76	42	47	11	82	51	61	45	1	35	12	23	41	60	37	80	84	40	39	8	63	14	56	9	18	22	78	52	66	10	24	19	27	70	49	50	48	57	71	28	21

Formula	Name	System	Class	Sign	2V	2E	Orientation	Lit.
$CaC_4H_4O_3.3H_2O$	Calcium malate	R.	Bi.	+			Ax. pl. b(010); Z∥a	(37)
$CaC_4H_4O_4.3H_2O$	Calcium succinate	?	Bi.			Very large		(37)
$CaC_4H_4O_6.3H_2O$	Calcium mesotartrate	M.	Bi.	−(?)		Very large	Ax. pl. b(010)	(G, 37)
$CaC_8H_{10}O_4$	Calcium crotonate	(?)	Bi.	−				(37)
$CaC_8H_{10}O_{10}.6H_2O$	Calcium acid malate	R.	Bi.	+		109° 6′ (red)	Ax. pl. a(100); Z∥c	(G)
$Ca_2C_{12}H_6O_{12}$	Calcium aconitate	?	Bi.			100° (apprx.)		(37)
$Ca_3C_{12}H_{10}O_{14}.4H_2O$	Calcium citrate	?	Bi.					(37)
$CaC_8H_4O_{10}N_2.(?)H_2O$	Calcium nitrotetronate(?)	M.	Bi.		32° 26′		Ax. pl. ⊥b(010); Z nearly ⊥a (100)	(G)
$Ca_2PbC_{18}H_{30}O_{12}$	Dicalcium lead propionate	Tet.	Un.	+				(G)
$CaPbC_{62}H_{106}O_{36}.12H_2O$	Tetracalcium butyrate pentalead propionate	C.						(G)
$CaCuC_8H_{12}O_8.6H_2O$	Calcium cupric acetate	Tet.	Un.					(G)
78 $SrC_2H_2O_4$	Strontium formate	R.	Bi.	+	74° 14′	143° 36′	Ax. pl. a(100); Z∥b	(G)
$SrC_2H_2O_4.2H_2O$	Strontium formate	R.	Bi.	−	66° 59.33′	114° 8′	Ax. pl. b(010); X∥c	(G)
$SrC_2H_4O_6S_2.H_2O$	Strontium disulfonate	M.	Bi.			Large	Ax. pl. ⊥(010)	(6)
$SrC_4H_{10}O_8S_2.2H_2O$	Strontium ethyl sulfate	M.	Bi.		75° 4′		Ax. pl. ⊥b(010); Z∧c = 70° in acute ∠β	(G)
$SrC_8H_4O_{10}N_2.(?)H_2O$	Strontium nitrotetronate	M.	Bi.		30° 23′		Ax. pl. b(010); X⊥a(100)	(G)
$SrC_8H_8O_{14}Sb_2$	Strontium antimonyl tartrate	H.	Un.	−				(G)
$Sr_2CuC_4H_4O_8$ $8H_2O$	Cupric strontium formate	Tri.	Bi.		72° 4′			(L-B)
$SrCa_2C_{18}H_{30}O_{12}$	Dicalcium strontium propionate	Tet.	Un.	+				(G)
79 $BaC_2H_2O_4$	Barium formate	R.	Bi.	+	77° 54.33′		Ax. pl. b(010); Z∥a	(G)
$BaC_4H_4O_6.5H_2O$	Barium *dl*-tartrate	M.	Bi.	+	93° 1′		Ax. pl. ⊥b(010)	(G)
$BaC_4H_6O_4.H_2O$	Barium acetate	Tri.	Bi.					(18)
$BaC_6H_{10}O_4.H_2O$	Barium propionate	R.	Bi.	−	81° 36′		Ax. pl. a(100); X∥b	(G)
$BaC_{12}H_{22}O_{14}.(?)H_2O$	Barium *d*-galactonate	M.	Bi.			77° 37′	Ax. pl. ⊥b(001); Z∥b	(G)
$BaC_{16}H_{18}O_6.4H_2O$	Barium methyluvinate	R.	Bi.		88° 12′		Ax. pl. a(100); Z∥b	(G)
$BaC_6H_4O_6S_2.2H_2O$	Barium *m*-benzenedisulfonate	R.	Bi.		62° 19′ (red)		Ax. pl. a(100); Z∥c	(G)
$BaC_6H_4O_7S_2.4H_2O$	Barium phenol-2, 4-disulfonate	M.	Bi.	−	61° 58′		Ax. pl. ∥a(100); X∧c = 5° 20′ in acute ∠β	(G)
$BaC_2H_2N_8.3.5H_2O$	Barium tetrazole	R.	Bi.			40° (apprx.)	Ax. pl. a(100); Z∥c	(G)
$BaC_6H_2O_8N_2S.3.5H_2O$	Barium dinitrophenol sulfonate	M.	Bi.	−		72° 13′	Ax. pl. b(010); X∧c = 77° in acute ∠β	(G)
$BaC_6H_8O_6N_2.2H_2O$	Barium methyloxaminate	M.	Bi.	+		40° (apprx.)	Ax. pl. b(010); Z∧c = 8° in obtuse ∠β	(G)
$BaC_{10}H_{10}O_4N_4.1.5H_2O$	Barium methylpyrazole carbonate	Tri.	Bi.		56° 42′		Ax. pl. ⊥b(010)(apprx.)	(G)
$BaC_{12}H_{24}O_8P_2.2H_2O$	Barium diacetonephosphinate	R.	Bi.	+		122° 44′	Ax. pl. b(010); Z∥c	(G)
$BaC_{26}H_{20}O_8N_2S_2$	Barium *p*-amidobenzophenone-*p*-sulfonate	M.					Ax. pl. ∥(010)	(5)
$BaCdC_4H_4O_8.2H_2O$	Barium cadmium formate	M.	Bi.	+	67° 36′	117°	Ax. pl. ⊥b(010); Z∧c = 46° 23′ in acute ∠β	(G)
$Ba_2CuC_6H_6O_{12}$	Barium copper formate	R.	Bi.	+		79°	Ax. pl. b(010)	(G)
$BaCa_2C_{18}H_{30}O_{12}$	Dicalcium barium propionate	C.						(G)
81 $LiC_4H_5O_5.5H_2O$	Monolithium malate	M.	Bi.	−		100°	Ax. pl. b(010)	(G)
$Li_2C_{10}H_6O_6S_2.2H_2O$	Lithium naphthalene-1, 5-disulfonate	M.	Bi.		23°		Ax. pl. ⊥(010)	(41)
$LiC_4H_8O_6N.H_2O$	Ammonium lithium tartrate	R.	Bi.	+	87° 6′			(G)
$LiC_4H_8O_6N.H_2O$	Lithium ammonium *dl*-tartrate	M.	Bi.	+	81° 42′		Ax. pl. b(010); Z∧c = 76.5° in obtuse ∠β	(G)
$LiTlC_4H_4O_6.H_2O$	Lithium thallium tartrate	R.	Bi.	+		24° 40′ (red)	Ax. pl. c(001)(red); Z∥b	(G)
$Li_6Cr_2C_{12}O_{24}.18(?)H_2O$	Lithium chromic oxalate	R.	Bi.	−		95° 26′	Ax. pl. b(010); X∥c	(G)
$LiUO_2C_6H_9O_6.5H_2O$	Lithium uranyl acetate	M.	Bi.	−		65° 14′	Ax. pl. b(010); X∧c = 12° in obtuse ∠β	(G)
$Li_6Al_2C_{12}O_{24}.12H_2O$	Lithium aluminium oxalate	Tri.	Bi.	−		100° 30′	Ax. pl. ⊥b(010)	(G)
82 $NaC_2H_3O_2.3H_2O$	Sodium acetate	M.	Bi.	−	62° 50′		Ax. pl. ⊥b(010); X∧c = 44° in acute ∠β	(G)
$NaC_3H_3O_4.H_2O$	Sodium acid malonate	R.	Bi.	−	39° 20′	55° 21′	Ax. pl. a(100); X∥c	(G)
$NaC_4H_5O_6.H_2O$	Sodium *dl*-tartrate	R.	Bi.	+	51° 31′ (red)	83° 34′ (red)	Ax. pl. a(100); Z∥c	(G)
$NaC_4H_7O_4$	Sodium diacetate	C.						(G)
$NaC_5H_5O_4$	Sodium citraconate	M.	Bi.	−	53° 25′ (red)		Ax. pl. b(010)	(G)
$NaC_8H_5O_4$	Sodium acid phthalate	R.	Bi.			30° (apprx.)	Ax. pl. c(001)	(G)
$NaC_{15}H_{19}O_4.3.5H_2O$	Sodium santonate	R.	Bi.	−		51° 46′	Ax. pl. a(100); X∥b	(G)
$NaC_{15}H_{21}O_4.3H_2O$	Sodium hydrosantonate	R.	Bi.	+		37° 24′ (red)	Ax. pl. a(100); Z∥c	(G)
$NaC_6H_5O_4S.2H_2O$	Sodium *p*-phenolsulfonate	M.	Bi.	+	69° 58′	125° 47′	Ax. pl. b(010); Z∧c = 9° in obtuse ∠β	(G)
$NaC_7H_5O_5S.2H_2O$	Sodium *m*-sulfobenzoate	Tri.	Bi.	−		86° 7′	X⊥b(010)	(G)
$NaC_8H_9O_3S$	Sodium *p*-xylenesulfonate	R.	Bi.	−		27° 46′	Ax. pl. c(001); X∥b	(G)
$Na_2C_2H_4O_6S_2.2H_2O$	Sodium ethane disulfonate	M.	Bi.			Large	Ax. pl. (010)	(6)
$Na_2C_{10}H_6O_6S_2.2H_2O$	Sodium naphthalene-1, 5-disulfonate	M.	Bi.	−	24° 0.5′		Ax. pl. ⊥(010)	(41)
$Na_2CH_2O_4N_4$	Sodium diisonitramidomethane	M.	Bi.	−	89° 20′		Ax. pl. b(010); X∧c = 43.66° in acute ∠β	(G)

Formula	Name	System	Class	Sign	2V	2E	Orientation	Lit.
$NaC_4H_5O_4N.H_2O$	Sodium aspartate	M.	Bi.			31° 30′	Ax. pl. b(010); Z∧c = 51° in acute ∠β	(G)
$NaC_4H_8O_6N.H_2O$	Sodium ammonium *dl*-tartrate	M.	Bi.	−	44° 20′		Ax. pl. ⊥b(010)	(G)
$NaC_4H_8O_6N.4H_2O$	Sodium ammonium tartrate	R.	Bi.	−	59° 52′	96° 30′	Ax. pl. a(100); X∥c	(G)
$NaTlC_4H_4O_6.4H_2O$	Sodium thallium tartrate	R.	Bi.	−		75° 49′-76° 47′ (red)	Ax. pl. a(100); X∥c	(G)
$NaC_5H_8O_4N$	Sodium acid glutamate	M.	Bi.		63° 3.5′		Ax. pl. ⊥b(010); Z⊥γ(10$\bar{2}$)	(G)
$NaC_6H_6O_3NS.2H_2O$	Sodium sulfanilate	R.	Bi.	+	65° 24′	115° 24′	Ax. pl. b(010); Z∥c	(G)
$NaC_{10}H_8O_3NS.4H_2O$	Sodium naphthalenesulfonate (stable)	M.	Bi.	+	69° 10′		Ax. pl. b(010); Z∧c = 3° 35′ in acute ∠β	(G)
$NaTl_3C_8H_8O_{12}$	Sodium trithallium tartrate	R.	Bi.	+		75° 40′	Ax. pl. c(001); Z∥b	(G)
$NaCuC_{18}H_{27}O_{24}.9H_2O$	Sodium cupric triuranyl acetate	M.	Bi.	+		90° 50′	Ax. pl. ⊥b(010)	(G)
$Na_6Fe_2C_{12}O_{24}.10H_2O$	Sodium ferric oxalate	M.	Bi.	−	30° 0′	46° 53′	Ax. pl. b(010); X∧c = 12° in obtuse ∠β	(G)
$Na_3Cr_2C_{12}H_{12}O_{24}N_3.7H_2O$	Sodium ammonium chromic oxalate	M.	Bi.	−		98° 20′	Ax. pl. ⊥(010)	(G)
$NaUC_6H_9O_8$	Sodium uranyl acetate	C.						(G)
$NaU_3MnC_{18}H_{27}O_{24}.9H_2O$	Sodium manganese triuranyl acetate	M.	Bi.	−		105° 30′	Ax. pl. ⊥b(010); X∧c = 70.5° in obtuse ∠β	(G)
$Na_3Al_2C_6H_{12}O_{12}N_3.7H_2O$	Sodium ammonium aluminium oxalate	M.	Bi.	−		134°	Ax. pl. ⊥b(010); X∧c = 76° in obtuse ∠β	(G)
$Na_3Al_2C_{12}H_{12}O_{24}N_3.7H_2O$	Sodium ammonium aluminium oxalate	M.	Bi.					(31)
$Na_6Al_2C_{12}O_{24}.10H_2O$	Sodium aluminium oxalate	M.	Bi.	−		83° 30′	Ax. pl. b(010); X∧c = 7.5° in obtuse ∠β	(G)
$Na_{24}Al_{22}C_{22}H_{300}O_{99}N_{42}$	Ammonium sodium aluminium oxalate	Tri.	Bi.	−		138°	Ax. pl. ⊥(001); Bx_a⊥(001)	(31)
$NaLiC_4H_4O_6.2H_2O$	Sodium lithium *dl*-tartrate	M.	Bi.	−	68° 57′ (red)		Ax. pl. b(010); X∧c = 34.5° in obtuse ∠β	(G)
83 $K_2C_2O_4.H_2O$	Potassium oxalate	M.	Bi.	−	82°	156°	Ax. pl. b(010); X∧c = 40° 45′ in obtuse ∠β	(G)
KC_2HO_4	Potassium acid oxalate	M.	Bi.	−	40°	64′	Ax. pl. ⊥b(010); X⊥c(100)	(G)
$KC_2HO_4.H_2O$	Potassium acid oxalate	R.	Bi.	−		75° 40′	Ax. pl. c(001); X∥b	(G)
$KC_4H_5O_4$	Potassium acid succinate	M.	Bi.			113°	Ax. pl. ⊥b(010)	(G)
$KC_4H_5O_4.2H_2O$	Potassium acid succinate	R.	Bi.				Ax. pl. c(001); Z∥a	(G)
$KC_4H_5O_6$	Potassium acid tartrate	R.	Bi.	−		161° 40′	Ax. pl. c(001); X∥b	(G)
$KC_8H_{11}O_8$	Potassium acid disuccinate	M.	Bi.	−		122° 50′	Ax. pl. ⊥b(010); X∧c = 44° in obtuse ∠β	(G)
$K_2C_4H_4O_6.\frac{1}{2}H_2O$	Potassium tartrate	M.	Bi.	−	62°	102° 16′ (red)	Ax. pl. ⊥b(010)	(G)
$K_2C_4H_4O_6.2H_2O$	Potassium *dl*-tartrate	M.	Bi.	−		130° 2′ (red)		(G)
$K_4C_6H_2O_{12}.2H_2O$	Potassium tetraoxalate	R.	Bi.	−			Bx_a⊥(001)	(12)
$K_6C_{12}O_{12}.9H_2O$	Potassium mellitate	R.	Bi.	−		73° 30′	Ax. pl. b(010); X∥c	(G)
KCH_3O_4S	Potassium formaldehyde sulfite	M.	Bi.	+		98° 18′	Ax. pl. b(010)	(G)
$KC_6H_5O_4S$	Potassium phenolsulfonate	R.	Bi.	+	69° 4′ (apprx.)		Ax. pl. c(001); Z∥b	(G)
$KC_6H_5O_4S.2H_2O$	Potassium phenolsulfonate	R.	Bi.	+			Ax. pl. a(100); Z∥c	(G)
$KC_6H_5O_4S$	Potassium phenylsulfate	R.	Bi.	+		87° 58′	Ax. pl. b(010); Z∥c	(G)
$KC_7H_7O_3S.H_2O$	Potassium *p*-toluenesulfonate	R.	Bi.	−	67° 4′		Ax. pl. a(100); X∥b	(G)
$K_2CH_2O_6S_2$	Potassium methanedisulfonate	M.	Bi.		72°		Ax. pl. ⊥b(010); Z∧c = 41° in obtuse ∠β	(G)
$K_2C_6H_4O_6S_2.H_2O$	Potassium *m*-benzenedisulfonate	M.	Bi.			96° (apprx.)	Ax. pl. ⊥b(010)	(G)
$K_2C_6H_4O_7S_2.H_2O$	Potassium phenoldisulfonate	R.	Bi.	−	65° 35′		Ax. pl. b(010); X∥a	(G)
$KC_6H_4O_3SCl$	Potassium *p*-chlorobenzenesulfonate	M.	Bi.		81° 25′ (red)		Z∥b	(G)
$K_2C_{10}H_6O_6S_2.2H_2O$	Potassium napthalene-1, 5-disulfonate	M.	Bi.		38° 50′		Ax. pl. ⊥(010); η_α∧c = 78°	(41)
$KC_8H_6O_3N$	Potassium phthalaminate	R.	Bi.	−		21° 2′	Ax. pl. b(010); X∥a	(G)
$KC_7H_3O_6N_2$	Potassium 3, 5-dinitrobenzoate	M.	Bi.	−		55° 25′	Ax. pl. b(010); X∧c = 65° in acute ∠β	(G)
$KC_6H_2O_7N_3$	Potassium picrate	R.	Bi.	−	33° 34′	67° 39′	Ax. pl. a(100); X∥c	(G)
$KC_5H_2N_4O_6$	Potassium acid uroxanate		Bi.					(21)
$KC_4H_4O_7Sb.H_2O$	Potassium antimonyl tartrate	R.	Bi.	−	42° 34′	72° 50′	Ax. pl. c(001); X∥b	(G)
$K_3IrC_4O_8Cl_2.H_2O$	Potassium iridium chloroxalate	M.	Bi.	+	76° 23′		Ax. pl. b(010); Z∧c = 13° 53′ in obtuse ∠β	(G)
$K_2PtC_2O_8N_2.H_2O$	Potassium platino nitrito oxalate	M.	Bi.		89° 40′		Ax. pl. ⊥b(010)	(G)
$K_6Fe_2C_{12}O_{24}.6H_2O$	Potassium ferric oxalate	M.	Bi.	−	80° 4′ (red)		Ax. pl. b(010); X∧c = 1.25° in obtuse ∠β	(G)
$K_2NiC_4O_4S_4$	Potassium nickel dithioxalate	M.	Bi.					(27)
$KCaC_8H_8O_{17}Sb_2N.H_2O$	Calcium antimonyl tartrate potassium nitrate	R.	Bi.			64° 1′	Ax. pl. a(100); Z∥b	(G)
$KLiC_2H_4O_6S_2.H_2O$	Lithium potassium ethanedisulfonate	M.	Bi.			82°	Ax. pl. (010); Bx_a ⊥(001) = 41° in obtuse ∠β	(6)
$KLiC_4H_4O_6.H_2O$	Lithium potassium tartrate	R.	Bi.	−	73° 58′		Ax. pl. b(010); X∥a	(G)
$KNaC_4H_4O_6.4H_2O$	Sodium potassium tartrate	R.	Bi.	+	69° 40′	117° 2′	Ax. pl. b(010); Z∥a	(G)
$KNaC_8H_8O_{16}SbN.H_2O$	Potassium antimonyl tartrate sodium nitrate	R.	Bi.	−		90° 45′	Ax. pl. c(001); X∥a	(G)
$KNaC_{16}H_{16}O_{28}SbN.2H_2O$	Potassium antimonyl tartrate sodium nitrate	R.	Bi.	−		88° 37′	Ax. pl. b(010); X∥a	(G)
$K_3NaIrC_2O_8Cl_2.2H_2O$	Potassium sodium iridium chloronitrito oxalate	R.	Bi.	+		63° 24′	Ax. pl. a(100); Z∥b	(G)

Formula	Name	System	Class	Sign	2V	2E	Orientation	Lit.
84 $Rb_2C_4H_4O_6.2H_2O$	Rubidium *dl*-tartrate	M.	Bi.	−	56° 6′		Ax. pl. b(010); X ∧ c = 82° 18′ in acute ∠β	(G)
$Rb_2C_4H_4O_6.H_2O$	Rubidium mesotartrate	Tri.	Bi.	−	75° 18′		Ax. pl. 19° with c-axis	(G)
$Rb_6Al_2C_{12}O_{24}.6H_2O$	Rubidium aluminium oxalate	M.	Bi.	−	80° 22′		Ax. pl. (010)	(G)
$RbLiC_4H_4O_6.H_2O$	Lithium rubidium tartrate	R.	Bi.	−	57° 10′ (red)		Ax. pl. c(001); X∥a	(G)
$Rb_3Na_3Cr_2C_{12}O_{24}.7H_2O$	Sodium rubidium chromic oxalate	M.	Bi.	−		56°	Ax. pl. b(010); X ⊥ c(001)	(G)
$Rb_{14}Na_{10}Al_8C_{48}O_{96}.23H_2O$	Sodium rubidium aluminium oxalate	M.	Bi.	−		24° 30′	Ax. pl. b(010); X ⊥ (001)	(G)

ℭ-TABLE

Index No.	Formula	Name	System	Class	Sign	2V	2E	Orientation	Lit.
21	CHI_3	Iodoform	H.	Un.	−				(G)
55	CH_4ON_2	Urea	Tet.	Un.					(G)
58	CH_4N_2S	Thiourea	R.	Bi.	−		69° 54′-70° 59′	Ax. pl. a(001); X∥b	(G)
64.1	CH_5O_3As	Methyl arsenate	M.	Bi.	−	14° 24′		Ax. pl. ⊥b(010); X ∧ c = 53° 20′ in acute ∠β	(G)
70	$CH_5O_4N_3$	Urea nitrate	M.	Bi.	−		23° 10′	Ax. pl. b(010); X ⊥ c(001)	(G)
	$CH_{10}O_6N_2S$	Ammonium methanedisulfonate	M.	Bi.	−	79° 34′		Ax. pl. ⊥b(010); X ∧ c = 39° in obtuse ∠β	(G)
84.1	$C_2Cl_4Br_2$	1, 2-Dibromo-1, 1, 2, 2-tetrachloroethane	R.	Bi.	−		87° 45′	Ax. pl. a(100); X∥c	(G)
87	C_2Br_6	Hexabromoethane	R.	Bi.	−		79° 30′	Ax. pl. a(100); X∥c	(G)
92	C_2Cl_6	Hexachloroethane	R.	Bi.	−		66° 28′	Ax. pl. a(100)	(G)
	$C_2O_2N_2I_2$	Diiodofuroxane	R.	Bi.		63° 38′		Ax. pl. c(001); Z∥a	(G)
147	$C_2H_2O_4$	Oxalic acid	R.	Bi.	+			Ax. pl. c(001); Z∥b	(G)
	$C_2H_2O_4.2H_2O$	Oxalic acid	M.	Bi.	−	68°		Ax. pl. ⊥b(010); X∥b	(G)
161	$C_2H_3O_2Cl_3$	Chloral hydrate	M.	Bi.	−	20° 48′	35° (apprx.)	Ax. pl. b(010); X ∧ c = 58° 45′ in obtuse ∠β	(G)
238	C_2H_5ON	Acetamide (Unst. mod.)	?	Bi.			120° (apprx.)		[37]
238	C_2H_5ON	Acetamide (St. mod.)	Trig.	Un.	−				(G)
248	$C_2H_6O_4N.H_2O$	Ammonium hydrogen oxalate	R.	Bi.	−		22° 32′	Ax. pl. a(100); X∥c	(G)
	$C_2H_6O_2NCl$	Glycocoll hydrochloride	R.	Bi.	−		63° 50′	Ax. pl. a(100); X∥b	(G)
303	$C_2O_4H_8N_2.H_2O$	Ammonium oxalate	R.	Bi.	−	61° 44′	110° 8′	Ax. pl. a(100); X∥c	(G)
306	$C_2H_{10}N_2Cl_2$	Ethylenediamine hydrochloride	M.	Bi.	−	81° 4′		Ax. pl. b(010); X ∧ c = 6° in acute ∠β	(G)
308.1	$C_3N_3Cl_3$	Cyanuric trichloride	M.	Bi.			28°	Ax. pl. ⊥b(010)	(G)
313.1	$C_3H_2ON_2Br_2$	Dibromocyanacetamide	M.	Bi.	+		29° 52′	Ax. pl. ⊥b(010); Z ∧ c = 34° in obtuse ∠β	(G)
	$C_3H_3N_2Cl$	4-Chloropyrazole	R.	Bi.	+		100° (apprx.)	Ax. pl. a(100)	(G)
	$C_3H_4O_3Br_2.H_2O$	Dibromopyroracemic acid	M.	Bi.	+		34° 9′	Ax. pl. ⊥b(010)	(G)
	$C_3H_4ON_2S$	Pseudothiohydantoin	R.	Bi.	−		81° 30′	Ax. pl. a(100); X∥b	(G)
	$C_3H_4O_3N_2S$	Pyrazol-4-sulfonic acid	Tet.	Un.					(L-B)
436	$C_3H_6O_2N_2$	Malonamide (metast. mod.)	Tet.	Un.	−				(G)
444	$C_3H_6O_3N_4$	Ammonium fulminurate	M.	Bi.					(G)
	$C_3H_7O_2N$	β-Alanine	R.	Bi.	−		70° (apprx.)	Ax. pl. c(001); X∥b	(G)
	$C_3H_{10}NBr$	Trimethyl ammonium bromide	M.	Bi.	+		50° (apprx.)	Ax. pl. (010)	(G)
	$C_3H_{10}NI$	Trimethyl ammonium iodide	M.	Bi.	+		53° (apprx.)	Ax. pl. (010)	(G)
535	$C_3H_{12}O_3N_6$	Guanidine carbonate	Tet.	Un.					(G)
	$C_4H_3O_2NBr_2$	Dibromosuccinimide	M.	Bi.	+		20° 50′	Ax. pl. b(010); Z ∧ c = 8° in obtuse ∠β	(G)
679.1	$C_4H_3O_6N.2H_2O$	Nitrotetronic acid	M.	Bi.				Ax. pl. b(010)	(G)
	$C_4H_4O_2Br_2$	*trans-α-β*-Dibromocrotonic acid	M.	Bi.			56° 1′	Ax. pl. ⊥b(010)	(G)
	$C_4H_4O_2N_2$	Mesotartaric acid nitrile	M.	Bi.	+		50° (apprx.)		(G)
	$C_4H_5O_2Cl$	α-Chlorocrotonic acid	M.	Bi.	+		68° 17′	Ax. pl. ⊥b(010); Z ∧ c = 35° in obtuse ∠β	(G)
592	$C_4H_5O_2N$(St. mod.)	Succinimide	R.	Bi.			99°	Ax. pl. (010); Bx_a ⊥(010)	[28]
602	$C_4H_6Br_4$	Butadiene tetrabromide	R.	Bi.	+		57° (apprx.)	Ax. pl. a(100); Z∥c	(G)
	$C_4H_8O_2NCl_3$	Ammonium trichloroisobutyrate	R.	Bi.	+		96°	Ax. pl. c(001)	(G)
	$C_4H_6O_3N_2S$	3-Methylpyrazole-4-sulfonic acid	M.	Bi.		53°	92°	Ax. pl. ⊥b(010); Z∥b	(G)
610	$C_4H_6O_3N_4$	Allantoin	H.	Un.					[21]
	$C_4H_6O_4Se$	Selenodiglycolic acid	M.	Bi.		78° 30′		Ax. pl. b(010); Z ∧ c = 41° in obtuse ∠β	(G)
640	$C_4H_6O_6.H_2O$	*dl*-Tartaric acid	Tri.	Bi.		67° 10′		Ax. pl. ∥p(110)	(G)
	$C_4H_7O_4N$	*dl*-Aspartic acid	M.	Bi.		81° 44′		Ax. pl. ⊥b(010)	(G)
	$C_4H_7O_5N$	Acetamide oxalate	R.	Bi.	−		25°	Ax. pl. a(100); X∥c	(G)
697.1	$C_4H_8O_2Cl_2$	Dichlorobutylene glycol	Trig.	Un.					(G)
	$C_4H_8O_7NSb.H_2O$	Ammonium antimonyl tartrate	R.	Bi.	−		130° 46′	Ax. pl. c(001); X∥b	(G)
708	$C_4H_8O_3N_2.H_2O$	Asparagine	R.	Bi.	+	l. 86° 40′ d. 87° 16′		Ax. pl. b(010); Z∥c	(G)

Index No.	Formula	Name	System	Class	Sign	2V	2E	Orientation	Lit.
709	$C_4H_8O_4N_2$	Tartramide	R.	Bi.	−		43° (apprx.)	Ax. pl. b(010); X∥a	(G)
	$C_4H_9O_4N$	Ethylamine dioxalate	M.	Bi.	−		89° 20′	Ax. pl. b(010)	(G)
776	$C_4H_9O_5N$	Ammonium hydrogen malate	R.	Bi.	−	47° 34′	75° 24′	Ax. pl. b(010); X∥c	(G)
778	$C_4H_9O_6N$	Ammonium hydrogen tartrate	R.	Bi.	−	79° 54′		Ax. pl. c(001); X∥b	(G)
786	$C_4H_9N_3O_3$	Guanidine lactate	R.	Bi.	+	79° 12′		Ax. pl. a(100); Z∥b	(G)
788	$C_4H_{10}N_4S_2$	Ethylenediamine thiocyanate	M.	Bi.	−	51°	89° 20′	Ax. pl. b(010); X∧c = 64° 30′ in obtuse ∠β	(G)
808	$C_4H_{10}O_4$	*i*-Erythrite	Tet.	Un.					(G)
	$C_4H_{12}NI$	Diethyl ammonium iodide	R.	Bi.	+		52° 15′ (apprx.)	Ax. pl. (001); Z∥a	(G)
	$C_4H_{12}O_5N_2$	Ammonium malate	R.	Bi.		47° 34′ (red)			(L-B)
835	$C_4H_{12}O_6N_2$	Ammonium tartrate	M	Bi.	−	39° 36′	64° 46′	Ax. pl. b(010); X∧c = 18° 41′ in obtuse ∠β	(G)
835.1	$C_4H_{12}O_6N_2$	Ammonium racemate	M.	Bi.	+	60° 54′		Ax. pl. b(010)	(G)
	$C_5H_3O_3Cl$	Chlorocitraconic acid	R.	Bi.	+	46° 24′ (blue)	75° 5′ (blue)	Ax. pl. b(010); Z∥c	(G)
	$C_5H_4O_4N_2.H_2O$	Pyrazole dicarboxylic acid	M.	Bi.		77°		Ax. pl. ⊥b(010); Z apprx. ⊥s(403)	(G)
868	$C_5H_4O_4$	Aconic acid	R.	Bi.	−			Ax. pl. a(100); X∥b	(G)
877	$C_5H_5O_2N$	Pyrrole-2-carboxylic acid	M.	Bi.	+	62° 7′		Ax. pl. b(010); Z∧c = 23° 45′ in obtuse ∠β	(G)
	$C_5H_6O_4N_2$	Urimidosuccinic acid	R.	Bi.	+	78° 14′		Ax. pl. a(100); Z∥c	(G)
900	$C_5H_6O_4$	Itaconic acid	R.	Bi.	+		97° 40′ (red)	Ax. pl. b(010); Z∥a	(G)
	$C_5H_7O_4Br$	Citrabromopyrotartaric acid	M.	Bi.		76°		Ax. pl. ⊥b(010); Z∧c = 62° in acute ∠β	(G)
	$C_5H_7O_3N_3$	Urimidosuccinic acid amide	M.	Bi.		79° 35′		Ax. pl. b(010)	(G)
947.1	$C_5H_8O_4$	Methyltetronic acid lactone	R.	Bi.	+		120° 10′		([14])
957	$C_5H_8O_6.H_2O$	Methyl hydrogen *d*-tartrate	R.	Bi.		60° (apprx.)		Ax. pl. a(100); Z∥c	(G)
	$C_5H_9O_2Br$	Bromohydrotiglic acid	M.	Bi.			150°		(G)
	$C_5H_9O_2N$	Hydroxypiperidone	M.	Bi.	+		92° 33′	Ax. pl. ⊥b(010); Z nearly ⊥a(100)	(G)
975.1	$C_5H_9O_3N$	α-Acetylaminopropionic acid	R.	Bi.	−	36° 9′		Ax. pl. a(100); X∥c	(G)
977	$C_5H_9O_4N$	*d*(*l*)-Glutaminic acid	R.	Bi.	−	40° 27′	66° 35′	Ax. pl. b(010); X∥a	(G)
988.1	$C_5H_{10}O_4NCl$	*d*(*l*)-Glutamic acid hydrochloride	R.	Bi.	+	70° 44′		Ax. pl. a(100); Z∥b	(G)
994.1	$C_5H_{10}O_2N_2$	Dimethylmalonamide	R.	Bi.	+		58° 27′	Ax. pl. b(001); Z∥c	(G)
996	$C_5H_{10}O_4N_2$	Amylene nitrosate	M.	Bi.	+	62° 65′	103° 53′	Ax. pl. ⊥b(010); Z∧c = 7° in obtuse ∠β	(G)
1035	$C_5H_{10}O_5$	*d*-Lyxose	M.	Bi.	−			Ax. pl. b(010)	(G)
1070.2	$C_5H_{11}O_4N$	Methyltetronamide	Not det.	Bi.	+		Large		([14])
	$C_5H_{12}NBr$	Piperidine hydrobromide	R.	Bi.			35° (apprx.)	Ax. pl. b(010); Z∥a	(G)
1075	$C_5H_{12}NCl$	Piperidine hydrochloride	R.	Bi.	−		52° 56′	Ax. pl. c(001); X∥a	(G)
1093	$C_5H_{12}O_4$	Pentaerythritol	Ditet.	Un.					(G)
	$C_5H_{13}NBr_2$	Trimethyl-bromoethylammonium bromide	M.	Bi.	+		40° 2′	Ax. pl. ⊥(010); Z∧c = 39° 30′ in acute ∠β	(G)
	$C_6O_4N_2Br_4$	1, 2, 3, 5-Tetrabromodinitrobenzene	M.	Bi.	−		45° 54′	Ax. pl. b(010); X⊥r(2̄01)	(G)
	C_6OCl_8	β-Octochlorocyclohexenone	R.	Bi.	+			Ax. pl. b(010); Z∥a	(G)
	C_6OCl_8	γ-Octochlorocyclohexenone	M.	Bi.	−	37° 38′	65° 59′	Ax. pl. b(010); X∧c = about 93° in obtuse ∠β	(G)
1120	C_6HCl_5O	Pentachlorophenol (β-mod.)	M.	Bi.	+		65° 23.5′	Ax. pl. ⊥b(010); Z∧c = 3° in acute ∠β	(G)
	$C_6H_2O_4N_2Br_2$	1, 3-Dinitro-4, 6-dibromobenzene (St. mod.)	R.	Bi.	+		56° 52′	Ax. pl. a(100); Z∥c	(G)
	$C_6H_2O_4N_2Br_2$	1, 3-D i n i t r o-4, 6-dibromobenzene (metast. mod.)	R.	Bi.	−		73° 5′	Ax.pl. ⊥b(010); X⊥a(100)	(G)
	$C_6H_2O_4N_2Br_2$	1, 2-Dinitro-4, 5-dibromobenzene	R.	Bi.	−	2H =	88° 22′	Ax. pl. a(100); X∥c	(G)
	$C_6H_2O_2NBr_3$	2, 4, 6-Tribromonitrobenzene	M.	Bi.	−		90° 13′	Ax. pl. ⊥b(010)	(G)
1142	$C_6H_2O_4N_2I_2$	1, 3-Dinitro-2, 4-diiodo-benzene	R.	Bi.	+	63° 26′		Ax. pl. a(100); Z∥c	(G)
1149	$C_6H_3O_4N_2Br$	3-Bromo-1, 2-dinitrobenzene	R.	Bi.	+	51° 30′ (red)		Ax. pl. b(010); Z∥c	(G)
1155	$C_6H_3O_2NBr_2$	3, 5-Dibromonitrobenzene	M.	Bi.	−		72° 19′	X∧c = 29° in obtuse ∠β	(G)
1155.1	$C_6H_3O_3NBr_2$	Nitrodibromophenol	M.	Bi.			70°–73°	Ax. pl. ⊥b(010)	(G)
1163	$C_6H_3O_4N_2Cl$	4-Chloro-1, 2-dinitrobenzene	M.		−		45° 31′	Ax. pl. ⊥b(010)	(G)
1165	$C_6H_3O_4N_2Cl$	α-4-Chloro-1, 3-dinitrobenzene (St. mod.)	R.	Bi.			102° 46′ (red)	Ax. pl. b(010); Z∥c	(G)
1165	$C_6H_3O_4N_2Cl$	α-4-Chloro-1, 3-dinitrobenzene (metast. mod.)	R.	Bi.	+		94° 15′	Ax. pl. a(100); Z∥b	(G)
1174.1	$C_6H_3O_3NCl_2$	4, 6-Dichloro-2-nitrophenol	M.	Bi.	−		62° 29′		(G)
	$C_6H_3O_3NI_2$	2, 6-Diiodo-4-nitrophenol	Tri.	Bi.			55° 30′		(G)
1200	$C_6H_3O_8N_5$	Tetranitroaniline	M. or Tri.	Bi.	−		120° (at least)		([37])
1216	$C_6H_4O_2NCl$	*m*-Chloronitrobenzene	R.	Bi.	−		91° 23′	Ax. pl. a(100); X∥a	(G)
	$C_6H_4O_4NSCl$	*p*-Nitrobenzenesulfonyl chloride	M.	Bi.	−		65° (apprx.)	Ax. pl. b(010); X∧c = 33° 36′ in obtuse ∠β	(G)
1243	$C_6H_4O_4S_2Cl_2$	*m*-Benzenedisulfonyl chloride	M.	Bi.	−		80° 35′	Ax. pl. b(010); X∧c = 85° in obtuse ∠β	(G)

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1274	$C_6H_4O_4N_2$	2, 3-Dinitrophenol	M.	Bi.			16°	Ax. pl. ⊥(010)	(29)
1277	$C_6H_4O_5N_2$	2, 6-Dinitrophenol	R.	Bi.	+		95° 40′	Ax. pl. b(010); Z∥a	(G)
1278	$C_6H_4O_4N_2$	3, 4-Dinitrophenol	Tri.	Bi.			65°		(29)
1377	C_6H_6NBr	*p*-Bromoaniline	R.	Bi.	+		26° 57.5′	Ax. pl. c(001); Z∥a	(G)
	$C_6H_6O_2NCl$	Nicotinic acid hydrochloride	R.	Bi.	−		96° 22′	Ax. pl. a(100); X∥c	(G)
	$C_6H_6O_2NCl$	Picolinic acid hydrochloride	R.	Bi.	−	41° 16′	73° 52′	Ax. pl. b(010); X∥c	(G)
1384	$C_6H_6Cl_6$	α-*trans*-Benzenehexachloride	M.	Bi.	+		62° 2′	Ax. pl. b(010); Z∧c = 42° 25′ in obtuse ∠β	(G)
	$C_6H_6ON_2$	Picolinamide	M.	Bi.	+		73° 20′ (red)	Ax. pl. b(010)	(G)
	$C_6H_6O_2N_2$	2-Methylpyrazine-5-carboxylic acid	R.	Bi.			35° (apprx.)	Ax. pl. a(100); Z∥c	(G)
	$C_6H_6O_4N_2S$	*p*-Nitrobenzenesulfamide	M.	Bi.		59°		Ax. pl. b(010); Z∧c = 70° in acute ∠β	(G)
1412	$C_6H_6O_7N_4$	Ammonium picrate	R.	Bi.	−		56°		(37)
1414	$C_6H_6O_2$	*o*-Dihydroxybenzene	M.	Bi.	+		58° (apprx.)	Ax. pl. ⊥b(010); Z∧c = 6°–7°	(G)
1415	$C_6H_6O_2$	Resorcinol	R.	Bi.	−	46° 14′	76° 6′	Ax. pl. c(001); X∥a	(G)
1416	$C_6H_6O_2$	Hydroquinonol	Trig.	Un.					(G)
	$C_6H_6O_3.2H_2O$	Phloroglucinol	R.	Bi.	−		63° 49′	Ax. pl. c(001); X∥a	(G)
	$C_6H_6O_3$	α-Methyl-β-hydroxy-γ-pyrone (β-mod.)	R.	Bi.			Small	Ax. pl. (001); Bx_o = b-axis	(30)
1448	C_6H_7ON	*p*-Aminophenol	R.	Bi.	−		47° 37′	Ax. pl. c(001); X∥a	(G)
	$C_6H_7O_3NS$	Phenylsulfohydroxamic acid	R.	Bi.	+		43° 29′	Ax. pl. c(001); Z∥a	(G)
	C_6H_8NBr	Aniline hydrobromide	R.	Bi.	−		35°	Ax. pl. a(100)	(G)
	$C_6H_8O_2Br_4$	Tetrabromocaproic acid	M.	Bi.	+		21° 52′	Ax. pl. ⊥b(010); Z∧c = 100° in obtuse ∠β	(G)
	$C_6H_8O_2N_2Cl_2$	1, 4-Dichloro-1, 4-dinitrosocyclohexane	M.	Bi.	+	61° 58′ (blue)	100° 15′ (white)	Ax. pl. b(010); Z∧c = 40° 30′ in acute ∠β	(G)
	$C_6H_8O_4NCl_3.2H_2O$	Ammonium trichlorodihydroxycyclopentane carboxylate	R.	Bi.			81° (apprx.)	Ax. pl. (100)	(4)
	$C_6H_8N_2$	2, 6-Dimethylpyrazine	M.	Bi.			86° (apprx.)	Ax. pl. b(010); Z∧c = 20° in obtuse ∠β	(G)
1507	$C_6H_8O_7.H_2O$	Citric acid	R.	Bi.	+	65° 42′	108° 40′	Ax. pl. a(100); Z∥a	(G)
1523	$C_6H_9O_3NS$	Ammonium benzenesulfonate	R.	Bi.	+		33° 36′	Ax. pl. a(100); Z∥c	(G)
	$C_6H_9O_3N$	Trimorpholine	M.	Bi.	+	80°		Ax. pl. b(010)	(G)
	$C_6H_9O_9N$	Acetamide dioxalate	Tri.	Bi.	−		69° 20′		(G)
	$C_6H_{10}O_4Br_2$	Inosite dibromhydrin	R.	Bi.	+	67° 30′		Ax. pl. b(010); Z∥a	(G)
	$C_6H_{10}ClNO_3$	Trimorpholine hydrochloride	M.	Bi.			50° 60′	Ax. pl. ⊥b(010) (red)	(G)
1562	$C_6H_{10}O_4$	Adipic acid	M.	Bi.	−		47° 30′	Ax. pl. b(010)	(G)
1563	$C_6H_{10}O_4$	1, 1-Dimethylsuccinic acid	M.	Bi.		16° 12′	41° 28′	Bx_a nearly ⊥(001); Ax. pl. (010)	(28)
	$C_6H_{10}O_5$	1-Glycosan (1-Glucose anhydride)	R.	Bi.	−		71° 45′	Ax. pl. a(100); X∥c	(G)
	$C_6H_{10}O_5$	*dl*-Dilactylic acid	R.	Bi.	−		65°	Ax. pl. ∥(010); Bx_a ⊥(001)	(17)
	$C_6H_{10}O_5$	Dilactylic acid	R.	Bi.	−		65° (apprx.)	Ax. pl. b(010); X∥c	(G)
	$C_6H_{10}O_5$	Isosaccharine	M.	Bi.	+		25° 19′	Ax. pl. ⊥b(010); Z∧c = 63° 15′ in obtuse ∠β	(G)
	$C_6H_{11}O_7N$	Acetamide ditartrate	M.	Bi.	−		70° 30′	Ax. pl. b(010); X∧c = 36° in acute ∠β	(G)
	$C_6H_{11}O_2N_3$	Pyrrolidine-α, α-dicarboxylic acid diamide	R.	Bi.	+		63° 30′ (apprx.)	Ax. pl. b(010); Z∥c	(G)
	$C_6H_{12}O_5N_2S_2.H_2O$	Ammonium phenol-2, 4(?)-disulfonate	M.	Bi.	+		113° 45′	Ax. pl. b(010); Z∧c = 25° 21′ in obtuse ∠β	(G)
	$C_6H_{12}O_2$	*cis-o*-Dihydroxyhexahydrobenzene	R.	Bi.	+		53° 10′	Ax. pl. b(010); Z∥c	(G)
	$C_6H_{12}O_5$	α-Methylxyloside	M.	Bi.	−	35° 14′	54° 55′	Ax. pl. b(010); X∧c = 30° in acute ∠β	(G)
1670	$C_6H_{12}O_5$	*d*-Quercitol	M.	Bi.	+		58° 1′	Ax. pl. b(010); Z∧c = 11° 46′ in acute ∠β	(G)
1672	$C_6H_{12}O_5.H_2O$	β-Rhamnose	M.	Bi.	−	58° 5′		Ax. pl. b(010)	(G)
	$C_6H_{12}O_6.2H_2O$	*d*(*l*)-Inosite	R.	Bi.	+		42° 30′	Ax. pl. a(100); Z∥c	(G)
	$C_6H_{12}O_6.2H_2O$	Dambose ("meso"-inosite)	M.	Bi.	+		47° 20′	Ax. pl. ⊥b(010); Z∧c = 17° in obtuse ∠β	(G)
	$C_6H_{13}O_5N.H_2O$	Ammonium hydrogen ethoxysuccinate	R.	Bi.			20° (apprx.)	Ax. pl. c(001); Z∥b	(G)
	$C_6H_{13}ON_2$	2-Propylantipyrine	M.	Bi.		52° 50′			(L-B)
	$C_6H_{14}O_4S_2N_2Cl_2$	Cystine hydrochloride	M.	Bi.	+		3° 16′	Ax. pl. ⊥b(010); Z⊥s(10$\bar{1}$)	(G)
1750	$C_6H_{14}O_6$	Dulcitol	M.	Bi.	−		151° 10′ (red)	Ax. pl. ⊥b(010); X∥b	(G)
1751	$C_6H_{14}O_6$	*d*-Mannitol (α-mod.)	R.	Bi.	−		100° (apprx.)	Ax. pl. c(001); X∥b	(G)
1751	$C_6H_{14}O_6$	*d*-Mannitol (β-mod.)	R.	Bi.	−		71° 30′	Ax. pl. a(100); X∥b	(G)
1752.1	$C_6H_{14}O_6.\frac{1}{2}H_2O$	Sorbitol	M.	Bi.	−		100° (apprx.)	Ax. pl. b(010); Z nearly ⊥c(001)	(G)
1769.1	$C_6H_{15}PS$	Triethylphosphine sulfide	H.	Un.	+				(G)
	$C_6H_{16}N_2Br_2.H_2O$	β-2, 5-Dimethylpiperazine hydrobromide	R.	Bi.	+		72° (apprx.)	Ax. pl. a(100); Z∥c	(G)
	$C_6H_{16}NI$	Dimethyl diethyl ammonium iodide	R.	Bi.			82°	Z∥c	(G)
	$C_7H_3O_3Cl_5$	1-Methyl-1, 3, 3, 5, 5-pentachlorocyclohexan-2, 4, 6-trione	R.	Bi.	+		15° (apprx.)	Ax. pl. a(100); Z∥c	(G)

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1789	$C_7H_3O_8N_3$	2, 4, 6-Trinitrobenzoic acid	R.	Bi.	+		84° 36′	Ax. pl. c(001); Z∥b	(G)
	$C_7H_4O_3Cl_2$	3, 5-Dichlorosalicylic acid	R.	Bi.	+		29° 15′	Ax. pl. b(010); Z∥c	(G)
1835	$C_7H_4O_6N_2$	2, 4-Dinitrobenzoic acid	M.	Bi.	−		18°	Ax. pl. (010); Bxa nearly ⊥(101)	(11)
1837	$C_7H_4O_6N_2$	2, 6-Dinitrobenzoic acid	R.	Bi.	+		103°	Ax. pl. (100); Bxa ⊥(010)	(11)
1839	$C_7H_4O_6N_2$	3, 5-Dinitrobenzoic acid	M.	Bi.	−		80° 16′	Ax. pl. b(010); X∧c = 48° in acute ∠β	(G)
	$C_7H_4O_6$	Chelidonic acid	M.	Bi.	−		40° (apprx.)	Ax. pl. ⊥b(010); X nearly ∥r(101)	(G)
1843	$C_7H_4O_7.3H_2O$	Meconic acid	R.	Bi.	−		48° 55′	Ax. pl. b(010); X∥c	(G)
1881	$C_7H_5O_2I$	*o*-Iodobenzoic acid	M.	Bi.			70° (apprx.)	Ax. pl. ⊥b(010); Bxa ∥c-axis	(G)
1903	$C_7H_5O_4N.2H_2O$	Dipicolinic acid	R.	Bi.	−		99°	Ax. pl. (001); Bx ⊥(010)	(33)
1909	$C_7H_5O_5N$	5-Nitro-2-hydroxybenzoic acid	M.	Bi.	+		105° 38′		(G)
1977	$C_7H_6N_2$	Benzimidazol	R.	Bi.	+	86° 45′		Ax. pl. c(001); Z∥b	(G)
1979	$C_7H_6N_2$	Indazole	M.	Bi.		50° (apprx.)		Ax. pl. b(010); Z∧c = 18° in obtuse ∠β	(G)
1985	$C_7H_6O_4N_2$	2, 4-Dinitrotoluene	M.	Bi.	−			Ax. pl. ⊥b(010); X∧c = 32° in acute ∠β	(G)
1987	$C_7H_6O_4N_2$	2, 6-Dinitrotoluene	R.	Bi.	−			Ax. pl. a(100); X∥c	(G)
1989	$C_7H_6O_4N_2$	3, 5-Dinitrotoluene	M.	Bi.	−		98° 4′	Ax. pl. ⊥b(010)	(G)
	$C_7H_6ON_4.H_2O$	*c*-Phenylhydroxytetrazole	R.	Bi.		60°–70°		Ax. pl. a(100); Z∥c	(G)
2074	$C_7H_7O_2N$	Anthranilic acid	R.	Bi.			78° 30′ (Hg, yellow)	Ax. pl. c(001); Z∥a; Bxa ⊥(100)	(G)
	$C_7H_7O_2N$	Benzohydroxamic acid	R.	Bi.	+		50° 2′	Ax. pl. a(100); Z∥b	(G)
	$C_7H_7O_2N.H_2O$	Pyridinebetaine	M.	Bi.	−	25° 16′		Ax. pl. b(010); X∧c = 12° 45′ in obtuse ∠β	(G)
	$C_7H_7O_4N_3$	3, 5-Dinitro-*p*-toluidine	R.	Bi.					(3)
	C_7H_8ONCl	Isobenzaldoxime hydrochloride	R.	Bi.			100° (apprx.)	Ax. pl. a(100); Z∥b	(G)
	$C_7H_8O_2NCl$	Pyridinebetaine hydrochloride	M.	Bi.	+	52° 3′	88° 8′	Ax. pl. ⊥b(010); Z∧c = 9° 27′ in acute ∠β	(G)
	$C_7H_8O_2N_3.H_2O$	Benzenylamidine nitrite	M. (?)	Bi.	−		78° 55′	Ax. pl. ∥d(010)	(G)
2174	$C_7H_8O_2$	Guaiacol	Trig.	Un.					(G)
2185	$C_7H_8O_4$	Hydrochelidonic anhydride	R.	Bi.	−		120° (apprx.)	Ax. pl. c(001); X∥a	(G)
	$C_7H_9O_5Br$	Bromo-shikimilactone	H.	Un.					(G)
	$C_7H_9N_2Cl.2H_2O$	Benzenylamidine hydrochloride	R.	Bi.			35° (apprx.)	Ax. pl. a(100); Z∥c	(G)
	$C_7H_9O_2Cl.2H_2O$	α, α-Dimethyl-γ-pyrone hydrochloride	R.	Bi.	−		90° (apprx.)	Ax. pl. a(100); X∥b	(G)
	C_7H_9ON	3-Amino-*p*-cresol	R.	Bi.	+		44° 46′	Ax. pl. a(100); Z∥c	(G)
	$C_7H_9ON.3H_2O$	2, 6-Dimethyl-4-hydroxypyridine	M.	Bi.			110° 41′	Ax. pl. b(010)	(G)
2225	$C_7H_9O_2N$	Ammonium benzoate	R.	Bi.	+		67°	Ax. pl. a(100); Z∥c	(G)
2233	$C_7H_9O_3NS$	*p*-Toluidine-2-sulfonic acid	M.	Bi.	+		87° 54′	Ax. pl. b(010); Z∧c = 8° in obtuse ∠β	(G)
2234.1	$C_7H_9O_5NS$	Ammonium *o*-sulfobenzoate	R.	Bi.	−	53° 29′	84° 39′	Ax. pl. b(010); X∥a	(G)
	$C_7H_{10}NBr$	Toluidine hydrobromide	R.	Bi.	−	82° 37′		Ax. pl. c(001); X∥b	(G)
	$C_7H_{10}O_5Br_2$	Dibromotrihydroxy tetrahydrobenzoic acid	R.	Bi.	+	76° 32′		Ax. pl. c(001)	(G)
2260.1	$C_7H_{10}O_7N_2$	Mono-uriendihydroxy dimethyl succinate	R.	Bi.		72° 15.5′		Ax. pl. b(010); Z∥c	(G)
2260.2	$C_7H_{10}O_5N_4$	Isohydroxydimethylurea	M.	Bi.	+	40° 9.5′	62° 34.25′	Ax. pl. ⊥b(010); Z∧c = 2° 15′ in acute ∠β	(G)
	$C_7H_{12}O_4N_2S.2H_2O$	2, 4-Toluylendiamine sulfate	M.	Bi.			100° (apprx.)		(G)
	$C_7H_{12}O_4$	Trimethyl succinic acid	R.	Bi.		84° 11′		Ax. pl. (100); Bxa ⊥(001)	(28)
	$C_7H_{14}O_5$	*l*-Methylrhamnoside	R.	Bi.	−	36° 11′	57° 8′	Ax. pl. b(010); X∥c	(G)
	$C_7H_{14}O_6$	α-Methyl mannoside	R.	Bi.	+	46° 58′	75°	Ax. pl. b(010); Z∥a	(G)
2372	$C_7H_{14}O_6$	α-Methyl glucoside	R.	Bi.	+	85° 18′		Ax. pl. b(010); Z∥c	(G)
2373	$C_7H_{14}O_6$	β-Methyl glucoside	Tet.	Un.					(G)
	$C_7H_{14}O_6.H_2O$	*dl*-α-Methyl galactoside	R.	Bi.	+	53° 5′	85° 45′	Ax. pl. a(100); Z∥c	(G)
	$C_8H_4O_5N_3Cl_3$	2, 4, 6-Trichloro-3-nitrobenzoic acid methyl nitramide	M.	Bi.	−		42° (apprx.)	Ax. pl. ⊥b(010); X∧c = 69° in acute ∠β	(G)
	$C_8H_5O_3N$	Isatoic acid anhydride	M.	Bi.			90° (apprx.)	Ax. pl. ⊥b(010)	(G)
	$C_8H_5O_3N$	Phthaloxime	M.	Bi.					(26)
2452	C_8H_6NBr	Bromobenzyl cyanide	Trig.	Un.					(L-B)
	$C_8H_6O_3N_2Br$	1-Nitro-3-bromo-4-acetanilide (St. mod.)	M.	Bi.	−		124° 10′	Ax. pl. ⊥b(010)	(G)
	$C_8H_6O_3Cl_4$	Tetrachlorophloroglucinol dimethyl ether	R.	Bi.	+		90° (apprx.)	Ax. pl. a(100)	(G)
	$C_8H_7O_3N_2Br$	Nitrobromoacetanilide (α-mod.)	M.	Bi.	−		124° 10′	Ax. pl. ⊥(010); Bxa nearly ⊥(001)	(2)
	$C_8H_7ONCl_2$	Dichloroacetanilide	M.	Bi.	+	83° 35′		Ax. pl. ⊥b(010); Z∧c = 61° in obtuse ∠β	(G)
2536	$C_8H_7O_6N_3$	2, 3, 6-Trinitro-*p*-xylene	M.	Bi.	−	64° 32′		Ax. pl. b(010); X∧c = 28° in obtuse ∠β	(G)

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	C_8H_8ONCl	Methylphenylurea chloride	R.	Bi.			27° 41′	Ax. pl. c(001); Z∥b	(G)
	$C_8H_8ON_4$	Methoxyphenyltetrazole	Tri.	Bi.	−	74° 48′		Ax. pl. ⊥b-axis	(G)
2556	$C_8H_8O_3N_2$	*m*-Nitroacetanilide	M.	Bi.			80° (apprx.)	Ax. pl. ⊥b(010)	(G)
2564	$C_8H_8O_4N_2$	2, 3-Dinitro-*p*-xylene	M.	Bi.	+		105° 8′	Ax. pl. ⊥b(010)	(G)
	$C_8H_8O_3N_4$	9-Allyluric acid		Un.					(21)
	$C_8H_8O_5$	Hematinic acid anhydride	R.	Bi.	+		53° (apprx.)	Ax. pl. b(010); Z∥a	(G)
	$C_8H_8O_7$	Acetylcitric anhydride	R.	Bi.	−	71° 2′	120° 10′	Ax. pl. a(100); X∥c	(G)
	$C_8H_9N_4Cl.H_2O$	Phenyliminotriazoline hydrochloride	M.	Bi.	+			Ax. pl. ⊥b(010); Z∧c = 44° in acute ∠β	(G)
	$C_8H_9O_2SCl$	Chloromethyl-*p*-tolyl sulfone	R.	Bi.	+		110° (apprx.)	Ax. pl. b(010); Z∥c	(G)
2649	C_8H_9ON	Acetanilide	R.	Bi.	+	88° 36′		Ax. pl. b(010); Z∥c	(G)
2657	$C_8H_9O_2N$	*p*-Acetaminophenol	M.	Bi.	−		90°	Ax. pl. ⊥b(010); X∥b	(G)
2681	$C_8H_9O_4N$	Biliverdic acid	M.	Bi.	−		31° (apprx.)	Ax. pl. ⊥b(010); X∧c = 55° in obtuse ∠β	(G)
	$C_8H_9O_4N_3$	2, 4-Dinitrodimethylaniline	R.	Bi.	−		23° 30′	Ax. pl. c(001); X∥a	(G)
	$C_8H_{10}O_2NCl$	Phenylglycocoll hydrochloride	R.	Bi.	−	18° 9′		Ax. pl. b(010); X∥a	(G)
	$C_8H_{10}O_2$	*p*-Hydroxyphenylethyl alcohol (Tyrosol)	R.	Bi.			84° 30′		(8)
	$C_8H_{10}O_3$	Dimethylpyrogallol	M.	Bi.	+		53° 47′	Ax. pl. ⊥b(010)	(G)
	$C_8H_{12}NBr$	Xylidine hydrobromide	R.	Bi.	−		55° 19′	Ax. pl. b(010); X∥a	(G)
	$C_8H_{12}O_2NBr$	Tetramethylsuccinic bromoimide	R.	Bi.	−		62° 15′ (Hg, yellow)	Ax. pl. (100); Bxa ⊥(001)	(28)
	$C_8H_{12}O_2NCl$	Tetramethylsuccinic chloroimide	R.	Bi.	−		47° 29′ (Hg, yellow)	Ax. pl. (010); Bxa ⊥(001)	(28)
	$C_8H_{12}O_2NCl$	Vanillylamine hydrochloride	M.	Bi.	−		70°		(23)
	$C_8H_{12}NI$	Ethylaniline hydroiodide	R.	Bi.	−		65° (apprx.)	Ax. pl. a(100); X∥c	(G)
2808.1	$C_8H_{12}O_4N_2$	Tetraacetylhydrazine	R.	Bi.	+	47° 5′	79° 33′	Ax. pl. c(001); Z∥b	(G)
	$C_8H_{12}O_4$	*trans*-Hexahydroterephthalic acid	M.	Bi.			65° (apprx.)	Ax. pl. ⊥b(010)	(G)
	$C_8H_{12}O_4$	Norpinic acid	M.	Bi.	+		7° (apprx.)	Ax. pl. ⊥b(010)	(G)
	$C_8H_{12}O_4$	Isopropylisoparaconic acid	M.	Bi.	+		51° 12′	Ax. pl. ⊥b(010); Z∧c = 83° in obtuse ∠β	(G)
	$C_8H_{14}O_6N_2$	Lysidine *d*-ditartrate	M.	Bi.	−	80° 1′		Ax. pl. b(010); X∧c = 30° in obtuse ∠β	(G)
	$C_8H_{16}O_{14}N_2Sb_2.H_2O$	Ammonium antimonyl tartrate	R.	Bi.		68° 8′			(L-B)
2915	$C_8H_{16}O_4$	Metaldehyde	Tet.	Un.					(G)
2916.1	$C_8H_{16}O_4$	*bis*-Methoxyacetol	M.	Bi.				Ax. pl. ⊥b(010)	(G)
2920	$C_8H_{16}O_6$	*d*, α-Ethyl glucoside	R.	Bi.	−	51° 14′		Ax. pl. b(010); X∥a	(G)
	$C_8H_{17}N_2Cl$	4, 4-Dimethyl-5-isopropylpyrazoline hydrochloride	M.	Bi.	−	56°	94° 40′	Ax. pl. b(010); X∧c = 21° in obtuse ∠β	(G)
	$C_8H_{17}N_2Cl$	Isobutyraldazine hydrochloride	M.	Bi.	−	56°	94° 41′	Ax. pl. b(010); X∧c = 21° in obtuse ∠β	(G)
2945	$C_8H_{18}NBr$	*d*-Coniine hydrobromide	R.	Bi.	+		45° 50′	Z∥c	(G)
2946	$C_8H_{18}NCl$	*d*-Coniine hydrochloride	R.	Bi.	+		20° 0′	Ax. pl. c(001); Z∥b	(G)
2948	$C_8H_{18}NI$	*d*-Coniine hydroiodide	M.	Bi.	−		107° 30′ (apprx.)	Ax. pl. b(010)	(G)
	$C_8H_{20}PI$	Tetraethyl phosphonium iodide	Trig.	Un.					(G)
	$C_9H_6OBr_2$	Dibromohydrindone	R.	Bi.	−		36° 29′	Ax. pl. b(010); X∥a	(G)
	C_9H_7OBr	Phenyl-α-bromoacrolein	R.	Bi.	+		39°	Ax. pl. b(010); Z∥c	(G)
	C_9H_7OCl	Phenyl-α-chloroacrolein	R.	Bi.	+		22°	Ax. pl. a(100); Z∥c	(G)
	$C_9H_8O_2Br_2$	Phenyldibromopropionic acid	M.	Bi.	+		57° (apprx.)	Ax. pl. ⊥b(010)	(G)
	$C_9H_8O_3Cl_2$	Ethyl dichlorosalicylate	R.	Bi.	−			Ax. pl. b(010); X∥c	(G)
3060	$C_9H_8N_2$	3-Aminoquinoline	R.	Bi.	−		45°	Ax. pl. c(001); X∥b	(G)
	$C_9H_8O_4$	Acetylsalicylic acid	Tri.	Bi.	−	Small		Sections ⊥Bxa; elongation = Z	(42)
	$C_9H_8O_{12}N_4$	Pentaerythritol nitrate	Tet.	Un.					(19)
	$C_9H_9O_4N_2Br$	Bromodinitromesitylene	M.	Bi.	−	42° 19′	88° 13′	Ax. pl. ⊥b(010); X∥b	(G)
	$C_9H_9Br_3$	Tribromomesitylene	Tri.	Bi.			24° 3′		(G)
	$C_9H_9O_3Cl_3$	1, 3, 5-Trimethyl-1, 3, 5-trichlorocyclohexan-2, 4, 6-trione	M.	Bi.	−		60° (apprx.)	Ax. pl. b(010)	(G)
3103	C_9H_9ON	Hydrocarbostyril	R.	Bi.	−	60° (apprx.)		Ax. pl. a(100); X∥c	(G)
	$C_9H_9O_3N$	Benzoylacetohydroxamic acid	M.	Bi.	−	47° 10′		Ax. pl. ⊥b(010); X∧c = 66° in acute ∠β	(G)
3111	$C_9H_9O_3N$	Hippuric acid	R.	Bi.	+	65° 49′		Ax. pl. c(001)	(G)
	$C_9H_9ON_3$	1-Phenyl-3-methylpyrrodiazoline	R.	Bi.	−		64° (red)	Ax. pl. b(010); X∥c	(G)
	$C_9H_{10}ON_2$	Isonitrosoanilacetone	R.	Bi.	−		41° 40′	Ax. pl. a(100); X∥c	(G)
	$C_9H_{10}O_4N_2$	Dinitromesitylene	R.	Bi.	−		50° (apprx.)	Ax. pl. a(100); X∥c	(G)
	$C_9H_{10}O_4$	Dihydrodiacetyllevulinic acid	M.	Bi.	+	74° 45′		Ax. pl. b(010); Z∧c = 5° in obtuse ∠β	(G)

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3177	$C_9H_{10}O_4$	d(l)-Phenylglyceric acid	M.	Bi.	+		19°	Ax. pl. b(010); Z∧c = 47° in acute ∠β	(G)
3178	$C_9H_{10}O_4$	dl-Phenylglyceric acid	M.	Bi.			19°	Ax. pl. (010)	(10)
3179	$C_9H_{10}O_4$	d(l)-p-Methoxymandelic acid	M.	Bi.			76° 30′ (apprx.)	Ax. pl. b(010)	(G)
	$C_9H_{11}O_3Br_3$	Tribromocincolic anhydride	R.	Bi.	+		75° (apprx.)	Ax. pl. a(100); Z‖c	(G)
	$C_9H_{11}O_4Cl$	β-Anhydrocamphoronyl chloride	R.	Bi.	+		75° (apprx.)	Ax. pl. c(001); Z‖c	(G)
3194	$C_9H_{11}ON$	o-Acetotoluide	R.	Bi.		58° 28′		Ax. pl. b(010); Z‖a	(G)
3196	$C_9H_{11}ON$	p-Acetotoluide	M.	Bi.	+	88° 30′		Ax. pl. b(010)	(G)
3199	$C_9H_{11}ON$	N-Methylacetanilide	R.	Bi.	+	51° 41′	87° 8′	Ax. pl. b(010); Z‖c	(G)
	$C_9H_{11}O_2N$	Methyl p-toluohydroxamic acid	M.	Bi.	−			Ax. pl. ⊥b(010); X‖b	(G)
	$C_9H_{11}O_2N$	Phenyl-β-aminopropionic acid	M.	Bi.	+		77° 37′	Ax. pl. ⊥b(010); Z∧c = 54° in obtuse ∠β	(G)
3220	$C_9H_{11}O_2N$	Nitromesitylene	R.	Bi.	−		65° 32′	Ax. pl. a(100); X‖c	(G)
	$C_9H_{11}O_2N_3$	ω′-Methyl-ω-phenyl biuret	H.	Un.					(8.5)
	$C_9H_{11}O_3NS.H_2O$	Tetrahydroquinoline-5-(ana)-sulfonic acid (St. mod.)	R.	Bi.			110° 39′ (apprx.)	Ax. pl. b(010); Z‖a	(G)
	$C_9H_{12}ON_2$	Benzenylaminooxime ethyl ether	R.	Bi.		83° 21′		Ax. pl. c(001); Z‖a	(G)
	$C_9H_{12}O_2N_2.H_2O$	Benzenylamidine acetate	M.	Bi.	−		53° 59′	Ax. pl. b(010); X∧c = 15° in obtuse ∠β	(G)
3232	$C_9H_{12}O_3N_4$	1, 3, 7, 9-Tetramethyluric acid	M.	Bi.	+	75° 19′		Ax. pl. ⊥b(010); Z∧c = 9° 30′ in acute ∠β	(G)
	$C_9H_{12}O_2S$	Ethyl-p-tolyl sulfone	R.	Bi.		84°		Z‖c	(G)
	$C_9H_{12}O_2S$	n-Propylphenyl sulfone	M.	Bi.	+		30° 10′	Ax. pl. b(010); Z∧c = 9° in obtuse ∠β	(G)
	$C_9H_{12}O_3.3H_2O$	Trimethylphloroglucinol	M.	Bi.	−		80° (apprx.)	Ax. pl. b(010); X⊥c(001)	(G)
3251	$C_9H_{12}O_3$	Pyrogallol trimethyl ether	R.	Bi.			80° (apprx.)	Ax. pl. b(010); Z‖c	(G)
	$C_9H_{12}O_4$	Anhydrocamphoronic acid	R.	Bi.	+		76° (apprx.)	Ax. pl. b(010); Z‖c	(G)
	$C_9H_{12}O_8$	Methanetetraacetic acid	Tet.	Un.					(19)
	$C_9H_{13}NBrCl$	m-Chlorophenyltrimethyl ammonium bromide	R.	Bi.	−		3° 35′	Ax. pl. a(100); X‖c	(G)
	$C_9H_{13}NCl_2$	m-Chlorophenyltrimethyl ammonium chloride	R.	Bi.	−		24° 59′	Ax. pl. b(010); X‖c	(G)
	$C_9H_{13}O_4NS$	Tetrahydroquinoline sulfate	M.	Bi.			71° 2′		(G)
	$C_9H_{13}O_2N_3$	Nitrodiaminomesitylene	M.	Bi.	+		40° (apprx.)	Ax. pl. b(010)	(G)
	$C_9H_{13}O_5N_3$	m-Nitrophenyltrimethyl ammonium nitrate	R.	Bi.			43° 7′	Ax. pl. c(100); Z‖c	(G)
	$C_9H_{13}O_7NS$	Tyrosine sulfate	M.	Bi.			86°	Ax. pl. b(010)	(G)
	$C_9H_{14}O_2NCl$	Veratryl amine hydrochloride	M.	Bi.	−		About 60°		(23)
	$C_9H_{14}O_7N_2$	Mono-uriendihydroxy diethyl succinate	R.	Bi.		84° 1.5′		Ax. pl. b(010); Z‖c	(G)
	$C_9H_{14}O_7$	β-Oxycamphoronic acid (?)	M.	Bi.	+	80° 17′		Ax. pl. b(010); Z∧c = 41° 45′ in obtuse ∠β	(G)
	$C_9H_{15}ON$	N-Methylgranatonine	R.	Bi.	+		78° 49′	Ax. pl. b(010); Z‖c	(G)
3293.1	$C_9H_{15}O_3N.H_2O$	l-Ecgonine	M.	Bi.			70° (apprx.)	Ax. pl. ⊥b(010).	(G)
	$C_9H_{15}O_4N$	α-Aminoethylidene diethyl succinate	R.	Bi.			83° 53′	Ax. pl. b(010); Z‖a	(G)
	$C_9H_{16}O_2N_3SCl.2H_2O$	Ergothionine hydrochloride	R.	Bi.	−		79°	Ax. pl. c(001); X‖b	(G)
	$C_9H_{16}O_2N_3SI.2H_2O$	Ergothionine hydroiodide	R.	Bi.	+		70° (apprx.)	Ax. pl. b(010); Z‖a	(G)
	$C_9H_{16}O_2$	3, 3, 5-Trimethylhexan-ol-olid	R.	Bi.	−	57° 16′	93° 14′	Ax. pl. c(001); X‖a	(G)
	$C_9H_{17}O_2N_3$	N-Methylpyrrolidine-α, α-dicarboxy methylamide	M.	Bi.	−		110° (apprx.)	Ax. pl. b(010)	(G)
3344	$C_9H_{18}O_7$	Galactite	R.	Bi.	−	69° 46′		Ax. pl. b(010); X‖a	(G)
	$C_{10}H_4OCl_6$	Hexachloro-α-ketohydronaphthalene	M.	Bi.	−	74° 44′		Ax. pl. ⊥b(010); X∧c = 108° (?) in obtuse ∠β	(G)
	$C_{10}H_4OCl_6$	Hexachloro-β-ketohydronaphthalene	R.	Bi.	+	91° 6′ (at axis c)		Ax. pl. a(100); Z‖b	(G)
	$C_{10}H_5OCl_3$	Trichloro-α-ketonaphthalene	M.	Bi.	−		113° 20′	Ax. pl. ⊥b(010); X∧c = 66° in acute ∠β	(G)
	$C_{10}H_5OCl_3$	α-Trichloro-β-ketonaphthalene	R.	Bi.		57° 6′	93° 34′	Ax. pl. a(100); Z‖c	(G)
	$C_{10}H_5OCl_5$	α-Pentachloro-β-ketohydronaphthalene	M.	Bi.	−			Ax. pl. ⊥b(010); X∧c = 17° 57′ (?) in acute ∠β	(G)
3404	$C_{10}H_5O_6N_3$	1, 3, 5-Trinitronaphthalene	R.	Bi.	−		94° 14′	Ax. pl c(001); X‖a	(G)
3495	$C_{10}H_8Cl_4$	Naphthalene tetrachloride	M.	Bi.			84° (apprx.)	Ax. pl. ⊥b(010)	(G)
	$C_{10}H_8O_3N_2$	Diisonitrosoisosafrol anhydride	R.	Bi.	−		62° 14′	Ax. pl. c(001); X‖b	(G)
	$C_{10}H_8O_3$	Pinastrinic acid	R.	Bi.	+			Ax. pl. a(100); Z‖c	(G)
3539	$C_{10}H_8O_6S_2.4H_2O$	Naphthalene-1, 5-disulfonic acid	M.	Bi.	−	55° 34′ (calc.)		Ax. pl. ⊥(010); n_α∧c = 84° 0.5′ in acute ∠β	(41)
3540	$C_{10}H_8O_6S_2.4H_2O$	Naphthalene-1, 6-disulfonic acid	M.	Bi.		79° 0.5′		Ax. pl. ⊥(010); n_β∧c = 72°–76° in acute ∠β	(41)
	$C_{10}H_9O_2Br$	Phenylisobromo butyro lactone	M.	Bi.			57° 12′	Ax. pl. ⊥b(010); Z∧c = 8° 45′ in obtuse ∠β	(G)

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	$C_{10}H_9O_3N$	Phthalylethylhydroxylamine	R.	Bi.	−		91° 17′	Ax. pl. a(100); X∥c	(G)
	$C_{10}H_9O_3N$	Phthaloxime ethyl ether	R.	Bi.			70° (apprx.)	Bxa ⊥(001)	[26]
	$C_{10}H_9O_6N$	Dimethylnitroterephthalate	Tri.	Bi.	−		95° 30′	X ⊥b(010)	(G)
	$C_{10}H_9O_5N_3$	Nitrodiisonitrosoanethol peroxide	M.	Bi.		73° 48′		Ax. pl. b(010); Z ∧ c = 38° in acute ∠β	(G)
3585	$C_{10}H_{10}ON_2$	*N*-Phenyl-3-methylpyrazolone	M.	Bi.			72° 56′	Ax. pl. ⊥b(010); Z∥b	(G)
	$C_{10}H_{10}O_2N_2$	Diisonitrosoanethol anhydride	M.	Bi.				Ax. pl. ⊥b(010); Z ∧ c = 40° in acute ∠β	(G)
	$C_{10}H_{10}O_3$	Phenylisooxybutyrolactone	M.	Bi.				Ax. pl. b(010); Z ∧ c = 96° in obtuse ∠β	(G)
	$C_{10}H_{10}O_4$	2, 4-Dihydroxycinnamic acid	M.	Bi.	−		106° 20′ (red)	Ax. pl. ⊥b(010)	(G)
	$C_{10}H_{11}O_4N_2Cl$	Dinitrochlorocymene	?	Bi.	+		120°		[37]
	$C_{10}H_{11}O_4N_2Cl$	2-Chloro-5, 6-dinitrocymene	M.?	Bi.	−		70°		[37]
	$C_{10}H_{11}ON$	β-β-Dimethyl-α-indolinone	R.	Bi.	−	46° 39′	81° 48′	Ax. pl. c(001); X∥a	(G)
	$C_{10}H_{11}ON$	β-Ethyl-α-indolinone	M.	Bi.	−		38° (apprx.)	Ax. pl. ⊥b(010)	(G)
	$C_{10}H_{11}O_4N$	Nitrocumic acid	M.	Bi.	−	36° 58′	64° 25′	Ax. pl. b(010); X ∧ c = 14° 11′ in acute ∠β	(G)
	$C_{10}H_{12}O_3N_2$	*p*-Aminophenaceturic acid	M.	Bi.	−		102° 30′	Ax. pl. ⊥b(010); X nearly ∥c	(G)
	$C_{10}H_{12}O_3N_2$	α-Diisonitrosoanethol	M.	Bi.	+		30° 45′	Ax. pl. ⊥b(010)	(G)
	$C_{10}H_{12}O_3N_2$	Ethyl N^{ω}-phenyl allophonate		Bi.					[8.5]
	$C_{10}H_{12}O_3$	*p*-Methoxyhydroatropic acid	M.	Bi.	+	77° 58′		Ax. pl. b(010); Z ∧ c = 57° in acute ∠β	(G)
	$C_{10}H_{12}O_4$	Cantharidin	R.	Bi.		89° 7′		Ax. pl. c(001); Z∥b	(G)
	$C_{10}H_{12}O_4S$	α-Phenylsulfonebutyric acid	R.	Bi.	−	46° 45′		Ax. pl. b(010); X∥a	(G)
	$C_{10}H_{12}O_5$	Methyl 4-hydroxy-3, 5-dimethoxybenzoate	M.	Bi.			63° (apprx.)	Ax. pl. b(010); X ⊥r(101)	(G)
	$C_{10}H_{13}Br_3$	Tribromocamphene	R.	Bi.	−	80° (apprx.)		Ax. pl. c(001); X∥b	(G)
3709	$C_{10}H_{13}ON$	*N*-Ethylacetanilide	R.	Bi.	+		103° 27′	Ax. pl. b(010); Z∥c	(G)
3716	$C_{10}H_{13}O_2N$	Phenacetin	M.	Bi.		62° 14′		Ax. pl. b(010)	(G)
	$C_{10}H_{13}O_2N$	*p*-Tolyl urethane	M.	Bi.	−		59° 46′	Ax. pl. b(010); X ∧ c = 27° in acute ∠β	(G)
	$C_{10}H_{13}O_3N$	Vanillyl acetamide	M.	Bi.	+		110° (115° calc.)		[24]
3732	$C_{10}H_{14}$	1, 2, 4, 5-Tetramethylbenzene	M.	Bi.	−	87° 22′		Ax. pl. b(010); X ∧ c = 0° 54′ in obtuse ∠β	(G)
	$C_{10}H_{14}O_3Br$	*d*-Bromopseudonitrocamphor	R.	Bi.	+	79° (apprx.)		Ax. pl. c(001); Z∥a	(G)
3742	$C_{10}H_{14}OBr_2$	*d*-α, α′-Dibromocamphor	R.	Bi.	−	56° 5′	90° 38′	Ax. pl. a(100); X∥b	(G)
	$C_{10}H_{14}OBr_2$	*d*-α, β-Dibromocamphor	R.	Bi.	−	77° 51′		Ax. pl. b(010); X∥c	(G)
	$C_{10}H_{14}OCl_2$	*d*-α, π-Dichlorocamphor	R.	Bi.	+		62° 18′	Z∥c	(G)
	$C_{10}H_{14}O_3SCl_2$	*d*-α-Chloro-π-camphosulfonic chloride	R.	Bi.		59° (apprx.)		Ax. pl. a(100); Z∥b	(G)
	$C_{10}H_{14}O_6N_2S_2$	Ammonium naphthalene-1, 5-disulfonate	M.	Bi.		49° 40′		Ax. pl. ⊥(010)	[41]
3756	$C_{10}H_{14}O$	Thymol	Trig.	Un.	+				(G)
	$C_{10}H_{14}O_3$	*d*(*l*)-Camphoric anhydride	R.	Bi.	−		31° 20′ (red)	Ax. pl. a(100); X∥c	(G)
	$C_{10}H_{14}O_4$	Tetramethylapionol	R.	Bi.	+	49° 13′	80° 1′	Ax. pl. a(100); Z∥c	(G)
	$C_{10}H_{14}O_5$	Methyl α-anhydrocamphoronate	R.	Bi.	−		120° (apprx.)	Ax. pl. a(100); X∥b	(G)
	$C_{10}H_{14}O_5$	Methyl β-anhydrocamphoronate	R.	Bi.	−		33° (apprx.)	Ax. pl. a(100); X∥b	(G)
	$C_{10}H_{14}O_8$	Dimethyl diacetylracemate	R.	Bi.	+	62° 36′	103° 29′	Ax. pl. c(001); Z∥b	(G)
3779	$C_{10}H_{15}OBr$	*d*-β-Bromocamphor	R.	Bi.	+	76° (apprx.)		Ax. pl. a(100); Z∥c	(G)
	$C_{10}H_{15}O_2N_2Br$	α-Bromopernitrosocamphor	R.	Bi.	+		99° 28′	Ax. pl. b(010); Z∥c	(G)
	$C_{10}H_{15}O_2N_2Br$	β-Isobromopernitrosocamphor	R.	Bi.	+		69° 20′	Ax. pl. a(100); Z∥c	(G)
	$C_{10}H_{15}OBr_3$	*d*(*l*)-Dihydrocarvone tribromide	R.	Bi.	+		59° 45′	Ax. pl. (100); Z∥c	(G)
	$C_{10}H_{15}O_3SBr$	*d*-π-Camphoricsulfonyl bromide	R.	Bi.	+		35°		(G)
	$C_{10}H_{15}O_3SCl$	*d*-π-Camphoricsulfonyl chloride	R.	Bi.	+		45° (apprx.)		(G)
	$C_{10}H_{15}O_7N$	*l*-Ratanhin sulfate	R.	Bi.			75° (apprx.)	Ax. pl. c(001)	(G)
	$C_{10}H_{16}NBr$	Diethylaniline hydrobromide	M.	Bi.	−	77° 33′		Ax. pl. ⊥b(010); X ∧ c = 70° in obtuse ∠β	(G)
	$C_{10}H_{16}OBr_2$	Pinol dibromide	R.	Bi.	−		131° 21′	Ax. pl. a(100); X∥c	(G)
	$C_{10}H_{16}NI$	*p*-Tolyltrimethylammonium iodide	R.	Bi.	+		20° 36′	Ax. pl. b(010); Z∥c	(G)
3867.1	$C_{10}H_{16}O_3$	*dl*-Pinonic acid	M.	Bi.		88° 32′		Ax. pl. b(010); Z ∧ c = 57° in acute ∠β	(G)
	$C_{10}H_{16}O_3$	*d*-α-Thugene ketonic acid	R.	Bi.	+		74° 14′	Ax. pl. a(100); Z∥c	(G)
	$C_{10}H_{16}O_5$	Isoketocamphoric acid	M.	Bi.	+		80° (apprx.)	Ax. pl. b(010); Z nearly ⊥c(001)	(G)
3873	$C_{10}H_{16}O_5.H_2O$	*l*-Cineolic acid	R.	Bi.	−	25° 30′		Ax. pl. b(010); X∥c	(G)
3886.1	$C_{10}H_{17}O_3N$	*dl*-α-Pinoneoxime	M.	Bi.	+		60°–70°	Ax. pl. b(010); Z ∧ c = 10° in acute ∠β	(G)

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	$C_{10}H_{18}O_2$	2-Hydroxy-Δ', 3-*p*-menthenone	M.	Bi.	−			X∧c = 63° 6' in obtuse ∠β	(G)
	$C_{10}H_{18}O_6$	α, α'-Methylisopropyl-α, α'-dihydroxy-adipic acid	?	Bi.	−		75°		(37)
	$C_{10}H_{19}ON$	Δ⁶, 8-Methylnonenyl amide		Bi.	+		60°		(23)
3964	$C_{10}H_{20}ONCl$	Lupinine hydrochloride	R.	Bi.	+	59° 18'	102° 10'	Ax. pl. c(001); Z‖a	(G)
	$C_{10}H_{20}O_6N_2.3H_2O$	α-2, 5-Dimethylpiperazine tartrate	M.	Bi.			80° (apprx.)	Ax. pl. ⊥b(010)	(G)
	$C_{10}H_{20}NPS$	Triethylallylphosphothiourea	M.	Bi.	−	72° 30'		Ax. pl. b(010); X∧c = 24° in acute ∠β	(G)
	$C_{10}H_{20}O_2$	*cis*-Terpine hydrate	R.	Bi.	+	77° 27'		Ax. pl. b(010); Z‖a	(G)
3980	$C_{10}H_{20}O_2$	*trans*-Terpine	M.	Bi.	+		74° 15'	Ax. pl. ⊥b(001); Z∧c = 5°–6° in acute ∠β	(G)
	$C_{11}H_6O_{10}.5H_2O$	Benzenepentacarboxylic acid	R.	Bi.	−		57° 30'	Ax. pl. b(010); X‖c	(G)
	$C_{11}H_8N_4O_3$	9-Phenyluric acid		Un.					(8.5)
	$C_{11}H_9O_4Br$	Phenylbromoparaconic acid	R.	Bi.		56° 50'		Ax. pl. b(010); Z‖a	(G)
	$C_{11}H_9O_2N$	Citraconanil	M.	Bi.	+		14° 56'	Ax. pl. b(010)	(G)
	$C_{11}H_{11}O_3Cl_3$	Trichloromethyl-*o*-methoxyphenyl-carbinol acetic ether	M.	Bi.	−		75° 11'	Ax. pl. ⊥b(010)	(G)
	$C_{11}H_{11}O_2N$	Glutaric aniline	M.	Bi.			90°	Ax. pl. (010)	(28)
4043.1	$C_{11}H_{11}ON_2Br$	4-Bromoantipyrine	Ditrig.	Un.					(G)
	$C_{11}H_{11}O_3N$	β-Benzyl malimide	R.	Bi.	−	62°–66°		Ax. pl. b(010); X‖c	(G)
4053	$C_{11}H_{11}O_4N$	Ethyl *o*-nitrocinnamate	R.	Bi.	−		57° 40'	Ax. pl. c(001); X‖a	(G)
	$C_{11}H_{11}ON_2$	4-Iodoantipyrine	Trig.	Un.					(G)
	$C_{11}H_{12}O_2Br_2$	Ethyldibromocinnamate	M.	Bi.	−	86° (apprx.)		Ax. pl. b(010); X∧c = 7° in acute ∠β	(G)
4058	$C_{11}H_{12}ON_2$	Antipyrine	?	Bi.		54° 20'	103° 21'		(L-B)
	$C_{11}H_{12}O_2N_2$	4-Hydroxyantipyrine	M.	Bi.			116° 23'	Ax. pl. b(010); Z⊥c(001)	(G)
	$C_{11}H_{13}O_3N$	Methyl phenaceturate	R.	Bi.				Ax. pl. b(010)	(G)
4086	$C_{11}H_{14}ON_2$	Cytisine	R.	Bi.	+	61° 36.5'		Ax. pl. a(100); Z‖c	(G)
	$C_{11}H_{14}O_2N_2$	Ethyl α-phenylhydrazine pyroracemate	M.	Bi.	−			Ax. pl. ⊥b(010); X∧c = 47° 4' in acute ∠β	(G)
	$C_{11}H_{14}O_5$	Methyl 3, 4, 5-methoxybenzoate	M.	Bi.			113° 13' (white)	Ax. pl. ⊥b(010)	(G)
	$C_{11}H_{15}ON_2Br.H_2O$	Cytisine hydrobromide	M.	Bi.	−	87° (apprx.)		Ax. pl. b(010)	(G)
	$C_{11}H_{16}O_5NCl$	Methyl 3, 4, 5-trimethoxy-2-aminobenzoate	R.	Bi.	−		70° (apprx.)	Ax. pl. c(001); X‖a	(G)
	$C_{11}H_{15}ON_2Cl.H_2O$	Cytisine hydrochloride	M.	Bi.		72° (apprx.)		Ax. pl. b(010); Z∧c = 55° in obtuse ∠β	(G)
	$C_{11}H_{15}O_3N$	Vanillyl propionamide	R.	Bi.	−		100° (98° calc.)		(24)
	$C_{11}H_{15}O_3N$	Pyrocatechol carboxyl diethylamide	M.	Bi.	+		7° 56'	Ax. pl. b(010); Z∧c = 55° in obtuse ∠β	(G)
	$C_{11}H_{15}O_7N$	*s*-Benzylhydroxylamine ditartrate	R.	Bi.			90° (apprx.)	Ax. pl. a(100); Z‖b	(G)
	$C_{11}H_{15}O_2N_3$	Nitrosoamylene nitroaniline	R.	Bi.	+	82° 51'		Ax. pl. b(010); Z‖c	(G)
	$C_{11}H_{15}O_4N_3.H_2O$	Cytisine nitrate	M.	Bi.	+	38° 49'		Ax. pl. b(010)	(G)
	$C_{11}H_{16}ON_2$	Amylene nitraniline	R.	Bi.	+	88° 21'		Ax. pl. a(100); Z‖c	(G)
	$C_{11}H_{16}O_6$	Dimethyl camphoronate	R.	Bi.	−		50° (apprx.)	Ax. pl. b(010); X‖a	(G)
	$C_{11}H_{17}ON_2Cl$	Amylene nitraniline hydrochloride	M.	Bi.	+	75° 41'		Ax. pl. ⊥b(010)	(G)
	$C_{11}H_{18}NBr$	Diethyl-*p*-toluidine hydrobromide	M.	Bi.	+	69° 41.5'		Ax. pl. ⊥b(010)	(G)
	$C_{11}H_{18}O_6$	Ethyl camphoronate	M.	Bi.			56° (apprx.)	Ax. pl. ⊥b(010)	(G)
	$C_{11}H_{18}O_8$	Triethyl desoxalate	M.	Bi.	−		61° 59'	Ax. pl. ⊥b(010)	(G)
	$C_{11}H_{20}ON_2$	Terpinene nitrolmethylamine	M.	Bi.		55° 20'	93° 56'	Ax. pl. ⊥b(010); Z∧c = 31° in obtuse ∠β	(G)
	$C_{11}H_{21}O_3N$	*N*-Methyl-2, 2, 6, 6-tetramethyl-4-hydroxypiperidine carboxylic acid	R.	Bi.	−	82° 31'		Ax. pl. a(100); X‖b	(G)
4184	$C_{12}H_8$	Acenaphthylene	R.	Bi.	+	70° 16'	114° 46'	Ax. pl. a(100); Z‖b	(G)
4185.1	$C_{12}H_8Br_2$	*p*, *p'*-Dibromodiphenyl	M.	Bi.		50°–60° (apprx.)		Ax. pl. ⊥b(010)	(G)
4218	$C_{12}H_{10}$	Acenaphthene	R.	Bi.	+	70° 26'	115° 40'	Ax. pl. a(100); Z‖b	(G)
4221.1	$C_{12}H_{10}ICl$	Diphenyliodonium chloride	M.	Bi.			Large	Ax. pl. b(010)	(G)
4225	$C_{12}H_{10}N_2$	Azobenzene	M.	Bi.	+		59° 5'	Ax. pl. ⊥b(010); Z∧c = 62° in acute ∠β	(G)
	$C_{12}H_{10}ON_2$	α-Benzoylpyridine oxime	R.	Bi.		66°		Ax. pl. b(010); Z‖a	(G)
	$C_{12}H_{10}ON_2$	γ-Benzoylpyridine oxime	M.	Bi.		28°		Ax. pl. b(010); Z∧c = 62° in obtuse ∠β	(G)
	$C_{12}H_{10}O_4S_4$	Benzenesulfone trisulfide	Tet.	Un.					(G)
4261	$C_{12}H_{10}S_2$	Diphenyl disulfide	R.	Bi.	−		85° (apprx.)	Ax. pl. b(010); X‖c	(G)
	$C_{12}H_{11}O_3SBr$	Ethyl 1, 5-bromonaphthalene sulfonate	R.	Bi.			29° 52'	Ax. pl. a(100); Z‖b	(G)
	$C_{12}H_{11}O_3SCl$	Ethyl 1, 5-chloronaphthalene sulfonate	M.	Bi.		42° (apprx.)		Ax. pl. b(010)	(G)
	$C_{12}H_{11}ON$	α-Phenylpyridyl carbinol	R.	Bi.		65°		Ax. pl. c(001); Z‖a	(G)

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4272	$C_{12}H_{11}O_2NS$	Benzenesulfanilide	Tet.	Un.					(G)
	$C_{12}H_{12}O_3N$	Vanillyl *n*-butyramide	Tri.	Bi.	+		Very large		(24)
	$C_{12}H_{12}O_3N$	Vanillyl isobutyramide	R.	Bi.	−		18° (17° 48′ calc.)		(24)
	$C_{12}H_{12}O_3$	Ethyl β-methylcoumarilate	R.	Bi.			72° 34′	Ax. pl. b(010); Z∥c	(G)
	$C_{12}H_{13}O_2$	*cis*-Dimethylsuccinic acid	R.	Bi.			124° 4′ (Hg, yellow)	Ax. pl. (010); Bx_o ⊥(001)	(28)
	$C_{12}H_{13}O_3$	Acetotetrahydrocinchoninic acid	R.	Bi.	−		12° 24′	X∥b	(G)
	$C_{12}H_{14}NI$	Tetrapropyl ammonium iodide	R.	Bi.	−		30° 1′	Ax. pl. (100); X∥b	(G)
	$C_{12}H_{14}NI$	1, 3, 3-Trimethyl-2-methylene indoline hydriodide	R.	Bi.	−	23° 48′ (red)	57° 16′ (red)	Ax. pl. c(110); X∥b	(G)
	$C_{12}H_{14}ON_2$	1-Phenyl-3-methyl-4-dimethylpyrazolone	M.	Bi.		74° 2′		Ax. pl. ⊥b(010)	(G)
	$C_{12}H_{14}ON_2$	4-Methylantipyrine	M.	Bi.		86° (apprx.)		Ax. pl. b(010); Z∧c = 47° in acute ∠β	(G)
4318.1	$C_{12}H_{14}O_3$	Ethyl *p*-methoxycinnamate	M.	Bi.				Ax. pl. b(010)	(G)
	$C_{12}H_{14}O_4$	Dimethyl phenylsuccinate	M.	Bi.	+		10° (apprx.)	Ax. pl. ⊥b(010)	(G)
	$C_{12}H_{15}ON_2I$	1-Phenyl-3-methyl-5-methoxypyrazole 2-methiodide	M.	Bi.	−	72°		Ax. pl. b(010); X∧c = 73° in obtuse ∠β	(G)
	$C_{12}H_{15}ON_2I$	Antipyrine pseudomethiodide				75° 44′			(L-B)
	$C_{12}H_{15}ON_2I$	Antipyrine pseudoethiodide	M.	Bi.	+	74° 45′		Ax. pl. b(010); Z∧c = 84° 30′ in obtuse ∠β	(G)
	$C_{12}H_{15}ON$	7-Isopropylhydrocarbostyril	R.	Bi.		64° 51′		Ax. pl. b(010); Z∥a	(G)
4330.1	$C_{12}H_{15}O_3N$	Ethyl phenaceturate	R.	Bi.				Ax. pl. b(010)	(G)
	$C_{12}H_{15}O_3N$	Vanillyl crotonylamide	R.	Bi.	+		Large		(24)
	$C_{12}H_{16}O_3$	2, 5-Dioxyacetophenone diethyl ether	Tri.	Bi.			85° (apprx.)	Ax. pl. ⊥c(001)	(G)
	$C_{12}H_{17}O_2N_3$	Nitrosoamylenenitrol-*p*-toluidine	R.	Bi.	+	77° 50′	167° 37′	Ax. pl. ⊥b(010); Z∥c	(G)
	$C_{12}H_{18}ON_2Cl$	Amylenenitrol-*p*-toluidine hydrochloride	M.	Bi.	+	59° 26′	97° 30′	Ax. pl. ⊥b(010); Z∧c = 12° in obtuse ∠β	(G)
	$C_{12}H_{18}ON_2$	Amylenenitrol-*p*-toluidine	M.	Bi.	−		72° 40′	Ax. pl. b(010); X∧c = 35° in acute ∠β	(G)
	$C_{12}H_{18}O_4$	Dimethylcantharidin	R.	Bi.	+		116°	Ax. pl. b(010)	(G)
4368.3	$C_{12}H_{18}O_6$	Diethyl 1, 1-diacetosuccinate	M.	Bi.	+	64° (apprx.)		Ax. pl. b(010)	(G)
	$C_{12}H_{20}O$	Matico camphor	Trig.	Un.					(G)
	$C_{12}H_{20}OS_2$	Methyl *l*-bornyl xanthate	R.	Bi.	−	33° 24′		Ax. pl. b(010); X∥a	(G)
	$C_{12}H_{22}ON_2$	Terpinene nitrolethylamine	M.	Bi.		70° 53′	128° 32′	Ax. pl. ⊥b(010); Z∧c = 26° in obtuse ∠β	(G)
4394	$C_{12}H_{22}O_{11}.H_2O$	Lactose	M.	Bi.	−		33° 35′	Ax. pl. ⊥b(010); X∧c = 10°–11° in obtuse ∠β	(G)
4396	$C_{12}H_{22}O_{11}$	Saccharose	M.	Bi.	−	48° 0′	79° 7′	Ax. pl. b(010); X∧c = 67° 45′ in obtuse ∠β	(G)
4397	$C_{12}H_{22}O_{11}.2H_2O$	Trehalose	R.	Bi.	+	50° 16′	78° 56′	Ax. pl. b(010); Z∥c	(G)
	$C_{12}H_{23}O_6N.2H_2O$	*d*-Coniine ditartrate	R.	Bi.	+		43° 33′	Ax. pl. a(100); Z∥c	(G)
	$C_{12}H_{24}O_{12}N_6.9H_2O$	Ammonium mellitate	R.	Bi.	−		17° (apprx.)	Ax. pl. b(010) (red); X∥c	(G)
	$C_{13}H_8O_3Cl_2$	Phenyl 3, 5-dichlorosalicylate	R.	Bi.	−		70° 35′	Ax. pl. a(100); X∥c	(G)
4434	$C_{13}H_9N$	Acridine	R.				117° (apprx.)	Ax. pl. c(001); Z∥a	(G)
	$C_{13}H_{10}N_2$	Benzenyl-*o*-phenylenediamine	M.	Bi.	+		63°	Ax. pl. b(010); Z nearly ⊥c(001)	(G)
4454	$C_{13}H_{10}O_2$	*p*-Hydroxybenzophenone	R.	Bi.	−		96° 20′	Ax. pl. b(010); X∥a	(G)
	$C_{13}H_9O_2Br$	Phenyl *m*-bromobenzoate	R.	Bi.	+		41° 4′	Ax. pl. b(010); Z∥c	(G)
	$C_{13}H_{11}O_4NS$	*p*-Aminobenzophenone-*p*′-sulfonic acid	M.	Bi.				Ax. pl. ∥(010); Z = c	(5)
	$C_{13}H_{12}O_4Br_2$	Ethyl dibromohydroxydimethylisocoumarilate	M.	Bi.			80° (apprx.)	Ax. pl. b(010); Z∧c = 30° in obtuse ∠β	(G)
	$C_{13}H_{12}O_4Cl_2$	Ethyl dichlorohydroxydimethylcoumarilate	M.	Bi.			75° (apprx.)	Ax. pl. ⊥b(010); Z∧c = 30°–35° in obtuse ∠β	(G)
4500	$C_{13}H_{12}ON_2$	*p*-Hydroxy-*p*′-methylazobenzene	M.	Bi.	−		52° 30′ (apprx.)	Ax. pl. b(010); X∧c = 57° in obtuse ∠β	(G)
	$C_{13}H_{12}O_3N_4$	1, 3-Dimethyl-9-phenyluric acid		Bi.			Large		(21)
	$C_{13}H_{12}O_3N_4$	1, 3-Dimethyl-9-phenylpseudouric acid		Bi.			Large		(21)
4509	$C_{13}H_{12}O_3S$	Phenyl *p*-toluene sulfonate	R.	Bi.	−		84° 19′	Ax. pl. a(100); X∥b	(G)
	$C_{13}H_{13}O_4N$	Acetanilinopyrotartaric anhydride	M.	Bi.			86° 2′	Ax. pl. ⊥b(010); Z⊥c(001)	(G)
	$C_{13}H_{14}O_4$	Ethyl hydroxydimethylisocoumarilate	R.	Bi.	+		65° (apprx.)	Ax. pl. c(001); Z∥a	(G)
4530.1	$C_{13}H_{16}ON_2$	4-Ethylantipyrine	M.	Bi.			30° (apprx.)	Ax. pl. b(010); Z∧c = 40° in obtuse ∠β	(G)
4530.2	$C_{13}H_{16}ON_2$	1-Phenyl-2-propyl-3-methylpyrazolone	M.	Bi.		52° 50′	79° 59′	Ax. pl. ⊥b(010); Z∥b	(G)
	$C_{13}H_{16}O_{10}$	Glycogallin	M.	Bi.	−		55° (apprx.)	Ax. pl. b(010); X∧c = 16° in obtuse ∠β	(G)
	$C_{13}H_{17}ON_2I$	1-Phenyl-3-methyl-5-ethoxypyrazole-2-methiodide	M.	Bi.	−		88° (apprx.)	Ax. pl. ⊥b(010); X∥b	(G)

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	$C_{13}H_{20}NCl$	2-Methyl-3, 3-diethyl-2, 3-dihydroindol hydrochloride	M.	Bi.	−	81° 51′			(G)
	$C_{13}H_{20}NI$	Methylethylallyl-*p*-tolylammonium iodide	R.	Bi.			89° (apprx.)	Ax. pl. c(001); Z∥c	(G)
	$C_{13}H_{20}O_8$	Pentaerythritol tetraacetate	Tet.	Un.					(19)
	$C_{13}H_{22}OS_2$	Ethyl *dl*-bornylxanthate	R.	Bi.	−		51° 16′	Ax. pl. b(010)	(G)
	$C_{14}H_7O_4N_2Cl_5$	Dinitrodichlorodiphenyltrichloroethane	M.	Bi.	−		58° (apprx.)	Ax. pl. b(010); X∧c = 28° 30′ in obtuse ∠β	(G)
	$C_{14}H_8Cl_2Br_2$	1, 1-Di(bromophenyl)-2-dichloroethylene	R.	Bi.	+		34° 22′	Ax. pl. c(001); Z∥a	(G)
	$C_{14}H_8Cl_4$	1, 1-Di(chlorophenyl)-2-dichloroethylene	R.	Bi.	+		34° 26′	Ax. pl. b(010); Z∥a	(G)
	$C_{14}H_9Cl_3Br_2$	1, 1-Di(bromophenyl)-2-trichloroethane	R.	Bi.	+		62° 12′	Ax. pl. c(001); Z∥b	(G)
4650	$C_{14}H_{10}$	Diphenylacetylene	M.	Bi.			42° (red)	Ax. pl. ⊥b(010)	(G)
	$C_{14}H_{10}Cl_2$	1, 1-Diphenyl-2-dichloroethylene	M.	Bi.	−		30° 50′	Ax. pl. ⊥b(010)	(G)
4656.1	$C_{14}H_{10}O_2N_2$	Phthalylphenylhydrazine (orange yellow)	M.	Bi.			85° (apprx.)	Ax. pl. ⊥b(010)	(G)
4672	$C_{14}H_{10}O_2$	Benzil	Trig.	Un.					(G)
4681	$C_{14}H_{10}O_3$	Disalicylaldehyde	M.	Bi.					(G)
4688	$C_{14}H_{10}O_4$	Benzoyl peroxide	R.	Bi.				Ax. pl. a(100); Z∥b	(G)
	$C_{14}H_{11}Br_3$	Diphenyltribromoethane	M.	Bi.	+		110°	Ax. pl. b(010)	(G)
4705	$C_{14}H_{11}O_2N$	Dibenzohydroxamic acid	R.	Bi.	+		54° 35′ (red)	Ax. pl. a(100); Z∥b	(G)
4708	$C_{14}H_{12}$	Stilbene	M.	Bi.	+		91° 33′	Ax. pl. ⊥b(010); Z∧c = 60° in acute ∠β	(G)
	$C_{14}H_{12}N_4$	1, 5-Diphenyl-3-iminotriazoline	M.	Bi.				Ax. pl. b(010)	(G)
	$C_{14}H_{12}O$	Phenyl *p*-tolyl ketone	M.	Bi.	−		35° 15′	Ax. pl. ⊥b(010); X∧c = 36° 57′ in acute ∠β	(G)
	$C_{14}H_{13}N$	*o*-Iminodibenzyl	M.	Bi.			69° 58.5′	Ax. pl. ⊥b(010)	(G)
4748	$C_{14}H_{13}ON$	*N*-Benzoyl-*o*-toluidine	R.	Bi.	+	87° 33′		Ax. pl. a(100)	(G)
4749	$C_{14}H_{13}ON$	*N*-Benzoyl-*m*-toluidine	M.	Bi.	−		38° 10′	Ax. pl. ⊥b(010)	(G)
4750	$C_{14}H_{13}ON$	*N*-Benzoyl-*p*-toluidine	R.	Bi.		73° 43′		Ax. pl. c(001); Z∥b	(G)
4752	$C_{14}H_{13}ON$	*N*-Diphenylacetamide	R.	Bi.	+	52° 2′		Ax. pl. c(001); Z∥a	(G)
	$C_{14}H_{13}O_2N_2$	*o*-Nitrobenzyl-*o*-toluidine	R.	Bi.			49° (red)	Ax. pl. a(100); Z∥b	(G)
	$C_{14}H_{13}O_2N_3$	ω, ω′-Diphenylbiuret		Bi.					(8.5)
	$C_{14}H_{14}ON_2$	Phenyl-*o*-phenetol	M.	Bi.	−	68°	154° (apprx.)	Ax. pl. ⊥b(010); X∧c = 39° in acute ∠β	(G)
4783	$C_{14}H_{14}O_2$	Isohydrobenzoin	M.	Bi.	−	84° 59′		Ax. pl. ⊥b(010)	(G)
	$C_{14}H_{14}O_2$	1, 2-Dihydroxyphenylethane	R.	Bi.	+		122° 14′	Ax. pl. (100)	(9)
	$C_{14}H_{14}O_2$	*o*, *o*′-Dimethoxydiphenyl	R.	Bi.			5°	Ax. pl. (010); Bx_a ⊥c(001)	(20)
	$C_{14}H_{14}O_2S_2$	Tolyl *p*-toluol thiosulfonate	M.	Bi.			19° 29′	Ax. pl. ⊥b(010); Z∥b	(G)
	$C_{14}H_{14}O_4S_6$	*p*-Toluenesulfone trisulfide	Tet.	Un.					(G)
4787	$C_{14}H_{14}S$	Dibenzyl sulfide	R.	Bi.	−	67° 38′		Ax. pl. b(010); X∥c	(G)
	$C_{14}H_{15}NO_4Br.H_2O$	Dipyridinebetaine hydrobromide	R.	Bi.	+	87° 30′		Ax. pl. c(001); Z∥b	(G)
	$C_{14}H_{15}O_4NCl.H_2O$	Dipyridinebetaine hydrochloride	R.	Bi.	+	83° 52′		Ax. pl. c(001); Z∥b	(G)
	$C_{14}H_{16}ONCl$	Diphenylhydroxyethylamine hydrochloride	H.	Un.	−				(G)
	$C_{14}H_{18}O_6$	β-Methyltetramethoxycinnamic acid	M.	Bi.	+		102° 4′	Ax. pl. ⊥b(010); Z ⊥c(001)	(G)
	$C_{14}H_{19}O_7N$	Thallin tartrate	R.	Bi.	+	78° 14′		Ax. pl. a(100)	(G)
	$C_{14}H_{20}O_2NI$	Ethyl tetrahydroquinoline-*N*-acetate methiodide	M.	Bi.			65° 70′	Ax. pl. ⊥b(010)	(G)
	$C_{15}H_{10}O_2$	Phenylcoumarin	M.	Bi.				Ax. pl. b(010); Z∧c = 30° 15′ in acute ∠β	(G)
	$C_{15}H_{12}N_2$	3, 5-Diphenylpyrazole	M.	Bi.			43° 30′	Ax. pl. ⊥b(010); Z∧c = 44° in acute ∠β	(G)
	$C_{15}H_{13}O_3N$	*syn*-Benzoylbenzohydroxamic methyl ether	R.	Bi.	−	70° 10′		Ax. pl. a(100); X∥c	(G)
	$C_{15}H_{13}O_3$	*o*-Hydroxydibenzoylmethane	M.	Bi.	+		75°	Ax. pl. (010); Bx_a∥c-axis	(22)
4919	$C_{15}H_{14}O_3$	Methyl benzilate	M.	Bi.	−		74° 52′	Ax. pl. ⊥b(010)	(G)
	$C_{15}H_{15}O_3N$	Vanillyl benzoyl amide	R.	Bi.	−		85° (89° calc.)		(24)
	$C_{15}H_{15}O_4NS.H_2O$	*p*-Dimethylaminobenzophenone sulfonic acid	Tri.	Bi.			79° (apprx.)	Ax. pl. ∥m(110)	(G)
	$C_{15}H_{16}O_5$	2, 6, 2′, 5′-Tetrahydroxydiphenylmethyl ethyl ether	R.	Bi.		79° 11′		Ax. pl. a(100); Z∥b	(G)
4936.1	$C_{15}H_{16}O_6.H_2O(?)$	Picrotoxinin	R.	Bi.				Ax. pl. c(001)	(G)
	$C_{15}H_{18}O_2$	Hyposantonin	R.	Bi.			46° (apprx.)	Ax. pl. b(010); Z∥b(?)	(G)
4943	$C_{15}H_{18}O_3$	Santonin	R.	Bi.	+		41° 17′–43° 33′	Ax. pl. a(100); Z∥b	(37)
	$C_{15}H_{18}O_3$	Santonide	R.	Bi.	+	67° 1′ (red)		Ax. pl. a(100); Z∥c	(G)
	$C_{15}H_{18}O_3$	Parasantonide	R.	Bi.	−		59° 25′ (red)	Ax. pl. a(100); X∥c	(G)
	$C_{15}H_{18}O_6$	Triethyl trimesate	H.	Un.	−				(G)
	$C_{15}H_{19}O_3N_2Cl_3$	Butyl chloral antipyrine	Tri.	Bi.	−		110°		(G)
	$C_{15}H_{20}O_3$	Hydrosantonide	R.	Bi.	+	55° 10′ (red)	93° 43′ (red)	Ax. pl. a(100); Z∥c	(G)

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	$C_{15}H_{20}O_4$	Santonic acid	R.	Bi.		87° 40′		Ax. pl. a(100)	(G)
	$C_{15}H_{20}O_4$	Metasantoic acid	R.	Bi.	+		68° 25′ (red)	Ax. pl. a(100); Z∥c	(G)
	$C_{15}H_{20}O_4$	Parasantoic acid	R.	Bi.	−	88° 13′ (red)		Ax. pl. a(100); X∥c	(G)
	$C_{15}H_{21}O_3N$	α-Isopropylglutaranilic acid	R.	Bi.	+		117° 15′	Ax. pl. b(010); Z∥c	(G)
4960	$C_{15}H_{21}O_2N_3$	Physostigmine	R.	Bi.	−	77° 42′		Ax. pl. b(010); X∥c	(G)
	$C_{15}H_{22}O_4$	Hydrosantoic acid	R.	Bi.	+		100° (red)	Ax. pl. a(100); Z∥c	(G)
	$C_{15}H_{22}O_5$	Photosantonic acid	R.	Bi.	−		107° 25′ (red)	Ax. pl. a(100); X∥c	(G)
	$C_{15}H_{23}O_3N$	Vanillyl *n*-heptoylamide	M.	Bi.	−		110° (107° calc.)		(24)
	$C_{15}H_{24}O$(?)	Juniperol	Tri. (?)	Bi.	−	34° 46′		Ax. pl. nearly ∥b(010); X∧c = 72° in acute ∠β	(G)
	$C_{15}H_{25}O_2N$	Sesquiterpene nitrate	R.	Bi.			18° 32′	Ax. pl. a(100) (red)	(G)
	$C_{15}H_{26}Cl_2$	*l*-Cadinene dihydrochloride	R.	Bi.	+		50° (apprx.)	Ax. pl. b(010); Z∥c	(37)
	$C_{15}H_{26}O$	Cypress camphor	R.	Bi.	+		61° 30′	Ax. pl. b(010); Z∥a	(G)
4997	$C_{15}H_{26}O$	Cedrol	R.	Bi.	+		64° 45′	Ax. pl. b(010); Z∥a	(G)
	$C_{15}H_{26}O_6$	Triacetone mannite	M.	Bi.	+	77° 4′	138° 13′	Ax. pl. ⊥b(010); Z∧c = 26° 54′ in obtuse ∠β	(G)
5028.1	$C_{16}H_{10}O_3$	Diphenylmaleic anhydride	R.	Bi.	+		Small	Ax. pl. a(100); Z∥c	(G)
	$C_{16}H_{11}O_2Br$	2, 3-Diphenyl-3-bromo-Δ′-crotono lactone.	M.	Bi.			55° (apprx.)	Ax. pl. ⊥b(010)	(G)
	$C_{16}H_{12}O_3$	Diphenylsuccinic anhydride	R.	Bi.			166° (Li) (apprx.)	Ax. pl. b(010); Z∥a	(G)
	$C_{16}H_{13}N_3$	Di-*p*-dicyanobenzylamine	Tri.	Bi.		69° 39′		Ax. pl. ∥c(001)	(G)
	$C_{16}H_{13}O_4N$	α-Benzoyl-β-acetylbenzoylhydroxylamine	M.	Bi.	+	75° 20′		Ax. pl. ⊥b(010)	(G)
5066.1	$C_{16}H_{14}N_2$	1, 5-Diphenyl-3-methyl pyrazole	M.	Bi.		68° 22′		Ax. pl. b(010); Z∧c = 7° in obtuse ∠β	(G)
5067.1	$C_{16}H_{14}O$	Benzylidene-*p*-tolyl ketone	R.	Bi.	+	36° 4′	61° 7′	Ax. pl. c(001); Z∥b	(G)
	$C_{16}H_{15}Cl_3$	Di-*p*-tolyltrichloroethane	M.	Bi.	+		85° 5′	Ax. pl. b(010); Z∧c = 4° in acute ∠β	(G)
	$C_{16}H_{15}O_3N$	Ethyl benzohydroxamic benzoate	R.	Bi.	+		94° 55′	Ax. pl. a(100); Z∥c	(G)
	$C_{16}H_{15}O_3N$	*anti*-Benzoyl benzohydroxamic ethyl ether	Tri.	Bi.	−		18° 30′ (apprx.)		(G)
	$C_{16}H_{15}O_4N$	Anisoyl *p*-toluohydroxamic acid	M.	Bi.	+	63° 49′	113° 6′	Ax. pl. b(010); Z⊥c(001)	(G)
	$C_{16}H_{15}O_4N$	*p*-Toluyl anisohydroxamic acid	M.	Bi.	+	50° 10′	82° 52′	Ax. pl. b(010); Z∧c = 49° in acute ∠β	(G)
	$C_{16}H_{15}ON_3$	Phenyl styryl ketone	R. (?)	Bi.					(13)
	$C_{16}H_{16}N_2$	Acetophenone methylphenylhydrazone	M.	Bi.			Large	Ax. pl. b(010); Z⊥a(100)	(G)
5082.4	$C_{16}H_{16}O_2N_2$	Diacetylhydrazobenzene	R.	Bi.	−	88° 45′		Ax. pl. b(010); X∥a	(G)
	$C_{16}H_{16}O_4N_2$	2-Phenyl-1-allybenzimidazolium sulfate	M.	Bi.	+		56° 48′	Ax. pl. ⊥b(010); Z∧c = 33° 51′ in obtuse ∠β	(G)
	$C_{16}H_{16}O_8N_4$	2, 3-Dinitro-*p*-xylene + 2, 6-dinitro-*p*-xylene	R.	Bi.	−		38° 36.5′	Ax. pl. a(100); X∥c	(G)
	$C_{16}H_{19}O_4N.4H_2O$	*l*-Benzoylecgonine tetrahydrate	R.	Bi.			45° (apprx.)	Ax. pl. a(100); Z∥b	(G)
5131	$C_{16}H_{22}O_3NBr$	Homatropine hydrobromide	R.	Bi.	−		69°–70°	Ax. pl. c(001); X∥b	(G)
	$C_{16}H_{22}O_3N_2$	Antipyrine isovalerianate	M.	Bi.		68° (apprx.)		Ax. pl. c(001); Z∧c = 17° in obtuse ∠β	(G)
5135.1	$C_{16}H_{22}O_4$	Methyl santoate	R.	Bi.	−	74° 24′ (red)	134° 12′ (red)	Ax. pl. a(100); X∥c	(G)
	$C_{16}H_{22}O_4$	Methyl metasantoate	M.	Bi.		90°		Ax. pl. ⊥b(010)	(G)
	$C_{16}H_{22}O_4$	Methyl parasantoate	R.	Bi.	−		58° 25′ (red)	Ax. pl. a(100); X∥c	(G)
	$C_{16}H_{23}O_4Br$	β-Bromoacetyltetraethylphloroglucinol	M.	Bi.	+		50° (apprx.)	Ax. pl. ⊥b(010)	(G)
	$C_{16}H_{23}O_6N.H_2O$	*l*-Phenyl-α′-methylpiperidine *d*-tartrate	R.	Bi.	−		55° 42′	Ax. pl. b(010); X∥c	(G)
5142.1	$C_{16}H_{26}O$	Guaiol (Champacol)	Trig.	Un.					(G)
	$C_{17}H_{17}O_4N$	Ethyl anisohydroxamic benzoate	M.	Bi.	+	71° 55′		Ax. pl. ⊥b(010); Z∥b	(G)
	$C_{17}H_{17}O_4N$	*syn*-Anisoylbenzohydroxamic ethyl ether	M.	Bi.	−		66° 13′	Ax. pl. ⊥b(010); X∧c = 55° 30′ in acute ∠β	(G)
	$C_{17}H_{17}O_4N$	*anti*-Benzoylanishydroxamic ethyl ether	M.	Bi.	−		63° 7′	Ax. pl. ⊥b(010)	(G)
5202	$C_{17}H_{19}O_3N.H_2O$	Morphine	R.	Bi.	−		125° (apprx.)	Ax. pl. ⊥ to elongation	(39)
	$C_{17}H_{20}NBr$	α-Benzylphenylallylmethylammonium bromide	R.	Bi.		30°–40° (apprx.)		Ax. pl. c(001); Z∥b	(G)
	$C_{17}H_{20}NCl$	α-Benzylphenylallylmethylammonium chloride	R.	Bi.			100° (apprx.)	Ax. pl. c(001); Z∥b	(G)
	$C_{17}H_{20}ON_2$	Oxymethylenecamphor phenylpyrazole	M.	Bi.	+		26° 40′	Ax. pl. ⊥b(010)	(G)
	$C_{17}H_{20}ON_2$	Pseudoephedrine phenylthiourea	R.	Bi.	+		76° 15′	Ax. pl. c(001); Z∥b	(G)
	$C_{17}H_{20}ON_2S$	Ephedrine phenylthiourea	R.	Bi.	+	66° 25′	89° 43′	Ax. pl. c(001); Z∥a	(G)
5213.1	$C_{17}H_{20}O_2$	(*p*-Dianisyl)dimethylmethane	R.	Bi.	−	89° 54.5′			(G)
5226	$C_{17}H_{22}O_4NBr.3H_2O$	Hyoscine hydrobromide	R.	Bi.	−		101° 12′	Ax. pl. b(010); X∥c	(G)
5228	$C_{17}H_{22}O_4NCl$	Cocaine hydrochloride		Bi.	−		Large (> 120°)	Ax. pl. (010)	(37)

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	$C_{17}H_{23}O_3Br$	Ethyl *d*(*l*)-bromosantonigate	R.	Bi.	+		123° 26′	Ax. pl. a(100); Z∥c	(G)
	$C_{17}H_{23}O_4N$	Menthyl-*o*-nitrobenzoate	R.	Bi.	−	30° 32′	47° 24′	Ax. pl. b(010); X∥c	(G)
	$C_{17}H_{22}O_3N_2$	2-Keto-6-methyl 4-(*p*-isopropyl phenyl)-1, 2, 3, 4-tetrahydropyrimidine-5-ethyl carboxylate.	M.	Bi.	+	44° (apprx.)		Ax. pl. b(010)	(G)
	$C_{17}H_{24}ON_2$	α-Dipentene nitrolbenzylamine	M.	Bi.	+		108° 14′	Ax. pl. b(010); Z ∧ c = 18° in acute ∠β	(G)
	$C_{17}H_{24}ON_2$	*d*(*l*)-Pinene nitrolbenzylamine	R.	Bi.	+		89° 9′	Ax. pl. c(001); Z∥a	(G)
	$C_{17}H_{24}O_2$	1, 1, 2-Trimethyl-2-phenylcyclopentane-3-ethyl carboxylate.	M.	Bi.	−	65° 20′		Ax. pl. b(010); X ∧ c = 50° in acute ∠β	(G)
5244	$C_{17}H_{24}O_2$	Menthyl benzoate	R.	Bi.			70° (apprx.)	Ax. pl. c(001); Z∥b	(G)
5244.1	$C_{17}H_{24}O_4$	Ethyl santoate	R.	Bi.	+	64° 6′ (red)		Ax. pl. a(100); Z∥c	(G)
	$C_{17}H_{24}O_4$	Ethyl parasantoate	R.	Bi.	−		35° 35′ (red)	Ax. pl. a(100); X∥c	(G)
	$C_{17}H_{24}O_{10}$	Ethyl tetraacetylquinate	R.	Bi.	−	79° 58′		Ax. pl. a(100); X∥c	(G)
	$C_{18}H_{12}O_{15}N_3S_3Bi.7H_2O$	Bismuth *m*-nitrobenzene sulfonate	M.	Bi.	+			Ax. pl. b(010); Z ∧ c = about 93° in obtuse ∠β	(G)
	$C_{18}H_{12}O_8N_4$	γ-Benzoylpyridine picrate	M.	Bi.		62°		Ax. pl. ⊥b(010); Z ∧ c = 65° in obtuse ∠β	(G)
	$C_{18}H_{14}O_7N_4$	α-Benzylpyridine picrate	M.	Bi.		19°		Ax. pl. b(010)	(G)
	$C_{18}H_{14}O_7N_4$	γ-Benzylpyridine picrate	Tri.	Bi.		28°			(G)
	$C_{18}H_{16}O_4$	Diacetyl dihydroxy stilbene	M.	Bi.	−	81° 39′		Ax. pl. ⊥b(010); X ∧ c = 13° in acute ∠β	(G)
5304	$C_{18}H_{16}O_7$	*d*(*l*)-Usnic acid	R.	Bi.	+			Ax. pl. a(100); Z∥c	(G)
	$C_{18}H_{18}O$	Diethylanthrone	R.	Bi.			60° (apprx.)	Ax. pl. c(001); Z∥a	(G)
	$C_{18}H_{18}O_4$	Hydrobenzoin diacetate	M.	Bi.		85° (apprx.)		Ax. pl. b(010); Z ∧ c = 12° in obtuse ∠β	(G)
	$C_{18}H_{18}O_4$	Isohydrobenzoin diacetate	R.	Bi.	−	80° 54′		Ax. pl. b(010); X∥c	(G)
	$C_{18}H_{20}$	*sym*-Tetramethylanthracene hydride	R.	Bi.	−		79°–83°	Ax. pl. b(010) (blue); X∥c	(G)
	$C_{18}H_{20}$	Tetramethyl-*p*-stilbene	M.	Bi.	+		24° (apprx.)	Ax. pl. b(010); Z ∧ c = 90° in obtuse ∠β	(G)
	$C_{18}H_{20}O_2$	Benzoyl-*p*-*tert*.-amyl phenol	R.	Bi.	−		58° 47′	Ax. pl. b(010); X∥a	(G)
5317	$C_{18}H_{21}O_3N$	Codeine	R.	Bi.	+		125° (apprx.)		(39)
5317	$C_{18}H_{21}O_3N.H_2O$	Codeine		Bi.	−		130° (apprx.)		(39)
5319	$C_{18}H_{12}O_3N$	Isocodeine	R.	Bi.	−			Ax. pl. b(010); X∥c	(G)
5320	$C_{18}H_{21}O_3N$	Pseudocodeine	M.	Bi.	+			Ax. pl. ⊥b(010); Z ∧ c = 22° in acute ∠β	(G)
	$C_{18}H_{24}O_8N_2$	Tetraethyl-*p*-diaminopyromellitate	M.	Bi.		85°–90°		Ax. pl. b(010)	(G)
5336	$C_{18}H_{27}O_3N$	Capsaicin		Bi.					(25)
	$C_{18}H_{29}O_3N$	Hydrocapsaicin		Bi.					(25)
	$C_{18}H_{29}O_3N$	Vanillyl *n*-decoylamide	R.	Bi.	+		23° (calc.)		(24)
5343.1	$C_{18}H_{32}$	Fichtelite (Retene perhydride)	M.	Bi.	−			Ax. pl. b(010); X∥a-axis	(G)
	$C_{18}H_{32}O_{16}.2H_2O$	Melezitose	R.	Bi.	−		85°	X = a, Y = b, Z = c	(36)
	$C_{19}H_{14}O_5$	Methyl pulvinate	M.	Bi.	−			Ax. pl. b(010); X∥c	(G)
	$C_{19}H_{15}O_4NS$	*ms*-Phenylacridonium hydrosulfate (green mod.)	Tri.	Bi.	−	42°			(G)
	$C_{19}H_{15}O_4NS$	*ms*-Phenylacridonium hydrosulfate (red mod.).	M.	Bi.	+			Ax. pl. b(010); Z ∧ c = 78° 30′ in obtuse ∠β	(G)
5414	$C_{19}H_{17}N_3$	α-Triphenylguanidine	R.	Bi.	+		38° 3′	Ax. pl. c(001); Z∥a	(G)
	$C_{19}H_{19}N_2I$	Phenyldiallylbenzimidazolium iodide	M.	Bi.	+	85° 40.5′		Ax. pl. ⊥b(010); Z ∧ c = 38° 52′ in obtuse ∠β	(G)
5424	$C_{19}H_{19}O_4N$	Bulbocapnine	R.	Bi.	−			Ax. pl. a(100); X∥b	(G)
	$C_{19}H_{20}N_2$	Cinchene	R.	Bi.			100° 56′	Ax. pl. c(001); Z∥b	(G)
	$C_{19}H_{20}ON_2$	Phenyldiallylbenzimidazolium hydroxide	M.	Bi.	+		60° 21′	Ax. pl. b(010); Z ⊥ c(001)	(G)
5428.1	$C_{19}H_{20}ON_2$	Cinchoninone	R.	Bi.		65° 20′		Ax. pl. c(001); Z∥b	(G)
	$C_{19}H_{21}N_2Cl.2H_2O$	Cinchonine chloride	R.	Bi.	+		13° (apprx.)	Ax. pl. a(100); Z∥c	(G)
5441	$C_{19}H_{22}ON_2$	Cinchonidine	R.	Bi.	+		100° ± 10°	Z = b	(40)
	$C_{19}H_{22}ON_2.C_6H_6$	Cinchonidine	R.	Bi.	+		Large		(40)
5442	$C_{19}H_{22}ON_2$	α-Cinchonine	M.	Bi.	−		38° ± 2°		(40)
5442	$C_{19}H_{22}ON_2$	α-Cinchonine	M.	Bi.	−		35° 52′	Ax. pl. ⊥b(010); X ∧ c = 57° in obtuse ∠β	(G)
	$C_{19}H_{22}O$	*d*-Cinnamalidene camphor	R.	Bi.	+		28° (apprx.)	Ax. pl. b(010); Z∥a	(G)
	$C_{19}H_{23}ON_2Br.H_2O$	Cinchonine hydrobromide	R.	Bi.			150°		(G)
	$C_{19}H_{23}ON_2Br.\frac{1}{2}C_2H_6O$	Cinchonine hydrobromide	R.	Bi.			155°		(G)
	$C_{19}H_{23}ON_2Br.\frac{1}{2}(?)H_2O$	Cinchonidine hydrobromide	R.	Bi.	+		140°	Ax. pl. a(100); Z∥c	(G)
	$C_{19}H_{23}ON_2Cl.2H_2O$	Cinchonine hydrochloride	M.	Bi.	−		102°	Ax. pl. ⊥b(010); X ∧ c = 35° in obtuse ∠β	(G)
	$C_{19}H_{23}ON_2Cl.\frac{1}{2}C_2H_6O$	Cinchonine hydrochloride	R.	Bi.	+		147°	Ax. pl. b(110); Z∥c	(G)
	$C_{19}H_{23}ON_2I.1.5CH_4O$	Cinchonine hydroiodide	R.	Bi.	+		147° 40′	Ax. pl. c(001); Z∥b	(39)
	$C_{19}H_{23}O_3N.H_2O$	Codethyline	R.	Bi.	+		About 125°		(G)
	$C_{19}H_{24}O_5N_2S.5H_2O$	Cinchonidine sulfate	M.	Bi.	+		115° 36′	Ax. pl. ⊥b(010); Z ∧ c = 59° in obtuse ∠β	(G)

Index No.	Formula	Name	System	Class	Sign	2V	2E	Orientation	Lit.
	$C_{19}H_{24}O_5N_2Se.5H_2O$	Cinchonidine selenate	M.	Bi.	+		156° 40′	Ax. pl. ⊥b(010); Z∧c = 59° in obtuse ∠β	(G)
5477	$C_{19}H_{28}O_2$	Abietic acid	M.	Bi.	−		65°	Ax. pl. b(010); X∧c = 13° in acute ∠β	(G)
	$C_{19}H_{29}O_3N$	Vanillyl undecenoylamide	R.	Bi.	−		Very large		[24]
	$C_{19}H_{31}O_3N$	Vanillyl *n*-undecoylamide	Tri.	Bi.	+		110° (106° calc.)		[24]
	$C_{20}H_{14}$	Benzal fluorene	R.	Bi.	+		13°	Ax. pl. a(100); Z∥c	(G)
	$C_{20}H_{16}O_4$	2, 4-Dihydroxytriphenylacetic acid	M.	Bi.	−	77° 18′		Ax. pl. ⊥b(010); X∧c = 7° in obtuse ∠β	(G)
	$C_{20}H_{17}O_3NS$	α-Naphylamine naphthalene-α-sulfonate		Bi.					[1]
	$C_{20}H_{17}O_3NS$	β-Napthylamine naphthalene-β-sulfonate		Bi.					[1]
	$C_{20}H_{17}O_3NS$	α-Napthylamine naphthalene-β-sulfonate		Bi.					[1]
	$C_{20}H_{17}O_3NS$	β-Napthylamine naphthalene-α-sulfonate		Bi.	+		85° 5′		[1]
	$C_{20}H_{18}O_6$	Pulvinic acid ethyl alcoholate	R.	Bi.		114°	61° 6′	Ax. pl. a(100); Z∥b	(G)
	$C_{20}H_{18}O_9$	Atranoric acid	R.	Bi.	+			Ax. pl. c(001); Z∥a	(G)
	$C_{20}H_{21}ON$	Benzoyl-β, β-diethylmethylindolenine	M.	Bi.	−		41° 25′	Ax. pl. b(010); X∧c = 30° in acute ∠β	(G)
	$C_{20}H_{21}O_4N$	*d*(*l*)-Bulbocapnine methyl ether	Tet.	Un.					(G)
	$C_{20}H_{23}O_4N$	Corydin	Tet.	Un.					(G)
5561	$C_{20}H_{24}O_2N_2$	Quinidine	R.	Bi.	−		100° ± 10°		[40]
	$C_{20}H_{22}O_4N_4$	Diethyl dihydroxysuccinate γ-osazone	R.	Bi.	+		143° 28′	Ax. pl. a(100); Z∥b	(G)
	$C_{20}H_{24}O_2N_2.C_2H_6O$	Quinidine	R.	Bi.	+		80° ± 5°		[40]
	$C_{20}H_{24}O_2N_2.\frac{1}{2}C_6H_6$	Quinidine	R.	Bi.	+		85° ± 2°		[40]
5567	$C_{20}H_{24}O_2N_2$	Quinine	R. (?)	Bi.					[40]
	$C_{20}H_{24}O_2N_2.C_6H_6$	Quinine	R.	Bi.	+		Large		[40]
	$C_{20}H_{24}O_2N_2.C_6H_6$	Quinine (Unst. mod.)	R.	Bi.	−		110° ± 10°		[40]
	$C_{20}H_{25}ON_2Br.H_2O$	Bromomethylcinchonine	M.	Bi.			80° (apprx.)	Ax. pl. ⊥b(010)	(G)
	$C_{20}H_{26}O_6N_2S.7H_2O$	Quinine sulfate	R.	Bi.	−		19° 15′	Ax. pl. a(100); X∥c	(G)
	$C_{20}H_{26}O_6N_2Se.7H_2O$	Quinine selenate	R.	Bi.	−		77° 15′	Ax. pl. a(100); X∥c	(G)
	$C_{20}H_{27}O_2N_2Br$	Cinchonidine hydrobromide methyl alcoholate	R.	Bi.			142°		(G)
	$C_{20}H_{27}O_2N_2Br$	Cinchonine hydrobromide methyl alcoholate	R.	Bi.	+		40° 40′	Ax. pl. b(010); Z∥c	(G)
	$C_{20}H_{27}O_2N_2Cl$	Cinchonidine hydrochloride methyl alcoholate	R.	Bi.	+		140°	Ax. pl. a(100); Z∥c	(G)
	$C_{20}H_{27}O_2N_2Cl$	Cinchonine hydrochloride methyl alcoholate	R.	Bi.	+		157°	Ax. pl. b(010); Z∥c	(G)
	$C_{20}H_{27}O_2N_2I$	Cinchonine hydroiodide methyl alcoholate	R.	Bi.	+		126° 50′	Ax. pl. b(010); Z∥c	(G)
	$C_{20}H_{28}N_4$	Diethylaniline azyline	M.	Bi.					(G)
5588	$C_{20}H_{30}O_2$	*d*-Pimaric acid	R.	Bi.	+		76° 36′	Ax. pl. a(100); Z∥c	(G)
	$C_{20}H_{30}O_2$	*l*-Pimaric acid	R.	Bi.	+ (?)	61° 45′	110° 22′	Ax. pl. a(100); Z∥b	(G)
	$C_{20}H_{30}O_4$	Camphorpinacone	R.	Bi.			126° 50′	Ax. pl. a(100)	(G)
	$C_{20}H_{32}O_2N_2Cl_2$	*d*(*l*)-α-Limonene nitrosochloride	M.	Bi.	+		99° 34′-100° 15′	Ax. pl. b(010); Z∧c = 4° 50′ in acute ∠β	(G)
	$C_{20}H_{33}O_3N$	Vanillyl *n*-dodecoylamide	M.	Bi.	+		100° (calc.)		[24]
	$C_{20}H_{34}O_4N$	Methylcapsaicin	M.	Bi.					[24]
	$C_{21}H_{18}O_3$	Benzil benzilate	M.	Bi.	−	74° 10′	149° 46′	Ax. pl. b(010); X∧c = 104° in obtuse ∠β	(G)
	$C_{21}H_{19}N_2Br$	Amarine hydrobromide	Trig.	Un.					(G)
	$C_{21}H_{19}N_2Cl$	Amarine hydrochloride	Trig.	Un.					(G)
	$C_{21}H_{20}$	Diphenyl-*p*-xylylmethane	M.	Bi.	+	57° 43′			(G)
	$C_{21}H_{21}O_2N_2Br$	α-Bromostrychnine	R.	Bi.	−		58°	Ax. pl. a(100); X∥c	(G)
5642	$C_{21}H_{22}O_2N_2$	Strychnine	M. (?)	Bi.					[37]
	$C_{21}H_{22}O_3N_2$	Tribenzylamine nitrate	R.	Bi.	−		45° 20′ (red)	Ax. pl. c(001); X∥a	(G)
5648	$C_{21}H_{23}O_5N$	Diacetylmorphine	R.	Bi	−		110° (apprx.)		[39]
	$C_{21}H_{24}O_7N_4$	β, β-Triethyl-α-methyleneindoline picrate	M.	Bi.	−		16° 7′		(G)
	$C_{21}H_{27}ON_2Br.H_2O$	Cinchonine ethobromide	R.	Bi.		87° 50′		Ax. pl. b(010); Z∥c	(G)
	$C_{21}H_{27}ON_3Cl_2$	Dichloromaleic-*p*-tolyl-dipiperidide	M.	Bi.	+		44° 40′	Ax. pl. b(010)	(G)
	$C_{21}H_{28}ON_2I_2.H_2O$	Cinchonidine hydroiodide ethiodide	M.	Bi.			90°	Ax. pl. ⊥b(010)	(G)
	$C_{21}H_{28}O_3N_2$	Quinidine methyl alcoholate	R.	Bi.	+		78°	Ax. pl. a(100); Z∥c	(G)
	$C_{21}H_{29}O_2N_2I$	Cinchonine hydroiodide ethyl alcoholate	R.	Bi.	−		19°	Ax. pl. b(101); X∥c	(G)
	$C_{21}H_{36}O_2$	*d*-Bornyl methylene ether	R.	Bi.	+	75° 44′		Ax. pl. b(010); Z∥c	(G)
	$C_{22}H_{16}O_3$	*p*-Cresolphthalein	R.	Bi.	+	39°		Ax. pl. c(001); Z∥a	(G)
	$C_{22}H_{17}ON$	α, β-Dibenzoylcinnamenimide	R.	Bi.		82° 40′		Ax. pl. b(010); Z∥a	(G)
	$C_{22}H_{17}O_5N$	Benzoyl benzohydroxamic anisate (α-mod.)	M.	Bi.	−		86° 30′		(G)
	$C_{22}H_{19}O_5N$	Anisoyl benzohydroxamic *p*-toluate (β-mod.)	M.	Bi.	+	56° 24′	100° 44′	Ax. pl. b(010)	(G)
	$C_{22}H_{20}N_2$	1, 3, 4-Triphenyltetrahydropyrazine	R.	Bi.	+	66° 4′		Ax. pl. a(100); Z∥c	(G)
	$C_{22}H_{22}O_2N_4$	Bisantipyrine	M.	Bi.		60° 52′	98° 4′	Ax. pl. b(010); Z∧c = 37° in obtuse ∠β	(G)
5704	$C_{22}H_{23}O_7N$	Narcotine	R.	Bi.	−		50° (apprx.)	Ax. pl. a(100); X∥c	(G)

Index No.	Formula	Name	System	Class	Sign	2V	2E	Orientation	Lit.
	$C_{22}H_{26}O_4$	Benzyl santoate	R.	Bi.	+	85° 57′ (red)		Ax. pl. a(100); Z∥c	(G)
	$C_{22}H_{30}ON_2I_2.2H_2O$	Cinchonidine ethiodide methiodide	R.	Bi.		73° 36′		Ax. pl. b(010); Z∥a	(G)
	$C_{22}H_{30}O_3N_2$	Quinidine ethyl alcoholate	R.	Bi.			78° 30′		(G)
	$C_{22}H_{38}O_2S_3$	Menthyl thioxanthic anhydride	R.	Bi.	−	85° 6′		Ax. pl. b(010); X∥a	(G)
	$C_{23}H_{18}ONBr$	Bromomethyltriphenyl pyrrolone	M.	Bi.	+	70° 15′	122° 55′	Ax. pl. ⊥b(010); Z apprx. ⊥s(10$\bar{1}$)	(G)
	$C_{23}H_{19}O_5N$	*p*-Toluyl anisohydroxamic benzoate (α-mod.)	M.	Bi.	+	64° 32.5′	120° 38′	Ax. pl. ⊥b(010); Z∧c = about 60° in obtuse ∠β	(G)
	$C_{23}H_{19}O_5N$	Anisoyl benzohydroxamic *p*-toluate (α-mod.)	M.	Bi.	+	78° 59′		Ax. pl. ∥c(001); Z∥a	(G)
	$C_{23}H_{19}O_5N$	Anisoyl *p*-toluhydroxamic benzoate	M.	Bi.	−	84° 55′		X∥b	(G)
	$C_{23}H_{19}O_5N$	Benzoyl *p*-toluohydroxamic anisate	M.	Bi.	−	68° 32′	145°	Ax. pl. b(010); X∧c = 33° in obtuse ∠β	(G)
	$C_{23}H_{19}O_5N$	Benzoyl anisohydroxamic *p*-toluate	M.	Bi.	+	71° 12′		Ax. pl. b(010)	(G)
	$C_{23}H_{19}O_6N$	Benzoyl anisohydroxamic anisate	M.	Bi.			16° 42′	Ax. pl. ⊥b(010); Z∧c = 53° 50′ in obtuse ∠β	(G)
	$C_{23}H_{24}O_2N_3.H_2O$	Methylene bisantipyrine	M.	Bi.		76° 30′		Ax. pl. b(010); Z∧c = 56° in obtuse ∠β	(G)
	$C_{23}H_{20}O_5NI.H_2O$	Methyl trimethylcolchidimethinate methiodide	R.	Bi.		72° (apprx.)		Ax. pl. a(100); Z∥b	(G)
5818	$C_{24}H_{18}$	1, 3, 5-Triphenylbenzene	R.	Bi.	−	9° 50′	18° 25′	Ax. pl. b(010); X∥c	(G)
	$C_{24}H_{21}ON$	Ethyltriphenylpyrrolone (β-mod.)	M.	Bi.	−		17° 20′	Ax. pl. ⊥b(010); X∧c = 63° in obtuse ∠β	(G)
	$C_{25}H_{23}ON$	Propyltriphenylpyrrolone (α-mod.)	R.	Bi.	+	65° 50′	135° 30′	Ax. pl. a(100); Z∥c	(G)
	$C_{25}H_{40}O_{10}$	Lepranthine	M.	Bi.				Ax. pl. b(010)	(G)
	$C_{26}H_{16}O$	Tetraphenylenepinacoline	M.	Bi.	−	80° (apprx.)		Ax. pl. b(010); X∧c = 50° (apprx.) in obtuse ∠β	(G)
	$C_{26}H_{23}O_5N$	*d*-Benzoylbulbocapnine	R.	Bi.	−	78° 34′	108° 58′	Ax. pl. c(001); X∥b	(G)
	$C_{26}H_{32}O_5N_2$	Strychnine ethyl carbonate	?	Bi.	+		30° (apprx.)		(37)
	$C_{27}H_{30}O_4N_2$	Cinchonine phenylglycolate	R.	Bi.	+			Ax. pl. b(010); Z∥c	(G)
	$C_{27}H_{46}Br_2$	Cholestene dibromide (St. mod.)	R.	Bi.	+		45°	Ax. pl. a(100); Z∥c	(G)
	$C_{28}H_{20}O_4$	Stilbeneglycol dibenzoate	M.	Bi.	+	85° 58′		Ax. pl. ⊥b(010); Z∥b	(G)
	$C_{28}H_{36}O_6N_2.3H_2O$	Brucine valerianate	M.	Bi.			86° (apprx.)	Ax. pl. ⊥b(010)	(G)
	$C_{28}H_{46}O_2$	Gurjum resin	Tri.	Bi.	−	86° 6′			(G)
5961	$C_{28}H_{46}O_2$	Cholesteryl formate	M.	Bi.	+			Ax. pl. b(010); Z∧c = 21° 30′	(G)
	$C_{30}H_{26}O_6N_2S_2$	α-Napthylamine naphthalene-1, 5-disulfonate		Bi.					(1)
	$C_{30}H_{26}O_6N_2S_2$	α-Napthylamine naphthalene-1, 6-disulfonate	M.	Bi.	−		Large		(1)
	$C_{30}H_{26}O_6N_2S_2$	α-Napthylamide naphthalene-2, 6-disulfonate		Bi.	−		Large		(1)
	$C_{30}H_{26}O_6N_2S_2$	α-Napthylamine naphthalene-2, 7-disulfonate		Bi.	+				(1)
	$C_{30}H_{26}O_6N_2S_2$	β-Napthylamine naphthalene-1, 5-disulfonate (normal salt).		Bi.	+		75° 5′ (obs.) 77° 6′ (calc.)		(1)
	$C_{30}H_{26}O_6N_2S_2$	β-Napthylamine naphthalene-1, 5-disulfonate (acid salt)		Bi.			Large		(1)
	$C_{30}H_{26}O_6N_2S_2$	β-Napthylamine naphthalene-1, 6-disulfonate		Bi.	−		Large		(1)
	$C_{30}H_{26}O_6N_2S_2$	β-Napthylamine naphthalene-2, 6-disulfonate		Bi.	+		70° 5′		(1)
	$C_{30}H_{26}O_6N_2S_2$	β-Napthylamine naphthalene-2, 7-disulfonate		Bi.	−		Large	Bx_O ⊥plates	(1)
	$C_{30}H_{48}$	*d*-α-Amyrilene	R.	Bi.	+	72° 12′		Ax. pl. c(001); Z∥a	(G)
	$C_{30}H_{48}$	*d*-β-Amyrilene	R.	Bi.	+	22° 21.5′	35° 26.5′	Ax. pl. c(001); Z∥b	(G)
	$C_{32}H_{26}O$	α-Isodypnopinacoline	R.	Bi.	+			Ax. pl. a(100); Z∥c	(G)
	$C_{32}H_{28}$	Tetraphenylethanebenzene	M.	Bi.			60° (apprx.)	Ax. pl. ⊥b(010)	(G)
	$C_{32}H_{28}O_2$	Dypnopinacone	M.	Bi.			26° (apprx.)		(G)
	$C_{32}H_{32}O_{12}$	Tetrarin	Tri.	Bi.	−		33° (apprx.)	Ax. pl. ⊥a(100)	(G)
6062.1	$C_{34}H_{40}O_{10}N_2S.7H_2O$	Morphine sulfate	R.	Bi.	−		69° 37′ (red)	Ax. pl. b(010); X∥a	(G)
6067	$C_{34}H_{47}O_{11}N$	Aconitine	R.	Bi.	+		56° 10′	Ax. pl. b(010); Z∥a	(G)
6075	$C_{34}H_{50}O_2$	Cholesterol benzoate	Tet.	Un.					(G)
	$C_{40}H_{52}O_7N_4Se$	Cinchonine selenate ethyl alcoholate	M.	Bi.			77° 40′		(G)
	$C_{42}H_{38}O_4N_4S.3.5H_2O$	Amarine sulfate	M.	Bi.	+		60° 57′	Ax. pl. ⊥b(010); Z∧c = 80° in obtuse ∠β	(G)
	$C_{42}H_{46}O_8N_4Se.5H_2O$	Strychnine selenate	M.	Bi.	+		14°	Ax. pl. ⊥b(010); Z∧c = 34° in acute ∠β	(G)
	$C_{42}H_{46}O_8N_4S.5H_2O$	Strychnine sulfate	M.	Bi.	+		16° 30′	Ax. pl. ⊥b(010); Z∧c = 32° 43′ in obtuse ∠β	(G)
	$C_{52}H_{88}O_4$	Zeorine	H.	Un.					(G)

LITERATURE

(For a key to the periodicals see end of volume)

(G) Groth, *Chemische Krystallographie*, 5 vols. 1906–1919. (L-B) Landolt-Börnstein-Roth-Scheel, *Physikalisch-Chemische Tabellen*, 5th Ed., 1923.

(1) Ambler, *45*, **12**: 1081; 20. (2) Artini, *72*, **46**: 475; 13. (3) Artini, *22*, **26 I**: 392; 17. (4) Beckenkamp, *94*, **40**: 597; 05. (5) Beger, *94*, **57**: 303; 22. (6) Bleicher, *94*, **51**: 504; 13. (7) Drugman, *94*, **50**: 579; 12. (7.5) Duffour, *6*, **30**: 169; 13. (8) Ehrlich and Pistschimuka, *25*, **45**: 2436; 12. (8.5) Gatewood, *1*, **47**: 411; 25. (9) Gilta, *27*, **31**: 250; 22.

(10) Goldschmidt, *94*, **55**: 123; 15. (11) Gossner, *94*, **53**: 488; 14. (12) Hartley, Drugman *et al*, *4*, **103**: 751; 13. (13) Heilbron and Wilson, *4*, **101**: 1489; 12. (14) Hudson and Chernoff, *1*, **40**: 1007; 18. (15) Jaeger, *64P*, **18**: 49; 15. (16) Jamieson and Wherry, *1*, **42**: 136; 20. (17) Jungfleisch, *34*, **155**: 801; 12. (18) Keenan, *O*. (19) Kraggs, *1*, **123**: 77; 23.

(20) Mieleitner, *94*, **55**: 51; 19. (21) Moore and Gatewood, *1*, **45**: 144; 23. (22) Müller, *4*, **107**: 874; 15. (23) Nelson, *1*, **41**: 1115; 19. (24) Nelson, *1*, **41**: 2122; 19. (25) Nelson and Dawson, *1*, **45**: 2180; 23. (26) Orndoff and Pratt, *11*, **47**: 95; 12. (27) Robinson and Jones, *4*, **101**: 64; 12. (28) Stefl, *94*, **54**: 343; 14. (29) Steinmetz, *94*, **54**: 467; 15.

(30) Steinmetz, *94*, **55**: 375; 16. (31) Stortenbeker, *70*, **32**: 226; 13. (33) Thoma, *57*, **33**: 403; 12. (34) Wahl, *5*, **87A**: 371; 13. (35) Wherry, *128*, **8**: 321; 18. (36) Wherry, *1*, **42**: 126; 20. (37) Wherry, *O*. (38) Wherry and Hann, *128*, **12**: 291; 22. (39) Wherry and Yanovsky, *128*, **9**: 507; 19.

(40) Wherry and Yanovsky, *1*, **40**: 1065; 18. (41) Widmer, *94*, **60**: 184; 24. (42) Hayman, Wagner and Holden, *284*, **14**: 388; 25.

Extensive data are given in Fedorow, "*Das Krystallreich. Tabellen zur krystallochemischen Analyse*," 1920; this is vol. 36 of *Mémoires de l'Académie des Sciences de Russie* (VIII series).

X-RAY DIFFRACTION DATA FROM CRYSTALS AND LIQUIDS

R. W. G. Wyckoff

Introduction.—To find a given substance, consult Table 𝔄 for all elementary substances, 𝔅 for all chemical compounds, 𝔇 for all alloys which are not definite chemical compounds, 𝔈 for all liquids, and 𝔉 for solid solutions of salts.

Except for the spacing observations given in Tables ℭ′ and 𝔈, there are recorded below only such observations as can be made to yield dimensions for at least a possible unit cell. The structure types of some of the simpler unit cells are shown in Figs. 1–11. The mode of designating these structures and other coordinate groups giving atomic positions is that described in Wyckoff, "*The Structure of Crystals*," Chemical Catalog Co., New York, 1924.

ABBREVIATIONS

2*a*, 4*b*, 8*f*, (4*b*, 4*c*), (4*b*, 4*d*), (32*b*, 48*c*), etc. refer to the correspondingly numbered coordinate groups in Wyckoff, l.c. and *Analytical Expression of the Results of the Theory of Space Groups* (Washington, 1922).

a_0, b_0, c_0	Edge length of unit cell along the *a*-, *b*-, and *c*-crystallographic axes, respectively.
α	The angle between the three equivalent axes of a rhombohedral unit; in a triclinic crystal, the angle between the *b*- and *c*-axes.
B.-c.	Body-centered type of structure. The cubic B.-c. arrangement (2*a*) is shown in Fig. 1.
β	Angle between the *a*- and *c*-axes.
C.-p.	The hexagonal close-packed type of atomic arrangement (*d*) (*see* Fig. 3).
γ	Angle between the *a*- and *b*-axes in a triclinic crystal.
2Ci	Holohedral symmetry class, monoclinic system. 2Ci-*m* (C_{2h}^m) as under T.
3Ci	Second sort hexagonal tetartohedral symmetry class, rhombohedral division, hexagonal system. 3Ci-*m* (C_{3i}^m) and 3Ci-*m* (*n*) as under T.
4C	Tetartohedral symmetry class, tetragonal system. 4C-*m* (C_4^m) as under T.
6Ci	Paramorphic hemihedral symmetry class, hexagonal division, hexagonal system. 6Ci-*m* (C_{6h}^m) as under T.
Dia.	Diamond type (8*f*.) of atomic arrangement (see Fig. 4).
2D	Enantiomorphic hemihedral symmetry class, orthorhombic (rhombic) system. 2D-*m* (V^m), as under T.
2Di	Holohedral symmetry class, orthorhombic system. 2Di-*m* (V_h^m) and 2Di-*m* (*n*) as under T.
3D	Enantiomorphic hemihedral symmetry class, rhombohedral division, hexagonal system. 3D-*m* (D_3^m) and 3D-*m* (*n*) as under T.
3Di	Holohedral symmetry class, rhombohedral division, hexagonal system. 3Di-*m* (D_{3d}^m) and 3Di-*m* (*n*) as under T.
4d	Second sort hemihedral symmetry class, tetragonal system. 4d-*m* (V_d^m) and 4d-*m* (*n*) as under T.
4D	Enantiomorphic hemihedral symmetry class, tetragonal system. 4D-*m* (D_4^m) as under T.
4Di	Holohedral symmetry class, tetragonal system. 4Di-*m* (D_{4h}^m) and 4Di-*m* (*n*) as under T.
6Di	Holohedral symmetry class, hexagonal division, hexagonal system. 6Di-*m*(D_{6h}^m) and 6Di-*m* (*n*) as under T.
2e	Hemimorphic hemihedral symmetry class, orthorhombic system. 2e-*m* (C_{2v}^m) as under T.
3e	Hemimorphic hemihedral symmetry class, rhombohedral division, hexagonal system. 3e-*m* (C_{3v}^m) and 3e-*m* (*n*) as under T.
6e	Hemimorphic hemihedral symmetry class, hexagonal division, hexagonal system. 6e-*m* (C_{6v}^m) and 6e-*m* (*n*) as under T.
F.-c.	Face-centered type of structure. Cubic F.-c. arrangement (4*b*) shown in Fig. 2.
Oi	Holohedral symmetry class, cubic system. Oi-*m* (O_h^m) and Oi-*m* (*n*) as under T.
P. S.	Possible structure. Used to designate those atomic arrangements which may be correct but for which additional results are needed or desirable.
P. U. C.	Possible unit cell. Used to designate those crystals for which the selected unit cells may be correct but which require additional experimental or theoretical treatment.
S. P.	Sample compressed.
T	Tetartohedral symmetry class, cubic system. T-*m* = m^{th} space group having this symmetry (= T^m). T-*m* (*n*) = n^{th} atomic arrangement under T-*m*. For instance T-3(*c*) is seen by reference to Wyckoff (*Analytical expression*, p. 122), to be arrangement 8*a*. Similarly 4Di-7 (*c*) is the coordinate pair 0½u; ½0ū (*ibid.*, p. 93).
Te	Hemimorphic hemihedral (tetrahedral) symmetry class, cubic system. Te-*m* (T_d^m) and Te-*m* (*n*) as under T.
Ti	Paramorphic hemihedral (pyritohedral) symmetry class, cubic system. Ti-*m* (T_h^m) and Ti-*m* (*n*) have meanings analogous to those of similar symbols under T.
u, or *v*	Variable *x*, *y* or *z* parameter.

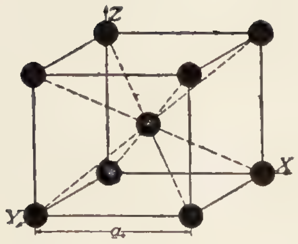

FIG. 1.—The unit cube of the body-centered cubic arrangement (2*a*). The coordinates of the atomic positions associated with this cell are 000; $\frac{1}{2}\frac{1}{2}\frac{1}{2}$.

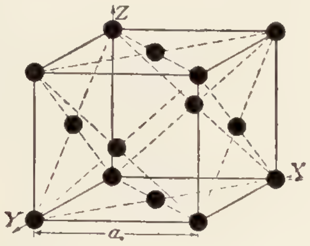

FIG. 2.—The unit cube of the face-centered cubic arrangement (4*b*). The coordinates of the atomic positions associated with this cell are 000; $\frac{1}{2}\frac{1}{2}0$; $\frac{1}{2}0\frac{1}{2}$; $0\frac{1}{2}\frac{1}{2}$.

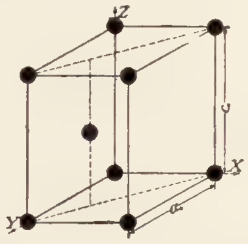

FIG. 3.—The unit cell of the hexagonal close-packed arrangement (*d*). The coordinates of the atomic positions associated with this cell are 000; $\frac{1}{3}\ \frac{2}{3}\ \frac{1}{2}$.

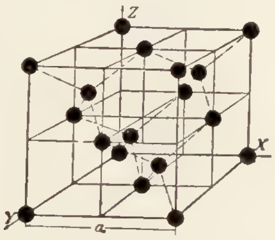

FIG. 4.—The unit cube of the diamond cubic arrangement (8*f*). The coordinates of the atomic positions associated with this cell are 000; $\frac{1}{2}\frac{1}{2}0$; $\frac{1}{2}0\frac{1}{2}$; $0\frac{1}{2}\frac{1}{2}$; $\frac{1}{4}\frac{1}{4}\frac{1}{4}$; $\frac{1}{4}\frac{3}{4}\frac{3}{4}$; $\frac{3}{4}\frac{1}{4}\frac{3}{4}$; $\frac{3}{4}\frac{3}{4}\frac{1}{4}$.

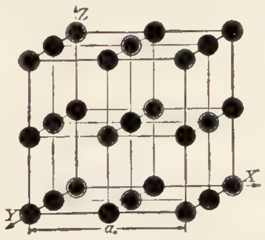

FIG. 5.—The unit cube of the NaCl-arrangement (4*b*, 4*c*). The atoms in positions 4*b* are shown as annuli; those in 4*c* as black circles. The coordinates of 4*c* are $0\frac{1}{2}0$; $\frac{1}{2}00$; $00\frac{1}{2}$; $\frac{1}{2}\frac{1}{2}\frac{1}{2}$.

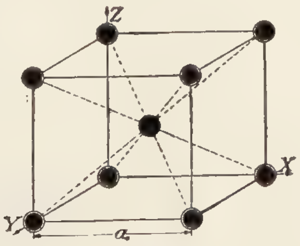

FIG. 6.—The unit cube of the CsCl-arrangement (1*a*, 1*b*). Atoms of one sort, in 1*a*, are shown as annuli; the other kind of atom, in 1*b*, appears as a black circle.

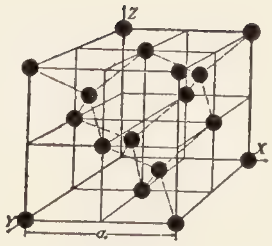

FIG. 7.—The unit cube of the ZnS-arrangement (4*b*, 4*d*). The atoms in position 4*d* appear as black circles; their coordinates are $\frac{1}{4}\frac{1}{4}\frac{1}{4}$; $\frac{1}{4}\frac{3}{4}\frac{3}{4}$; $\frac{3}{4}\ \frac{1}{4}\frac{3}{4}$; $\frac{3}{4}\ \frac{3}{4}\ \frac{1}{4}$.

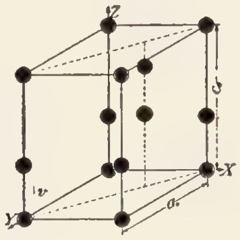

FIG. 8.—The unit cell of the ZnO-arrangement (*e'*). The coordinates of equivalent atomic positions are 000; $\frac{2}{3}\ \frac{1}{3}\ \frac{1}{2}$ and $00v$; $\frac{2}{3}, \frac{1}{3}, v + \frac{1}{2}$.

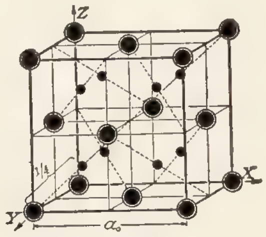

FIG. 9.—The unit cell of the CaF_2-arrangement (4*b*, 8*e*). The atoms in positions 8*e*, shown as black circles, have the coordinates $\frac{1}{4}\frac{1}{4}\frac{1}{4}$; $\frac{1}{4}\frac{3}{4}\frac{3}{4}$; $\frac{3}{4}\frac{1}{4}\frac{3}{4}$; $\frac{3}{4}\frac{3}{4}\frac{1}{4}$; $\frac{3}{4}\frac{3}{4}\frac{3}{4}$; $\frac{1}{4}\frac{1}{4}\frac{3}{4}$; $\frac{3}{4}\frac{1}{4}\frac{1}{4}$; $\frac{1}{4}\frac{3}{4}\frac{1}{4}$.

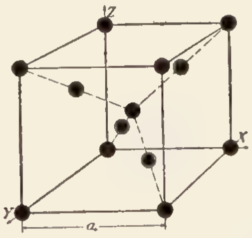

FIG. 10.—The unit cube of the Cu_2O-arrangement (2*a*, 4*d*). The atoms in positions 4*d* are shown as annuli, those in 2*a* appear as black circles.

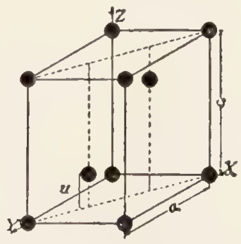

FIG. 11.—The unit cell of the hexagonal $Mn(OH)_2$ arrangement (*h*). The coordinates of the equivalent atomic positions in the unit are 000 and $\frac{1}{3}\ \frac{2}{3}u$; $\frac{2}{3}\ \frac{1}{3}\bar{u}$.

A-Table.—Elements

Chemical symbol	Crystal system	Structure type	Space group	Unit cell Size, Å a_0	c_0	Molecules	Calculated density	Lit. and remarks
A	C.	F.-c.(4*b*)		5.43		4	1.645	(227) (temp. *ca.* −253°)
Ag	C.	F.-c.(4*b*)		4.079		4	10.49	(82, 142, 165, 218, 235, 240, 241, 265, 329, 371)
Al	C.	F.-c.(4*b*)		4.043		4	2.692	(84, 127, 128, 141 197, 206, 216, 241, 329, 366, 361)
As	H.	3Di-5(*c*)	3Di-5	4.142; 54° 7′		2	5.75	(43, 366) u. = 0.226, probably correct
Au	C.	F.-c.(4*b*)		4.064		4	19.4	(82, 84, 142, 165, 218, 241, 329, 371)
Be	H.	C.-p.(*d*)	6Di-4?	2.283	3.607	2	1.828	(163)
Bi*	H.	3Di-5(*c*)	3Di-5	4.726; 57° 16′		2	9.86	(82, 118, 139, 140, 142, 166, 193)
C-dia.	C.	Dia.(8*f*)	Oi-7	3.56		8	3.51	(52, 59, 60, 128)
Graph.†	H.	6e-4(*a*, *b*)	6e-4?	2.46	6.79	4	2.22	(14, 88, 89, 105, 119, 128, 262, 310)
Ca	C.	F.-c.(4*b*)		5.56		4	1.538	(134, 135)
Cd	H.	C.-p.(*d*)	6Di-4?	2.98	5.63	2	8.56	(134, 136, 229)
Ce	C.	F.-c.(4*b*)		5.12		4	6.90	(137)
	H.	C.-p.(*d*)	6Di-4?	3.65	5.96	2	6.73	(137). Existence (?) (224)
Co	C.	F.-c.(4*b*)		3.554		4	8.67	(131, 136), *cf.* (224)
	H.	C.-p.(*d*)	6Di-4?	2.514	4.105	2	8.66	(131, 136), *cf.* (224)
Cr	C.	B.-c.(2*a*)		2.875		2	7.22	(131, 136, 201, 206)
Cu	C.	F.-c.(4*b*)		3.603		4	8.95	(46, 82, 84, 141, 145, 196, 197, 198, 199, 200, 329, 374, 371)
Fe-α	C.	B.-c.(2*a*)		2.855		2	7.92	(82, 84, 122, 128, 131, 168, 196, 250 253, 254, 255, 256, 362)
Fe-β	C.	B.-c.(2*a*)		2.90 at 800°		2	7.55	
Fe-γ	C.	F.-c.(4*b*)		3.63 at 1100° 3.68 at 1425°		4	7.70 at 1100° 7.40 at 1425°	No structural inversion, α to β (250, 253, 254, 255, 256, 257)
Fe-δ	C.	B.-c.(2*a*)		2.93 at 1425°		2	7.33	
Ga				Symmetry said to be not cubic				(285)
Ge	C.	Dia.(8*f*)	Oi-7	5.62		8	5.38	(14, 138)
Hf	H.	C.-p.(*d*)	6Di-4?	3.32	5.46	2	11.3	(324, 379)
Hg		Two different structures have been deduced						(2, 170)
In	Tet.?	?		4.58	4.86	4	7.43	(134, 136) P. U. C.
Ir	C.	F.-c.(4*b*)		3.823		4	22.8	(134, 136, 284)
K	C.	B.-c.(2*a*)		5.20 at −150°		2	0.917 at −150°	(162). Approximate only
Li	C.	B.-c.(2*a*)		3.50		2	0.534	(32, 33, 128)
Mg	H.	C.-p.(*d*)	6Di-4?	3.22	5.23	2	1.709	(36, 128, 129, 196)
Mn (α)	C.?			8.89		56?	7.21	(350) P. U. C.
Mn (β)	C.?			6.289		20?	7.29	(350) P. U. C.
Mn (γ)	Tet.?			3.774	3.533	4	7.21	(350, 368) P. U. C.
Mo	C.	B.-c.(2*a*)		3.143		2	10.20	(82, 136, 236, 329)
Na	C.	B.-c.(2*a*)		4.30		2	0.954	(128)
Nb	C.?			4.19		4		(366) P. U. C. Impure
Ni	C.	F.-c.(4*b*)		3.499		4	9.04	(36, 82, 84, 128, 131, 136, 168, 206, 260, 299, 329, 360, 361)
Os	H.	C.-p.(*d*)		2.714	4.32	2	22.8	(137)
P (black)	H.			5.96; 60° 16′		8		(392) P. S. like As
Pb	C.	F.-c.(4*b*)		4.920		4	11.48	(82, 84, 156, 196, 206, 241, 329, 340)
Pd	C.	F.-c.(4*b*)		3.859		4	12.25	(134, 136, 164, 167, 329, 393)
Pt	C.	F.-c.(4*b*)		3.913		4	21.5	(82, 134, 136, 142, 329, 393)
Rh	C.	F.-c.(4*b*)		3.820		4	12.2	(136, 393)
Ru	H.	C.-p.(*d*)	6Di-4?	2.686	4.272	2	12.6	(134, 136)
S	R.		2Di-24	10.61	24.56	128	2.02	(61, 314) b_0 = 12.87
Sb	H.	3Di-5(*c*)	3Di-5	4.500; 56° 37′		2	6.73	(140, 193) u. = 0.231
Se	H.	3D-4(*a*) (or 3D-6(*a*))	3D-4 or 3D-6	4.34	4.95	3	4.86	(42, 232, 308, 366) u. = 0.216. P. S.
Si	C.	Dia.(8*f*)	Oi-7	5.42		8	2.32	(88, 107, 108, 127, 128, 153, 154)
Sn (gray)	C.	Dia.(8*f*)	Oi-7	6.46		8	5.81	(29, 30, 31), *cf.* (206)
(white)	Tet.	4Di-19(*a*)	4Di-19?	5.824	3.165	4	7.30	(29, 30, 31, 172, 173, 174, 206, 238)
Ta	C.	B.-c.(2*a*)		3.272		2	17.1	(25, 134, 136)

Chemical symbol	Crystal system	Structure type	Space group	Unit cell Size Å a_0	Unit cell Size Å c_0	Unit cell Molecules	Calculated density	Lit. and remarks
Te	H.	3D-4(*a*) or 3D-6(*a*)	3D-4 or 3D-6	4.44	5.90	3	6.26	(42, 232, 308, 366) $u = 0.269$. P. S.
Th	C.	F.-c.(4*b*)		5.04		4	12.0	(36, 137)
Ti	H.	C.-p.(*d*)	6Di-4?	2.92	4.67	2	4.58	(36, 137, 201)
Tl	H.?	C.-p.(*d*)?	6Di-4(?)	3.47	5.52	2	11.7	(25, 156). Correct unit uncertain
	Tet.(?)			4.75	5.40			
U				Said to be not cubic				(25)
V	C.	B.-c.(2*a*)		3.04		2	5.98	(138)
W	C.	B.-c.(2*a*)		3.155		2	19.3	(67, 82, 84, 87, 136, 374)
Zn	H.	C.-p.(*d*)	6Di-4?	2.657	4.948	2	7.04	(134, 136, 206, 229, 346)
Zr	H.	C.-p.(*d*)	6Di-4?	3.23	5.14	2	6.47	(137, 379)

* u = 0.237. (142, 61 early editions) give incorrect structures.
† u for 6e-4 (a) = 0. u for 6e-4 (b) = $\frac{1}{14}$.

B-Table.—Standard Arrangement *v.* p. 96

Chemical symbol	Crystal system	Structure type	Space group	Unit cell, size, Å a_0	Unit cell, size, Å c_0	M	Calculated density	Lit.	Additional data and remarks
H_2O	H.			4.52	7.32	4	0.918	(54, 90, 114, 210, 213)	P. U. C. Atomic arrangement not yet known with certainty.
HCl	C.	F.-c.?		5.50; −168°C		4	1.45	(228)	
11 N_2O	C.	(4*f*)	T-4	5.77		4	1.51	(233, 358)	$u_0 = 0.228$, distance O-N = 1.06Å. P. S.
NH_3	C.	[4*f*, T-4(*b*)]	T-4	5.19(*ca.* −80°)		4	0.81	(338)	$u = 0.22$
NH_4Cl (high)	C.	NaCl-like		6.53(250°)		4	1.27	(20)	
NH_4Cl (low)	C.	CsCl-like		3.866		1	1.528	(20, 120, 244, 280)	
$N_2H_6Cl_2$	C.	FeS_2-like (8*h*, 8*h*)	Ti-6	7.89		4	1.41	(281)	u_N = *ca.* 0.04, $u_{Cl} = 0.27$
NH_4Br (high)	C.	NaCl-like		6.90(250°)		4	1.97	(20)	
NH_4Br (low)	C.	CsCl-like		4.047		1	2.438	(20, 120, 244)	
NH_4I	C.	NaCl-like		7.244		4	2.517	(20, 120, 243)	
$(NH_4)_2SO_4$	R.		2Di-16	5.95	7.73	4	1.80	(155)	$b_0 = 10.56$
12 PH_4I	Tet.	4Di-7(*a*, *c*)	4Di-7	6.34	4.62	2	2.88	(94)	$u_I = 0.40 \pm 0.01$
$(NH_4)H_2PO_4$	Tet.		4d-12	7.48	7.55	4	1.80	(342)	N atoms at 4d.-12(*a*); P at 4d-12 (*b*)
As_2O_3	C.	(32*b*, 48*c*)	Oi-7	11.06		16	3.86	(41)	$u_{As} = 0.895$, $v_0 = 0.21$
Sb_2O_3	C.	(32*b*, 48*c*)	Oi-7	11.14		16	5.57	(41)	$u_{Sb} = 0.886$, $v_0 = 0.23$
16 CO_2	C.	(4*b*, 8*h*)	Ti-6	5.62		4	1.64	(317, 318, 358, 382)	u_0 uncertain. Liquid air-temperature

For other carbon compounds belonging here *v.* the C-Table *infra*

Chemical symbol	Crystal system	Structure type	Space group	a_0	c_0	M	Calculated density	Lit.	Additional data and remarks
SiO_2 (β-quartz)	H.	6D-4, 6D-5 } (*c*, *j*)	6D-4 & 6D-5	5.01	5.47	3	2.50	(331, 332, 359)	$u = 0.197$
SiO_2 (low quartz)	H.		3D-3 & 3D-5 or 3D-4 & 3D-6	4.903	5.398	3	2.648	(21, 48, 169, 227, 331)	P. U. C. a_0-spacing for quartz very accurately determined.
SiO_2 (β-cristobalite)	C.	(8*f*, 16*b*)	Oi-7 ?	7.12(290°)		8	2.20	(288, 377, 380)	
$(NH_4)_2SiF_6$	C.	(4*b*, 8*e*, 24*a*)	Oi-5	8.38		4	2.00	(38)	$u_F = 0.205$
SiC, I	H.			3.095	37.9	15	3.15	(383)	Complex structure assigned
SiC, II	H.		6C-6 ?	3.095	15.17	6	3.15	(347, 348)	C at 6C-6(*a*) if $u = 0$ and 6C-6-(*b*), if $u = \frac{1}{3}$ and $\frac{2}{3}$. Si at 6C-6(*a*) if $u' = \frac{1}{3}$ and 6C-6(*b*) if u' = 0.29 and 0.95 P. S.
SiC, III	H.			3.095	10.10	4	3.16	(390)	C at 000; 00½; ⅓ ⅔ ½; ⅔ ⅓ ½. Si at 00*u*; 0, 0, $u + \frac{1}{2}$; ⅓, ⅔, $u + \frac{1}{2}$; ⅔, ⅓, $u + \frac{1}{2}$, u = *ca.* $\frac{3}{16}$. P. S.
TiO_2 (rutile)	Tet.	4Di-14(*a*, *f*)	4Di-14	4.58	2.98	2	4.21	(83, 113, 241, 263)	
TiO_2 (anatase)	Tet.			5.27	9.37	8	4.05	(242)	P. U. C.
Ti_2O_3	H.	3Di-6(*c*, *e*)	3Di-6	5.37; 56° 48′		2	4.67	(351)	
TiN	C.	NaCl(4*b*, 4*c*)		4.23?		4	5.40?	(13, 306)	The later determination gives $a_0 = 4.40$
TiC	C.	NaCl(4*b*, 4*c*)		4.29?		4	5.01?	(13, 306)	The later determination gives $a_0 = 4.60$
21 ZrO_2	C.	CaF_2(4*b*, 8*e*)	Oi-5	5.08		4	6.19	(13)	P. S. Other data (83) conflict. 2 modifications?
ZrS_2	H.	$Mn(OH)_2$(*h*)	3Di-3	3.68	5.85	1	3.73	(13)	P. S. u = *ca.* 0.25
$ZrSe_2$	H.	$Mn(OH)_2$(*h*)	3Di-3	3.79	6.18	1	5.35	(13)	P. S. u = *ca.* 0.25
ZrN	C.	NaCl(4*b*, 4*c*)		4.61		4	7.1	(13, 306)	P. S.
$(NH_4)_3ZrF_7$	C.	(4*d*, 4*e*, 12*a*, 24*u*)	Oi-4	9.35		4	2.25	(13)	$0.15 < u_N < 0.21$; $0.42 < u_F < 0.48$; $0.23 < v_F < 0.28$
ZrC	C.	NaCl(4*b*, 4*c*)		4.73		4	6.4	(13, 306)	P. S.
$ZrSiO_4$	Tet.			9.20	5.87	8	4.85	(241)	P. U. C.

Chemical symbol	Crystal system	Structure type	Space group	Unit cell, size, Å a_0	c_0	M	Calculated density	Lit.	Additional data and remarks
SnO	Tet.	4Di 7(a, c)?		3.77	4.77	2	6.56	(300)	
SnO_2	Tet.			4.72	3.16	2	7.07	(83, 241, 263)	P. U. C.
SnI_4	C.	Ti-6(c, d)	Ti-6	12.28		8	4.52	(96, 175)	$u_{Sn} = 0.129$, $u_I = 0.258$, $x = 0.009$, $y = 0.001$, $z = 0.25_5$
$(NH_4)_2SnCl_6$	C.	(4b, 8e, 24a)	Oi-5	10.05		4	2.39	(92)	$u_{Cl} = 0.245$ and < 0.25
23 PbO	Tet.	4Di-7(a, c)		3.99	5.01	2	9.28	(97, 300)	u_{Pb}[4Di-7(c)] = 0.24
PbO_2	Tet.	4Di-14(a, f)	4Di-14	4.97	3.40	2	9.40	(345, 386)	
$PbF_2(\beta)$	C.	CaF_2(4b, 8e)	Oi-5	5.93		4	7.76	(340)	
PbS	C.	NaCl(4b, 4c)		5.97		4	7.42	(61, 76, 154, 340, 357)	
PbSe	C.	NaCl(4b, 4c)		6.14		4	8.17	(357, 366)	
PbTe	C.	NaCl(4b, 4c)		6.34		4	8.67	(357)	
$Pb(NO_3)_2$	C.	(4b, 8h, Ti-6(24))	Ti-6	7.84		4	4.54	(191, 245)	
ThO_2	C.	CaF_2(4b, 8e)	Oi-5	5.59		4	9.98	(13, 83, 111)	Another determination of a_0 (289) varies widely from this.
Ga_2O_3	H.	3Di-6(c, e)	3Di-6	5.281; 55° 35′		2	6.62	(351)	
In_2O_3	C.		Oi-10	10.12		16	7.07	(351)	
$(Ga, In)_2O_3$	C.		Oi-10	9.76		16		(351)	39 mol. % In_2O_3
Tl_2O_3	C.		Oi-10	10.57		16	10.2	(351)	
TlCl	C.	CsCl(1a, 1b)	Oi-1	3.84		1	6.98	(85, 239, 369)	
TlBr	C.	CsCl(1a, 1b)	Oi-1	3.97		1	7.44	(239, 369)	
ZnO	H.	ZnO(e′)	6e-4	3.25	5.23	2	5.61	(4, 7, 51, 61, 121, 249)	
$Zn(BrO_3)_2.6H_2O$	C.	(4b, 8h, Ti-6(24))	Ti-6	10.31		4	2.59	(278)	
α-ZnS (wurtzite)	H.	ZnO(e′)	6e-4	3.84	6.28	2	4.01	(9, 51, 381)	$u_S = ca. \frac{3}{8}$
β-ZnS (blende)	C.	ZnS(4b, 4d)	Te-2	5.43		4	4.02	(47, 103, 108, 154)	
ZnSe	C.	ZnS(4b, 4d)	Te-2	5.65		4	5.29	(80)	
$ZnCO_3$	H.	3Di-6(a, b, e)	3Di-6	5.62; 48° 23′		2	4.54	(160)	
29 CdO	C.	NaCl(4b, 4c)		4.72		4	8.06	(86, 217)	
CdF_2	C.	CaF_2(4b, 8e)	Oi-5	5.40		4	6.30	(340)	
CdI_2	H.	$Mn(OH)_2(h)$	3Di-3	4.24	6.84	1	5.67	(39)	$0.23 < u_I < 0.253$
α-CdS	H.	ZnO(e′)	6e-4	4.14	6.72		4.78	(51, 381)	$u_S = ca. \frac{3}{8}$
β-CdS	C.	ZnS(4b, 4d)	Te-2	5.82		4	4.84	(381)	
Hg_2Cl_2	Tet.	4Di-17(e)		4.47	10.89	2	7.16	(344)	$u_{Hg} = \frac{1}{9}$, $u_{Cl} = \frac{1}{3}$. P. S.
Hg_2Br_2	Tet.	4Di-17(e)		4.65	11.10	2	7.71	(344)	$u_{Hg} = \frac{1}{9}$, $u_{Br} = \frac{1}{3}$. P. S.
HgI_2	Tet.			4.356	12.34	2	6.40	(397)	
Hg_2I_2	Tet.	4Di-17(e)		4.92	11.61	2	7.68	(344)	$u_{Hg} = \frac{1}{9}$, $u_I = \frac{1}{3}$. P. S.
HgS (metacinnabarite)	C.	ZnS(4b, 4d)	Te-2	5.84		4	7.71	(150, 151, 154, 336, 337, 365, 366)	
HgS (cinnabar)	H.		3D-4 & 3D-6	4.16	9.54	3	8.12	(180, 357, 365, 366)	P. S. suggested
CuO	Tri.			3.74	4.67	4	6.48	(188)	P. S. This suggested structure resembles NaCl. $b_0 = c_0$. $\alpha = 85° 21′$; $\beta = 86° 25′$; $\gamma = 93° 35′$
Cu_2O	C.	Cu_2O(2a, 4d)	Oi-4	4.28		2	6.02	(61, 113, 188)	
CuCl	C.	ZnS(4b, 4d)	Te-2	5.40		4	4.15	(76, 293)	
CuBr	C.	ZnS(4b, 4d)	Te-2	5.75		4	4.98	(76, 293)	
CuI	C.	ZnS(4b, 4d)	Te-2	6.07		4	5.62	(8, 76, 293)	
Cu_2Se	C.	CaF_2(4b, 8e)	Oi-5	5.75		4	7.16	(80)	
Cu_2Zn_3	C.			4.01				(24) cf. (197)	Correctness in doubt
32 Ag_2O	C.	Cu_2O(2a, 4d)	Oi-4	4.72		2	7.27	(76, 88, 161, 277)	
AgCl	C.	NaCl(4b, 4c)		5.54		4	5.56	(76, 264, 265)	
AgBr	C.	NaCl(4b, 4c)		5.77		4	6.45	(76, 264, 265)	
AgI	H.	ZnO(e′)	6e-4	4.59	7.50	2	5.66	(6, 8, 265)	
AgI	C.	ZnS (4b, 4d)	Te-2	6.49		4	5.67	(76, 264, 265)	
Ag_3PO_4	C.	(2a, 6f, 8a)	Te-4	6.00		2	6.37	(287)	
Ag_3AsO_4	C.	(2a, 6f, 8a)	Te-4	6.12		2	6.66	(287)	
(4AgI:CuI) miersite	C.	ZnS(4b, 4d)	Te-2	6.35		4		(8)	A solid solution of AgI and CuI. Exact composition unknown
$(NH_4)_2PtCl_6$	C.	(4b, 8e, 24a)	Oi-5	9.84		4	3.08	(292)	$0.22 < u_{Cl} < 0.24$
$PtAs_2$ (sperrylite)	C.	FeS_2(4b, 8h)	Ti-6	5.94		4		(357)	Composition unknown
$(NH_4)_2PdCl_4$	Tet.	4Di-1(a, e, j)	4Di-1	7.21	4.26	1	2.12	(95)	$u_{Cl} = 0.23$
MnO	C.	NaCl(4b, 4c)		4.40		4	5.50	(157)	
MnO_2	Tet.			4.44	2.89	2	5.04	(214)	Pyrolusite gives the same pattern as polianite
$Mn(OH)_2$	H.	$Mn(OH)_2(h)$	3Di-3	3.34	4.68	1		(3)	Dimensions of this unit calculated from the density $\rho = 3.26$. $u_0 = ca. 0.22$
MnS	C.	NaCl(4b, 4c)		5.21		4	4.06	(272)	
MnS_2	C.	FeS_2(4b, 8h)	Ti-6	6.15		4		(104, 106)	$u_s = 0.40_0$. Size of unit cell calculated from the best available density, [$\rho = 3.38$(162)]
$MnCO_3$	H.	3Di-6(a, b, e)	3Di-6	5.84; 47° 45′		2	3.79	(47, 270)	C atoms at (a); $u_0 = 0.27$
43 FeO	C.	NaCl(4b, 4c)		4.294		4	5.99	(322)	
Fe_2O_3	H.	3Di-6(c, e)	3Di-6	5.42; 55° 17′		2	5.25	(61, 81, 181, 205, 351)	$u_{Fe} = 0.105 \pm 0.001$: $u_0 = 0.292 \pm 0.007$
Fe_3O_4	C.	(8f, 16c, 32b)	Oi-7	8.37		8	5.21	(50, 121, 189, 394)	$u_0 = ca. 0.37$
FeS (troilite)	H.	6e-4(a, b)		3.43	5.79	2	4.90	(356, 391)	If $u_{Fe} = 0$, $u_S = ca. \frac{1}{4}$. If $u = \frac{1}{4}$ exactly, the space group is 6Di-4

Chemical symbol	Crystal system	Structure type	Space group	Unit cell, size, Å		M	Calculated density	Lit.	Additional data and remarks
				a_0	c_0				
FeS_2 (pyrite)	C.	FeS_2(4*b*, 8*h*)	Ti-6	5.38		4	5.08	(47, 104, 106, 357)	$u_S = 0.388$
FeS + S_x	H.	6*e*-4(*a*, *b*)		3.43	5.68	2		(356, 391)	Artificial and natural pyrrhotites containing excess sulfur
FeSe	H.	6*e*-4(*a*, *b*)		3.61	5.87	2		(356)	39.4% Fe (weight)
FeSe + Se_x	H.	6*e*-4(*a*, *b*)		3.51	5.55	2		(356)	35.0% Fe (weight)
Fe(S, Se)	H.	6*e*-4(*a*, *b*)		3.54	5.91	2		(356)	49.8% (weight) Fe, 12.0% S, 38.2% Se
$(NH_4)_3FeF_6$	C.	(4*b*, 4*c*, 8*e*, 24*a*)	Oi-5	9.10		4	1.96	(203)	N atoms at (4*c*) and (8*e*). 0.187 < u_F < 0.217, best around 0.21
$NH_4Fe(SO_4)_2.12H_2O$	C.	(4*b*, 4*c*, 8*h*, 8*h*, Ti.-6 (24))	Ti-6	12.14		4	1.81	(248)	
Fe_3C	R.			4.52	6.74	4	7.67	(5, 6, 7, 254, 261)	Cementite and cohenite are identical in structure. Atomic arrangement unknown. $b_0 = 5.07$
$FeCO_3$	H.	3Di-6(*a*, *b*, *e*)	3Di-6	5.82; 47° 45′		2	3.86	(47, 270)	C atoms at (*a*); $u_0 = 0.27$ probably
FeSi	C.			4.48		4	6.16	(207)	Probably tetartohedral; atomic arrangement unknown
$FeSi_2$	Tet.			2.69	5.08	1	5.02	(207)	P. U. C., structure unknown
$FeCuS_2$	Tet.	4*d*-5(*c*, *a*, *g*)?	4*d*-5 ?	5.23	5.15	2		(65, 115)	Fe atoms at (*c*). u_0 = *ca.* 0.21. Probably correct structure.
CoO	C.	NaCl(4*b*, 4*c*)		4.24		4	6.49	(351)	
CoS	H.	6*e*-4(*a*, *b*)		3.37	5.14	2	5.94	(356)	
CoAsS	C.	FeS_2-like(4*f*)	T-4	5.65		4	6.07	(183, 357)	Reflection microscopic results (161) suggest that this structure may not be correct
(Fe, Co)S (synthetic)	H.	6*e*-4(*a*, *b*)		3.36	5.29	2		(356)	Composition = *ca.* 50 atomic % FeS
45 NiO	C.	NaCl(4*b*, 4*c*)		4.172		4	6.75	(74, 86, 299, 351, 353, 360)	
NiS (synthetic)	H.	6*e*-4(*a*, *b*)		3.42	5.30	2	5.58	(356)	u_S = *ca.* ½ taking $u_{Ni} = 0$
NiS (millerite)	H.	3*e*-5(*b*, *b*)	3*e*-5	5.64; 116° 36′		3		(356)	Possible atomic positions are suggested
Ni_3S_2	C.?			4.08		1		(356)	P. U. C.
NiSe	H.	6*e*-4(*a*, *b*)		3.66	5.33	2		(356)	
$Ni(NO_3)_2.6NH_3$	C.	(4*b*, 8*h*, Ti-6(24))	Ti-6	10.96		4	1.43	(275)	u_N in (8*h*) = *ca.* ¼, y_N and z_N = *ca.* 0, x_0 and y_0 = *ca.* ¼.
$NiCl_2.6NH_3$	C.	(4*b*, 8*e*, 24*a*)	Oi-5	10.09		4	1.49	(274)	$u_N = 0.24$
$NiBr_2.6NH_3$	C.	(4*b*, 8*e*, 24*a*)	Oi-5	10.48		4	1.84	(274)	
$NiI_2.6NH_3$	C.	(4*b*, 8*e*, 24*a*)	Oi-5	11.01		4	2.05	(274)	$u_N = 0.24$
NiAs	H.	6*e*-4(*a*, *b*)		3.61	5.03	2		(9, 356, 391)	Niccolite from Eisleben.
NiAsS (gersdorffite)	C.	FeS_2-like(4*f*)	T-4	5.68		4		(357, 366)	
NiSb	H.	6*e*-4(*a*, *b*)		3.92	5.11	2	8.78	(356, 391)	For the mineral breithauptite from Andreasberg a_0 = 3 90, c_0 = 5.09
NiSbS (ullmanite)	C.	FeS_2-like(4*f*)	T-4	5.91		4		(357)	Composition unknown
(Ni, Fe)S (synthetic)	H.	6*e*-4(*a*, *b*)		3.408	5.540	2		(356)	S = 37.8%, Fe = 33.9%, Ni = 28.3% (weight)
(Ni, Fe)S (synthetic)	H.	6*e*-4(*a*, *b*)		3.408	5.434	2		(356)	S = 38.4%, Fe = 28 7%. Ni = 32.8% (weight)
(Ni, Fe)S (pentlandite)	C.		Oi-5 ?	10.00		32		(356)	(8*l*, 24*a*, 32*a*) with u_{Fe}(24*a*) = *ca.* ¼ and u_S = *ca.* ⅛ gives fair agreement. Various compositions
Cr_2O_3	H.	3Di-6(*c*, *e*)	3Di-6	5.35; 54° 58′		2	5.28	(351)	
MoS_2	H	6Di-4(*c*, *f*)	6Di-4	3.15	12.30	2	5.00	(99, 311)	$u_S = 0.621$
$(NH_4)_3MoO_3F_3$	C.	(4*b*, 4*c*, 8*e*, 24*a*)	Oi-5 ?	9.10		4	2.23	(203)	N atoms at (4*c*) and (8*e*). F + O at (24*a*). 0.194 < $u_{F,O}$ < 0.220
$PbMoO_4$	Tet.			3.85	6.02	1		(91)	P. U. C.
Ag_2MoO_4	C.	(8*f*, 16*c*, 32*b*)	Oi-7	9.26		8	6.25	(276)	0.34 < u_0 < 0.40
49 UO_2	C.	CaF_2(4*b*, 8*e*)	Oi-5	5.47		4	10.89	(13, 111)	
$UO_2(NO_3)_2.6H_2O$	R.		2Di-17	13.15	11.42	4	2.75	(68, 204)	U atoms probably at 2Di-17 (*c*) with *u* = 0.13. b_0 = 8.02
V_2O_3	H.	3Di-6(*c*, *e*)	3Di-6	5.43; 53° 53′		2	5.09	(351)	
VN	C.	NaCl(4*b*, 4*c*)		4.28		4	5.47	(306)	
VC	C.	NaCl(4*b*, 4*c*)		4.30		4	5.23	(306)	
CbN	C.	NaCl(4*b*, 4*c*)		4.41		4	8.25	(306)	
CbC	C.	NaCl(4*b*, 4*c*)		4.40		4	8.14	(306)	
TaN	H.	ZnO(*e*′)	6*e*-4	3.05	4.94	2	16.2	(13)	P. S. *Cf.* (307) which gives conflicting results
TaC	C.	NaCl(4*b*, 4*c*)		4.58		4	13.7	(13, 306)	
B_2H_6	H.			4.54	8.69	2	0.589	(349)	B atoms probably at 6Di-4 (*f*) with *u* = *ca.* 0.10. Temperature not stated
55 Al_2O_3	H.	3Di-6(*c*, *e*)	3Di-6	5.12; 55° 17′		2	3.96	(61, 81, 181, 205, 351)	The α-form. u_{Al} = 0.105 ± 0.001; u_0 = 0.303 ± 0.003

Chemical symbol	Crystal system	Structure type	Space group	Unit cell, size, Å a_0	c_0	M	Calculated density	Lit.	Additional data and remarks
AlN	H.	ZnO(e′)	6e-4	3.11	4.98	2	3.24	(195)	$u = 0.38 \pm 0.01$
$(NH_4)_3AlF_6$	C.	(4b, 4c, 8e, 24a)	Oi-5	8.40		4	2.17	(203)	N atoms at (4c) and (8e). $0.194 < u_F < 0.200$
$NH_4Al(SO_4)_2.12H_2O$	C.	(4b, 4c, 8h, 8h, Ti.-6 (24))	Ti-6	12.0_0		4	1.76	(248, 282)	
AlSb	C.	ZnS(4b, 4d)	Te-2	6.13		4	4.26	(298)	
$Al_2F_2(SiO_4)$ topaz	R.		2Di-16	4.64	8.37	4		(158)	Topaz from San Luis Potosi, Mexico; $b_0 = 8.78$
CuAl	H.	F.-c.?		3.89; 94° 36′		4		(141, 197, 258)	This structure may be incorrect
Cu_3Al	C.	F.-c.		3.47		4		(24) cf. (141)	Probably incorrect
$CuAl_2$	Tet.	B.-c.		6.05	4.88	4	4.35	(141, 197, 258)	Atomic arrangement unknown
(Fe″, Mn″)$_3$ $Al_2(SiO_4)_3$ (garnet)	C.		Oi-10	11.4_0		8		(190)	67 atomic % of ferrous iron
NiAl	C.	CsCl(1a, 1b)?		2.82		1	6.2_5	(24)	More work needed
56 Sc_2O_3	C.		Oi-10	9.79		16	3.89	(351)	
ScN	C.	NaCl(4b, 4c)		4.44		4	4.4_6	(306)	
$(Sc, In)_2O_3$	C.		Oi-10	9.90		16		(351)	66.8 mol. % Sc_2O_3
$(Al, Sc)_2O_3$	C.		Oi-10	9.22		16		(351)	Composition unknown
Yt_2O_3	C.		Oi-10	10.56		16	5.0_7	(351)	
$YtPO_4$	Tet.			9.60	5.94	8	4.44	(242)	P. U. C.
$(Yt, Tl)_2O_3$	C.		Oi-10	10.53		16		(351)	50 weight % Yt_2O_3
$(Yt, Bi)_2O_3$	C.		Oi-10	10.72		16		(351)	37.4 mol % Bi_2O_3
La_2O_3	H.			3.94_5	6.15_1	1	6.4_8	(351)	
CeO_2	C.	CaF_2(4b, 8e)	Oi-5	5.41		4	7.1_8	(83, 111)	
Ce_2O_3	H.			3.88_0	6.05_7	1	6.8_6	(351)	
60 Pr_2O_3	H.			3.85_1	5.99_6	1	7.0_7	(351)	
Pr_6O_{11}	C.			10.98		?		(352)	P. U. C.
Nd_2O_3	H.			3.84_1	6.00_9	1	7.2_3	(351)	
Sa_2O_3	C.		Oi 10	10.85		16	7.2_1	(351)	
Eu_2O_3	C.		Oi-10	10.84		16	7.2_9	(351)	
Gd_2O_3	C.		Oi-10	10.79		16	7.6_2	(351)	
66 Tb_2O_3	C.		Oi-10	10.70		16	7.9_0	(351)	
Tb_4O_7?	C.			10.55		?		(352)	P. U. C. "Brown terbium oxide"
Dy_2O_3	C.		Oi-10	10.63		16	8.2_0	(351)	
Ho_2O_3	C.		Oi-10	10.58		16	8.3_5	(351)	
Er_2O_3	C.		Oi-10	10.54		16	8.6_4	(351)	
Tu_2O_3	C.		Oi-10	10.52		16	8.7_7	(351)	
Yb_2O_3	C.		Oi-10	10.39		16	9.3_0	(351)	
Lu_2O_3	C.		Oi-10	10.37		16	9.4_2	(351)	
$(NH_4)_3HfF_7$	C.	(4d, 4e, 12a, 24u)	Oi-4	9.40		4		(117)	Contains 15% $(NH_4)_3ZrF_7$
75 BeO	H.	ZnO(e′)	6e-4	2.70	4.39	2	2.98	(109, 163, 333, 364)	u_0 ca. $\frac{3}{8}$.
$Be_4O(C_2H_3O_2)_6$	C.			15.7_2		8	1.38	(56, 62)	A possible atomic arrangement suggested
$Be_4O(C_3H_5O_2)_6$	M.			16.0_0	9.1_5	2	1.26	(62)	P. U. C. $b_0 = 9.7_6$, $\beta = 116° 7'$
MgO	C.	NaCl(4b, 4c)		4.20_8		4	3.59	(86, 107, 109, 110, 121, 132, 222, 271, 287)	
$Mg(OH)_2$	H.	$Mn(OH)_2$(h)	3Di-3	3.11	4.73	1	2.43	(3, 5, 159)	
MgF_2	Tet.	4Di-14(a, f)	4Di-14	4.66	3.08	2	3.11	(328, 345, 367)	$u_F = 0.30$
MgS	C.	NaCl(4b, 4c)		5.08		4	2.84	(125)	
$MgCO_3$	H.	3Di-6(a, b, e)	3Di-6	5.61; 48° 12′		2	3.10	(160)	
Mg_2Si	C.	CaF_2(4b, 8e)	Oi-5	6.39		4	1.94	(298)	
Mg_2Sn	C.	CaF_2(4b, 8e)	Oi-5	6.78		4	3.54	(202, 370)	
Mg_2Pb	C.			6.75		4	5.47	(370)	Structure probably CaF_2(4b, 8e)
(Mg, Fe″)$_2SiO_4$ olivine	R.		2Di-5	4.77	6.00	4		(28, 212)	14 atomic % of ferrous iron. $b_0 = 10.28$
Al_3Mg_4	C.			4.80			2.62	(24)	More work needed
$MgAl_2O_4$	C.	(8f, 16c, 32b)	Oi-7	8.07		8		(50, 189)	$u_0 = 0.37$. Value of a_0 calculated from the best available density ($\rho = 3.57$)
77 CaO	C.	NaCl(4b, 4c)		4.79		4	3.37	(79, 86, 107, 109)	
$Ca(OH)_2$	H.	$Mn(OH)_2$(h)	3Di-3	3.52	4.93	1	2.31	(158)	
CaF_2	C.	CaF_2(4b, 8e)	Oi-5	5.46		4	3.17	(47, 76, 107, 108)	
CaS	C.	NaCl(4b, 4c)		5.68		4	2.60	(79, 125)	
$CaSO_4$	R.		2Di-17	6.21	6.96	4		(326)	Anhydrite, not analyzed. $b_0 = 6.95$
$CaS_2O_3.6H_2O$	Tri.							(15)	Some unreduced measurements have been recorded for this salt
CaSe	C.	NaCl(4b, 4c)		5.91		4	3.81	(79)	
$Ca(NO_3)_2$	C.	(4b, 8h, Ti-6(24))	Ti-6	7.60		4	2.47	(245)	
$Ca(F, Cl)Ca_4(PO_4)_3$ apatite	H.		6Ci-2	9.41	6.88	2		(123)	Composition unknown
$CaCO_3$ (calcite)	H.	3Di-6 (a, b, e)	3Di-6	6.36; 46° 6′		2		(47, 49, 179, 221, 270)	C atoms at (a). $u_0 = 0.25$. A wave length standard
$CaCO_3$ (aragonite)	R.	2Di-16(c, c, c, d)?	2Di-16	4.94	5.72	4	2.94	(58, 286)	A possible atomic arrangement has been suggested. $b_0 = 7.94$
$Ca(HCOO)_2$	R.		2Di-5 ?	10.16	6.20	8	2.03	(323)	P. U. C.
$CaTiO_3$	C.?			7.68		8		(343)	P. U. C. (?) More work necessary
$CaWO_4$	Tet.			3.64	5.64	1		(91)	P. U. C.

Chemical symbol	Crystal system	Structure	Space group	Unit cell, size, Å		M	Calculated density	Lit.	Additional data and remarks
				a_0	c_0				
$CaMg(CO_3)_2$ (dolomite)	H.	3Ci-2(*a, b, c, f*)	3Ci-2	6.02; 47° 7′		1	2.84	(61, 239, 313)	
$CaMg(SiO_3)_2$ (diopside)	M.		2Ci-6	9.71	5.24	4	3.28	(291)	b_0 = 8.89; β = 74° 10
Ca(Mg, Fe)$(CO_3)_2$	H.	3Ci-2(*a, b, c, f*)	3Ci-2	6.02; 47° 7′		1		(289)	30 atomic % of ferrous iron
78 SrO	C.	NaCl(4*b*, 4*c*)		5.10		4	5.15	(107, 109)	
SrF_2	C.	CaF_2(4*b*, 8*e*)	Oi-5	5.86		4	4.12	(13)	
$SrCl_2$	C.	CaF_2(4*b*, 8*e*)	Oi-5	7.00		4	3.05	(341)	
SrS	C.	NaCl(4*b*, 4*c*)		5.87		4	3.90	(125)	
SrSe	C.	NaCl(4*b*, 4*c*)		6.23		4	4.55	(230, 231, 308)	
$Sr(NO_3)_2$	C.	(4*b*, 8*h*, Ti-6(24))	Ti-6	7.81		4	2.93	(191, 245)	
BaO	C.	NaCl(4*b*, 4*c*)		5.50		4	6.08	(107, 109)	
BaF_2	C.	CaF_2(4*b*, 8*e*)	Oi-5	6.20		4	4.86	(76)	
BaS	C.	NaCl(4*b*, 4*c*)		6.35		4	4.37	(125)	
$BaSO_4$	R.		2Di-16	8.898	7.170	4	4.432	(1, 290, 326, 327, 334, 335)	b_0 = 5.448
BaSe	C.	NaCl(4*b*, 4*c*)		6.62		4	4.93	(231, 308)	
$Ba(NO_3)_2$	C.	(4*b*, 8*h*, Ti-6(24))	Ti-6	8.11		4	3.23	(191, 245)	Approx. atomic positions are said to be u_N, x_0 and y_0 = *ca.* ¼, z_0 = *ca.* 0
81 Li_2O	C.	CaF_2(4*b*, 8*e*)	Oi-5	4.61		4	2.01	(35)	
LiH	C.	NaCl(4*b*, 4*c*)		4.10		4	0.76	(34)	
LiF	C.	NaCl(4*b*, 4*c*)		4.01		4	2.65	(78, 88, 132, 367)	
LiCl	C.	NaCl(4*b*, 4*c*)		5.14		4	2.06	(78, 194, 219)	
LiBr	C.	NaCl(4*b*, 4*c*)		5.49		4	3.46	(78, 194, 219)	
LiI	C.	NaCl(4*b*, 4*c*)		6.00		4	4.09	(78, 194, 219, 294)	
Li_2S	C.	CaF_2(4*b*, 8*e*)	Oi-5	5.70		4	1.64	(339)	
$Li_2C_2O_4$	R?			6.58	6.61	4	2.15	(25)	b_0 = 7.74. P. U. C.
$LiCHO_2$	M?			7.61	4.87	4	1.53	(25)	b_0 = 6.03; β = 95° 42′. P. U. C., S. P.
$LiC_2H_3O_2$	R.?			12.80	7.43	12	1.17	(25)	b_0 = 11.63. P. U. C., S. P.
$LiC_3H_5O_2$	R.?			16.98	9.45	16	1.08	(25)	b_0 = 12.15. P. U. C., S. P.
$LiC_4H_5O_2$ crotonate	H.?			24.8	10.7	48	1.27	(25)	P. U. C., S. P.
$LiC_4H_7O_2$ butyrate	H.?			27.7	10.1	48	1.07	(25)	P. U. C., S. P.
$LiC_4H_7O_2$ isobutyrate	Tet.?			19.75	9.25	24	1.01	(25)	P. U. C., S. P.
$LiC_5H_9O_2$ valerate	Tet.?			24.5	9.4	32	1.01	(25)	P. U. C., S. P.
$LiC_5H_9O_2$ isovalerate	R.?			11.70	6.93	4	1.00	(25)	b_0 = 8.70. P. U. C., S. P.
$LiC_5H_9O_2$ trimethylacetate	C.?			18.56		36	1.00	(25)	P. U. C., S. P.
$LiC_7H_{13}O_2$ heptylate	Tet.?			27.4	9.3	32	1.02	(25)	P. U. C., S. P.
$LiC_8H_{15}O_2$ caprylate	H.?			42.1	10.9	72	1.05	(25)	P. U. C., S. P.
$LiC_9H_{17}O_2$ nonylate	Tet.?			36.6	9.3	48	1.04	(25)	P. U. C., S. P.
$LiC_{11}H_{19}O_2$ undecylenate	H.?			52.6	9.5	72	0.99	(25)	P. U. C., S. P.
$LiC_{11}H_{21}O_2$ undecylate	Tet.?			41.8	9.2	48	0.94	(25)	P. U. C., S. P.
$LiC_{12}H_{23}O_2$ laurate	Tet.?			28.3	11.7	24	0.87	(25)	P. U. C., S. P.
$LiC_{18}H_{33}O_2$ oleate	H.?			64.6	9.5	72	0.99	(25)	P. U. C., S. P.
$LiC_{18}H_{35}O_2$ stearate	H.?			62.5	9.8	72	1.04	(25)	P. U. C.
82 NaF	C.	NaCl(4*b*, 4*c*)		4.62		4	2.81	(75, 78, 209)	
$NaHF_2$	H.	3Di-5(*a, b, c*)?	3Di-5	5.17; 39° 44′		1	2.01	(211)	Na at (*a*); u_F = 0.42. P. S.
NaCl	C.	NaCl(4*b*, 4*c*)		5.628		4		(44, 45, 47)	One of the fundamental wave length standards
$NaClO_3$	C.	(4*f*, 4*f*, T-4(12))	T-4	6.56		4	2.49	(98, 143, 144, 147, 148, 149, 246, 247, 266)	u_{Na} = *ca.* 0.06, u_{Cl} = *ca.* 0.41. Different positions have been suggested for the O atoms
NaBr	C.	NaCl(4*b*, 4*c*)		5.94		4	3.24	(75, 78, 273)	
$NaBrO_3$	C.	(4*f*, 4*f*, T-4(12))	T-4	6.71		4	3.30	(98, 143, 148, 149, 163, 246, 247)	u_{Na} = *ca.* 0.09, u_{Br} = *ca.* 0.41. Different positions have been suggested for the O atoms
NaI	C.	NaCl(4*b*, 4*c*)		6.46		4	3.67	(75, 78, 273)	
Na_2S	C.	CaF_2(4*b*, 8*e*)	Oi-5	6.53		4	1.85	(339)	
NaN_3	H.	3Di-5(*a, b, c*)	3Di-5	5.481; 38° 43′		1	1.838	(396)	*u* = 0.423
$NaNO_3$	H.	3Di-6(*a, b, e*)	3Di-6	6 32· 48° 6′		2	2.19	(47, 267)	N atoms at (*a*). u_0 = 0.25
$NaH(C_2H_3O_2)_2$	C.		Ti-7?	15.98		24	1.38	(279)	
$NaC_xH_yO_2$ v. Table C′.									
$NaCd_2$	C.							(202)	Apparently very complicated
$NaSb(AlO_3)_2$	H.	6Di-4(*a* or *b, d, f*, etc.)	6Di-4	5.40	8.81	2		(10)	u_{Al} < 0.10; O positions not known
83 KF	C.	NaCl(4*b*, 4*c*)		5.33		4	2.53	(75, 78, 132, 273)	
KHF_2	Tet.	4Di-18(*a, h*)	4Di-18	5.67	6.81	4	2.35	(40)	u_F = 0.14 ± 0.01. The H atoms may have arrangement 4Di-18 (*d*)
KCl	C.	NaCl(4*b*, 4*c*)		6.280		4	1.987	(44, 75, 78, 120)	
KBr	C.	NaCl(4*b*, 4*c*)		6.578		4	2.760	(44, 75, 120, 273)	
KI	C.	NaCl(4*b*, 4*c*)		7.052		4	3.124	(69, 70, 71, 75, 78, 120, 132, 273, 283, 366)	
KI_3	M.			9.36		4		(69, 70, 71)	P. U. C. b_0 and c_0 approx. = a_0, and β approx. = 90°.
K_2SO_4	R.		2Di-16	5.73	7.42	4	2.70	(192, 276)	b_0 = 10.01
KN_3	Tet.	4Di-18(*a, d, h*)	4Di-18	6.094	7.056	4	2.045	(396)	*u* = 0135
KH_2PO_4	Tet.		4d-12	7.40	6.96	4	2.36	(342)	K atoms at 4d-12(*a*); P at 4*d*-12(*b*)
KCN	C.	NaCl-like		6.55		4	1 53	(37, 72, 73)	

Chemical symbol	Crystal system	Structure type	Space group	Unit cell, size, Å		M	Calculated density	Lit.	Additional data and remarks
				a_0	c_0				
KCNO	Tet.			6.07_0	7.03_0	4	2.06_5	(396)	Structure similar to KN_3
$KH_2C_4O_4Cl$ (H chloromaleate)	R.		2D-16(?)	7.62	10.95	8		(398)	$b_0 = 15.74$
$KC_xH_yO_2$ *v.* Table 𝕮′.									
K_2SnCl_6	C.	(4*b*, 8*e*, 24*a*)	Oi-5	9.96		4	2.74	(92)	$u_{Cl} = 0.24_5$ and < 0.25
$K_2Zn(CN)_4$	C.	(8*f*, 16*c*, 32*b*)	Oi-7	12.5_4		8	1.66	(93)	$u_C = ca.\ 0.34$, $u_N = ca.\ 0.40$; $\frac{1}{2}(u_C + u_N) = 0.37$
$K_2Cd(CN)_4$	C.	(8*f*, 16*c*, 32*b*)	Oi-7	12.8_4		8	1.84	(93)	$\frac{1}{2}(u_C + u_N) = 0.37$
$K_2Hg(CN)_4$	C.	(8*f*, 16*c*, 32*b*)	Oi-7	12.7_6		8	2.43	(93)	$\frac{1}{2}(u_C + u_N) = 0.37$
K_2PtCl_4	Tet.	4Di-1(*a*, *e*, *j*)	4Di-1	6.99	4.13	1	3.40	(95)	$0.233 < u_{Cl} < 0.238$
K_2PtCl_6	C.	(4*b*, 8*e*, 24*a*)	Oi-5	9.7		4	$3._5$	(219, 220)	Assigned value, $u_{Cl} = 0.16$, probably incorrect
K_2PdCl_4	Tet.	4Di-1(*a*, *e*, *j*)	4Di-1	7.04	4.10	1	2.65	(95)	$u_{Cl} = 0.23$
$KCr(SO_4)_2.12H_2O$	C.	(4*b*, 4*c*, 8*h*, 8*h*, Ti-6 (24))	Ti-6	11.9_8		4	1.97	(248)	
$KAl(SO_4)_2.12H_2O$	C.	(4*b*, 4*c*, 8*h*, 8*h*, Ti-6 (24))	Ti-6	12.0_8		4	1.81	(186, 237, 248, 282)	
$KAlSi_3O_8$ (adularia)	M.		2Ci-3	8.57	7.23	4		(314)	$b_0 = 13.01$, $\beta = 116°\ 7'$ Composition unknown
$KLiSO_4$	H.		6C-6?	5.13	8.60	2	2.39	(330)	P. U. C. An atomic arrangement is suggested
84 RbF	C.?	CsCl(1*a*, 1*b*)?		3.66?		1?		(78, 209, 294)	Structure probably incorrect
RbCl	C.	NaCl(4*b*, 4*c*)		6.57_1		4	2.81_2	(78, 102, 273, 366)	
RbBr	C.	NaCl(4*b*, 4*c*)		6.86_8		4	3.36_9	(74, 78, 120)	
RbI	C.	NaCl(4*b*, 4*c*)		7.32_5		4	3.56_6	(77, 78, 120, 273)	
Rb_2SO_4	R.		2Di-16	5.95	7.78	4	3.66	(192)	$b_0 = 10.3_9$
CsF	C.	NaCl(4*b*, 4*c*)		6.01		4	4.6_2	(78, 209)	
CsCl	C.	CsCl(1*a*, 1*b*)	Oi-1	4.11_0		1	3.99_9	(78, 85, 120)	
CsBr	C.	CsCl(1*a*, 1*b*)	Oi-1	4.29		1	4.45	(77, 78, 273)	
CsI	C.	CsCl(1*a*, 1*b*)	Oi-1	4.56_2		1	4.51_4	(69, 70, 71, 75, 78, 273)	
CsI_3	R.			6.82	11.0_1	4	4.51	(177, 178, 179, 325)	$b_0 = 9.9_5$
$CsCl_2I$	H.	3Di-5(*a*, *b*, *c*)	3Di-5	5.46; 70° 42′		1	3.88	(268)	I probably at (*b*); $u_{Cl} = 0.31$
$CsBr_2I$	R.		2Di-16	6.57	10.66	4	4.29	(177, 178, 179, 325)	$b_0 = 9.18$
Cs_2SO_4	R.		2Di-16	6.22	8.20	4	4.30	(192)	$b_0 = 10.8_8$
Tourmaline	H.		3*e*-1 3*e*-2	16.2_8	7.2_6			(152)	P. U. C. Composition unknown
$R'AlSi_3O_8$ and $R''Al_2Si_2O_8$	Tri. and M.							(116)	Unreduced powder- and Laue-photographs have been prepared from various feldspars

𝕮-Table.—The 𝕮-Arrangement. *See* also Table 𝕮′ *infra*

Chemical formula	Name	Crystal system	Unit cell, size, Å			M	Calculated density	Lit.	Remarks
			a_0	b_0	c_0				
CH_4N_2O	Urea	Tet.	5.63		4.7_0	2	1.33	(25, 175)	Space group 4d-3
$C_2H_2O_4$	Oxalic acid	R.	6.46	7.79	6.02	4	1.96	(315)	Space group 2Di-15
C_2H_6	Ethane	H.	4.46		8.19	2	0.70_8	(349)	C atoms probably at 6Di-4(*f*) with $u = ca.\ 0.10$. Temperature not stated.
$C_2H_6N_2O$	*N*-Methylurea	R.	5.63	5.64	4.70	4?		(171)	Space group 2D-4?
C_2H_7NO	Acetaldehyde ammonia	H.	8.18; α = 84° 50′			6		(171, 316)	Space group 3Di-5?
$C_2H_6O_6$	Oxalic acid dihydrate	M.	6.05	3.57	11.9	2	1.68	(315)	Space group 2Ci-5. $\beta = 106°\ 12'$
$C_3H_8N_2O$	1, 2-Dimethylurea	R.	4.53	10.9	5.14	2		(171)	Space group 2e-7?
$C_4H_2O_3$	Maleic anhydride	R.	6.58	11.4_8	5.90	4	1.44	(25)	P. U. C., S. P.
$C_4H_2O_4$	Acetylenedicarboxylic acid	M?	7.88	9.04	6.62	4	1.70	(25)	$\beta = 111°\ 6'$. P. U. C., S. P.
$C_4H_4NIO_2$	Iodosuccinimide	Tet.	6.29		15.5_5	4	2.41	(385)	P. U. C. Space group 4C-2 and 4C-4?
$C_4H_4O_3$	Succinic anhydride	R.	6.95	11.64	5.41	4	1.51	(296)	P. U. C., *cf.* (25)
$C_4H_4O_4$	Maleic acid	M.	7.49	10.14	7.12	4	1.46	(25, 399)	$\beta = 117°\ 7'$. Space proup 2Ci-5(?)
$C_4H_5NO_2$	Succinimide	R.	7.50	9.60	12.75	8	1.42	(296)	P. U. C. Space group 2Di-1?
$C_4H_4O_4$	Fumaric acid	T.	7.56	15.00	6.20	6		(399)	$\alpha = 90°\ 40'$, $\beta = 88°\ 30'$, $\gamma = 89°\ 48'$
$C_4H_6O_4$	Succinic acid	M.	5.07	8.92	5.53	2		(296)	$\beta = 91°\ 20'$. P. U. C., *cf.* (25)
$C_4H_6O_6$	*dl*-Tartaric acid	Tri.	14.8_2	9.74	4.99	4		(17)	$\alpha = 82°\ 20'$; $\beta = 122°\ 56'$; $\gamma = 111°\ 52'$. P. U. C.
$C_4H_6O_6$	*d*-Tartaric acid	M.	7.70	6.04	6.20	2	1.76	(16)	$\beta = 100°\ 17'$, *cf.* (25)
$C_5H_8N_4O_{12}$	Pentaerythritol tetranitrate	Tet.	13.2		6.66	4	1.80	(363)	Space group 4Di-7
$C_5H_{12}O_4$	Pentaerythritol	Tet.	6.16		8.76	2		(25, 176, 395)	Space group 4e-9
$C_6H_4N_2O_4$	*o*-Dinitrobenzene	M.	7.95	13.0	7.45	4		(55)	$\beta = 112°\ 7'$. P. U. C.
$C_6H_4O_2$	Quinone	M.	11.4_0	6.43	6.85	4	1.40	(25)	$\beta = 93°\ 20'$. P. U. C., S. P
C_6H_6	Benzene	R.	9.76	7.39	6.85	4	1.04	(64, 101, 378)	P. U. C., measurements at −20°C
$C_6H_6O_2$	Resorcinol	R.	9.56	10.2_5	5.64	4		(53, 55)	P. U. C., *cf.* (25)
$C_6H_6O_2$	Hydroquinol	M.	13.5_8	5.22	8.13	4		(53)	$\beta = 107°$. P. U. C.
		H.	10.9_2		7.55	6	1.39	(25)	P. U. C., Latter S. P.
$(C_6H_{10}O_5)x$	Cellulose and starch	Powder photographs have been obtained and possible units have been suggested.						(124, 234)	

Chemical formula	Name	Crystal system	Unit cell, size, Å			M	Calculated density	Lit.	Remarks
			a_0	b_0	c_0				
$C_6H_{12}N_4$	Hexamethylenetetramine	C.	7.02			2	1.336	(100, 112)	u_N = *ca.* 0.12; u_C = *ca.* 0.235. Structure type (8*a*, 12*a*); space group Te-4
$C_6H_{14}O_6$	*d*(*l*)-Mannitol	R.	10.36	8.1	4.55	2	1.55	(27)	P. U. C.
$C_7H_6O_2$	Benzoic acid	M.	5.44	5.18	21.6	4		(55)	β = 97° 5′; P. U. C.
$C_4H_7NO_4$	Ammonium hydrogen fumarate	T.	7.00	7.44	6.56	2		(398)	α = 107° 1′, β = 117° 58′, γ = 69° 16′
$C_4H_9ClN_2O_4$	Ammonium chlorofumarate	M.	9.30	6.70	6.735	2		(398)	β = 108° 25′, Space group 2C-2(?).
$C_7H_6O_3$	Salicylic acid	M.	11.56	11.22	4.93	4	1.58	(55)	β = 91° 22′. P. U. C
$C_7H_{14}O_6$	α-Methyl glycoside	R.	10.80	14.60	5.61	4	1.46	(25)	P. U. C.
$C_8H_4O_3$	*o*-Phthalic anhydride	R.	7.74	13.66	5.86	4	1.54	(25)	P. U. C., S. P.
$C_8H_6O_4$	*o*-Phthalic acid	M.	9.33	7.13	5.10	2	1.60	(25) *cf.* (61)	β = 94° 36′. P. U. C., S. P.
$C_8H_{16}O_4$	Metaldehyde	Tet.	10.36	4.10		8		(171, 316)	Space group 4C-5?
$C_9H_8O_2$	*trans*-Cinnamic acid	M.	11.65	14.10	4.26	4	1.40	(25)	β = 98° 36′. P. U. C., S. P.
$C_9H_{10}O_2$	Hydrocinnamic acid	M.	12.90	9.20	6.98	4	1.23	(25)	β = 103° 36′. P. U. C., S. P.
$C_{10}H_8$	Naphthalene	M.	8.34	5.98	8.68	2		(53, 57)	β = 122° 44′. P. U. C., *cf.* (25)
$C_{10}H_8O$	α-Naphthol	M.	13.1	4.9	13.4	4	1.22	(53)	P. U. C. β = 117° 10′
$C_{10}H_8O$	β-Naphthol	M.	11.70	4.28	17.4	4	1.22	(53)	P. U. C. β = 119° 48′
$C_{12}H_{10}$	Acenaphthene	R.	8.32	14.15	7.26	4	1.19	(53)	P. U. C.
$C_{12}H_{10}N_2$	Azobenzene	M.	12.50	5.28	8.38	2	1.23	(25)	β = 116°. P. U. C.
$C_{12}H_{12}N_2$	Hydrazobenzene	R.	11.10	9.93	9.33	4	1.17	(25)	P. U. C., S. P.
$C_{12}H_{22}O_{11}$	Saccharose	M.	10.65	8.70	8.00	2	1.57	(27)	β = 105° 44′. P. U. C.
$C_{12}H_{24}O_2$	Lauric acid	Tet.?	28.3		11.4	24	0.86	(25)	P. U. C., S. P. *See* Table ℭ′.
$C_{14}H_8O_2$	Anthraquinone	R.	12.05	15.05	2.69	2	1.40	(25)	P. U. C., S. P.
$C_{14}H_{10}$	Anthracene	M.	8.58	6.02	11.18	2	1.25	(53, 57)	β = 125°. P. U. C., *cf.* (25)
$C_{14}H_{10}$	Phenanthrene	M.	9.56	6.72	7.55	2	1.18	(25)	β = 92°. P. U. C., S. P.
$C_{14}H_{10}O_2$	Benzil	H.	8.15		13.46	3	1.41	(27)	P. U. C.
$C_{14}H_{12}$	Stilbene	M.	9.6	8.9	12.6	4	1.25	(27)	β = 118° 40′. P. U. C.
$C_{14}H_{14}$	Dibenzyl	M.	12.7	6.1	7.4	2	1.18	(27)	β = 119°. P. U. C.
$C_{14}H_{28}O_2$	Myristic acid	H?	57.4		11.4	72	0.83	(25)	P. U. C., *see* Table ℭ′.
$C_{16}H_{10}N_2O_2$	Indigotin	H.	20.2		12.15	12	1.20	(25)	P. U. C., Measurements also on S. P.
$C_{16}H_{32}O_2$	Palmitic acid	H.?	60.0		11.0	72	0.88	(25)	P. U. C., *see* Table ℭ′.
$C_{18}H_{34}O_2$	Elaidic acid	Tet.?	26.5		10.8	16	0.98	(25)	P. U. C., S. P., *see* Table ℭ′.
$C_{18}H_{36}O_2$	Stearic acid	H.?	62.0		10.7	72	0.94	(25)	P. U. C., S. P., *see* Table ℭ′.
$C_{19}H_{16}$	Triphenylmethane	R.	14.52	25.62	7.42	4		(23, 26) *cf.* (177, 178)	
$C_{19}H_{16}O$	Triphenylcarbinol	H.	16.5		8.8	6	1.23	(27)	P. U. C.
$C_{39}H_{76}O_5$	α, α′-Distearin	H.?	81.5		10.8	48	0.82	(25)	P. U. C., S. P.

ℭ′-Table.—Long Chain Compounds

Arrangement by Classes

1. *Aliphatic Hydrocarbons* (320, 401)

Formula	Maximum spacing, Å	Spacings of broad lines, Å					
	d_1	d_2	d_3	d_4	d_5	d_6	d_7
$C_{17}H_{36}$	24.3	4.25	3.93		2.54	2.32	
$C_{18}H_{38}\alpha$	25.9		4.0				
$C_{18}H_{38}\beta$	23.9	4.58	3.80	3.66	2.61		2.05
$C_{19}H_{40}$	26.9	4.22	3.84		2.52	2.25	
$C_{20}H_{42}\alpha$	28.0		3.9				
$C_{20}H_{42}\beta$	26.2	4.63	3.82	3.61	2.59	2.12	2.03
$C_{21}H_{44}$	29.45	4.17	3.77	3.01	2.50	2.25	
$C_{23}H_{48}$	32.2						
$C_{24}H_{50}$	33.05	4.18	3.80	3.02	2.50	2.25	
$C_{27}H_{56}$	37.1	4.17	3.77	3.01	2.51	2.25	
$C_{31}H_{64}$	43.0	4.14	3.74	2.99	2.49	2.21	
$C_{35}H_{72}$	47.7						

Formula	Max. spacing	Formula	Max. spacing
$C_{22}H_{46}$(?)	30.6	$C_{30}H_{62}$	40.4
$C_{24}H_{50}$	32.9	$C_{31}H_{64}$	41.6*
$C_{25}H_{52}$	34.3		42.9†
$C_{26}H_{54}$	35.6	$C_{32}H_{66}$	42.7
$C_{28}H_{58}$	37.7	$C_{34}H_{70}$	45.3
$C_{29}H_{60}$	39.4		

Specimens for (320) pressed, those for (401) melted on glass plates only.

* Melted. † Pressed.

2. *Aromatic Hydrocarbons*

$C_{24}H_{42}$, Octadecylbenzene, d_1 = 49.2 (225)

3. *Aliphatic Acids*

a. Monobasic

Formula	Name	Maximum spacing, Å d_1	Broad line spacing, Å				Lit.
			d_2	d_3	d_4	d_5	
CH_2O_2	Formic	5.19					(309)
$C_2H_4O_2$	Acetic	6.66					(309)
$C_3H_6O_2$	Propionic	6.75	4.03			3.43	(309)
$C_4H_8O_2$	Butyric	9.65	4.09	3.65		3.45	(309)
$C_5H_{10}O_2$	Valeric	10.1(?)					(309)
$C_6H_{12}O_2$	Caproic	14.6	4.14	3.65		3.47	(309)
$C_7H_{14}O_2$	Heptoic	16.4	4.29	3.75	3.97	3.49	(309)
$C_8H_{16}O_2$	Caprylic	19.0	4.14	3.65		3.48	(309, 354)
$C_9H_{18}O_2$	Nonylic	22.9	4.22	3.71	3.97	3.48	(309)
$C_{10}H_{20}O_2$	Capric	23.3	4.14	3.73			(354, 309, 274)
$C_{11}H_{22}O_2$	Undecylic	25.8					(185)
$C_{12}H_{24}O_2$	Lauric	27.0	4.11	3.68			(184, 354)
$C_{14}H_{28}O_2$	Myristic	32.2	4.12	3.72			(184, 354)
$C_{15}H_{30}O_2$	Pentadecylic	36.2	4.00	3.76			(185)
$C_{16}H_{32}O_2$	Palmitic	34.7	4.08	3.65			(184, 354)
$C_{17}H_{34}O_2$	Margaric	39.2	4.05	3.77			(185)
$C_{18}H_{34}O_2$	Oleic	36.2(?)					(185)
$C_{18}H_{34}O_2$	Isoleic	35.9					(185)
$C_{18}H_{34}O_2$	Elaidic	48.3	4.03	3.65			(185)

3. *Aliphatic Acids.* *a.* Monobasic.—(*Continued*)

Formula	Name	Maximum spacing, Å d_1	Broad line spacing Å d_2	d_3	d_4	d_5	Lit.
$C_{18}H_{36}O_2$	Stearic	38.7	4.05	3.62			(184, 354)
$C_{22}H_{42}O_2$	Erucic	46.3	4.22	3.72			(185)
$C_{22}H_{42}O_2$	Brassidic	59.9	4.25	3.72			(185)
$C_{22}H_{44}O_2$	Behenic	47.8	4.10	3.66			(184)
	b. Dibasic						
$C_4H_6O_4$	Succinic	4.5					(354)
$C_6H_{10}O_4$	Adipic	7.0					(354)
$C_7H_{12}O_4$	Pimelic	7.6					(354)
$C_8H_{14}O_4$	Suberic	9.3					(354)
$C_9H_{16}O_4$	Azelaic	9.6					(354)
$C_{10}H_{18}O_4$	Sebacic	11.4					(354)

4. *Salts*

Formula	Name	Maximum spacing Å d_1	Broad line spacing Å d_2	d_3	d_4	d_5	Lit.
$PbC_{12}H_{22}O_4$	Caproate	20.0					(355)
$PbC_{16}H_{30}O_4$	Caprylate	25.4					(355)
$PbC_{20}H_{38}O_4$	Caprate	30.6					(355)
$PbC_{24}H_{46}O_4$	Laurate	35.8					(355)
$PbC_{28}H_{54}O_4$	Myristate	41.2					(355)
$PbC_{32}H_{62}O_4$	Palmitate	46.3					(355)
$PbC_{36}H_{66}O_4$	Oleate	37.5; 29.8					(355)
$PbC_{36}H_{66}O_4$	Elaidate	50.0					(355)
$PbC_{36}H_{70}O_4$	Stearate	51.3					(355)
$NaC_{12}H_{23}O_2$	Laurate	33.5	4.22	4.88			(208)
$NaC_{14}H_{27}O_2$	Myristate	38.5	4.18	4.9			(208)
$NaC_{16}H_{31}O_2$	Palmitate	43.5	4.15	4.9			(208)
$NaC_{18}H_{33}O_2$	Oleate	43.5					(63)

Similar results obtained with K and NH_4 oleates.

5. *Esters*

Formula	Name	d_1	d_2	d_3	d_4	d_5	Lit.
$C_{17}H_{34}O_2$	Methyl palmitate	22.0	4.07	3.72			(225)
$C_{18}H_{18}N_2O_5$	Ethyl *p*-azoxybenzoate	16.2	d_1 = 19.9 in the "smectic" state				(321)
$C_{18}H_{36}O_2$	Ethyl palmitate	23.2	4.07	3.67			(225)
$C_{19}H_{38}O_2$	Methyl stearate	24.0	4.07	3.74			(225)
$C_{20}H_{40}O_2$	Ethyl stearate	25.2	4.14	3.69			(225)
$C_{24}H_{48}O_2$	Octyl palmitate	30.4	4.16	3.72			(225)
$C_{32}H_{64}O_2$	Cetyl palmitate	40.4	4.05	3.69			(225)
$C_{54}H_{104}O_6$	Glycerol margarate	48.0					(355)

6. *Ketones* (319)

Formula	Name	Maximum spacing Å d_1
$C_{13}H_{26}O$	Di-*n*-hexyl	18.7
$C_{15}H_{30}O$	Methyl-*n*-tridecyl	42.4
$C_{17}H_{34}O$	Methyl *n*-pentadecyl	47.6
$C_{18}H_{36}O$	Methyl *n*-hexadecyl	50.0
$C_{18}H_{36}O$	Ethyl *n*-pentadecyl	25.2
$C_{18}H_{36}O$	Hexyl *n*-undecyl	25.2
$C_{19}H_{38}O$	Methyl *n*-heptadecyl	52.9
$C_{19}H_{38}O$	Propyl *n*-pentadecyl	26.3
$C_{20}H_{40}O$	Ethyl *n*-heptadecyl	27.3
$C_{21}H_{42}O$	Propyl *n*-heptadecyl	28.9
$C_{22}H_{44}O$	Hexyl *n*-pentadecyl	31.1
$C_{23}H_{46}O$	Di-*n*-undecyl	31.6
$C_{24}H_{48}O$*	Hexyl *n*-heptadecyl	33.6
$C_{27}H_{54}O$	Di-*n*-tridecyl	37.0
$C_{31}H_{62}O$	Di-*n*-pentadecyl	41.1
$C_{35}H_{70}O$	Di-*n*-heptadecyl	47.2

* A few orders of 30.8Å also present.

7. *Phenols* (225)

$C_{22}H_{38}O$	*p*-Hexadecyl	46.5
$C_{24}H_{42}O$	*p*-Octadecyl	51.3

TABLE D.—ALLOYS

(*a*) *Non-ferrous. Standard Arrangement. All Compositions in Atomic %*

Pb-Sn.—0 to 3.6% Sn alloys are F.-c. cubic (like Pb) with a_0 decreasing to 4.931Å, taking a_0 for Pb as 4.942Å. 10% – 95% Sn alloys are mixtures of the Pb-like and Sn structures. 95% – 100% Sn alloys show no measurable distortion in size or shape of the Sn unit cell (206).

Hg-Sn.—The structure varies, as follows, with the atomic % of Hg: 0 to ±2%, Tet.-Sn structure I; 2% I, with traces of "Hexagonal" amalgam, (composition unknown) structure II; 5%, I and II; 6%, trace of I with II; 6 to ±17%, II; ±17 to 33%, II and liquid alloy (229).

Hg-Pb.—A 20% Hg alloy had the F.-c. cubic structure (4*b*) of Pb, with a unit cell length 1.6% less than that of Pb (229).

Hg-Zn.—Two structures, the hexagonal Zn structure (*d*), and an "hexagonal" structure belonging to an amalgam of unknown composition. The relative intensities of the patterns of these two phases are as follows (229).

Atomic % Hg	0	10	20	35
Zn structure	strong	medium	weak	absent
"Amalgam" structure	absent	medium	strong	strong

Hg-Cd.—An 18% Hg amalgam gave a pattern substantially the same as that of Cd; 37 and 50% Hg amalgams yield a different pattern (229).

Cu-Si.—Though Si has the smaller atomic volume the unit cube of Cu which has dissolved Si is larger than that of pure Cu. No data available (84).

Cu-Sn.—Figure 12*a*. Black circles: metal melted in air; open circles: metal melted in vacuum (18, 372).

Cu-Zn.—Figure 13. Unless otherwise stated on the figure these data are from (198). *Cf.* (12, 199, 258, 375, 371) which gives a different structure for γ-brass.

Ag-Sn.—Solution of Sn increases the Ag unit though its atomic volume is less. No data available (84).

Ag-Zn.—The observed phases are the same as those for Cu-Zn alloys (371).

Phase	Composition wt. % Zn	Symmetry	Structure	a_0 Å	c_0 Å	No. atoms in unit cell
β	38.25	Cubic	(1*a*, 1*b*)	3.156		2
γ	50.3	Cubic		9.327		52.37
ϵ	60.5	Hexagonal	Mg-like	2.818	4.456	2
	78.1	Hexagonal	Mg-like	2.815	4.382	2
η	Hexagonal close-packed with Zn-like structure					

Ag-Cu.—Broken series of solid solutions. Both components F.-c. cubic (4*b*) (370).

At. % Cu	0	4	9.2	16–80	96.4	100
a_0	4.06	4.05	4.03	Superimposed patterns of Ag and Cu	3.61	3.61

Au-Zn.—These alloys show all the phases of Cu-Zn alloys and two additional (371).

Phase	Composition wt. % Zn	Symmetry	Structure	a_0 Å	c_0 Å	No. atoms in unit cell
β	30.2	Cubic	(1*a*, 1*b*)	3.146		2
γ	36.9	Cubic		9.268		52.97
	41.1	Cubic		9.223		51.96
ϵ	67.5	Hexagonal	Mg-like	2.809	4.377	2
	72.3	Hexagonal	Mg-like	2.809	4.369	2
η	95.0	Hexagonal	Zn-like	2.674	4.887	2
γ' ($AuZn_3$)?	50.2	Cubic	?	7.880		32
γ''		may be cubic				

Au-Cu.—Figure 12 (18, 145, 361).

Au-Ag.—Data conflicting. Probably an unbroken series of solid solutions, though marked variations from this relation have been reported. Figure 16 (18, 165, 239, 372).

Ir-Os.—A single alloy of unknown composition was found to be C.-p. Hex. (11).

Pd-H.—Data conflicting. One result (295, 376) shows that the Pd unit is swelled by an amount proportional to the quantity of occluded H (79). The other study (164) shows a discontinuous absorption of H in the sense that some crystals may be saturated though others in the same material have not begun to absorb gas. The length, a_0, of the edge of the unit cube of the saturated solution was found to vary between 4.000Å and 4.039Å with values usually not less than 4.023Å.

Pd-Cu and **Pd-Au.**—Figures 20 and 19 (301).

Pd-Ag.—(15) Figure 17 (165).

Mn-Cu.—67% Cu is F.-c. cubic, like Cu, and has a_0 = 3.615Å, taking a_0 for Cu as 3.60Å (18). 70% Cu is said to give a_0 = 3.70Å (200, 384).

Ni-Cu.—Figure 15 (18, 197, 361, 370).

Cr-Ni.—100% to 40% Ni alloys are F.-c. cubic (like Ni) with values of a_0 which change proportionately to the % of Cr added from 3.521Å (for Ni) to 3.576Å (206).

W-Mo.—(67) Said to show an unbroken series of solid solutions. No numerical data available (18). No lines (86) have been found from a 1:1 alloy to indicate the existence of a compound W-Mo (239).

Al-Zn.—0 to 20% Zn alloys are F.-c. cubic (like Al), a_0 changing from 4.043Å (for Al) to 4.034Å. 20%–95% Zn alloys show mixtures of cubic Al and hexagonal Zn structures. 95%–100% Zn alloys are C.-p. hexagonal with no measurable distortion from size or shape of the Zn unit cell (206).

Al-Cu.—Figure 14. The data on this figure are from (22, 141, 197, 258).

Al-Ag.—The dissolving of Al in Ag increases the unit cube in the latter, though Al has a smaller atomic volume. No numerical data available (84).

Al-Mn-Cu.—Heussler Alloys. Alloy 15.9% Al, 23.9% Mn, 60.3% Cu is said to be F.-c. cubic with a_0 = 3.70Å. Alloys 14.3% Al, 28.6% Mn, 57.1% Cu is said to be a mixture of the preceding structure with a smaller amount of a B.-c. cubic phase having a_0 = 2.98Å (12, 297).

Mg-Sn.—0 to 67% Mg give the superimposed patterns of Sn and Mg_2Sn; 67–100% Mg yield the superimposed patterns of Mg_2Sn and Mg. No evidence of solid solution (370).

Mg-Pb.—0 to 67% Mg give the superimposed patterns of Pb and $PbMg_2$; 67–100% Mg yield the superimposed patterns of $PbMg_2$ and Mg. No evidence of solid solution (370).

Mg-Al.—91.2% Al is F.-c. cubic (4*b*) with a_0 = 4.106Å, taking a_0 for Al as 4.05Å. 7.3% Al is C.-p. hexagonal (*d*) with a_0 = 3.151Å, c = 5.23Å, taking a_0 for Mg as 3.17Å and c_0 = 5.17Å (197).

(*b*) *Ferrous Alloys*

Fe-C Steels.—(1) Austenitic Steels. Structure that of γ-Fe, F.-c. cubic (4*b*) (250–259).

Composition, wt. %	a_0 in Å	Remarks
(1) 1.25% C, quenched at 750°C	3.601	Contains also martensite.
(2) 1.98% C, quenched at 1100°C	3.629	Contains also martensite.
(3)* 1.34% C, 12.1% Mn, 0.52% Si, 0.1% P	3.624	
(2) quenched at 750°C	3.606	A mixture of austenite and martensite.
(4) 1.18% C, 24.3% Ni, 6.05% Mn quenched from 1000°C	3.64	
(5) 0.24% C, 25.2% Ni, quenched from 1000°C	3.56	

* Density calculations thought to indicate that C is present in interstitial solid solution in steel No. (3).

(2) Martensite Steels. Structure that of α-Fe, B.-c. cubic (2*a*) (19, 122, 250–258).

(5) Chilled subsequently in liquid air	2.81	Partly martensite and partly austenite.
(2)	2.90	Martensite lines very diffuse.
(1)	2.88	Martensite lines very diffuse.
(6) 0.80% C quenched in oil from 750°C	2.89	Martensite lines very diffuse.
(7) 0.80% C, 0.14% Cr, 0.35% Mn, 0.19% Si	2.851	Broad lines, less intense than from Fe.
(8) 1.31% C, 0.12% Cr, 0.24% Mn, 0.17% Si	2.851	Density calculations from this steel thought to indicate that C isomorphously replaces Fe unless martensite is annealed when it is a mixture of α-Fe with cementite.

Fe-Si.—(207, 252, 389).

Weight % Si	0–15	17–30	33	40	50	75–100
Phases	Fe	Fe + FeSi	FeSi	FeSi + $FeSi_2$	$FeSi_2$	$FeSi_2$ + Si

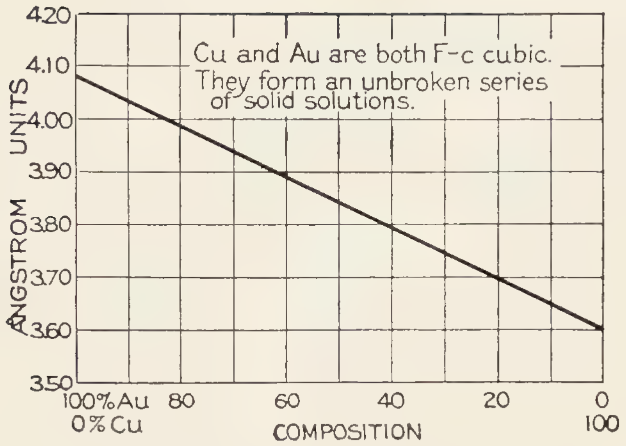

FIG. 12.—The diffraction data on Cu-Au alloys.

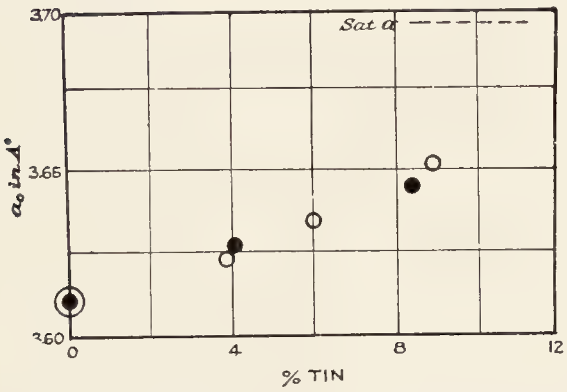

FIG. 12a.—The diffraction data on Cu-Sn alloys.

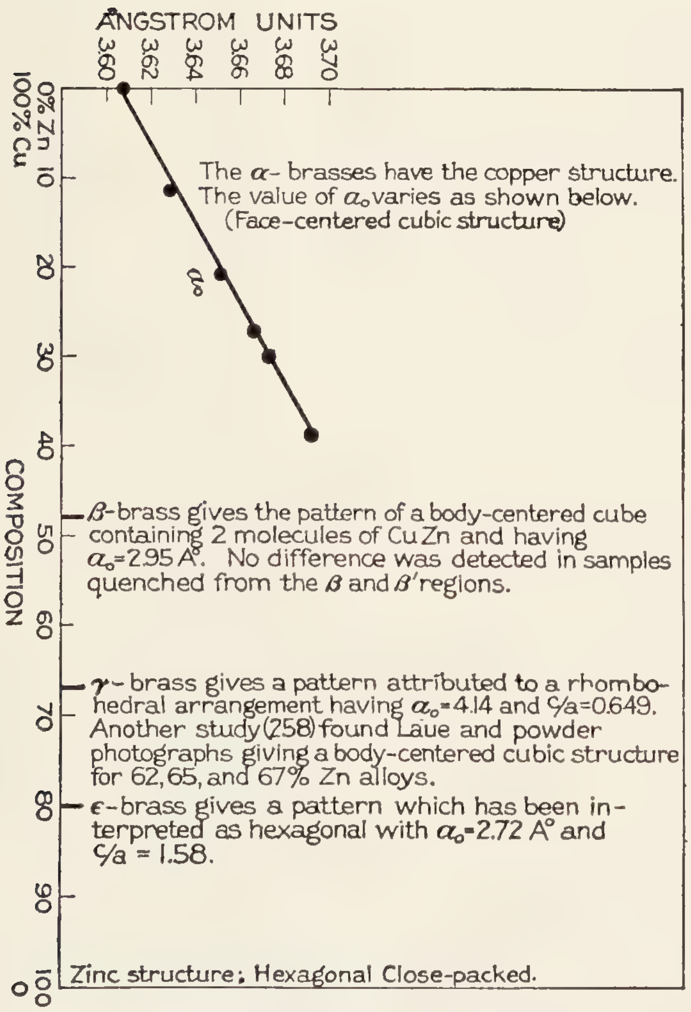

FIG. 13.—The diffraction data on brasses.

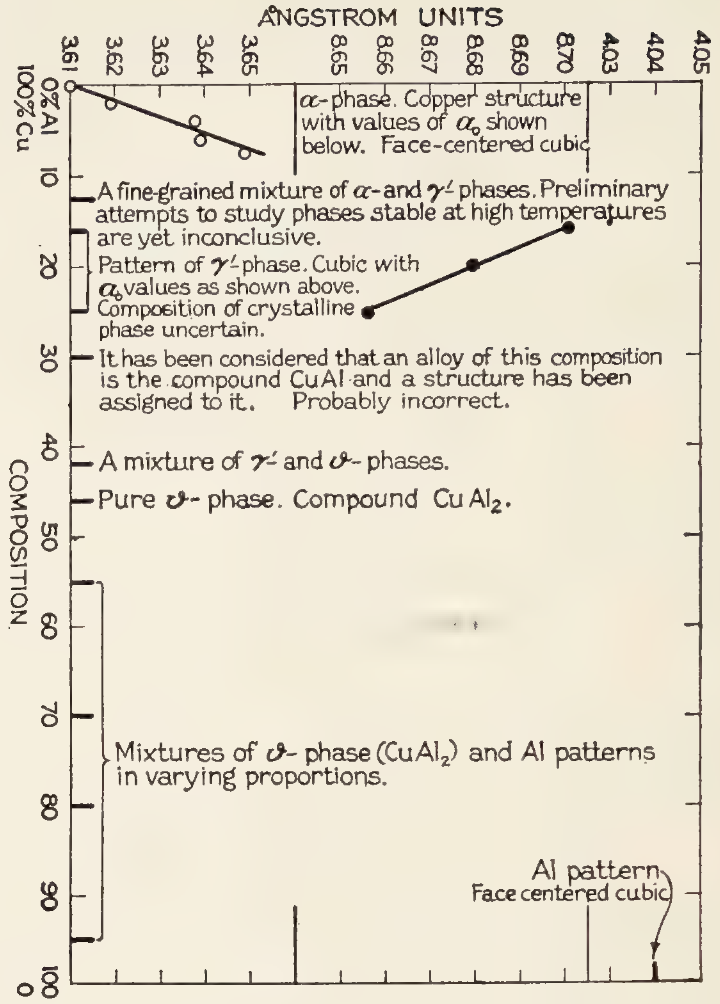

FIG. 14.—The diffraction data on Cu-Al alloys.

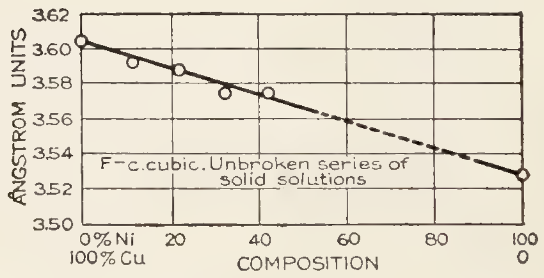

FIG. 15.—The diffraction data on Cu-Ni alloys.

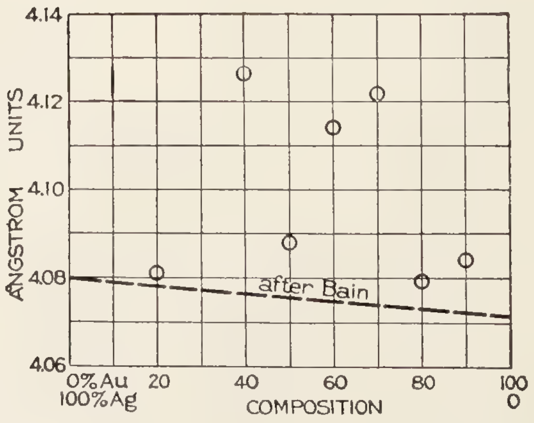

FIG. 16.—The diffraction data on Ag-Au alloys.

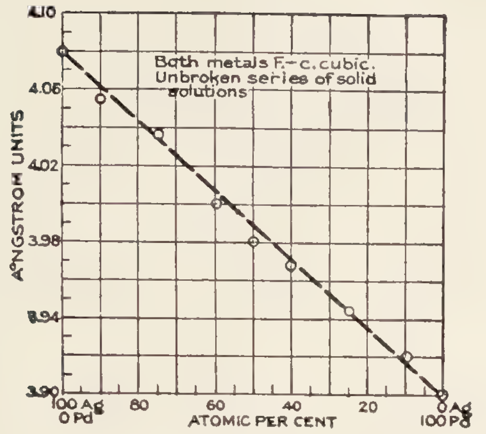

FIG. 17.—The diffraction data on Ag-Pd alloys.

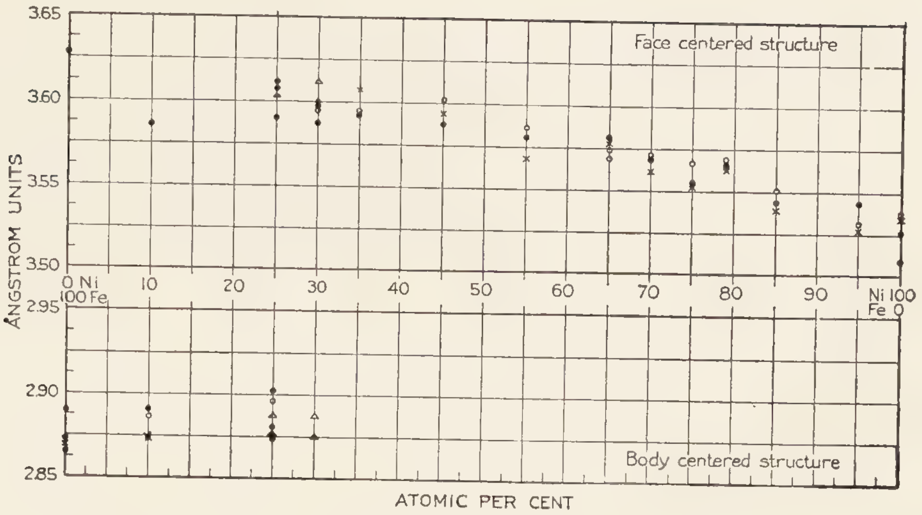

FIG. 18.—The diffraction data on Fe-Ni alloys.

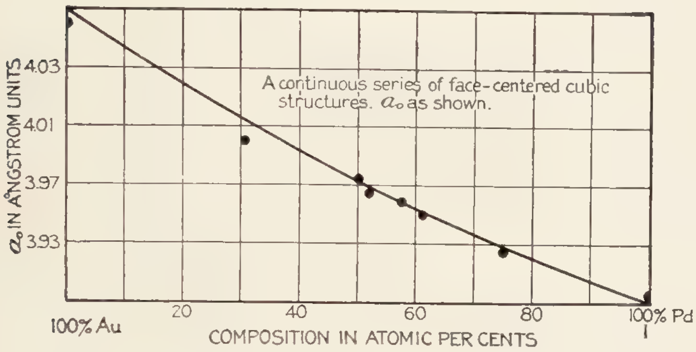

FIG. 19.—The diffraction data on Au-Pd alloys.

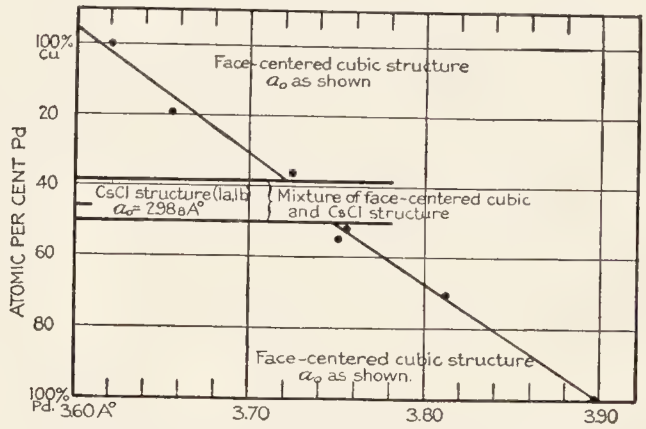

FIG. 20.—The diffraction data on Cu-Pd alloys.

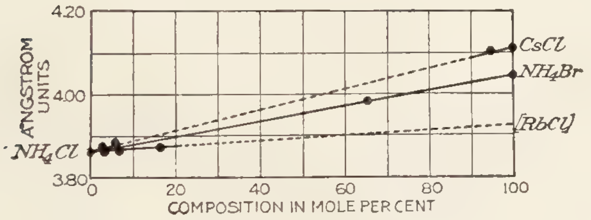

FIG. 21*a*.—The diffraction data on solid solutions of the alkali halides.

Fe-Mn.—These alloys are said to have the following structures. No numerical data available (18).

Atomic % Mn.	0–30	30–60	60–100
Structure......	B.-c. cubic (2*a*)	F.-c. cubic (4*b*)	Complex Mn

Fe-Co.—No numerical data available (12).

Weight % Co...	0–80	85	90–98	98–100
Structure.......	B.-c. cubic (2*a*)	B.-c. (2*a*) with F.-c. (4*b*)	F.-c. cubic (4*b*)	F.-c. (4*b*) with C.-p. hex.

Fe-Ni.—The best available data are shown in Fig. 18. The fused alloys were swaged, drawn and rolled into thin tapes. Spacings from photographs of these specimens without further treatment are shown as open circles, results after (1) annealing at 900–950°C followed by slow cooling, black circles; (2) after an additional heating to 600°C followed by rapid cooling in the air, crosses; and (3) after cooling for a time in liquid air following (1), triangles (12, 168).

Fe-Cr.—Interpretation of data uncertain (18).

Fe-W and **Fe-Mo.**—It is said that Fe dissolves a few atomic percents of each of these metals without apparent alteration in the size of the unit cell. In each case a 1:1 compound is formed. No numerical data available (18).

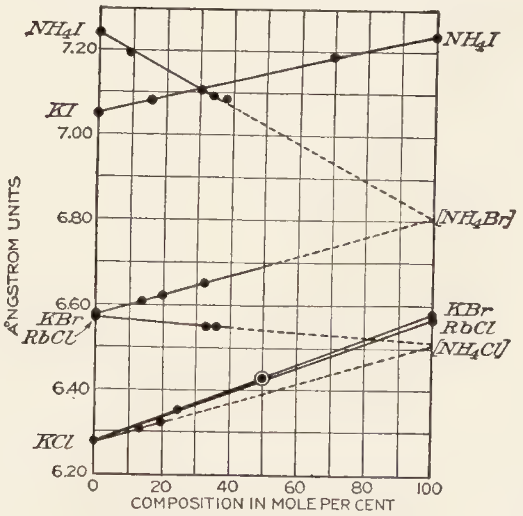

FIG. 21*b*.—The diffraction data on solid solutions of the alkali halides.

𝕿-TABLE.—THE POSITIONS OF X-RAY DIFFRACTION BANDS FROM LIQUIDS

Angle of Deviation and Wave Length, λ, of X-rays Used

Liquid..........	A		N_2	O_2	
Angle, deg.......	13.0; 18.9	27	11.3; 17.0	12.5; 19.5	27
λ, in Å..........	0.712	1.54	0.712	0.712	1.54
Lit.............	(304)	(303)	(304)	(303)	(303)

Liquid.............	H_2O		CS_2	HCOOH	CH_3CHO Acetaldehyde
Angle, deg..........	13.4	29	13.2	24	22.7
λ, in Å.............	0.712	1.54	0.712	1.54	1.54
Lit................	(304)	(303)	(304)	(303)	(373)

Liquid	C_2H_5OH	$C_4H_8O_2$ Butyric acid	$C_4H_8O_2$ Ethyl acetate	$(C_2H_5)_2O$
Angle, deg	22	20.7; 36.5	20.7	19
λ, in Å	1.54	1.54	1.54	1.54
Lit.	[303]	[373]	[373]	[303]

Liquid	C_6H_6		$(C_2H_4O)_3$ Paraldehyde	C_6H_5CHO Benzaldehyde
Angle, deg	8.5	18	23.3	19.3; 44.4
λ, in Å	0.712	1.54	1.54	1.54
Lit.	[301]	[302, 303]	[373]	[373]

Liquid	C_8H_{18}	C_9H_{12} Mesitylene	$C_{14}H_{12}O_2$ Benzyl benzoate
Angle, deg	8.1	4.1; 6.2	18.3; 42.7; 65.8
λ, in Å	0.712	0.712	1.54
Lit.	[301]	[301]	[373]

𝔉-Table.—Data on Solid Solutions of Salts

Alkali Halides.—For data on the solutions NH_4I-NH_4Br, NH_4I-KI, NH_4Br-KBr, RbCl-NH_4Cl, NH_4Cl-KCl, KCl-RbCl, KCl-KBr, CsCl-NH_4Cl, NH_4Br-NH_4Cl, RbCl-NH_4Cl see Fig. 21 [120]. For additional data on KBr-KCl see [387, 388].

AgCl-NaCl [387].—Broken series of solid solutions. Quenched preparations: Both patterns present together.

	Composition mol % AgCl	a_0 Å
Annealed	100	5.53
	75	5.54
	50	5.57

AgCl-AgBr [402].—Both structures like NaCl (4*b*, 4*c*). Unbroken series of solid solutions.

Composition mol % AgCl	a_0 Å
0	5.77
20	5.72
40	5.68
50	5.65
60	5.63
80	5.59
100	5.54

AgBr-AgI [402].—Broken series of solid solutions.

Composition mol % AgI	a_0 Fused and slowly cooled, Structure (4*b*, 4*c*)	Fused and slowly cooled, Structure (4*b*, 4*d*)	Fused and quenched, Structure (4*b*, 4*c*)	Fused and quenched, Structure (4*b*, 4*d*)	Precipitated, Structure (4*b*, 4*c*)
0	5.768		5.768		5.768
10	5.814		5.816		5.806
20	5.842		5.854		5.84
30	5.86		5.876		5.878
40	5.896	(6.47)	5.908		
50	5.912	(6.47)	5.932		
60	5.918	6.47	5.96	(6.48)	
70	{6.014; 5.946; 5.994}	6.48	5.956	6.48	
80	5.916	6.47	(5.892)	(6.48)	
90		6.472	5.898	6.483	
95		6.481		6.487	
100		6.493		6.493	

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SOME NUMERICAL DATA PERTAINING TO DISPERSOIDOLOGY

P. P. VON WEIMARN

From the large and heterogeneous mass of numerical data recorded in the literature of "Colloids," it seems desirable to present here only some selected illustrative examples of results of physical measurements which meet the following requirements: (1) The composition of the system is definite, reproducible, and exactly known; (2) all of the essential variables which affect the system are understood and are accurately controlled or measured; (3) the system, its behavior, and the resulting quantitative data are reproducible in the hands of any investigator working under *these same* controllable conditions; and (4) the examples selected shall be illustrative of some general law describing the behavior of dispersed systems.

As meeting the above conditions, the following examples have been selected and are presented in graphical form. Concise explanations are given in connection with the graphs. For a detailed description, explanation, discussion, and bibliography, the reader is referred to von Weimarn, Chem. Rev. **2**: 217; 25.

THE PRECIPITATION LAWS

Figures 1–9 illustrate the following precipitation laws: With increasing concentration of the reacting solutions, the average size of the precipitated crystalline individuals (*not their aggregates*) (1) passes through a maximum during, and (2) decreases continually after the completion of, the process of direct crystallization; (3) for the same absolute concentration of the reacting solutions (*other conditions being equal*), with decreasing solubility of a substance (Fig. 4; *cf.* Fig. 13), the average size of the precipitated crystals also decreases.

Figures 10–13 show that, if the aggregation of the individual ultramicrocrystals has not *proceeded too far*, the second law of precipitation remains valid; and besides they illustrate the law: (4) With increasing viscosity of the dispersion medium, the average size of the particles decreases (Fig. 12) (3, 4); *cf.* (1).

The following general remarks apply to the figures: (1) The dispersion medium is indicated thus (60 vol. % C_2H_5OH); (2) mixing was brought about in all cases by pouring and shaking. The direction of pouring is indicated by the arrow. (3) In Figs. 1–9, the volumes mixed in each experiment satisfied the relation, concentration × volume = a constant (approx.), for a given dispersion medium; (4) the time, t_0, represents the period (*ca.* 10–15 min) required for the operations of sampling and photomicrographing; (5) all data shown are the averages of at least two independent experiments.

1. Precipitation of Ag_2SO_4.—*Reaction.*—$2AgNO_3 + MnSO_4 = Ag_2SO_4 + Mn(NO_3)_2$ (Figs. 1–7). In Figs. 4–5, per liter of final solution, C = Ag_2SO_4 produced by the reaction and S = its solubility, both in g-equivalents (8).

2. Precipitation of $AgC_2H_3O_2$.—*Reaction.*—$AgNO_3 + KC_2H_3O_2 = AgC_2H_3O_2 + KNO_3$ (Figs. 8–9) (6). These curves show the effect of time; the periods of time for the four curves are the same in both figures.

3. Precipitation of Se.—*Reaction.*—(*a*) 5 cc of aniline (an.) containing *m* mg of Se are poured into 100 cc of 93.5 wt. % C_2H_5OH (alc.) or (Fig. 13) mixtures thereof with an. or (Fig. 12) glycerol (gl.). $t = 20°$ (Figs. 10–13 *a* curves) (7). (*b*) As in (*a*) but with quinoline (q.) instead of aniline and using 90 wt. % C_2H_5OH (Figs. 10–13 *b* curves) (7).

4. Effects of Salts Dissolved in the Dispersion Medium on the Duration of Life of Dispersoidal Solutions.—(*a*) *$BaSO_4$ Reaction.*—50 cc ($2a + 2x$ equiv.) BaR_2 + 50 cc ($2a$ equiv.) $MnSO_4$ = 1 equiv. $BaSO_4$ + 1 equiv. MnR_2 + x equiv. BaR_2. Dispersion medium, 63 wt. % C_2H_5OH (Figs. 14–17) (5).

(*b*) *S.*—Dispersoidal solution of sulfur prepared by the method of grinding with grape-sugar. *Ca.* 25 mg S per liter of H_2O; particles *ca.* 85$\mu\mu$ (Figs. 18–23). C = millimols salt per liter. The dotted horizontal is for $C = 0$. To the right of the dotted vertical (Fig. 23) the disperse phase begins to dissolve by chemical action (10); *cf.* (2).

(*c*) *$Al(OH)_3$.*—Prepared as in (*b*) *supra*. *Ca.* 55 mg $Al_2O_3.3H_2O$ per liter of H_2O; particles *ca.* 90$\mu\mu$ (Fig. 24). The dotted horizontal is for $C = 0$. Dissolving begins at points marked with crosses (11); *cf.* (2).

5. Adsorption and Solubility of Salts.—Adsorbent used—$BaSO_4$ extra pure; 20 g used per 100 cc of the salt solution. After shaking the solution with the adsorbent for 10 min, 24 hr. were allowed for the precipitate to settle. Fifty cc of the upper clear layer were used for analysis. Because partial dispergation occurred in the case of $BaCl_2$ in dilute C_2H_5OH solutions, these were centrifuged before analysis (Fig. 25) (9).

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(For a key to the periodicals see end of volume)

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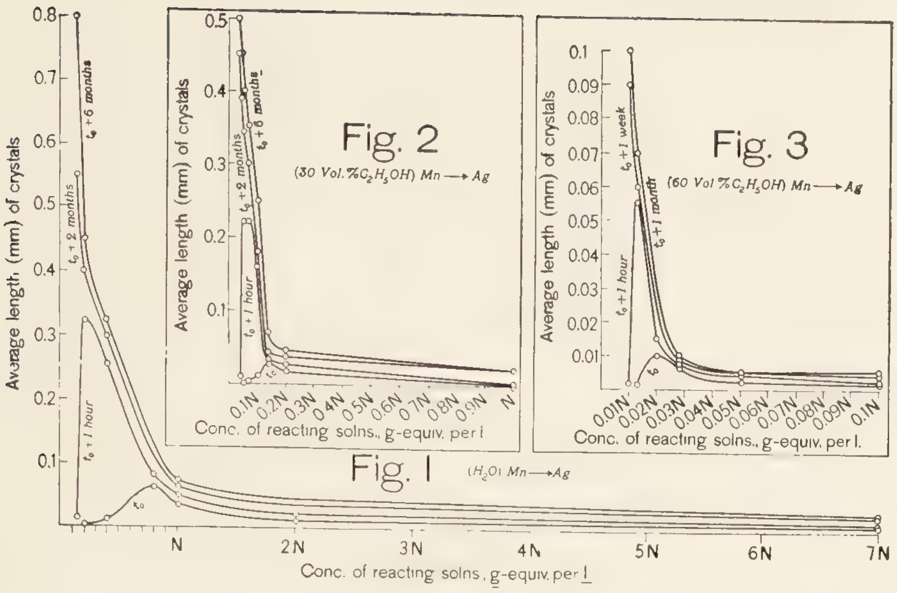


Fig. 1
(H_2O) Mn → Ag
Average length, (mm) of crystals
Conc. of reacting solns., g-equiv. per l
Fig. 2
(30 Vol. % C_2H_5OH) Mn → Ag
Average length (mm) of crystals
Conc. of reacting solns., g-equiv. per l
Fig. 3
(60 Vol % C_2H_5OH) Mn → Ag
Average length (mm) of crystals
Conc. of reacting solns., g-equiv. per l.

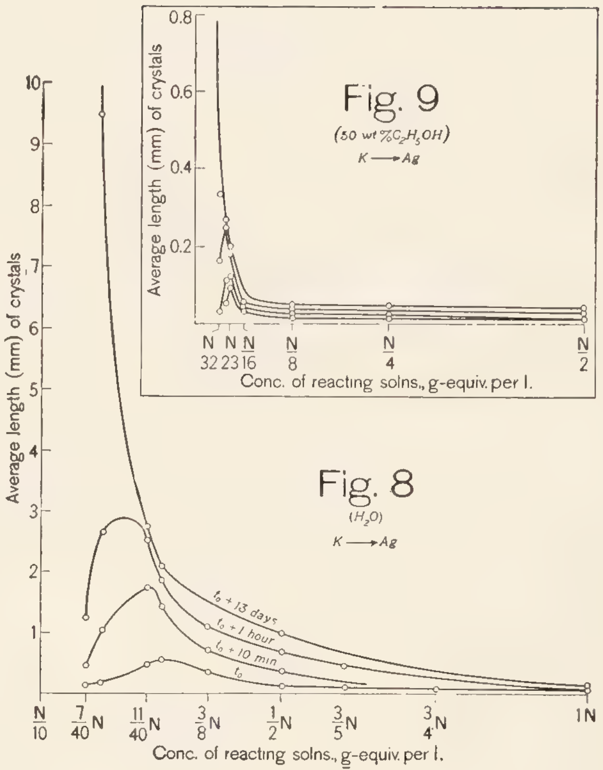


Fig. 8
(H_2O)
K → Ag
Average length (mm) of crystals
Conc. of reacting solns., g-equiv. per l.
Fig. 9
(50 wt % C_2H_5OH)
K → Ag
Average length (mm) of crystals
Conc. of reacting solns., g-equiv. per l.

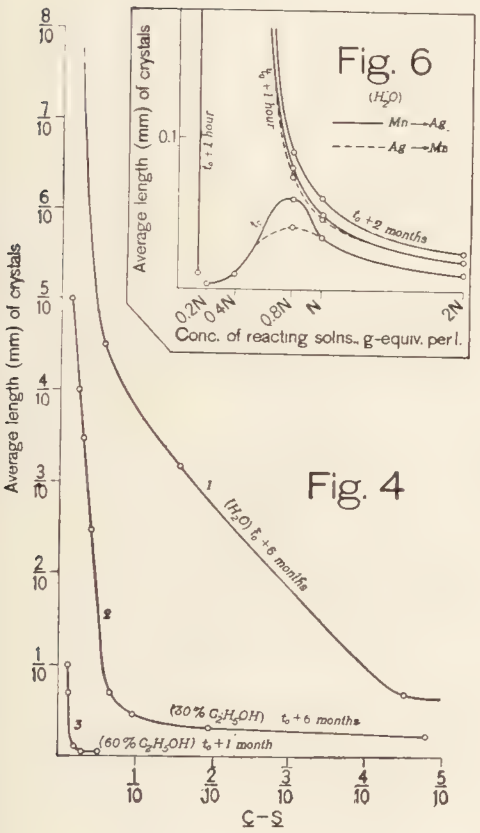


Fig. 4
(H_2O) t_0 + 6 months
(30 % C_2H_5OH) t_0 + 6 months
(60 % C_2H_5OH) t_0 + 1 month
Average length (mm) of crystals
C−S
Fig. 6
(H_2O)
Mn → Ag
Ag → Mn
Average length (mm) of crystals
Conc. of reacting solns., g-equiv. per l.

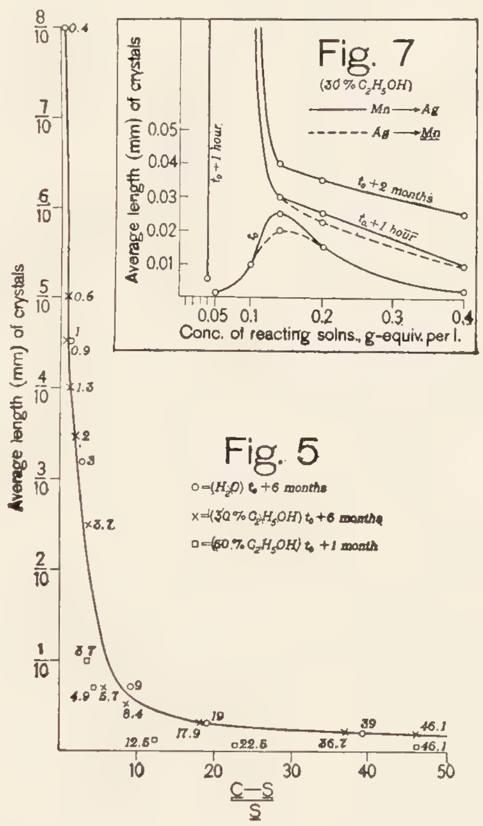


Fig. 5
○=(H_2O) t_0 + 6 months
×=(30 % C_2H_5OH) t_0 + 6 months
□=(60 % C_2H_5OH) t_0 + 1 month
Average length (mm) of crystals
C−S / S
Fig. 7
(30 % C_2H_5OH)
Mn → Ag
Ag → Mn
Average length (mm) of crystals
Conc. of reacting solns., g-equiv. per l.

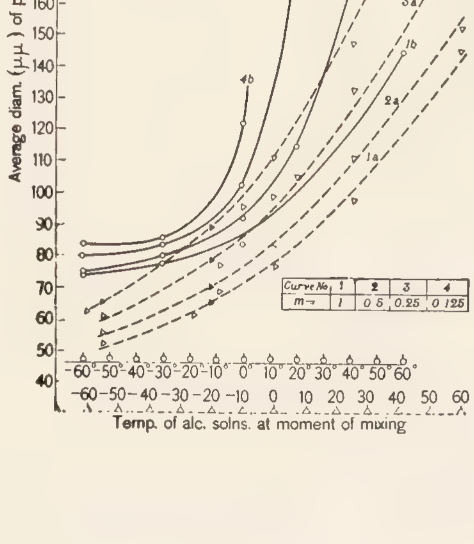


Fig. 10
▲ Interpolated
△ Experimental
Average diam. (μμ) of particles at room temp.
Temp. of alc. solns. at moment of mixing
Curve No. | 1 | 2 | 3 | 4
m → | 1 | 0.5 | 0.25 | 0.125

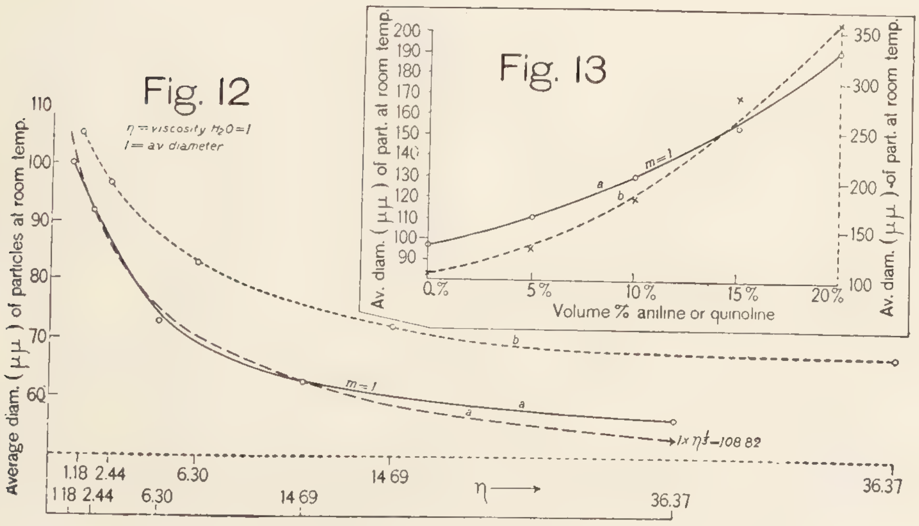


Fig. 12
η = viscosity H_2O = 1
l = av. diameter
Average diam. (μμ) of particles at room temp.
η
Fig. 13
Av. diam. (μμ) of part. at room temp.
Volume % aniline or quinoline

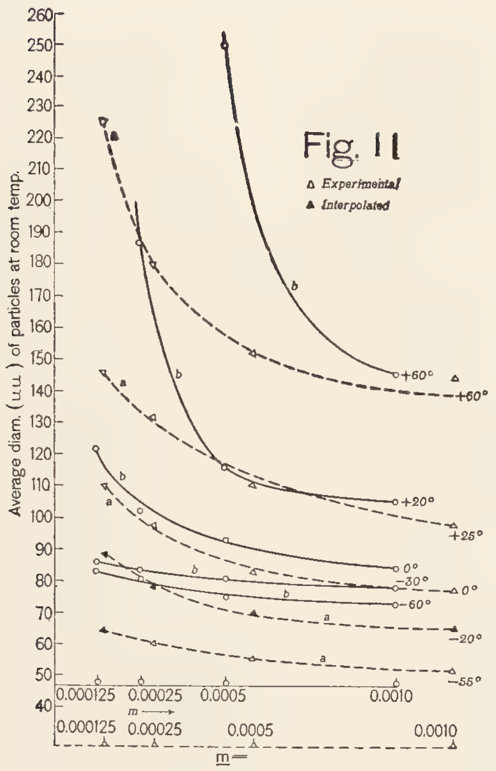


Fig. 11
Experimental
Interpolated
Average diam. (u.u.) of particles at room temp.
+60°
+20°
+25°
0°
−30°
−60°
−20°
−55°
0.000125 0.00025 0.0005 0.0010
m
m=

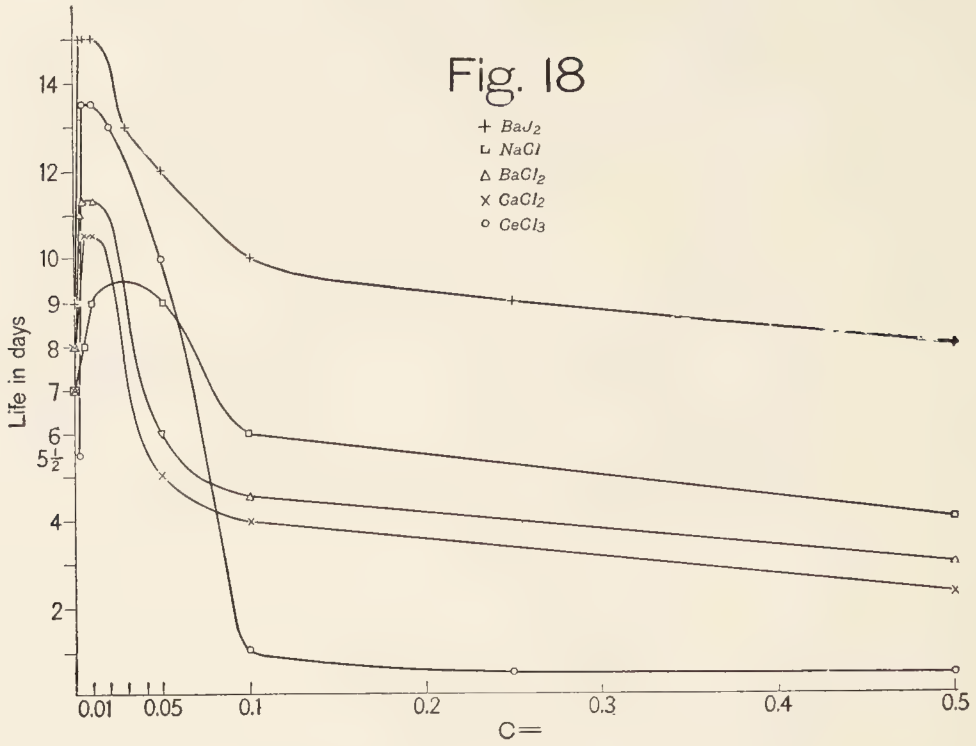


Fig. 18
+ BaJ2
NaCl
Δ BaCl2
× CaCl2
o CeCl3
Life in days
C=
0.01 0.05 0.1 0.2 0.3 0.4 0.5

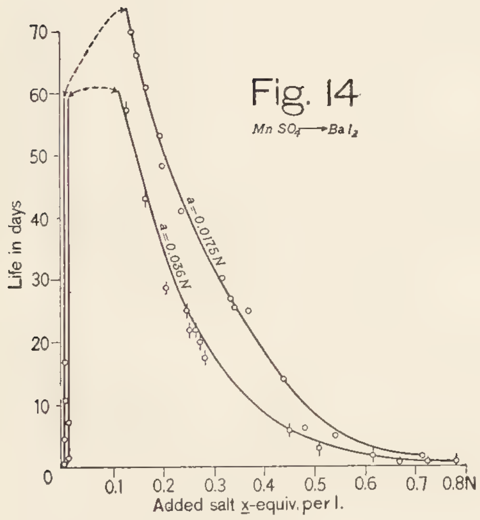


Fig. 14
Mn SO4 → Ba I2
a=0.0175N
a=0.036N
Life in days
Added salt x-equiv. per l.

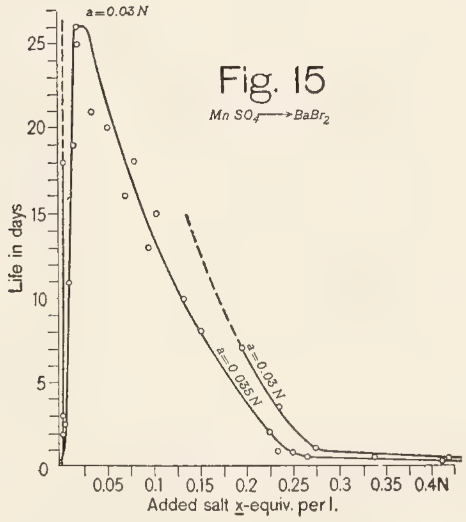


Fig. 15
Mn SO4 → BaBr2
a=0.03N
a=0.035N
Life in days
Added salt x-equiv. per l.

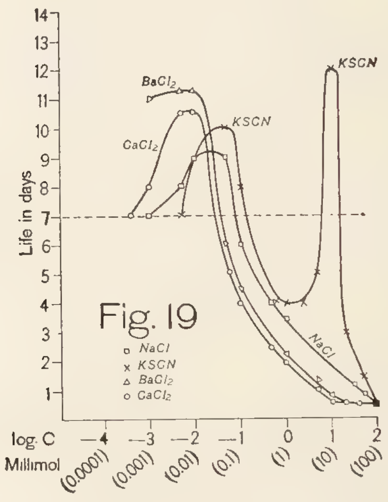


Fig. 19
BaCl2
CaCl2
KSCN
NaCl
Life in days
log. C
Millimol

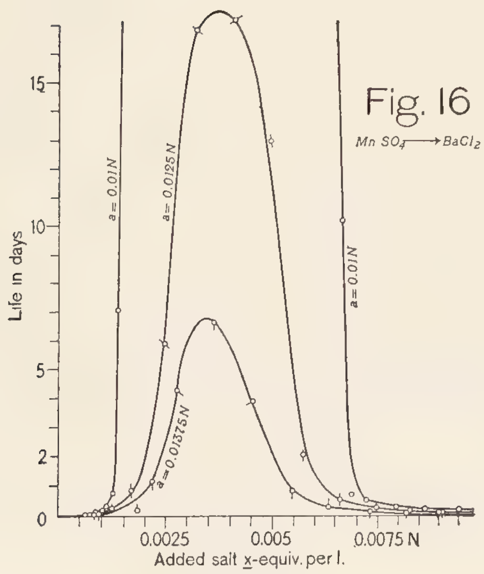


Fig. 16
Mn SO4 → BaCl2
a=0.01N
a=0.0125N
a=0.01375N
Life in days
Added salt x-equiv. per l.

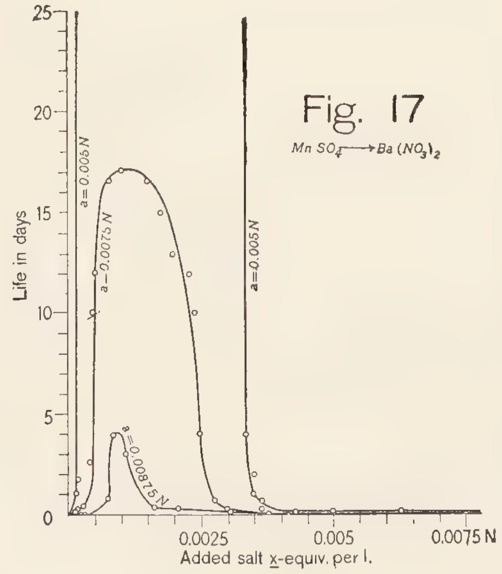
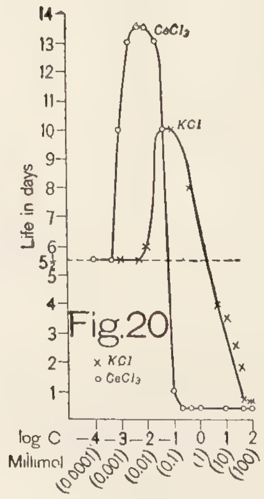
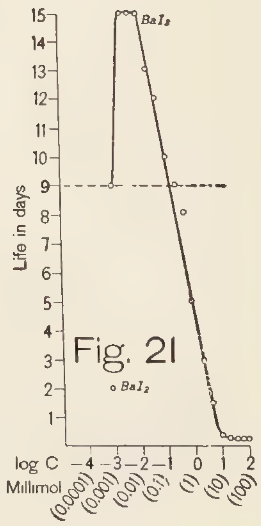
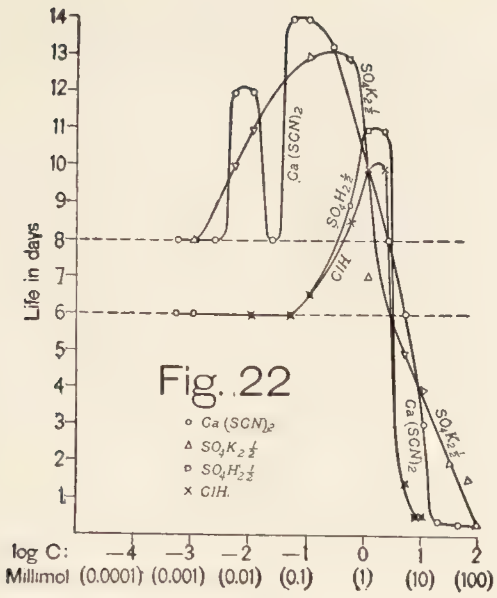
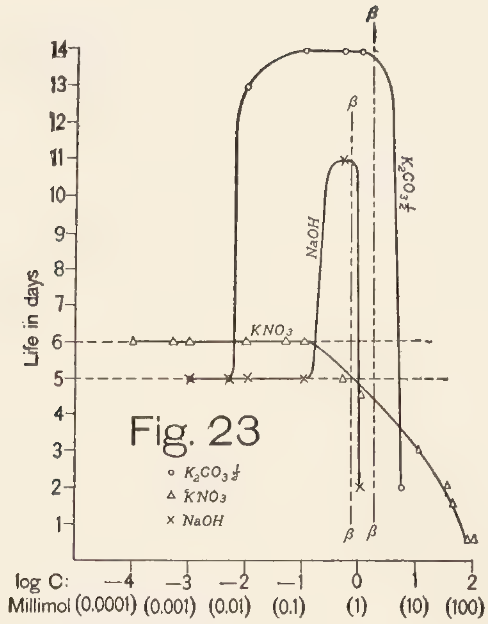


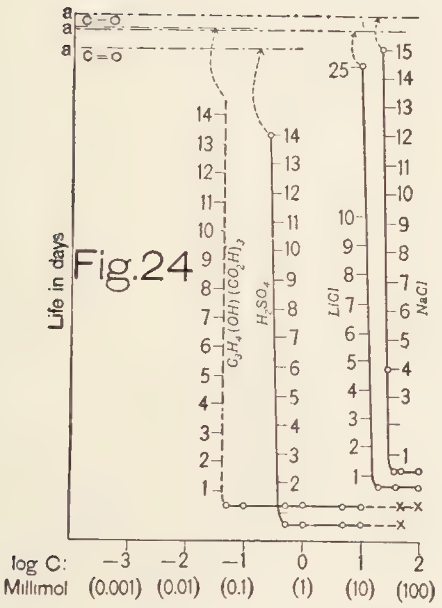
Fig. 17
Mn SO4 → Ba (NO3)2
a=0.005N
a=0.0075N
a=0.00875N
Life in days
Added salt x-equiv. per l.

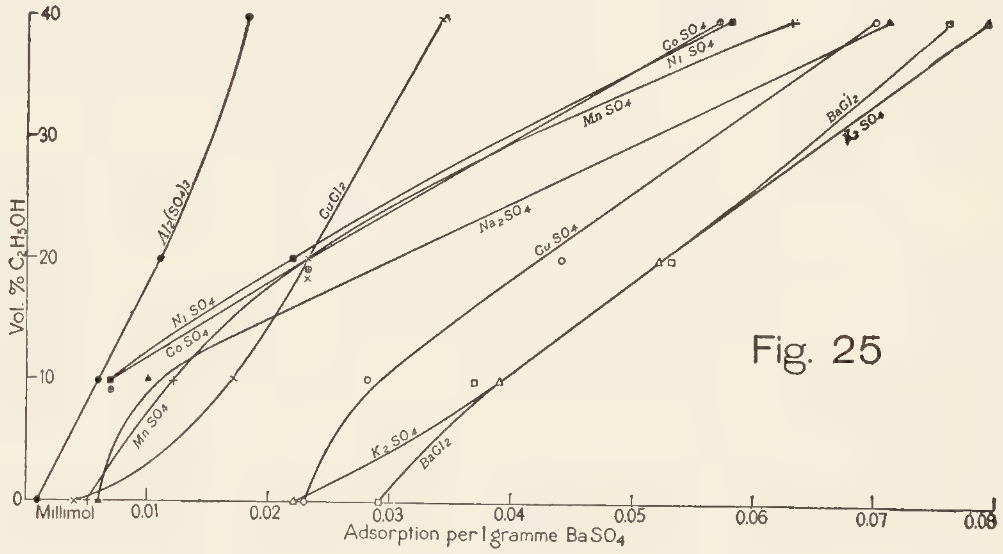

CaCl2
KCl
Fig.20
× KCl
o CaCl2
Life in days
log C
Millimol


BaI2
Fig. 21
o BaI2
Life in days
log C
Millimol









SWEETENING AGENTS. RELATIVE SWEETENING POWER

C. F. Walton, Jr.

The relative sweetness of various substances is usually cited in comparison with sucrose as unity. Since the concentration of the standard sucrose solution employed by different investigators has varied from 1 to 10%, and since the degree of sweetness does not decrease proportionately with dilution, the values reported in the literature vary accordingly, and are difficult to arrange accurately in numerical order. The following table, therefore, indicates only the approximate degree of sweetness, as reported by different investigators employing a variable procedure.

Relative Degree of Sweetness

(Sucrose = 1.0)

Name	Formula	Degree of sweetness	Lit.
Lactose	$C_{12}H_{22}O_{11}$	0.27–0.28	(26)
Dulcitol	$C_6H_{14}O_6$	0.41	(26)
Mannitol	$C_6H_{14}O_6$	0.45	(26)
Sorbitol	$C_6H_{14}O_6$	0.48	(26)
Glycerol	$C_3H_8O_3$	0.48	(26)
Glycol	$C_2H_6O_2$	0.49	(26)
Dextrose (*d*-glucose)	$C_6H_{12}O_6$	0.50–0.60	(10, 26, 29)
Maltose	$C_{12}H_{22}O_{11}$	0.60	(26, 29)

RELATIVE DEGREE OF SWEETNESS.—(*Continued*)

Name	Formula	Degree of sweetness	Lit.
Invert sugar (dextrose + levulose)	$C_6H_{12}O_6 + C_6H_{12}O_6$	0.78–0.95	(10, 26, 29)
Sucrose	$C_{12}H_{22}O_{11}$	1.00	(10, 26, 29)
Levulose (*d*-fructose)	$C_6H_{12}O_6$	1.03–1.50	(10, 26, 29)
p-Anisylurea	$CH_3OC_6H_4NHCONH_2$	18	(5)
Chloroform	$CHCl_3$	40	(31)
Glucin	Mixture	100	(11)
p-Methylsaccharin	$CH_3C_6H_3COSO_2NH$	200	(19)
Dulcin (*p*-phenetylurea)	$C_2H_5OC_6H_4NHCONH_2$	70–350	(11, 26)
6-Chlorosaccharin	$ClC_6H_3COSO_2NH$	100–350	(19)
n-Hexylchloromalonamid	$n\text{-}C_6H_{13}CCl(CONH_2)_2$	300	(11)
Saccharin (*o*-benzosulfonimid)	$C_6H_4COSO_2NH$	200–700	(11, 26)
Perillaldehyde α-anti-aldoxime (peryllartine)	$C_6H_8C(CH_3)CH_2CHNOH$	2000	(16)

LITERATURE

(For a key to the periodicals see end of volume)

The following list contains certain general references on methods of testing relative sweetening power, etc.

(1) Auerbach, *218*, **10**: 710; 22. (2) Barral and Ranc, *271*, **56**: 712; 18. (3) Barral and Ranc, *283*, **17**: 16; 20. (4) Becker and Herzog, *202*, **52**: 496; 07. (5) Boedecker and Rosenbuch, *273*, **30**: 251; 20. (6) Braun and Rawicz, *25*, **49**: 799; 16. (7) Cohn, Die Organischen Geschmackstoffe (Siemanroth, Berlin, 1914). (8) Cohn, *196*, **22**: 1; 16. (9) Cohn, *274*, **55**: 735, 763; 14.

(10) Deerr, *275*, **24**: 481; 22. (11) Dox and Houston, *1*, **46**: 1278; 24. (12) Dyson, *276*, **11**: 572; 24. (13) Foerster, *282*, **28**: 400; 11. (14) Fränkel, Arzneimittelsynthese (Springer, Berlin, 1921): 134–53. (15) Furukawa, Japanese Patent 35332; 19. (16) Furukawa, *41*, **41**: 706, 979; 20. (17) Hermann, *13*, **429**: 163; 22. (18) Holleman, *70*, **40**: 446; 21. (19) Holleman, *70*, **42**: 839; 23.

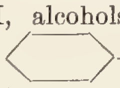
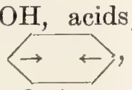
(20) Holleman and Choufoer, *64V*, **33**: 307; 24. (21) Kionka and Strätz, *277*, **95**: 241; 22. (22) Kodama, *41*, **41**: 495; 20. (23) Lasarev, *278*, **194**: 293; 22. (24) Oertley and Myers, *1*, **41**: 855; 19. (25) Ogilvie, *275*, **24**: 288; 22. (26) Paul, *279*, **43**: 137; 22. (27) Paul, *280*, **26**: 610; 22. (28) Pauli, *205*, **125**: 97; 21. (29) Sale and Skinner, *45*, **14**: 522; 22.

(30) Speckam, *273*, **32**: 83; 22. (31) Sternberg, *281*, **38**: 272; 05. (32) Zuntz, *92*, **23**: 385; 10.

ODORIFEROUS MATERIALS

H. ZWAARDEMAKER

The unit used for expressing odor is the *olfacty*, the normal stimulus threshold for a given odor.

The characteristic grouping giving rise to odor is termed odoriphore (8), also called aromatophore (Klimout, 1897) and osmophore (Rupe, 1900). The principal **odoriphores** are: ←C(:O)O-Alkyl, esters; ←C(:O)H, aldehydes; ⇄CO, ketones; Alkyl-O-Alkyl, ethers; ⇄C=OH, alcohols; ←C(:O)OH, acids; $\leftarrow NO_2$, nitrites; ←CN, nitriles; →, terpenes;  pinenes; ←S–S→, sulfides; ←As–As→, arsenides; ←As–O–As→, cacodyls; ←Hal., halogens; N, pyridine; NH, pyrrole.

CLASSIFICATION

LINNÉ, MODIFIED BY ZWAARDEMAKER

Type	Key letter
Odores aetherei Lorry (Ethereal)	A
Odores aromatici Linné (Aromatic):	
1. Almond	B
2. Camphoric	C
3. Citric	D
Odores fragantes Linné (Balsam):	
1. Floral	E
2. Lilylike	F
3. Vanillin	G
Odores ambrosiae Linné (Musk)	H
Allyl	I
Cacodylic	J
Odores empyreumatic Haller (Empyreumatic)	K
Odores hircini Linné (Caprylic)	L
Odores tetri Linné (Narcotic)	M
Odores nauseois Linné (Nauseous)	N

Intensity.—The intensity of the odor of an odorivector (5) depends on (1) its volatility from dilute solution, (2) its rate of diffusion, (3) its absorption by a humid surface and (4) its solubility in liquids. (All odorous substances are soluble in oil (2).) The significance of an odor as a reflex stimulus depends on physiological, its pleasing or repulsive value on psychological conditions.

VOLATILITY OF ODOR FROM PARAFFINIC SOLUTIONS (4)

Substance	Concn. per-cent	Volatility 10^{-6} g per min
Ethyl sulfide (I)	1	0.14
Scatole (N)	1	0.18
Valeric acid (L)	0.1	0.28
Guaiacol (K)	1	0.5
Pyridine (M)	10	0.93
Isoamyl acetate (A)	5	3.6
Terpineol (C)	25	7.5
Nitrobenzene (B)	50	9.2

DIFFUSION IN FREE AIR IN NEIGHBORHOOD OF SOURCE (10)

	cc per sec		cc per sec
Eugenol (C)	1.3	Ethyl ether (A)	4.4
Camphor (C)	2.1	Ethylacetone (A)	10

Extremes—ethyl acetate (A) and naphthalene (K). The anemodispersibility of odors depends on the size of the cloud and the velocity of the wind.

Spray Electricity.—All odorous substances lower the surface tension of water and therefore produce static electricity by spraying an aqueous solution of the odorivector against a disc well insulated with amber and paraffin. The value is expressed as 10^{-10} coulomb per cc of a saturated solution.

Substance	10^{-10} coulombs	Lit.
Cumidine (K)	0.2	(12)
Aniline (K)	0.4	(6)
Toluidine (K)	0.4	(6)
Xylidine (K)	0.9	(6)
Scatole (N)	1.0	(12)
Trinitroisobutyltoluene (H)	1	(12)
Pseudocumene (K)	3.4	(2)
Ethyl acetate (A)	3.5	(2)
Xylene (K)	3.8	(6)
Aniline (K)	4.8	(2)
Toluene (K)	5.1	(2)
Thymol (C)	6.5	(2)
Benzene (K)	7.5	(2)
Toluidine (K)	7.9	(2)
Xylidine (K)	9.3	(2)
Nitrobenzene (B)	9.6	(2)
Vanillin (G)	10	(2)
Dimethylaniline (K)	11.6	(6)
Benzaldehyde (B)	12.4	(2)
Anisaldehyde (G)	14.8	(2)
Phenol (K)	15.2	(2)
Xylenol (K)	17	(2)
Ethyl alcohol (A)	17.2	(2)
Cresol (K)	19.1	(12)
Camphor (C)	20.3	(12)
Heliotropin (F)	44	(2)
Vanillin (G)	47	(12)
Heliotropin (F)	52	(12)
Acetone (A)	60	(12)
Guaiacol (K)	81.1	(2)
Carvacrol (C)	82.3	(2)
Terpineol (E)	89.1	(2)
Amyl acetate (A)	96.4	(2)
Ethyl acetate (A)	122	(12)
Guaiacol (K)	289	(12)
Terpineol (E)	296	(12)
Citral (D)	360	(12)
Methyl anthranilate (E)	602	(12)

RELATION BETWEEN SPRAY ELECTRICITY AND CONCENTRATION OF AQUEOUS SOLUTIONS (12)

	CHARGE IN 10^{-10} COULOMBS PER CC						
Degree of saturation	1	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{8}$	$\frac{1}{16}$	$\frac{1}{32}$	$\frac{1}{512}$
Coumarin	6.5	2	0.5	0			
Heliotropin	52	22	10	2	1.4	1.4	0
Vanillin	72	32	6	2	0.5	0	

ADSORPTION OF ODORS BY SURFACES EXPRESSED AS THE DURATION OF THE AFTER EFFECT FOLLOWING AN EXPOSURE TO A CONTINUOUS STREAM OF ODORIFEROUS AIR FOR 5 MINUTES (11). THE TERM sec DENOTES A FEW SECONDS, m = MINUTE, d = DAY, h = HOUR, min = SOME MINUTES

	Aluminium	Copper	Glass	Gold	Iron	Lead	Nickel	Porcelain	Silver	Steel	Tin	Zinc
Ethyl disulfide	1 m	sec	sec	sec	sec	1 m	sec	2 m	sec	sec	sec	sec
Guaiacol	15 m	3 m	1 m	12 m	8 m	sec	5 m	5 m	0	7 m	8 m	25 m
Ionone	2.5 d	2 d	sec	......	4 d	1 d	2 d	sec	sec	4 d	min	
Isoamyl acetate	0	0	0	0	sec	0	sec	15 m	0	2 m	0	sec
Muscon	1 d	4 d	1 d	2 d	min	12 d	4–9 d	sec	2 d	sec	4 d	3 d
Nitrobenzene	sec	sec	sec	sec	sec	sec	sec	8 m	sec	sec	sec	sec
Pyridine	0	2 m	0	0	45 m	sec	sec	5 m	0	30 m	0.5 m	2.5 m
Scatole	9 d	3 d	1.5 h	1.5 d	10 d	10 d	3.5 d	0	1 d	20 d	7 d	14 d
Terpineol	0	sec	0	0	sec	0	0	5 m	sec	4 m	0	0
Valeric acid	3 m	0	30 m	sec	0	0	sec	0	5 m	0	2 m	0

Destruction of Odors by Ultraviolet Light.—The values are expressed as number of minutes required to reduce the odor in air from 2 to 1 olfacty by the radiation from a quartz mercury lamp (7).

Substance	Time	Substance	Time
Apiol (C)	0.10	Methyl salicylate (C)	0.30
Valeric acid (L)	0.10	Trimethylamine (J)	0.30
Menthol (C)	0.15	Methyl nonyl ketone (C)	0.35
Ethyl sulfide (I)	0.25	Thymol (C)	0.40
Carvacrol (C)	0.25	Borneol (C)	0.45
Bornyl acetate (C)	0.30	Isoamyl acetate (A)	0.45
Caproic acid (L)	0.30	Pyridine (M)	0.45

Substance	Time	Substance	Time
Safrol (C)	0.50	Methylheptenone (A)	2.30
Salicylaldehyde (C)	0.50	Eugenol (C)	3
Scatole (N)	0.50	Styrone (F)	3
Citral (D)	0.55	Coumarin (G)	3.30
Indole (N)	1.0	Ethyl isovalerate (A)	4
Aniline (K)	1.40	Cresol (K)	5
Methyl anthranilate (E)	1.45	Ethyl butyrate (A)	5
Methyl butyrate (A)	2.0	Terpineol (E)	5
Vanillin (G)	2.0	Chloroform (A)	6
Citronellol (E)	2.30	Ethyl succinate	6
Eucalyptol (C)	2.30	Anethol (C)	6.30
Isobutyl alcohol (K)	2.30	Linalyl acetate (D)	7

ODORIMETRY

The olfacty of an odor is the threshold or minimum perceptible concentration expressed in gms per cc which multiplied by $6.06 \times 10^{21}/M$, where M is the molecular weight, gives molecules per cc.

The authorities quoted are: Backman (1); Berthelot (2); Fischer and Peuzoldt (3); Henning (4); Hermanides (5); Huyer (6); Ohma (7); Passy (8); Tempelaar (9); van Wartenberg (10); Zwaardemaker (11).

Compound		Molecules per cc = $A \cdot 10^x$		Authority
Name	Formula	A	x	
Ionone (F)	$C_{13}H_{20}O$	16	5	4
		32	5	9
Ethyl bisulfide (I)	$C_4H_{10}S$	15	6	9
Scatole (N)	C_9H_9N	16	6	5
		18	6	9
Vanillin (G)	$C_8H_8O_3$	20	6	8
Trinitroisobutyltoluene (H)	$C_{11}H_{13}N_3O_6$	21	6	9
Coumarin (G)	$C_9H_6O_2$	33	6	9
Citral (D)	$C_{10}H_{16}O$	40	6	8
Valeric acid (L)	$C_5H_{10}O_2$	47	6	4
Butyric acid (L)	$C_4H_8O_2$	69	6	8
Isoamyl alcohol (K)	$C_5H_{12}O$	69	6	8
Vanillin (G)	$C_8H_8O_3$	72	6	9
Valeric acid (D)	$C_5H_{10}O_2$	12	7	9
Heptylic acid (C)	$C_7H_{14}O_2$	16	7	8
Guaiacol (K)	$C_7H_8O_2$	18	7	5
		20	7	9
Citral (D)	$C_{10}H_{16}O$	20	7	8
Methyl anthranilate (E)	$C_8H_9NO_2$	24	7	9
Nitrobenzene (B)	$C_6H_5NO_2$	32	7	4
Heliotropine (F)	$C_8H_6O_3$	40	7	4
Coumarin (G)	$C_9H_6O_2$	41	7	8
Iodoform	CHI_3	42	7	2
Bromoform	$CHBr_3$	48	7	8
Osmium tetroxide	OsO_4	48	7	10
Oenanthyl alcohol (C)	$C_7H_{16}O$	52	7	8
Valeric acid (D)	$C_5H_{10}O_2$	59	7	8
Cinnamaldehyde (C)	C_9H_8O	64	7	9
Nonylic acid (E)	$C_9H_{18}O_2$	77	7	8
Isobutyl alcohol	$C_4H_{10}O$	82	7	8
Thymol (C)	$C_{10}H_{14}O$	15	8	9
Capric acid (L)	$C_{10}H_{20}O_2$	18	8	8
Heliotropine (F)	$C_8H_6O_3$	20	8	8
Nitrobenzene (B)	$C_6H_5NO_2$	20	8	5
		20	8	9
Borneol (C)	$C_{10}H_{18}O$	20	8	9
Coumarin (G)	$C_9H_6O_2$	21	8	8
Eucalyptol (C)	$C_{10}H_{18}O$	22	8	9
Citral (D)	$C_{10}H_{16}O$	25	8	9
Linalyl acetate (D)	$C_{12}H_{20}O_2$	29	8	9
Lauric acid (C)	$C_{12}H_{24}O_2$	30	8	8
Pyridine (M)	C_5H_5N	31	8	9
Pulegon (M)	$C_{10}H_{16}O$	33	8	9
Eucalyptol (C)	$C_{10}H_{18}O$	39	8	7
Heliotropine (F)	$C_8H_6O_3$	40	8	8
Carvacrol (C)	$C_{10}H_{14}O$	40	8	9
Propionic acid	$C_3H_6O_2$	41	8	8
Durol (K)	$C_{10}H_{14}$	41	8	1
Isoamyl acetate (A)	$C_7H_{14}O_2$	42	8	5
		42	8	9
Safrol (C)	$C_{10}H_{10}O_2$	48	8	7
Citral (D)	$C_{10}H_{16}O$	52	8	7
Anethol (C)	$C_{10}H_{12}O$	57	8	9
Methyl butyrate (A)	$C_5H_{10}O_2$	58	8	9
Terpineol (E)	$C_{10}H_{18}O$	79	8	9
Eugenol (C)	$C_{10}H_{12}O_2$	85	8	7
Pseudocumene (K)	C_9H_{12}	10	9	1
Bornyl acetate (C)	$C_{12}H_{20}O_2$	14	9	9
Methylheptenone (A)	$C_8H_{13}O$	15	9	9
Ethyl butyrate (A)	$C_6H_{12}O_2$	15	9	9
Methyl acetate (A)	$C_3H_6O_2$	16	9	11
Carvone (C)	$C_{10}H_{14}O$	22	9	9
Caproic acid (L)	$C_6H_{12}O_2$	27	9	8
Ethyl succinate (A)	$C_8H_{14}O_4$	28	9	9
Methyl salicylate (C)	$C_8H_8O_3$	39	9	9
Xylene (K)	C_8H_{10}	46	9	1
Cresol (K)	C_7H_8O	50	9	9
Methylnonyl ketone (C)	$C_{11}H_{22}O$	61	9	9
Ethyl ether (A)	$C_4H_{10}O$	61	9	4
Aniline (K)	C_6H_7N	63	9	9
Camphor (C)	$C_{10}H_{16}O$	64	9	8
Amyl alcohol (K)	$C_5H_{12}O$	69	9	8
Safrol (C)	$C_{10}H_{10}O_2$	75	9	9
Phenol (K)	C_6H_6O	77	9	4
Butyl alcohol (K)	$C_4H_{10}O$	82	9	8
Ethyl ether (A)	$C_4H_{10}O$	82	9	8
Fenchone (C)	$C_{10}H_{16}O$	92	9	9
Acetaldehyde (A)	C_2H_4O	96	9	9
Citronellol (E)	$C_{10}H_{20}O$	11	10	9
Valeric acid (L)	$C_5H_{10}O_2$	12	10	5
Toluene (K)	C_7H_8	13	10	1
Ethyl isovalerate (A)	$C_7H_{14}O_2$	21	10	9
Trimethylamine (J)	C_3H_9N	22	10	9
Phenol (K)	C_6H_6O	26	10	9
Benzene (K)	C_6H_6	41	10	1
Acetone (A)	C_3H_6O	42	10	11
Acetic acid (L)	$C_2H_4O_2$	50	10	8
Propyl alcohol (K)	C_3H_8O	51	10	8
Acetic acid (L)	$C_2H_4O_2$	71	10	9
Toluidine (K)	C_7H_9N	79	10	6
Xylidine (K)	$C_9H_{11}N$	10	11	6
Toluidine (K)	C_7H_9N	15	11	6
		16	11	6
Menthol (C)	$C_{10}H_{20}O$	26	11	9
Aniline (K)	C_6H_7N	30	11	6
Formic acid	CH_2O_2	33	11	8
Terpineol (E)	$C_{10}H_{18}O$	73	11	5
Pyridine (M)	C_5H_5N	12	12	5
Ethyl alcohol (A)	C_2H_6O	24	12	4
		33	12	4
Formic acid	CH_2O_2	84	12	9
Methyl alcohol	CH_4O	11	13	9
Methyl alcohol	CH_4O	19	13	8
Apiol (C)	$C_{12}H_{14}O_4$	17	15	9

Value of an Olfacty Expressed as Degree of Saturation of Air with the Odorivector

Substance	% Saturation	Substance	% Saturation
Eucalyptol	0.058	Methyl alcohol	1.388
Eugenol	0.144	Toluidine	1.515
Toluene	0.158	Ethyl alcohol	2.5
Benzene	0.169		

Value of an Olfacty in cm of the Zwaardemaker Olfactometer

The constants of Zwaardemaker olfactometer are: width of cylinder, 0.8 cm; length, 10 cm; contents, 50 cc; air contact per cc of cylinder, 2.5 cm^2; velocity of air in the air tube, 100 cc per sec (exposure, 0.33 sec).

Minimum Perceptible in cm of Olfactometer Scale

Saturated solutions (9)

Substance	cm	Substance	cm
Terpineol—H_2O	0.01	Caproic acid—H_2O	0.10
Ethyl propionate—H_2O	0.02	Trinitroisobutyltoluene—H_2O	0.10
Ionone—H_2O	0.02	Guaiacol—H_2O	0.20
Camphor—H_2O	0.07	Trimethylamine—Paraffin	0.20

Aqueous solutions (10)

Substance	Concentration Wt. %	cm
Pyridine	0.05	0.1
Ethyl disulfide	0.02	0.5
Citral	0.01	0.2
Scatole	0.01	0.4
Valeric acid	0.01	0.5
Isoamyl acetate	0.01	0.7
Guaiacol	0.0007	1.0

Paraffin solutions (11)

Substance	Concentration Wt. %	cm	Substance	Concentration Wt. %	cm
Borneol	1.0	0.001	Citral	1.0	0.09
Cadaverine	0.1	0.001	Isoamyl acetate	0.5	0.29
Scatole	0.1	0.002	Guaiacol	0.1	0.62
Ethyl sulfide	0.01	0.01	Ionone	0.0004	0.62
Pyridine	1.0	0.03	Safrol	3.0	1.12
Valeric acid	0.01	0.04	Terpineol	2.5	1.60
Nitrobenzene	5.0	0.06			

LITERATURE

(For a key to the periodicals see end of volume)

(1) Allison and Katz, *45*, **11**: 336; 19. (2) Backman, *278*, **168**: 351; 17. (3) Henning, *Der Geruch*, 1924. (4) Hermanides, *Thesis, Utrecht*, 1907. (5) Heyninx, *Thesis, Brussels*, 1919. (6) Huyer, *Thesis, Utrecht*, 1917. (7) Tempelaar, *Thesis, Utrecht*, 1913. (8) Zwaardemaker, *Physiol. des Geruchs*, **1895**: 247. (9) Zwaardemaker, *Arch. Anat. Physiol., Physiol. Abt.*, **1903**: 48.

(10) Zwaardemaker, *In* Abderhalden, *Handb. biol. Arbeitsm.* **5**, pt. **7**: 455; 23. (11) Zwaardemaker, *In* Tigerstedt, *Handb. Physiol.* **3**, pt. **1**: 49; 14. (12) Zwaardemaker, *Arch. Neerl. Physiol.*, **1** : 347; 17.

RADIOACTIVITY

S. C. Lind, Special Editor

Page

1923 INTERNATIONAL TABLE
RADIOACTIVE ELEMENTS AND THEIR CONSTANTS

λ *(sec)*$^{-1}$ is the *radioactive constant of transformation.*

$$dQ = -\lambda Q dt, \qquad Q = Q_0 e^{-\lambda t}, \qquad \log_{10}\frac{Q_0}{Q} = 0.4343\lambda t,$$

in which Q_0 is the initial quantity and Q the quantity remaining after a time t (seconds).

$\lambda = -\frac{dQ}{Q}\frac{1}{dt}$ represents the fraction of the element transformed, reduced to the unit of time.

In the case of a double transformation, the values between brackets [ ] refer to the constants corresponding with the separate branches; the constant for both branches not being put between brackets.

The sign (?) indicates that the value has been indirectly deduced from the range of the α-rays expelled.

$\theta = \frac{1}{\lambda}$ is the *average life* of the radioactive atoms.

T is *the half period, i.e.,* the time in which the quantity of radio-element is diminished to one half:

$$\lambda T = -\log_e 0.5 = 0.69315 \text{ and } \theta = 1.443T$$

Radiation.—The brackets ( ) indicate that the radiation is relatively feeble.

REMARKS CONCERNING THE NOMENCLATURE

It is desirable that the nomenclature adopted by the international commission should be accepted universally but that now put forward for the present year is provisional, to serve as a basis of discussion with the view to the adoption ultimately of a standard nomenclature.

The most important points are:

1. The three radioactive emanations have been given the names radon, actinon, and thoron, with the symbols Rn, An, Tn, to suggest both their origin and their chemical character as members of the family of the rare gases of which the valency is zero;
2. In the branches which occur at the C members the sign (′) has been used to indicate the products resulting from the emission of β-rays (isotopes of polonium) and the sign (″) to indicate the products resulting from the emission of α-rays (isotopes of thallium);
3. The ultimate products have been indicated by the letter Ω.

EXPLANATION OF THE NOTES

NOTE 1.—*Uranium I.*—The value given for θ is that obtained from the equation:

$$\theta = \frac{1}{\lambda} = 2440 \times 0.97 \times 3 \times 10^6 \times \frac{226}{238} = 6.75 \times 10^9$$

in which the number 2440 represents the average life of radium in years, the number 0.97 the branching coefficient and $3 \times 10^6 \times \frac{226}{238}$ is the ratio between the numbers of atoms of uranium and radium in equilibrium in minerals.

If the actinium series is independent from that of uranium I, λ cannot be calculated by this method.

The value of λ obtained by the direct counting of the α-particles from a compound of uranium is 4.57×10^{-18} from which $\theta = 7 \times 10^9$ years and $T = 4.8 \times 10^9$ years.

NOTE 2.—*Uranium X_2* is also called brevium.

NOTE 3.—Radon replaces the names *radium emanation* and *niton* (the latter of which was proposed by Sir William Ramsay).

NOTE 4.—*Radium C* undergoes a double disintegration: 99.97% of the atoms emit β-rays and produce the substance Ra-C′ which gives α-rays, and 0.03% of the atoms emit α-rays and produce the substance Ra-C″ which gives β-rays.

a_0 is the *range* in cm of the α-rays in air at 0°C and a pressure of 760 mm of mercury.

The range at τ° C. and under p mm of mercury is

$$a = \frac{a_0(273 + \tau)760}{273p}$$

V is the velocity of α or β-rays relatively to that of light.

To convert to cm per sec multiply by 3×10^{10}.

For the α-rays:

$$V = 0.0342\, a^{1/3}$$

$\mu_{\beta Al}$ is the absorption coefficient of the β-rays in aluminium, the thickness being measured in cm.

$\mu_{\gamma Al}$ and $\mu_{\gamma Pb}$ are the absorption coefficients of the γ-rays in aluminium and lead respectively, the thickness being measured in cm; the latter is only given for the most penetrating type of γ-rays.

If I_0 is the initial intensity and I the intensity after the rays have traversed x cm of the absorbent:

$$I = I_0 e^{-\mu x} \qquad \log_{10}\frac{I_0}{I} = 0.4343\mu x$$

If D is the thickness corresponding with the absorption of one-half of the rays:

$$\mu D = 0.693$$

NOTE 5.—*Radium D* is also called radiolead.

NOTE 6.—*Radium C″* is also called radium C_2.

NOTE 7.—*Uranium Y* is the first known member of the actinium series. It may be derived from Uranium I or Uranium II. In this case, 3% of the atoms of Uranium produce the actinium family, and 97% the radium family.

The hypothesis has also been put forward that the actinium series may be produced independently from a third (hypothetical) isotope of Uranium for which the name actinouranium has been proposed.

NOTE 8.—*Protoactinium* is also called eka-tantalum.

NOTE 9.—A new radioactive substance named uranium Z, and isotopic with protoactinium, accompanies uranium in minute quantity. (*25*, **54B**: 1131; 21). Its period is from 6 to 7 hours. It emits a β-radiation for which DAI varies from: 0.0014 to 0.012. Its parent is an isotope of thorium, but it cannot yet be placed in the series.

NOTE 10.—*Actinon* is also called actinium emanation.

NOTE 11.—*Actinium C.* 0.2% of the α-rays emitted by this substance have a range $a_0 = 6.10$, instead of 5.12. From this it has been concluded that 0.2% of the atoms undergo a transformation by the emission of β-rays as is the case in the radium C and thorium C branches (*3*, **27**: 690; 14. **28**: 818; 14). Confirmatory evidence appears to be desirable.

NOTE 12.—*Actinium C″* is also called actinium D.

NOTE 13.—*Thorium.* The value given for λ is that obtained from the direct counting of the α-particles emitted by a compound of thorium. All the other values are less; the smallest being 0.55 of that given in the table and giving $\theta = 3.45 \times 10^{10}$ years and $T = 2.37 \times 10^{10}$ years (*63*, **19**: 259; 18).

NOTE 14.—*Thoron* is also called thorium emanation.

NOTE 15.—*Thorium C* undergoes a double disintegration: 65% of the atoms emit β-rays and produce the substance Th-C′ which gives α-rays, and 35% emit α-rays and produce the substance Th-C″ which gives β-rays.

NOTE 16.—*Thorium C.* The value $a_0 = 4.69$ is that corresponding with $V = 0.0572$ which has been directly measured.

NOTE 17.—*Thorium C″* is also called thorium D.

NOTE 18.—*Potassium* and *rubidium* emit β-rays but show no other evidence of radioactivity.

T	$\theta = \frac{1}{\lambda}$	λ (sec)$^{-1}$	Name	Symbol	Atomic Wt.	Atomic No.	Isotope	Radiation	a_0	V	μ_β Al	μ_γ Al	μ_γPb	Notes
			Series of Uranium and Radium											
4.67×10^9 yrs	6.75×10^9 yrs	4.7×10^{-18}	Uranium I	U_I	238	92	U	α	2.37	0.0456				1
24.6 days	35.5 days	3.26×10^{-7}	Uranium X_1	U-X_1	234	90	Th	β			463			
1.15 min	1.65 min	0.010	Uranium X_2	U-X_2	234	91	Pa	β (γ)			14.4	24; 0.7; 0.14	0.72	2
2×10^6 yrs	3×10^6 yrs	10^{-14} (?)	Uranium II	U_{II}	234	92	U	α	2.75	0.0479				
6.9×10^4 yrs	10^5 yrs	3.2×10^{-13}	Ionium	Io	230	90	Th	α	2.85	0.0485				
1690 yrs	2440 yrs	1.30×10^{-11}	Radium	Ra	226	88	Ra	α ($\beta + \gamma$)	3.13	α 0.0500; β 0.52; 0.65	312	354; 16; 0.27		
3.85 days	5.55 days	2.085×10^{-6}	Radon	Rn	222	86	Rn	α	3.94	0.0540				3
3.0 min	4.32 min	3.85×10^{-3}	Radium A	Ra-A	218	84	Po	α	4.50	0.0565				
26.8 min	38.7 min	4.30×10^{-4}	Radium B	Ra-B	214	82	Pb	β (γ)		0.36; 0.41; 0.63; 0.70; 0.74	13.1; 80	230; 40; 0.51		
19.5 min	28.1 min	5.92×10^{-4}	Radium C	Ra-C	214	83	Bi	99.97% β and γ		0.786; 0.862; 0.949; 0.957	13.2; 53	0.115	0.50	4
10^{-6} sec	10^{-6} sec	10^6 (?)	Radium C′	Ra-C′	214	84	Po	α	6.57	0.0641				
16.5 yrs	23.8 yrs	1.33×10^{-9}	Radium D	Ra-D	210	82	Pb	(β and γ)		0.33; 0.39	5500	45; 0.99		5
5.0 days	7.2 days	1.61×10^{-6}	Radium E	Ra-E	210	83	Bi	β			43.3			
136 days	196 days	5.90×10^{-8}	Radium F (Polonium)	Ra-F (Po)	210	84	Po	α (γ)	3.58	0.0523		585		
			Radium Ω (Lead)	Ra Ω′ Pb^{206}	206	82	Pb							
		[1.8×10^{-7}]	Radium C	Ra-C	214	83	Bi	0.03% α	?					
1.4 min	2.0 min	8.3×10^{-3}	Radium C″	Ra-C″	210	81	Tl	β						6
			Radium Ω″ (hypothetical)	Ra Ω″	210	82	Pb							
			Series of Actinium											
			Uranium ?		?	92	U	α						7
1.04 days	1.5 days	7.8×10^{-6}	Uranium Y	U-Y	?	90	Th	β			About 300			
1.2×10^4 yrs	1.7×10^4 yrs	1.9×10^{-12}	Protoactinium	Pa	?	91	Pa	α	3.314	0.0510				8, 9
20 yrs	28.8 yrs	1.1×10^{-9}	Actinium	Ac	?	89	Ac							
19.5 days	28.1 days	4.11×10^{-7}	Radioactinium	Rd-Ac	?	90	Th	α (β)	4.36	α 0.0559; β 0.38; 0.43; 0.49; 0.53; 0.60; 0.67; 0 73	About 170	25; 0.19		
11.4 days	16.4 days	7.06×10^{-7}	Actinium X	Ac-X	?	88	Ra	α	4.17	0.0550				
3.9 sec	5.6 sec	0.178	Actinon	An	?	86	Rn	α	5.40	0.0600				10
2.0×10^{-3} sec	2.9×10^{-3} sec	345	Actinium A	Ac-A	?	84	Po	α	6.16	0.0627				
36.1 min	52.1 min	3.2×10^{-4}	Actinium B	Ac-B	?	82	Pb	(β and γ)			Very large	120; 31; 0.45		11
2.15 min	3.10 min	5.37×10^{-3}	Actinium C	Ac-C	?	83	Bi	α	5.12	0.0589				
4.71 min	6.83 min	2.44×10^{-3}	Actinium C″	Ac-C″	?	81	Tl	β and γ			28.5	0.198	1.2 to 1.8	12
			Actinium Ω″ (hypothetical)	Ac Ω″	?	82	Pb							
			Series of Thorium											
1.31×10^{10} yrs	1.89×10^{10} yrs	1.68×10^{-18}	Thorium	Th	232	90	Th	α	2.58	0.0469				13
6.7 yrs	9.67 yrs	3.28×10^{-9}	Mesothorium 1	Ms-Th1	228	88	Ra							
6.2 hrs	8.9 hrs	3.12×10^{-5}	Mesothorium 2	Ms-Th2	228	89	Ac	β and γ		0.37; 0.39; 0.43; 0.50; 0.57; 0.60; 0.66 and >0.70	20.2 to 38.5	26; 0.116	0.62	
2.02 yrs	2.91 yrs	1.09×10^{-8}	Radiothorium	Rd-Th	228	90	Th	α (β)	3.67	α 0.0527; β 0.47; 0.51				
3.64 days	5.25 days	2.20×10^{-6}	Thorium X	Th-X	224	88	Ra	α	4.08	0.0546				
54 sec	78 sec	0.0128	Thoron	Tn	220	86	Rn	α	4.74	0.574				
0.14 sec	0.20 sec	5.0	Thorium A	Th-A	216	84	Po	α	5.40	0.0600				14
10.6 hrs	15.3 hrs	1.82×10^{-5}	Thorium B	Th-B	212	82	Pb	β and γ		0.63; 0.72	110	160; 32; 0.36		
60 min	87 min	1.92×10^{-4}	Thorium C	Th-C	212	83	Bi	65% β		(C + C″) 0.29; 0.36; 0.93 to 0.95	14.4			15
10^{-11} sec	10^{-11} sec	1.25×10^{-4}	Thorium C′	Th-C′	212	84	Po	α	8.16	0.0688				
		10^{11} (?)	Thorium Ω′ (Lead)	Th Ω′ Pb^{208}	208	82	Pb							
		[6.7×10^{-5}]	Thorium C	Th-C	212	83	Bi	35% α	4.55 / ?4.69	0.0572				16
3 1 min	4.5 min	3.70×10^{-3}	Thorium C″	Th-C″	208	81	Tl	β and γ		(See Th-C)	21.6	0.096	0 46	17
			Thorium Ω″ (Lead)	Th Ω″ Pb^{208}	208	82	Pb							
			Potassium	K	39.1	19	K	β			22 to 38			18
			Rubidium	Rb	85.5	37	Rb	β			308 to 347			18

PHYSICAL PROPERTIES OF THE RADIOELEMENTS AND THEIR COMPOUNDS
(Except Ra, Th, U and Rn)

GEORG HEVESY

1. Atomic Weights.—Io (mixture of Io + Th), 231.51 (2). RaΩ (=U-Pb), 206.04 (2). ThΩ (=Th-Pb), 207.97.

2. Molecular Weights.—An (=Ac-Em), 220–232 (4). Tn (=Th-Em), 201–210 (4). Rate of effusion method.

3. Density (5).—RaΩ, 11.273 g cm^{-3} at 19.94°C.

4. Melting Point (26).—RaΩ′, differs from Pb <0.05°.

5. Boiling Point (32).—Ra-FH_2, 37°C.

6. Solubility.—S = solubility mol l^{-1}. $\alpha' = \frac{C_{Air}}{C_{H_2O}}$. An (14), $\alpha' = 2$ at 18°. Tn (15), $\alpha' = 1$ at 18°. Rn (16). $S = 1.7989$ (15b) in H_2O at 25°. $S\,[RaΩ'(NO_3)_2] - S[Pb(NO_3)_2] < 10^{-4}$.

RELATIVE SOLUBILITY OF AN IN DIFFERENT SOLVENTS AT 18°

H_2O	Sat. KCl soln.	Conc. H_2SO_4	C_2H_5OH	$C_5H_{11}OH$	C_6H_5CHO	C_6H_6	$C_6H_5CH_3$	Kerosene	CS_2
1	0.9	0.95	1.11	1.6	1.7	1.7	1.8	1.9	2.1

7. Rate of Solution.

PERCENT DISSOLVED FROM SURFACE AT 18°

By H_2SO_4 in 15 sec (17)				
H_2SO_4, equiv. per liter =	10^{-3}	10^{-2}	10^{-1}	1
Ra-B from glass	80	80	97	88
Ra-C from glass	28	60	88	99

By HNO_3 in 60 sec (18)							
HNO_3, equiv. per liter =	0	10^{-5}	10^{-4}	10^{-3}	10^{-2}	10^{-1}	1
Th-B from quartz	60	61	60	80	81	83	84
Th-C from quartz	37	38	35	61	72	77	87

PERCENT RA-B AND RA-C DISSOLVED FROM GLASS SURFACE (17)

By H_2O in 5 min					
t	Ra-B	Ra-C	t	Ra-B	Ra-C
0°	0.29	0.19	42°	0.78	0.67
17°	0.47	0.35	70°	0.97	0.91
By H_2SO_4 in 15 sec					
t	Ra-B	Ra-C	t	Ra-B	Ra-C
0°	0.74	0.52	42°	0.895	0.71
17°	0.80	0.60	70°	0.96	0.81

8. Adsorption.—Ratio of molal conc. in gas at equilibrium to moles adsorbed per liter of charcoal at 18°, An (19) 0.05, Tn (20) 0.02. Percent of initial amount present (per 50 cc of solution) adsorbed by 1 g of adsorbent (21). (*a*) By $BaSO_4$, from 0.1 *N* HCl, Th-B 81, Th-C 32; from 0.1 *N* KOH, Th-B 20, Th-C 64; from 0.1 *N* NH_3, Th-B 100, Th-C 86. (*b*) By Cr_2O_3, from 0.1 *N* HCl, Th-B 2.5, Th-C 69. (*c*) By AgBr, from 0.1 *N* HBr, Th-B 81, Th-C 34. (*d*) By $BaSO_4$, from 1 *N* HCl, Ra 80. (*e*) By Cr_2O_3, from 1 *N* HCl, Ra 0. (*f*) By AgCl, from 1 *N* HCl, Ra 0.

9. Vapor Pressure.—$p_{700°}$ for RaΩ′ is 2% greater than for Pb (22).

10. Temperature of Volatilization.—Depends on nature of surface and chemical state of the radioactive element. *v.* (23, 24, 25).

11. Coefficient of Diffusion.

(*a*) IN GASES AT 76 CM AND 15°

An, in	Air	H_2	CO_2	SO_2	A
Δ, $cm^2\ sec^{-1}$	0.098–0.123 (6, 7, 8, 9)	0.330 (7); 0.412 (8)	0.075 (7, 8)	0.062 (7)	0.107 (7)

Tn, in	Air	A
Δ, $cm^2\ sec^{-1}$	0.085–0.103 (6, 7, 9)	0.084 (7)

(*b*) THE CATIONS IN WATER (10) AT 18°

Ion	UX_1^{++++}	Io^{++++}	$Ra\text{-}D^{++}$	$Ra\text{-}E^{+++}$	$Ra\text{-}F^{++}$	Ac^{+++}
Δ, $cm^{-2}\ day^{-1}$	0.4	0.33	0.65	0.45	0.76	0.46

Ion	AcX^{++}	$Rd\text{-}Th^{++++}$	ThX^{++}	$Th\text{-}B^{++}$	$Th\text{-}C^{+++}$
Δ, $cm^{-2}\ day^{-1}$	0.69	0.33	0.66	0.67	0.5

Th-CCl_3 in 1/12 *N* NH_3, Δ = 0.37. Ra-FCl_2 in 1/2 *N* NH_3, Δ = 0.19.

(*c*) IN METALS. Δ IN CM^{-2} DAY^{-1}

	t	Δ
Th-B in Pb	343°	2.2 (11)
Ra-D in Pb	280°	$<10^{-4}$ (12)
Ra-F in Pb	280°	$<10^{-4}$ (12)
Ra-F in Au	470°	*ca.* 10^{-9} (13)
Ra-B + Ra-C in Ag	470°	3.8×10^{-7} (13)
Ra-B in Au	470°	8.2×10^{-7}
Ra-B in Pt	470°	3.4×10^{-7}

In re diffusion of Th-B in single crystals, in lead foils and in thallium foils *v.* (35).

12. Refractive Index (27).—$n_D^{25°}$ for cryst. $RaΩ'(NO_3)_2 = 1.7814$.

13. X-ray Spectra.—All lines of the L series and the $M\alpha$ and $M\beta$ lines of RaΩ′ differ by less than 5×10^{-12} cm from the same lines for Pb (28).

14. Relative Ionic Mobilities (10).—In capillary tubes by comparison against Ra (Λ = 57.3 mhos).

Cation	Ra	Ra-C	Ra-D	Ra-E	Ra-F	AcX	ThX	Th-B	Th-C
Λ	57.3	54.5	61.9	61.9	68.8	56.1	58.0	55.4	54.0

15. Emf.—RaΩ′ / *N* $RaΩ'(NO_3)_2$ // *N* $Pb(NO_3)_2$ / Pb. <0.1 millivolt (31).

16. Deposition Voltage.—From 1/10 *N* HNO_3 containing 10^{-8} mole Ra-F, cathodic deposition occurs on Au electrodes at E_{Hg} = 0.35 volt, anodic at E_{Hg} = 1.05 volt (30).

LITERATURE AND REMARKS

(For the key to periodicals see end of volume)

(1) Hönigschmid, *9*, **22**: 21; 16. This mixture contained about 30% Io and 70% Th and was probably contaminated with some Th not present in the pure pitchblende (*cf.* Soddy and Hitchins, *3*, **47**: 1148; 24. Meyer and Ulrich, *75*, **132**: 279; 23). (2) Lowest value found. Higher values probably due to presence of lead. Richards and Lembert, *1*, **36**: 1329; 14. *93*, **88**: 429; 14. Hönigschmid and Horowitz, *75*, **123**: 2407; 14. *9*, **20**: 319; 14. Curie, *34*, **148**: 1676; 14. *198*, **34**: 586; 23. Richards, *Ann. Rep. Smithsonian Inst.* **1918**: 205. Richards and Putzeys, *1*, **45**: 2954; 23. (3) Highest value found. Lower values probably due to presence of lead and RaΩ. Hönigschmid, *9*, **25**: 91; 19. Soddy, *4*, **105**: 1402; 14. *58*, **94**: 615; 15. **98**: 469; 17. **99**: 244; 17. (4) Leslie, *4*, **24**: 637; 12. *34*,

153: 328; 11. Marsden and Wood, *4*, **26**: 948; 13. (5) Richards and Wadsworth, *1*, **38**: 221, 1658; 16. *Cf.* Soddy, *58*, **107**: 41; 21. Egerton and Lee, *5*, **103**: 487; 23. (6) Rutherford, "*Radioactivity*," Cambridge, 1913, p. 387. (7) Russ, *4*, **17**: 540; 09. (8) B. Bruhat, *199*, **6**: 67; 09. *Cf.* Debierne, *199*, **4**: 213; 07. McLennan, *2*, **30**: 660; 10. Eckmann, *200*, **9**: 177; 12. Thomsen *201*, **15**. 377; 09. Hevesy, *200*, **10**: 198; 13. (9) Leslie, *34*, **153**: 328; 11. Rutherford, *l.c.*

(10) Hevesy, *63*, **14**: 49, 1202; 13. *4*, **26**: 586; 14. Paneth, *75*, **122**: 1636; 13. The radioelements probably present in colloidal state. (11) Gróh and Hevesy, *8*, **63**: 85; 20. Diffusion rate of a mixture of Th-B and Pb in lead. Th-B used as indicator. (12) Gróh and Hevesy, *8*, **65**: 216; 21. Diffusion rate of a mixture of Ra-D and Pb in lead. (13) Wertenstein and Dobrowolska, *51*, **4**: 324; 23. Diffusion rate of active deposit (probably of oxides). (14) Hevesy, *63*, **12**: 1214; 11. *50*, **16**: 429; 12. (15) Klaus, *63*, **6**: 820; 05. Boyle, *Macdonald Phys. Build. Bull.*, No. **1**: 52; 10. α of short-lived An and Tn determined by making assumptions only partly justified. α of An and Tn probably practically identical with that of Rn. (16) Richards and Schumb, *1*, **40**: 1403; 18. The RaΩ′ used contained some common lead, its atomic weight being 206.34. The solubility of common lead (at. wt. 207.19) was found by the same authors to be 1.7993. *Cf.* Fajans and Lembert, *93*, **95**: 297; 16. (17) Ramstedt, *147*, II: No. **31**; 13. *Cf.* Arrhenius, *199*, **7**: 228; 10. Godlewski, *199*, **10**: 250; 13. Schräder, *4*, **24**: 131; 12. Hevesy, *9*, **19**: 291; 13. (18) Hevesy and Rona, *7*, **89**: 294; 15. *In re* Ra-F, *cf.* Paneth and Hevesy, *75*, **123**: 1050; 13. (19) Hevesy, *63*, **12**: 9; 12. *50*, **18**: 429; 12.

(20) Boyle, *4*, **17**: 389; 09. Ra-B and Th-B between Pb amalgam and $Hg(NO_3)_2$; *cf. Z.* Klemensievicz, *34*, **158**: 1889; 14. (21) Paneth, *63*, **15**: 924; 14. Horowitz and Paneth, *75*, **129**: 1819; 14. *In re* adsorption UX *cf.* Ebler and Rhyn, *25*: **54**: 2896; 21. A. C. Brown, *4*, **121**: 1738; 22. Freundlich and Wreschner, *7*, **106**: 366; 23. Adsorption of Ra-B, Ra-C, Th-B and Th-C. Hevesy, *75*, **127**: 1787; 18. Cranston and Burnett, *4*, **119**: 2036; 21. **121**: 2890; 22. Paneth and Vorwerk, *7*, **101**: 445; 22. Fajans and Frankenberg, *7*, **105**: 255; 23. Absorption of Ra-F, Paneth, *55*, **13**: 1, 288; 13. Lachs and Werthenstein, *63*, **23**: 318; 22. Escher, *34*, **177**: 3, 172; 23. (22) Egerton, *5*, **103**: 469; 23. (23) Russell, *4*, **24**: 134; 12. *cf.* Schräder, *4*, **24**: 125; 12. (24) St. Loria, *63*, **17**: 6; 16. (25) Wood, *5*, **91**: 543; 15. *Cf.* Barrat and Wood, *67*, **26**: 248; 14. Wood, *4*, **28**: 808; 14. *In re* volatilization of Tn *cf.* Fleck, *4*, **29**: 337; 15 and St. Loria, *75*, **129**: 829; 15. Volatilization of $RaFH_2$ and of the hydrides of Ra-B, Th-B and Th-C, Paneth, *25*, **51**: 1704; 18. **53**: 1693; 20. *9*, **26**: 452; 20. (26) Richards and Hall, *1*, **42**: 1550; 20. *cf.* Lembert, *9*, **26**: 59; 20. (27) Richards and Schumb, *1*, **40**: 1403; 18. For $Pb(NO_3)_2$, $n_D^{20} = 1.7815$. (28) Siegbahn and Stenström, *63*, **18**: 547; 17. *Cf.* Duane and Shimizu, *197*, **5**: 198; 19. Cooksey and Cooksey, *2*, **16**: 327; 20. *In re* slight difference in the wave length of optical spectrum of ordinary Pb and mixtures of RaΩ and ordinary Pb, *cf.* Aronberg, *197*, **3**: 710; 17. *21*, **47**: 96; 18. Harkins and Aronberg, *1*, **42**: 1328; 20. Merton, *5*, **99**: 87; 21. **100**: 84; 21. (29) Hevesy, *4*, **25**: 410; 13. *63*, **14**: 49; 13.

(30) Hevesy and Paneth, *75*, **123**: 161; 14. Meitner, *63*, **12**: 1094; 11. Hevesy, *4*, **23**: 628; 12. Wertensteinowa, *256*, **10**: No. 6, 771; 17. On the deposition of Th-B and Ra-E, Paneth and Hevesy, *75*, **122**: 1037; 13. (31) Hevesy and Paneth, *75*, **124**: 381; 15. (32) Paneth, *O.* (33) Fajans and Lembert, *93*, **95**: 297; 16. (34) Richards and Schumb, *l.c.* (35) Hevesy and Obrutsheva, *58*, **115**: 674; 25.

ARTIFICIAL DISINTEGRATION OF THE ELEMENTS

G. Rudorf

Disintegration by the splitting off of positively charged hydrogen nuclei by the action of rapidly moving α-particles.

(*a*) Disintegration obtained with B, N, F, Ne, Na, Mg, Al, Si, P, S, Cl, A, K (1, 2, 3, 5).

(*b*) No disintegration obtained with H, He, Li, C, O, Ni, Cu, Zn, Sc, Kr, Mo, Pd, Ag, Sn, X, Au, U (2, 3, 5).

(*c*) Doubtful, Be (4, 5).

LITERATURE

(For a key to the periodicals see end of volume)

(1) Rutherford, *3*, **37**: 581; 19. *5*, **97**: 374; 20. (2) Rutherford and Chadwick, *3*, **42**: 809; 21. (3) Rutherford and Chadwick, *3*, **44**: 417; 22; also Rutherford, *4*, **121**: 400; 22. (4) Kirsch and Petterson, *75*, **132**: 299; 24. *3*, **47**: 500; 24. (5) Rutherford and Chadwick, *67*, **36**: 417; 24.

Range of Emitted Hydrogen Nuclei (2, 3, 5)

Element	Forward range in cms	Backward range in cms
B	58	38
N	40	18
F	65	48
Na	58	36
Al	90	67
P	65	49
Mg, Si, S, Cl, A, K	18–30	
Ne	16	

The values for B, F, Na, P are possibly somewhat in error (3) but are certainly greater than 40 (2).

ELECTRON EMISSION PRODUCED BY RADIATION FROM RADIOACTIVE SUBSTANCES

Pierre Auger

Relative Ionization of Gases by Po α-Rays Having a 3.8 cm Range (1)

Gas	Air	O_2	N_2	CO_2	Illuminating gas
I	1	1.12	0.97	1.23	0.38

Relative Molecular Ionization of Gases by β and γ Rays (2)

Gas	Air	H_2	O_2	NH_3	N_2O	CO_2	C_2N_2	SO_2	CS_2	C_6H_{12}
$I\beta$	1	0.16	1.17	0.89	1.55	1.60	1.86	2.25	3.62	4.55
$I\gamma$	1	.16	1.16	.90	1.55	1.58	1.71	2.27	3.66	4.53

Gas	C_6H_6	CH_3OH	CH_3Br	$CHCl_3$	CH_3I	CCl_4	C_2H_4O
$I\beta$	3.95	1.69	3.73	4.94	5.11	6.28	2.12
$I\gamma$	3.94	1.75	3.81	4.93	5.37	6.33	2.17

Gas	C_2H_5Cl	C_2H_5Br	C_2H_5I	$(C_2H_5)_2O$	$Ni(CO)_4$
$I\beta$	3.24	4.41	4.39	5.90	
$I\gamma$	3.19	4.63	4.29	6.47	5.98

Residual Ionization as Dependent on the Pressure

Ionization from the walls (a secondary radiation) in air confined for 10 days. N_I = number of ions per cm^3 per sec (3).

P. atm.	0	10	20	27	40	46	50	60
N_I	0	17	30	38	46	50	50	50

Number of Electrons (δ-rays) Liberated by α-rays

l = thickness of metal traversed. N_E = electrons emitted per incident particle (4).

$10^5\, l$ (g cm^{-2})	In Al							In Ag		In Au	
	81	162	243	324	410	492	570	28.5	591	12.3	1223
N_E	11.9	14.2	15.0	17.2	17.8	18.9	19.4	8.12	13.76	9.82	18.16

Pairs of Ions Produced by α-rays

If R_0 cms is the range of the α-particle in air, it will produce n pairs of ions. $n = n_0 R_0^{2/3}$, where $n_0 = 6.233 \times 10^4$. Direct measurement for Ra-C′ gives $n = 2.20 \times 10^5$ (5).

Energy

Energy of electrons (Sec. β-rays) emitted by metals subjected to the action of γ-rays from Ra(C + E). Three groups of rays (6).

Metal	Pb	Pt	W	U	Ba
Atomic number	82	78	74	92	56
Energy of the secondary rays. Volts $\times 10^{-5}$.	1.49	1.58	1.66	1.22	
	2.03	2.12	2.20	1.74	2.53
	2.60	2.69	2.76	2.31	

Secondary β-ray Velocities

Pb subjected to the action of γ-rays from Ra-B has been found to emit the following secondary β-rays:

$$RH = \frac{mu^2}{e(1-\beta^2)} = 3610,\ 3250,\ 2990,\ 2735,\ 2225,\ 2130,\ 2000,$$
1935, 1825, 1750, 1620, 1560, 1400, 1240, 1150, 1010, 950, 820, 800 (8).

Absorption

Absorption of the secondary β-rays emitted by metals when subjected to the radiation from Ra(B + C). μ_h for the hard rays, μ_s for the soft rays. Absorbing screen, Al (7).

Metal	Ag	Al	Au	Cu	Fe	Ni	Pb
μ_h, cm^{-1}	69	14	118	35	41	52	118
μ_s, cm^{-1}	207	52.5	345	105	165	165	345

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ENERGY OF RADIOACTIVE PROCESSES

Stefan Meyer

HEAT PRODUCTION OF RADIOACTIVE SUBSTANCES

Joules per hour per gram of the radioactive element and the decay products in equilibrium therewith. (1 Joule = 0.2390 g-cal.)

Substance	Rays	Meyer & Hess(4)	Hess(2)	Rutherford & Robinson (7)
Ra	α and recoil		105.5	
Rn	α and recoil			105.0
Ra-A	α and recoil	573	467.7	119.7
Ra-B + Ra-C	α and recoil			127.6
	and β, γ			211.3
Total		573	573	565

Substance	Heat	Lit.
Th	10.0×10^{-5}	(5)
U	4.2×10^{-4}	(6)
Pitchblende (*ca.* 64% U)	27.2×10^{-5}	(6)

Ellis and Wooster (1) have determined the γ-heat effect of Ra-B to be 3.6; Ra-C, 32.2; total, 36 joules/h. Calculations of the heat effect of β-α and γ-rays have been made by Meitner (3) and Thibaud (8).

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CHEMICAL EFFECTS OF α-PARTICLES

S. C. Lind and D. C. Bardwell

M is the total number of molecules reacting (on the left hand of the equation, first column); *N* is the total number of ion pairs produced in the reactants by α-particles.

$$\frac{M}{N} = \frac{\left(\frac{k_\mu}{\lambda}\right)' \cdot V}{D \cdot F \cdot G \cdot H} \times 1.66 \times 10^8$$

V = volume in cm^3 of, and D = diameter in cm of, the reaction sphere.

F = average intensity of ionization (1). G = specific molecular ionization (air = 1).

$H = (\alpha + R)/\alpha$ where α and R are α-ray and recoil atom effects resp. (2).

$$\left(\frac{k\mu}{\lambda}\right)' = \left(ln\frac{P_1}{P_2}\right) \div [E_o(e^{-\lambda t_1} - e^{-\lambda t_2})] \quad (3)$$

where E_o = initial radon (in curies), P = pressure (mm Hg), λ = decay constant of radon (in reciprocal days) and t = time (in days).

Where the quantity of gas in the reaction vessel at atmospheric pressure exceeds the air equivalent of a bulb 2.5 cm in diameter, the ionization is calculated by equations developed by W. Mund (17), slightly modified:[1]

[1] The modified equation is derived by correcting the integration of Mund's function $\varphi(r) = \int_0^{2R}(r-x)^{2/3}x^2dx$ (equation 5, p. 340). In the large bulbs used by Mund no error was introduced by employing his equation since $2R>r$.

$$I = N_0\,(1-e^{-\lambda t})k\Big[r^{2/3} + \frac{1}{2}r'^{2/3} + \frac{1}{2}r''^{2/3} - \frac{3}{20R}\Big\{3r^{5/3} + r'^{5/3} + r''^{5/3} - 3\,(r-2R)^{5/3} - (r'-2R)^{5/3} - (r''-2R)^{5/3}\Big\} + \frac{81r^{11/3}}{3520R^3} - \frac{27}{160}(r-2R)^{2/3}\Big\{\left(\frac{r-2R}{R}\right)^2 + \frac{3}{22}\left(\frac{r-2R}{R}\right)^3\Big\}\Big]$$

I = Number of ions produced by the three sets of α-particles in the time t.

N_2 = Number of atoms of radon present initially ($t = 0$) (1 curie = 1.772×10^{16} atoms Rn)

R = Radius of reaction bulb in cms.

λ = Decay constant of radon (as above)

$k = 6.67 \times 10^4 \frac{\text{ions}}{cm^{2/3}}$ = ionization constant per α-particle as a function of the range (5); $i = kr^{2/3}$ or $kr'^{2/3}$ or $kr''^{2/3}$ for Rn, Ra-A, and Ra-C, resp. (air at 760 mm and 0°C)

r, r', r'' = ranges of α-particles from Rn, Ra-A, and Ra-C, resp. Wourtzel's (13) M/N values are recalculated by the Mund equation

The values adopted for the number of α-particles per sec per g of radium, and the total ions from one α-particle of Ra-C in its completed path in air are respectively, for column (*a*) 3.72×10^{10} (4) and 2.37×10^5 (5), and for (*b*) 3.40×10^{10} (6, 7) and 2.20×10^5 (8). Other combinations of these numbers give intermediate values of M/N.

Reaction l = liquid, g = gas, s = solid	$\frac{M}{N}$ (a)	$\frac{M}{N}$ (b)	Lit.
$2H_2g + O_2g \rightarrow 2H_2Ol$	5.13	6.05	(9, 10)
Dry or moist; at 25°C to −75°C			
$2H_2Ol \rightarrow 2H_2g + O_2g$	0.86	1.01	(11)
	1.05	1.24	(11)
$2H_2Og \rightarrow 2H_2g + O_2g$	<0.01	<0.01	(11)
$2H_2Os \rightarrow 2H_2g + O_2g$	0.05	0.06	(11)
$CO_2g \rightarrow$ 1% disappearance of gas, no decomposition products	5×10^{-3}	6×10^{-3}	(18)
$COg \rightarrow CO_2g + C_nO_ms + Cs$	1.85	2.18	(18)
$2COg + O_2g \rightarrow 2CO_2g$ at room temperature	5.7	6.7	(18)
$2COg + O_2g \rightarrow 2CO_2s$ at liquid air temp.	>3.1	>3.7	(18)
$COg + H_2g \rightarrow$ carbohydrate s	3.13	3.7	(18)
$CO_2g + H_2g \rightarrow$ carbohydrate $s + H_2Ol$	1.44	1.70	(18)
$CO_2g + CH_4g \rightarrow$ carbohydrate $s + H_2Ol$	0.76	0.90	(10)
$CH_4g \rightarrow H_2g$ + hydrocarbons g,l and s	2.0	2.4	(10)
$C_2H_6g \rightarrow H_2g$ + hydrocarbons g,l and s	1.7	2.0	(10)
$C_3H_8g \rightarrow H_2g$ + hydrocarbons g,l and s	1.5	1.8	(10)
$C_4H_{10}g + H_2g$ + hydrocarbons g,l and s	1.4	1.6	(10)
$CH_4g + 2O_2g \rightarrow CO_2g + H_2Ol$	4.4	5.2	(10)
$CH_4g + 2O_2g$ + [1 mol % $(C_2H_5)_2Se$] $\rightarrow CO_2g + H_2Ol$	5.7	6.7	(10)
$2C_2H_6g + 7O_2g \rightarrow CO_2g + H_2Ol$	6.8	8.0	(10)
$(CN)_2g \rightarrow$ {5% to N_2g and Cs; 95% to paracyanogen s}	7.8	9.2	(12)
$2NH_3g \rightarrow N_2g$ and $3H_2g$, 18°	1.01	1.19	(13)
$2NH_3g \rightarrow N_2g$ and $3H_2g$, 25°	1.0	1.2	(10)
$2NH_3g \rightarrow N_2g$ and $3H_2g$, 108°	2.0	2.35	(13)
$2NH_3g \rightarrow N_2g$ and $3H_2g$, 220°	2.92	3.44	(13)
$2NH_3g \rightarrow N_2g$ and $3H_2g$, 315°	3.15	3.80	(13)
$H_2Sg \rightarrow H_2g + Ss$, 18°	3.40	4.00	(13)
$H_2Sg \rightarrow H_2g + Ss$, 95°	2.80	3.30	(13)
$H_2Sg \rightarrow H_2g + Ss$, 220°	2.38	2.80	(13)
$H_2Ss \rightarrow H_2g + Ss$, −190°	3.?	4.?	(13)
$N_2Og \rightarrow$ {$N_2g + O_2g$; $N_2g + NOg$}, −78°	2.74	3.23	(13)
$N_2Og \rightarrow$ {$N_2g + O_2g$; $N_2g + NOg$}, 18°	2.21	2.61	(13)
$N_2Og \rightarrow$ {$N_2g + O_2g$; $N_2g + NOg$}, 220°	2.95	3.48	(13)
$H_2g + Cl_2g \rightarrow 2HClg$	4000	4700	(14)
$2HClg \rightarrow H_2g + Cl_2g$	0.76	0.90	(15)
	1.24	1.46	(10)
$H_2g + Br_2g \rightarrow 2HBrg$	0.54	0.64	(16)
$2HBrl \rightarrow H_2g + Br_2g$	2.6	3.1	(16)
KI in acid soln. → free I	0.76	0.90	(16)

Reaction l = liquid, g = gas, s = solid	$\frac{M}{N}$ (a)	$\frac{M}{N}$ (b)	Lit.
$xHCN \rightarrow (HCN)_xs + 5\%\ N_2g$	10.5	12.4	(12)
$C_2N_2g + O_2g \rightarrow$ {63% → $(CNO)_xs$; 37% → $CO_2g + N_2g$}	7.2	8.5	(10)
$C_2N_2g + H_2g \rightarrow$ {67% $C_2N_2 \rightarrow (HCN)_xs$; 33% $C_2N_2 \rightarrow (C_2N_2)_xs$}	6.8	8.0	(10)
$C_2H_4g \rightarrow H_2g$ + hydrocarbons g, l, and s	5.0	5.9	(10)
$C_2H_2g \rightarrow (C_2H_2)_xs + 2\%\ H_2g$	19.5	23.0	(10)
$C_2H_2g \rightarrow (C_2H_2)_xs + 1+\%\ H_2g$	20.5	24.2	(19)
$C_2H_2g + H_2g \rightarrow (C_2H_2)_xs$ (11% H_2 reacted)	19.6	23.1	(10)

Catalytic Effect of Inert Gases (10, 20, 21)

The $-M/N$ values in the table below give the total number of molecules of reactants disappearing for each ion pair of both catalyst and reactants. Example: $\frac{M_{C_2H_2}}{N_{(C_2H_2 + N_2)}} = 18.7$, means that 18.7 molecules of C_2H_2 polymerize to $(C_2H_2)_xs$ for each ion pair whether formed in the reactant or in the catalyst. With the increasing ratio of catalyst to reactant, a decrease in the $-M/N$ is indicated—probably attributable to exhaustion effects. Values by the (a) method only are given.

Reactants	Catalysts: Pure gas	N_2	H	Ne	A	Xe	CO_2	H_2
C_2H_2	19.5	18.7 to 17.8	20.1 to 17.0	19.6 to 16.3	18.2 to 15 0	18.5	17.4	19.6
C_2N_2	7.2	7.2				7.2		reacts
HCN	10.8	10.0				10.0		
$2H_2 + O_2$	5.13	5.0					reacts	
$2CO + O_2$	5.7				3.9		none	

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SATURATION CURRENT. ABSORPTION IN LIQUIDS AND SOLIDS

Stefan Meyer

SATURATION CURRENT AND NUMBER OF IONS FOR α-RADIATORS

The saturation current is $I_s = Zke$ where Z = number of α-particles per sec per unit mass, k = number of ion-pairs per α-particle and $e = 4.774 \times 10^{-10}$ es.

Number of Ions, k

Based on the values of Ra-C′ and the following alternative Z values for 1 g of Ra: (a) $Z_{Ra} = 3.72 \times 10^{10}$ (19, 25); (b) $Z_{Ra} = 3.45 \times 10^{10}$ (12).

$k = A \times 10^5$ (9, 11, 13, 18, 45, 47)

Element	A (a)	A (b)	Element	A (a)	A (b)
U_I	1.16	1.25	An	1.95	2.10
U_{II}	1.27	1.37	Ac-A	2.12	2.28
Io	1.31	1.41	Ac-C	1.88	2.03
Ra	1.36	1.47	Ac-C′	(2.09?)	(2.25?)
Rn	1.55	1.67	Th	1.23	1.32
Ra-A	1.77	1.83	Rd-Th	1.53	1.64
Ra-C	(1.47?)	(1.58?)	Th-X	1.61	1.73
Ra-C′	2.20*	2.37*	Tn	1.78	1.92
Po	1.50	1.62	Th-A	1.92	2.07
Pa	1.44	1.55	Th-C	1.71	1.85
Rd-Ac	1.69	1.82	Th-C′	2.54	2.73
AcX	1.61	1.74			

*Basic values.

The value of $Z_U = Z_{U_I} + U_{II}$ may be obtained from Z_{Ra} and the basic equilibrium ratio $Z_{Ra}/Z_U = 3.4 \times 10^{-7}$.

The value of Z_{Th} may be calculated from the decay constant of Th. For the following assumed values of the half-life, $T_{½}$, of Th we find for Z_{Th}: 1.25 × 10¹⁰ yrs, 4.5 × 10³ α sec⁻¹; 1.65 × 10¹⁰, 3.4 α sec⁻¹; and 2.2 × 10¹⁰, 2.6 α sec⁻¹.

Saturation Current

1. (In Electrostatic Units) (2, 3, 4, 5, 6, 7, 8, 20, 26, 31, 32, 34, 43)

Element		U_I U_{II}	Io	Ra	Rn	Ra-A	99.96 % Ra-C′	Po
In equilibrium with 1 g U	I_s =	1.47	0.79	0.82	0.94	1.03	1.33	0.91
In equilibrium with 1 g Ra	$I_s \times 10^{-6}$ =	4.32	2.33	2.42	2.75	3.02	3.91	2.66

2. On the basis of a branching ratio of 3% for the Ac family in equilibrium with 1 g Ra (1, 2, 10, 15, 16, 17, 23, 30, 33, 38, 41).

Element =	Pa	Rd-Ac	Ac-X	An	Ac-A	99.7% Ac-C
$I_s \times 10^{-4}$ =	7.93	9.00	8.86	10.7	11.7	10.4

3. 1 g U in ores [*i.e.* U + 97% (Io→Ra-G) + 3% (Pa→Ac-D)] is equivalent to I_s = 7.30; 1 g (U_3O_8→Ra-G) to I_s = 6.2; and 1 g average ore with 50% U_3O_8 to I_s = 3.1.

4. 1 curie Rn is equivalent to $I_s = 2.75 \times 10^6$ and 1 curie Rn + ½(Ra-A + Ra-C′) to $I_s = 6.22 \times 10^6$.

5. In equilibrium with 1 g Th and based on the following alternative Z values for 1 g Th: (*a*), $Z_{Th} = 4.5 \times 10^3$ α sec⁻¹ and (*b*), $Z_{Th} = 3.4 \times 10^3$ α sec⁻¹.

Element		Th	Rd-Th	Th-X	Tn	Th-A	35% Th-C	65% Th-C′
I_s =	(*a*)	0.264	0.329	0.346	0.382	0.413	0.129	0.355
	(*b*)	0.200	0.248	0.261	0.289	0.312	0.097	0.268

RANGE OF α-PARTICLES IN LIQUIDS AND SOLIDS

All values in microns, $\mu = 10^{-4}$ cm

A. In Liquids

	From Po (35)								From Ra-C′ (37, 48)				
Liquid	$C_2H_5OC_2H_5$	C_2H_5OH	CS_2	C_6H_6	$CHCl_3$	$C_6H_5NH_2$	H_2O	$C_3H_5(OH)_3$	C_2H_5OH	C_6H_6	C_5H_5N	H_2O	
$R_{15°}$	43.0	37.1	36.7	36.3	34.3	33.0	32.0	27.9	7.05	70.–	63.9	60.0	59.5

B. In Solids

From Ra-C′ (49, 50, 51)

Solid	Li	Mg	Al	Ca	Fe	Ni	Cu	Zn
$R_{15°}$	129.1	57.8	40.6	78.8	18.7	18.4	18.3	22.8
Solid	Ag	Cd	Sn	Pt	Au	Tl	Pb	
$R_{15°}$	19.2	24.2	29.4	12.8	14.0	23.3	24.1	

C. In Photographic Plates

Source	Ra-A	Ra-C′			Th-C	Po	
Type of plate	Ilford	Sigurd (Jahr)	Ilford			Sigurd	
$R_{15°}$	34.8	50.0	50.7	54	48.2	27.7	23
Lit.	(21)	(36)	(21)	(21)	(22)	(36)	(35)

D. Pleochroitic Haloes *v.* (53)

STOPPING POWER EQUIVALENTS OF AIR AND METALS AT DIFFERENT PARTS OF THE PATH OF AN α-RAY

Milligrams per cm² of foil equivalent to 1 cm air lying between the distances given, measured from end of range. 15°C and 1 atm. (29).

Distances cms	0–1	1–2	2–3	3–4	4–5	5–6	6–7
Al	1.90	1.71	1.65	1.64	1.63	1.62	1.62
Ag	3.805	3.28	3.10	3.01	2.93	2.86	2.81
Au	6.10	4.84	4.44	4.25	4.06	3.96	3.91

INITIAL VELOCITIES OF RECOIL ATOMS

$u = A \times 10^7$ cm sec⁻¹

From	To	A =	From	To	A =
U_I	UX_I	2.39	An	Ac-A	3.36
U_{II}	Io	2.54	Ac-A	Ac-B	3.58
Io	Ra	2.62	Ac-C	Ac-C″	3.44
Ra	Rn	2.72	Ac-C′	Ac-D	3.61
Rn	Ra-A	2.96	Th	$Ms-Th_1$	2.40
Ra-A	Ra-B	3.16	Rd-Th	Th-X	2.86
Ra-C	Ra-C″	2.99	Th-X	Tn	2.99
Ra-C′	Ra-D	3.66	Tn	Th-A	3.20
Po	Ra-G	3.08	Th-A	Th-B	3.39
Pa	Ac	2.74	Th-C	Th-C″	3.26
Rd-Ac	Ac-X	3.02	Th-C′	Th-D	3.97
Ac-X	An	3.01			

RANGES (PENETRATION) OF RECOIL ATOMS

Ra-A to Ra-B, 0.14 mm in air; 0.83 mm in H_2; *ca.* 20μμ in Ag (52).

Rn to Ra-A—Ra-C, *ca.* 10μμ in Cu and Ni (14, 40).

Th-C to Th-C″, at 15° and 1 atm., 0.553 mm in H_2; 0.129 mm in air (24).

Th-C to Th-D, 15° 1 atm., 0.963 mm in H_2; 0.224 mm in air (24).

THE McCOY NUMBER

The McCoy number is the ratio of the total α radiation to the uni-directional radiation per cm² from a U_3O_8 surface of α-saturated thickness. McCoy (27, 28) found 793 with $I_s = 1.74 \times 10^{-3}$ es per cm² U_3O_8 and St. Meyer and Paneth (34) found 790 with $I_s = 1.73 \times 10^{-3}$. These numbers are smaller than the theoretical.

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RADIOACTIVE RADIATIONS IN GASES

R. D. Kleeman

I. RANGE AND VELOCITY OF α-RAYS IN GASES AT 1 ATMOSPHERE

At $t°$ and 1 atm., $R_t = R_0 \dfrac{T}{273.1}$

Range in Air at 0° and 1 Atm. (13)

From	U_I	U_{II}	Io	Ra	Rn	Ra-A
R_0, cms	2.531	2.910	3.028	3.212	3.907	4.476

From	Ra-C′	Ra-C′$_1$*	Ra-C′$_2$*	Ra-F, Po	Pa	Rd-Ac
R_0, cms	6.608	8.8	10.6	3.721	3.482	4.432

* Two new α-rays from Ra-C′ by the scintillation method (24).

From	Ac-X	An	Ac-A	Ac-C	Th	Rd-Th
R_0, cms	4.141	5.487	6.241	5.224	2.749	3.810

From	Th-X	Tn	Th-A	Th-C	Th-C′
R_0, cms	4.127	4.799	5.387	4.538	8.168

Measured Ranges in Other Gases

	From Ra-C′				From Po		
Gas	Air	O_2	H_2	He	Air	O_2	H_2
$R_{15°}$	6.93 to 6.97	6.26	30.93	32.54	3.76 to 3.95	3.43	16.8
Lit.	(12, 15, 17, 27)	(27)	(27)	(27)	(9, 12, 14, 16, 18, 19, 20, 21, 22, 23, 27)	(21, 27)	(21, 27)

	From Po							
Gas	He	N_2	CH_4	CO	CO_2	NO	SO_2	CH_3Br
$R_{15°}$	17.62	3.82	4.18	3.70	2.49	3.41	2.08	1.86
Lit.	(27)	(21)	(21)	(21)	(21)	(21)	(21)	(21)

For range of recoil atoms, *see* p. 368.

Distribution of Ranges.—This follows a probability law. Thus the most probable range for a Ra-F (=Po) α-ray is 3.85 cm at 15° and 1 atm.; 90% lie between 3.75 and 3.95, and 60% between 3.8 and 3.9 (8). For long range particles from Th-C, Ac-C, and Ra-F, *v.* (2). I. Curie (8.5) found for a very narrow beam for Po, the range $R_{15}^{760} = 3.87$ cm, as against the much greater value of H. Geiger, $R_{15}^{760} = 3.925$ cm.

Velocity of α-particles.—The velocity, u, of any α-ray may be computed from the relation $u^3 = aR$ where a is a constant and R the length of the remaining path (11). Taking $u = 1.922 \times 10^9$ cm sec^{-1} (25) as the *initial* velocity of the α-particles from Ra-C′, at 0° and 1 atmosphere in air, this becomes $u = 1.0246 \times 10^9 R^{1/3}$ where R is the range.

Example: R_0 for Th-C′ in air is 8.168 cm (Table 1, *supra*). Hence $u = 1.0246 \times 10^9 \times \sqrt[3]{8.168} = 2.064$ cm sec^{-1}, the initial velocity.

The following values of $u \times 10^{-9}$ at 0° and 1 atm. have been directly measured: Ra-A, 1.690 (28); Ra-C′, 1.922 (25); Po, 1.593 (7); Th-C, 1.714 (30); Th-C′, 2.060 (30). S. Rosenblum (22.5) determined directly the ratio of the initial velocities of the α-particles from Th-C—Th-C′ = 1.209.

For velocity of recoil atoms see p. 368.

II. NATURE OF PATH

The path of an α-particle may undergo sudden bends (4, 26, 29). The table gives the number of bends (whose angles lie between the limits $\theta_1 - \theta_2$) for path-lengths (between bends) within the limits $l_1 - l_2$, for 281 Ra-F α-rays in air containing 75% A. The unit of l is 1/126 cm. 0° and 1 atm. (3).

$l_1 - l_2$ \ $\theta_1 - \theta_2$ =	20°–30°	30°–40°	40°–50°	50°–60°	60°–70°	70°–80°	80°–90°	90°–180°
3–7	11	20	22	8	13	7	6	8
7–15	21	17	16	5	7 (60°–90°)			5
15–30	12	8	7	2	5 (60°–180°)			
$\theta_1 - \theta_2$ =	10°–20°	20°–30°	30°–180°					
30–100	20	3	3					

The ionization along the path of a β particle varies inversely as the square of the velocity of the particle (28.5). The table gives the number, N_I, of ions produced by a ray per first cm of path (13.5). $e = 4.774 \times 10^{-10}$ es.

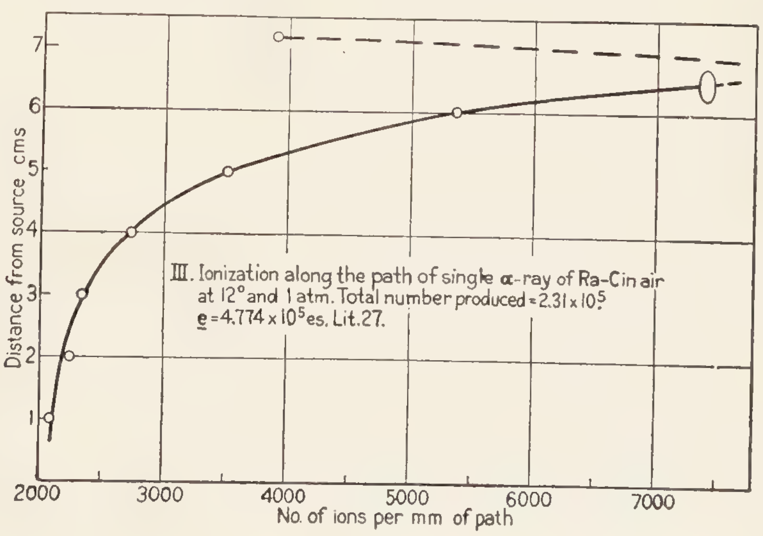
Source	Ac-C″	Th-C″	Ra-B	Ra-C	Ra-E	U
N_I	132	132	130	105	67	76

Coefficients of absorption, λ, of β rays in air and CO_2 at 1 atm. and 22° (18.5).

Substance	Ra-E	Ac-C″	Th-C″	U-X_2
Air, λ in cm^{-1}	0.0152	0.0091	0.0068	0.0065
Air, λ in (g/cm^2)$^{-1}$	12.70	7.60	5.68	5.43
CO_2, λ in cm^{-1}	0.0297	0.0175	0.0129	0.0114
CO_2, λ in (g/cm^2)$^{-1}$	16.31	9.62	7.08	6.26

Substance	U-X_1	Ra-D	Ra-D very soft	Th-B	Ac-B
Air, λ in cm^{-1}	0.12	0.097	0.64	0.090	0.31
Air, λ in (g/cm^2)$^{-1}$	100	81	535	75	260
CO_2, λ in cm^{-1}	0.23	0.183	1.69	0.142	
CO_2, λ in (g/cm^2)$^{-1}$	126	101	930	78	

Coefficient of absorption λ in cm^{-1} of γ rays from Ra-C′ in air at 1 atm. and 22° is 0.447×10^{-4} (17.5).



III. Ionization along the path of single α-ray of Ra-C in air at 12° and 1 atm. Total number produced = 2.31 x 10^5. e = 4.774 x 10^5 es. Lit. 27.

IV. STOPPING POWER OF GASES

$S = \frac{R_{Gas}}{R_{Air}}$ for the same temperature and pressure [6].

1. Ionization method [5]. 2. Track-condensation method using Ra-F [21]. 3. Scintillation method. α-rays of $R_{15°}$ 6.15 cm [1].

Gas	S	Method	Gas	S	Method
A	0.951 Ra-C′	1	CO	.985 Ra-C′	1
	.934 Ra-A			.976 Ra-A	
A	.930	3	CO	1.02 Ra-F	2
H_2	.24	1	CO_2	1.505 Ra-C′	1
H_2	.22 Ra-F	2		1.488 Ra-A	
He	.201	1	CO_2	1.52 Ra-F	2
He	.1757	3	CH_4	0.860 Ra-C′	1
Kr	1.330	3		.880 Ra-A	
N_2	.989 Ra-C′	1	CH_4	.91 Ra-F	2
	.982 Ra-A		CCl_4	4.00	1
N_2	.99 Ra-F	2	CS_2	2.18	1
Ne	.586	3	$CHCl_3$	3.16	1
O_2	1.064 Ra-C′	1	CH_3Br	2.03	1
	1.057 Ra-A		CH_3Br	2.04 Ra-F	2
O_2	1.08 Ra-F	2	CH_3I	2.58	1
Xe	1.804	3	C_2H_2	1.118 Ra-C′	1
Air	1.00	1		1.121 Ra-A	
H_2O	.77 Ra-F	2		1.122 Rn + Ra	
SO_2	1.82 Ra-F	2	C_2H_4	1.349 Ra-C′	1
N_2O	1.46	1		1.369 Ra-A	
N_2O	1.11 Ra-F	2		1.379 Rn	

Gas	S	Method	Gas	S	Method
	1.405 Ra		C_2H_6O	2.00	1
C_2H_5Cl	2.371 Ra-C′	1	$C_4H_{10}O$	3.437 Ra-C′	1
	2.385 Ra-A			3.471 Ra-A	
C_2H_5I	3.12	1	C_5H_{12}	3.544 Ra-C′	1
C_2H_6	1.514 Ra-C′	1		3.595 Ra-A	
	1.526 Ra-A		C_6H_6	3.33	1

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ABSORPTION AND DIFFUSION OF β-RAYS IN LIQUIDS AND SOLIDS

PIERRE AUGER

Absorption Coefficients.—If I_0 be the initial intensity, and I_x the intensity after screen thickness x is traversed, $I_x = I_0 e^{-x\mu}$ where μ, the absorption coefficient, varies slightly with the thickness traversed. d = density.

ABSORPTION BY AL

Source	Ra-D	Th-A	Ra-E	Ac-C	Th-D	Ra-C
μ, cm^{-1}	130	111.0	43.3	28.5	16.3	13.5
Lit.	(12)					

Source	Ra-D very soft	Ra-B		Rb	Ra	U-X$_1$	U-X$_2$
		Soft	Hard				
μ, cm^{-1}	5500	91	13	347	312	500	15
Lit.	(13)	(6)		(10)	(9)	(5)	(5)

ABSORPTION OF β-RAYS FROM U-X [11]

Screen material	Ag	Al	C	Ca	Cd	Fe	Ir	Mg	Ni	Pb
μ/d, cm^2 g^{-1}	7.31	4.1	3.75	6.3	7.4	6.61	9.5	4.0	6.35	9.75

Screen material	Rh	S	Sb	Sn	Ta	Zn	NH_4Cl	$CaSO_2$	$SrSO_4$
μ/d, cm^2 g^{-1}	7.0	4.52	7.74	7.6	8.9	6.4	5.2	4.95	6.50

Screen material	$BaCl_2$	$BaSO_4$	NaCl	KF	KCl	KBr	KI
μ/d, cm^2 g^{-1}	8.07	7.7	4.68	4.8	4.88	6.1	7.8

ABSORPTION OF β-RAYS OF RA-E [7]

Screen	C	Al	Cu	Mo	Ag	Sn
μ/d	15.8	16.9	19.2	21.0	21.7	22.1

If N is the atomic number of the screening element, $\mu/d = 15 + 0.142\ N$.

RANGE IN ALUMINUM OF β-RAYS OF VARIOUS VELOCITIES (LINEAR EXTRAPOLATION) [15]

RH	1380	1930	2535	3170	3790	4400
Range in cm	0.018	0.064	0.124	0.189	0.279	0.360

RH	5026	6230	7490	8590	11 370
Range in cm	0.440	0.580	0.785	0.925	1.36

Velocity Decrease.—R = Radius of curvature of the β-ray in a magnetic field of N units and field force H gauss. ΔRH is the change in RH due to a screen of 0.01 g cm^{-2} and is proportional to the velocity. According to Bohr, $\frac{\Delta RH}{c^3} u^3$ = a constant, K. u = the velocity of the particle, and c that of light [14].

DECREASE OF VELOCITY FOR β-RAYS FROM RA-B AND RA-C

RH	ΔRH	K	ΔRH	K	ΔRH	K
No screen	Mica screen		Sn screen		Au screen	
1392	138.1	34.8	89.2	22.8		
1660	101.4	34.7	67.4	23.4		
1925	78	33.1	56.8	24.1		
2235	72.6	36.2				
2960	66.7	43.5				
3260	59.2	41				
4840	47.3	39.9	37.6	31.7	32.2	27.3
5255	49.3	42.2	37.8	32.5		
5880	43.1	38	32.2	28.6	32.6	29
6160	41	36.7				
7060	38.4	35.4	30.2	27.8		

Dispersion of β-rays [2, 3, 8].

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WAVE LENGTHS OF γ-RAYS

E. VON SCHWEIDLER

GENERAL RELATIONS

A wave length of λ milli-Ångstroms (10^{-3} Å = 10^{-11} cm = 1 *X*-unit), corresponds to:

$$\text{A Frequency } (\nu) = 2.9986 \times 10^{21}/\lambda \text{ sec}^{-1}$$
$$\text{An Energy } (E = h\nu) = 1.9653 \quad 10^{-5}/\lambda \text{ ergs}$$
$$\text{A Potential } \left(P = \frac{h\nu}{e}\right) = 1.2344 \quad 10^{7}/\lambda \text{ volts}$$

The equivalent electron velocity as a fraction of the velocity of light,

$$(\beta) = \sqrt{1 - \frac{1}{\left(1 + \frac{24.288}{\lambda}\right)^2}}$$

$$h\nu = \frac{hc}{\lambda} = E = Pe = c^2 m_0 \left[\frac{1}{\sqrt{1-\beta^2}} - 1\right].$$

See p. 17 for values of basic constants.

WAVE LENGTHS DETERMINED WITH CRYSTAL GRATINGS

φ = angle of reflexion, *d* = grating space = 2.814 Å for rock salt = 3.028 Å for calcite. λ = 2*d* sin φ. Intensity indicated thus, s = small, m = moderate, g = great, vg = very great.

(*a*) Soft Radiations from Ra-B. Using rock salt (2, 3). Corresponding to L-series of elements of atomic Nos. 82 and 83, according to Swinne (5) and Wagner (6).

λ, in 10^{-3} Å..	1365 m	1349 m	1315 s	1286 s	1266 s	1219 s	1196 m
φ, deg. min...	14° 00′	13° 52′	13° 31′	13° 14′	13° 00′	12° 31′	12° 16′
λ, in 10^{-3} Å..	1175 g	1141 m	1100 s	1074 s	1055 s	1029 m	1006 m
φ, deg. min...	12° 03′	11° 42′	11° 17′	11° 00′	10° 48′	10° 32′	10° 18′
λ, in 10^{-3} Å..	982 g	953 m	917 s	853 m	838 m	809 m	793 m
φ, deg. min...	10° 03′	9° 45′	9° 23′	8° 43′	8° 34′	8° 16′	8° 06′

(*b*) Hard Radiations from Ra-B + Ra-C, Sec. 1. Radiations from Ms-Th and its products, Sec. 2.

λ, in 10^{-3} Å...	1. Using rock salt (4)	428	(393)	(324)	296	262	242	229	196
φ, deg. min...		4° 22′	4° 00′	3° 18′	3° 00′	2° 40′	2° 28′	2° 20′	2° 00′
Remarks.....			Probably 2nd order spectrum to 196 and 159		K-series				

λ, in 10^{-3} Å.......	169 g	159 g	137	116	99 g	71	72	66
φ, in deg. min.....	1° 43′	1° 37′	1° 24′	1° 11′	1° 06′	43′	41′	37.5′
Remarks..........	K-line						Using calcite (18)	
	Ra-C?	Ra-B?						

λ, in 10^{-3} Å...	58	48	37	28	2. Ms-Th (29)	168 g	145 g	62 s	52 m
φ, deg. min...	33′	27.5′	21′	16′					
Remarks	Using calcite (18)						to Rd-Th		to Th-B

WAVE LENGTHS CALCULATED FROM THE ENERGY OF β-RAYS

Primary γ-rays of energy E_γ produce in the disintegrating atom itself, or in other atoms, secondary β-rays of energy $E_\beta = E_\gamma - A$, where *A* is the work of removal and depends upon the level from which the β-rays originate. Sometimes it is assumed that the β-rays are primary and produce secondary γ-rays of energy $E_\gamma = E_\beta$. The energy of the β-rays is obtained from their magnetic deflections.

λ, in 10^{-3} Å.......	Ra	66	Ra-B	230	174	155	51.9	51.3 m
Lit..............		(14, 28)		(26)	(26)	(26)	(22)	(26, 29)

λ, in 10^{-3} Å......	48.0 s	42.6	42.0 m	35.6	35.2 g	Ra-C + Ra-C″	209?	52.1?
Lit..............	(29)	(22)	(26)	(22)	(26)		(26)	(26)

λ, in 10^{-3} Å.......	49.8?	44.4?	28.9?	45.4	37.5	32.0	30.2	29.0
Lit..............	(26)	(26)	(26)	(16)	(16)	(16)	(22)	(29)

λ, in 10^{-3} Å.....	24.9	24.3	21.2	20.6	20.4	20.3	16.2?	10.93 g
Lit............	(16)	(29)	(29)	(22)	(29)	(26)	(29)	(29)

λ, in 10^{-3} Å.........	10.0 s	9.93 g	7.00 s	6.94 g	5.56? g	Ra-D	269
Lit	(29)	(29)	(29)	(29)	(29)		(13)

λ, in 10^{-3} Å........	Ms-Th	171	59.7	53.0	37.1	37.0	29.7	26.9 g
Lit..............		(22)	(22)	(22)	(29)	(22)	(22)	(29)

λ, in 10^{-3} Å....	Rd-Th	147	Th-B	52.9 g	52	41.6	41.3 s	Th-C″	45.2 s
Lit...........		(13)		(29)	(13)	(16)	(29)		(29)

λ, in 10^{-3} Å......	24.5	21.3	13.6 g	13.5 g	12.8 m	Th-B + Th-C	4.84	4.71
Lit............	(16)	(29)	(29)	(29)	(29)		(34)	(34)

EFFECTIVE WAVE LENGTHS CALCULATED FROM ABSORPTION AND SCATTERING

The ordinary or "apparent" absorption coefficient, $\mu' = \mu + \sigma$, where μ is the "true" or "fluorescent" absorption coefficient, and σ the coefficient of scattering. For dependence on wave length *v.* Glocker (8); Compton (12); Wingårdh (23); Warburton and Richtmyer (24); Jauncy (28); and Allen (30).

γ-RAYS FROM RA-C

$\lambda_{eff.}$, in 10^{-3} Å................	<63	<60	120–60	80–30
Calc. from....................	Abs.	Abs.	Scat.	Abs.
Lit........................	(7)	(9)	(12a)	(10b)

$\lambda_{eff.}$, in 10^{-3} Å............	30–25	21	24	8	19	19.5
Calc. from................	Scat.	Abs.	Abs.		Scat.	Scat.
Lit.......................	(12b)	(31)	(33)		(32a, 32b)	

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(For a key to the periodicals see end of volume)

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RADIOACTIVE RADIATIONS FROM ORDINARY METALS

R. B. Moore

1. POTASSIUM AND RUBIDIUM

β-rays only are emitted spontaneously, the emission being an atomic property independent of the temperature.

Activity of K in Arbitrary Units (4)

Salt	K_2SO_4	KI	KBr	KCl	KF	$KClO_3$	KNO_3
%K	44.91	23.58	32.87	52.48	67.32	28.91	28.69
Activity	37.8	21	27.8	42.2	54.0	25.5	30.6
K/Act	118	112	118	124	123	110	126

Absorption of the β-radiation (6)
λ = absorption coefficient cm^{-1}, d = density of absorbent

λ/d for β-rays from K		λ/d for β-rays from Rb	
By K_2SO_4	11.32	By Rb_2SO_4	96.7
By Sn (90% of the rays)	14	By paper (90% of the rays)	162
By Sn (10% of the rays)	90	By paper (10% of the rays)	950

Absorption of β-rays from Rb by Paper (5)

W = wt. paper/cm². I_0, intensity of the initial radiation; Ip, that of the emergent radiation.

W	0	0.00153	0.00305	0.00458	0.00764	0.0107	0.0153	0.0198
Ip/I_0	1	0.725	0.545	0.422	0.260	0.159	0.087	0.034

2. CAESIUM, SODIUM, LEAD, IRON AND ZINC

Cs and Na are not radioactive (8, 9, 10). Ordinary Pb shows a slight, very old Pb only a trace of activity. On account of their exceptionally small activity Fe and Zn are recommended for construction of sensitive instruments for radioactive measurements. Ca, Ba, Sr, C, Cl, Br, Cu, Fe, Pb, Mg, Mn, Ni, Ag, Zn, W, Ta, La, Se, As, Sn, Au, Sb, Al and Hg are inactive (10).

3. NOTES

O. Hahn and M. Rothenbach (3) compared Rb salts of various ages but no difference in activity was detected. The Rb rays were found to be more penetrating than the β-rays of UX_1, but not so penetrating as those of Ra. The ratio of the intensity of the Rb rays to those of UX_1 is 1:15. The half-life of rubidium is calculated to be 10^{11} years and that of potassium 3 to 7 times greater. The absorption coefficient in Al of K is from 39.6 to 55.4 as foil thickness increases from 0.0135 to 0.0405 cm. Rb decreases from 593 to 522 as foil increases from 0.0017 to 0.0051 cm.

According to Bergwitz (1) the velocity of the Rb rays is 1.85×10^{-10} cm-sec^{-1}

Ringer (7) states that pure K and Rb give off homogeneous β-rays, the K rays having 10 times the penetrating power of the Rb rays. Harkins and Guy (10) give this figure as from 10 to 15 and state that the radiation from Rb is slightly heterogeneous.

Geiger (2) found that the saturation current from RbCl is the same at room temperature and at liquid-air temperatures.

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(For a key to the periodicals see end of volume)

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DISTRIBUTION OF RADIOACTIVE MATERIALS IN THE ATMOSPHERE, THE HYDROSPHERE AND THE LITHOSPHERE

Herman Schlundt

TABLE OF CONTENTS

RADON IN THE ATMOSPHERE

Method A: Rn absorbed in charcoal.
Method B: Rn condensed with liquid air.
Method C: Rn directly determined in large ionization chamber.
Method D: Rn computed from active deposit on negatively charged wire.

Place	Micro-micro Curies (10^{-12} Curies) Rn per cubic meter	Method	Number of determinations	Lit.
Montreal, Can.	24–127, Mean, 80	A		(21)
Montreal, Can.	Mean, 60	A	50 during 1907–8	(22)
Cambridge, Eng.	35–350, Mean, 105	A	60 during 6 mos	(93)

Place	Micro-micro Curies (10^{-12} Curies) Rn per cubic meter	Method	Number of determinations	Lit.
Chicago, U. S. A.	45–200, Mean, 100	B	6	(1)
Manila, P. I.	71	A	30 during 1 year	(136)
Freiburg, Switzerland	54–305, Mean, 131	A or B		(78)
Innsbrück, Austria	40–1110, Mean, 433	C	49	(137)
Seeham, Austria	188	C		(116)
Tokyo, Japan	5	D		(49)
Pacific Ocean	1.3	D	Mean of 169, 1915–21	(66)
Atlantic Ocean	1.7	...	Mean of 79	(66)
Indian Ocean	1.3	...	Mean of 37	(66)
Southern Ocean S. of lat. 50°	0.3	...	Mean of 48	(66)
All accessible ocean areas	1.2	...	Mean of 333	(66)
High seas	2.6	...	Mean of *ca.* 400*	(66)

* Includes some made relatively near large bodies of land.

RADIOACTIVITY OF SPRING AND WELL WATERS AND SPRING GASES

mμCl^{-1} = Millimicrocuries (10^{-9} Curies) per liter

Ra, $\mu\mu$gl^{-1} = Dissolved radium, micro-micro-grams (10^{-12} g) per liter

North America

Source	t°C	mμCl^{-1} Water	mμCl^{-1} Gas	Ra, $\mu\mu$gl^{-1}	Lit.
CANADA					
Quebec					
Maskinonge	8	0.079	0.250	0.5	(99)
Radnor Forges	10	0.345		0.3	(99)
St. Benoit	11	0.028		0.0	(99)
St. Leon (Lupien)	8	0.148	0.46	0.8	(99)
St. Hyacinthe (Philudor)	8	0.106		46	(99)
St. Severe	8	0.087		2.8	(99)
Varennes	9	0.224	0.81	9.2	(99)
Ontario					
Borthwick, near Ottawa	11	0.140		8.4	(99)
Sulfur Spring, Caledonia Spr.	8	0.073		5.6	(99)
				15.0	(23)
Duncan Spring, Caledonia Spr	9	0.053	0.204	5.6	(99)
Duncan Spring, Caledonia Spr	9		0.42	18.0	(23)
Gas Spring, Caledonia Spr.	8	0.090	0.306	8.4	(99)
Gas Spring, Caledonia Spr.	8		0.62	15	(23)
White Sulfur Spring, Carsbad	9	0.09		0.8	(99)
Magic Spring	9	0.087		25	(99)
Soda Spring	9	0.081	0.23	1.1	(99)
Russell Lithia, Bourget	10	0.056		5.9	(99)
Alberta (Banff)					
Upper Hot Spring	46	0.221		8.6	(99)
Kidney Spring	39	0.392		8.5	(99)
Cave Spring	30	0.470	3.34	8.5	(99)
Basin Spring	35	0.232	2.37	8.5	(99)
Auto Road Spring	19	0.640		23.5	(99)
British Columbia					
Fairmont Springs		3.5		100	(11)
Sinclair		4.0		tr.	(11)
UNITED STATES					
Arlington, R. I.					
Graphite Mine Spr.		8.78			(79)
Williamstown, Mass.					
Wampanoag	22	0.22	7.3		(118)
Sherman Spring		0.04			(118)
Saratoga Spr., N. Y.					
Emperor	10	0.07	0.221	68	(71)
Hathorn No. 1	10	0.142	0.213	42	(71)
Geyser	10	0.039	0.034		(71)
Pump Well No. 4	12	0.231	0.678	21	(71)
Crystal Rock	10	0.88	0.847	9	(71)
Indiana					
Mean of 27 sprs	cold	0.75			(89)
French Lick					
Pluto Spring	13	0.54			(5)
Bowles Spring	10	1.78			(5)
Illinois					
Dixon Spr. No. 2		2.93			(115)
Creal Spr. No. 3		0.84			(115)
Well, Joliet		0.39			(115)
Mt. Vernon Spring		0.18			(115)
Yellowstone Nat. Pk.					
Mammoth Hot Spr., Hot River	51	1.44		2.5*	(104)
Main Spring	71	none	none	3.8*	(104)
Apollinaris Spr	9	1.08			(104)
Nymph Spring, Tower Falls		0.23	6.5		(104)
Upper Geyser Basin, Bench Spring	86	0.22	124		(104)
Fish Cone, West Thumb			41.8		(104)
Lower Geyser Basin, Firehole Lake	85	0.28	294		(104)
Missouri					
Sweet Springs		0.81			(103)
Rollins Spring, Columbia		0.15			(103)
Hot Springs, Ark.					
Imperial Spring	61	9.03			(9)
Palace Spring	61	0.12			(9)
Avenue Spring	62	0.89			(9)
Twin Spring	62	2.22			(9)
Arsenic Spring	54	0.49			(9)
Horseshoe Spring	60	0.18			(9)
Liver Spring	8	0.59			(9)
Kidney Spring	13	3.63			(9)
Madison, Wisconsin					
Merrill Springs		0.49			(101)
Manitou, Colo.					
Shoshone Spring	15	3.38	12.7		(102)
Manitou Soda	15	1.25			(102)
Manitou Soda	15	0.268	1.62		(54)
Shoshone		1.66	15.52		(54)
Iron Soda Spring	15	0.24	1.15		(54)
Iron Soda Spring	15	1.53	1.07		(102)
Navajo Spring		1.37	3.4		(102)
Navajo Spring	22	1.21	3.3		(54)
Steamboat Springs, Colo.					
Soda	15	0.18	1.42		(102)
Soda	15	1.36	6.03		(54)

* Ra in 10^{-12} g per g of residue.

Source	t°C	$m\mu Cl^{-1}$		Ra, $\mu\mu gl^{-1}$	Lit.
		Water	Gas		
UNITED STATES.—(*Cont'd*)					
Steamboat Springs, Colo.—(*Cont'd*)					
Bath House	40	0.08	0.54		(102)
Bath House	40		0.79		(54)
Iron	24	0.99	3.71		(102)
Iron	24	0.91	3.50		(54)
Craddock, Glenwood Springs, Colo		2.21			(54)
Virginia					
Mean of 11 springs		0.21			(120)
Ohio					
Mean of 9 springs	cold	0.34			(89)
Bloomington, Ind.					
Hottle Spring*		0.806			(90)

* Mean of 37 tests during 9 months.

EUROPE

Source	t°C	$m\mu Cl^{-1}$		Lit.
		Gas	Water	
AUSTRIA				
Tauern Tunnel		3.81*		(62)
Böckstein Valley		3.20†		(62)
Near Vienna				
Johannesbad	30	1.86	6.8	(63)
Haupt Quelle, Vöslau	23	0.29	1.07	(63)
Tyrol				
Magenquelle, Froy	6	17.6		(2)
Eisenquelle, Froy	8	4.5		(2)
Badequelle, Steinhof	9	0.8		(2)
Herrenbadquelle, Fischau	19	0.23	0.80	(63)
Gastein				
Grabenbäckerquelle	36	55.5		(60, 61)
Elizabethstollen, Hauptquelle	47	53.3		(61)
Nordquelle	44	9.0		(61)
Rudolfsstollen	47	21.3		(61)
Franz Josephstollen	41	34.6		(60, 61)
Reissacherstollen	36	84		(61)
Teichquelle, Tanbach		21.3		(61)
Melaniequelle, Radegund		5.3		(132)
Annenquelle, Mariatrost		0.36		(132)
Johannesbrunnen, Semmering	5	1.27		(3)

* Mean of 101 springs; highest 23.7.
† Mean of 3 springs.

Source	$m\mu Cl^{-1}$		Lit.
	Gas	Water	
BELGIUM			
Delcor Spa	1.45		(34)
Marie-Henriette Spa	1.45		(34)
Prince de Conde I. Spa	1.44	1.74	(34)
Tounelet, Spa	1.67	2.58	(34)
La Fraineuse Spa	2.43		(34)
Claire-Fagne Spa	2.1		(34)
Salmon E. superieure Spa	3.31		(34)

Source	t°C	$m\mu Cl^{-1}$	
		Water	Gas
CZECHO-SLOVAKIA (20, 51, 63, 139)			
Loimannsquelle, Franzenbad	11	0.39	0.27
Salzquelle, Franzenbad	11	0.05	
Mine water, St. Joachimsthal 60 m depth	6	13.5	
375 m depth	14	75.9	
500 m depth		163.8	448.0
Bernhardsbrunnen, Karlsbad	61	0.65	1.14
Mühlbrunnen, Karlsbad	39	12.9	38.6
Schlossbrunnen, Karlsbad	30	7.1	20.6
		3.61	
Hospitalquelle, Karlsbad	12	0.96	
Sprudel,* Karlsbad	71	0.16	0.36
Eisenquelle, Karlsbad	8	15.7	
		19.5	
Ferdinandsbrunnen, Marienbad	10	0.27	
Kreuzbrunnen, Marienbad	8	1.75	3.56
Marienquelle, Marienbad		0.71	
Waldquelle, Marienbad	7	1.87	4.47
Augenquelle, Teplitz Schönau	22	1.28	
Riesenquelle, Dux		3.58	
Urquelle, Dux	46	2.03	9.0

* 55 × 10^{-12} Ra per liter.

Source	$m\mu Cl^{-1}$		Lit.
	Water	Gas	
ENGLAND			
Nine Wells, Cambridge	0.130		(94)
Well, Dale's Brewery, Cambridge	0.196		(94)
King's Well, Bath	1.73	33.65	(88)
Cross Spring, Bath	1.19		(88)
Hetling Spring, Bath	1.70		(88)
Hospital Natural Baths, Buxton	0.83	7.70	(64)
Gentlemen's Natural Baths, Buxton	1.10		(64)

Source	t°C	$m\mu Cl^{-1}$		Lit.
		Gas	Water	
FRANCE				
Choussy, La Bourboule		22.9	141.5	(52)
Choussy, La Bourboule		20.5	161.4	(53)
de la Grange, Beaucens		3.03	10.36	(52)
Chaude, Audinac		0.14	0.59	(52)
Rivière, Chaudeau		6.51	39.5	(12)
Dames, Plombières		10.76		(12)
Lambinet, Plombières		15.96		(12)
Savonneuse, No. 2, Plombières		7.47	35.1	(12)
Vauquelin, Plombières		4.83	86.4	(12)
Chaudes-Fontaines, Reherry		4.1	19.8	(12)
Celestins, Vichy	44	0.653	4.1	(52)
Chomel, Vichy	44	0.653	4.1	(52)
Boussange, Vichy	42	0.103	0.60	(52)
Hôpital, Vichy	34	0.022	0.14	(52)
Condanny, Usson		0.563	34.5	(65)
Plaies, Usson		0.663	1.9	(65)
d'Alun, Aix-les-Bains		4.1	25.8	(16)
Le Lymbe, Bourbon-Lancy		1.5	14.6	(16)
Pavillon, Coutreville		0.51		(16)
Bordeu (Grande Source), Luchon	43	16.1	134.8	(73)
Main Spring (Saline and H_2S), Uriage-les-Bains		0.113		(8)
Gasseng, Columbières-sur Orb			6.69	(18)
Cabanel, Columbières-sur Orb			2.22	(18)
Crémieu, Columbières-sur Orb			1.49	(12)
Viguerie, Ax			16.8	(72)
Savonneuse, Bains-les-Bains			25.6	(72)
Vielle, Eaux-Bonnes			3.7	(72)
La Chaldette			93.7	(72)
Romaine, Maizières			10.8	(72)
Souveraine, Vals-les-Bains		1.047	5.08	(6)
Dominique, Vals-les-Bains		8.80		(6)

Source	t°C	mμCl⁻¹		Lit.
		Gas	Water	
Caroline, Mont-Doré		0.34	2.49	(57)
Lepape, Bagnères-de-Luchon		41.5		(53)
Providence, Vernet-les-Bains	38	15.7	115.9	(53)
Santé, Vernet-les-Bains	37	2.7		(53)
Pastural, Les Escalades	27	3.5		(53)
Bassin Carré, Thuès-les-Bains	74	1.04	17.7	(53)
Saint-Victor, Royat	21	15.35	35.2	(53)
Hamel, Sail-les-Bains	34	11.5	50.2	(53)
Rouge, Saint-Nectair	21	0.54	2.2	(53)
Grande Source, Bagnoles-de-l'Orne		0.74		(56)
Chaude fontaine, Antoigny		3.86		(56)
Saint-Ursin, Lignières		1.57		(56)
Fontaine Minerale, St. Michel		0.44		(56)

Source	t°C	mμCl⁻¹ Water	Lit.
GERMANY			
Schwarzwald Region			
Antoniusquelle, Antogast	cold	6.6	(20)
Büttquelle, Baden-Baden	24	51.3	(20)
Murquelle, Baden-Baden	59	9.8	(20)
Kirchenquelle, Baden-Baden	56	1.35	(20)
Hauptquelle, Badweiler	28	3.1	(20)
Gemeindequelle, Badweiler	23	4.2	(20)
Badquelle, Griesbach	cold	10.6	(20)
Sofienquelle, Petersthal	cold	1.76	(33)
Wenzelquelle, Rippoldsau	cold	0.86	(33)
Warme Quelle, Wildbad	36	1.35	(20)
Kalte Quelle, Wildbad	cold	0.08	(20)
Well, Heidelberg	27	2.15*	(7)
Wurttemberg			
Göppinger, Sauerbrunnen		1.27	(50)
Göppinger, Staufenbrunnen		0.57	(50)
Kursaal, Kanstatt		0.22	(50)
Karlsquelle, Mergentheim		0.98	(50)
Hirchquelle, Feinach		0.42	(50)
Wildbad		0.76	(50)
Hessen and Adjoining Regions			
Sprudel XII, Bad Nauheim	33	5.8†	(105)
Karlsbrunnen, Bad Nauheim	15	9.6†	(105)
Bad Homburg, Elizabethbrunnen	11	1.46†	(105)
Luisenbrunnen	11	0.84†	(105)
Wilhelmsbrunnen, Bad Soden	14	6.62†	(105)
Solbrunnen, Bad Soden	16	1.56†	(105)
Inselquelle, Kreuznach	13	7.42†	(105)
Theodorshalle, Kreuznach	7	3.06†	(105)
Hauptbrunnen, Münster am Stein	31	8.5†	(105)
Kochbrunnen, Wiesbaden	68	0.43‡	(39)
Adlerquelle, Wiesbaden	64	2.23‡	(39)
Schützenhofquelle, Wiesbaden	50	0.29‡	(39)
Racoczy, Kissingen		1.04†	(41)
Maxquelle, Kissingen		1.58†	(41)
Maxquelle, Dürkheim a.d. Haardt	20	0.69	(7)

* 1620 × 10^{-12} g Ra per liter of water.
† Values obtained by multiplying Mache units by 3.64 × 10^{-10}.
‡ Values obtained by multiplying Mache units by 4.1 × 10^{-10}.

Source	mμCl⁻¹ Water	No. of samples	Lit.
Bavaria			
Alexanderbad	7.73	2 spr., 6 wells, 1 reservoir	(38)
Ebermanstadt and env	0.43	18 spr., 2 w.	(38)
Epprechstein and env	1.17	2 spr., 7 w., 2 reservoirs	(38)
Fichtelgebirge, Neubau	1.55	5 spr., 8 w.	(38)
Leinleiterthal	0.36	21 spr., 5 w.	(38)
Leupoldsdorf and env	25.0	6 spr., 2 w., 5 reservoirs	(38)
Schwarzenfeld and env	0.64	3 spr., 6 w.	(38)
Weisenthau	1.32	15 spr., 6 w.	(38)
Wolsenberg and env	4.87	17 springs	(38)
Wundsiedel and env	7.7	13 spr., 6 w., 1 reservoir	(38)
Saxony			
Wettingquelle, Brambach	826.2		(31)
	650 to 754		(59)
Trinkquelle, Oberschlema	688 to 920		(59)
Marx Semler Stollen, Oberschlema.	288 to 330 at 10°C		(97)
Himmelfahrtstollen, Georgenthal	24.1		(97)
Olga Brunnen, Schneeberg	13.1		(97)
Rockelmann Quelle, Schwarzenberg	12.3		(97)

Source	t°C	mμCl⁻¹		Lit.
		Water	Gas	
HUNGARY				
Budapest				
Rakocsy, St. Lucasbad	42	7.40		(134)
Composite, 17 spr. Lucasbad		3.35	9.08	(128)
Trinkquelle, Kaiserbad	60	0.31		(134)
Grosse Quelle, Ritzenbad	43	3.16		(134)
Kerekmalom Quelle	20	0.11		(32)
Arpadquelle	23	0.046	0.624	(32)

Source	t°C	mμCl⁻¹ Water	Lit.
ITALY			
Sorgente Montirone, Abano near Padua	87	2.05*	(20)
Upper Sulfur Therm, Aqui Piemont	72	0.28*	(20)
Fiuggi, Anticoli		8.02*	(20)
Surgonne Grotta, Battaglia near Padua	74	3.34*	(20)
Acidola, Castellamare	13	9.27*	(20)
Domenico Tricarico, Bagnoli near Naples	52	0.79*	(20)
Purgativo, Agnano near Naples	90	0.79*	(20)
Stabilimento, Porto d'Ischia	65	1.93*	(20)
Manzi I, Cassamicciola, Ischia	85	0.57	(20)
Old Roman Spring, Lacco Ameno, Ischia	57	152.5*	(20)
Fonte di Castello, Santa fiora	12	3.01	(77)
Fonte della Casella, Casteldelpiano	12	1.85	(77)
Acqua dei Bagnoli, Acidoso	14	3.29	(77)
Polla di Sotto, Bagnore	20	1.52	(77)
Sambuco, Montagna	8	2.08	(77)
Baleno Carcaiole, Uliveto		1.09 Gas = 8.6	(75)
Pozzo delle Saline, Salsomaggiore		4.41	(76)
Bagni di Casciana		0.0 Gas = 1.8	(77)
Parlanti, Monsummano	31	0.064	(92)

* Values obtained by multiplying Mache units by 4.1 × 10^{-10}.

Source	t°C	mμCl^{-1} Water
NORWAY (86)		
Nasodden		17.9
Sandsvar		12.9
Jellum, near Modum		31.2
Tandberg estate, Simoa Valley		67.4
PORTUGAL (81)		
Sabroso, Sabroso (Vidago)		3.29
Fonte Romana, Fonte Romana		2.05
Da Bica, Ferez		8.20
Das Lamas, Cucos		10.4
RUMANIA (58)		
Orsova		
Hercules, Baile Herculane	46	0.19*
Regina Maria, Baile Herculane	60	0.22
RUSSIA (68)		
Essentuky No. 6, Caucasus		3.5
Batalinsky, Caucasus		0.6
SPAIN (15)		
Rivas, Gerona		0.33
Buitre, Seirra de Fuensante, Murcia		0.05
Garganton y Pianolon, Sierra de Guadarrama		12.5
La Raja, Mazarron, Murcia		0.46
El Tubo, Mazarron, Murcia		0.48
Posa de Levante, Mazarron, Murcia		0.36
Medica Catalan, Mazarron, Murcia		0.68
SWEDEN (91, 119)		
Slottskallan, Upsala	7	1.8
Bourbrum, Upsala	6	1.55
Birjerjarlsg No. 120, Stockholm	6	14.6
Gamla (spring), Porla	7	1.77
Sofia (spring), Helsingborg	10	3.00
Villastaden (drilled well), Lidingon	8	17.06
Norrb, L. (well), Bodens fastning	5	70.6
Stockh l. (well), Vinterviken	10	67.2
Hermelinsgruf (well), Malmberget	3	2.75
Kalmar, l. (spring), Sodra Vi	6	14.1
Sanatorie parken (spring), Mosseberg	7	0.90

* Emanation content changes with season and even on same day.

Rock formation of source	No. samples	mμCl^{-1} Water
SWEDEN.—(*Continued*)		
Boulders, morainal deposits	110	2.40
Diabase	10	0.70
Granite (Archean)	53	13.24
Granite (gneissic)	20	5.66
Granulite	14	10.2
Gray gneiss with granite intrusives	6	6.11
Gneiss (granitic)	20	2.99
Iron-bearing gneiss	12	9.31
Limestone	42	0.78
Peat	16	1.18
Quartz porphyry	5	2.09
Sandstone	37	2.91
Slate	42	1.11
Syenite and granulitic syenite	15	15.46

Source	t°C	mμCl^{-1} Water	Lit.
SWITZERLAND			
St. Placidus Spring, Disentis		4.66	(127)
Val Lunpegnia, Disentis	8	3.75	(117)
Leuk	51	0.12	(127)
Waadt, Lavey		4.51	(117)
Paracelsusquelle, Engadine, St. Moritz	5	0.57	(117)
Stollenquelle, Pfafers-Ragaz	36	0.29	(117)
Sotsassquelle, Schuls		0.42	(117)
Carolaquelle, Tarast	7	0.46	(117)
Kurhaus, Acquarossa	25	1.24	(117)
Thomas, Val Sinestra	8	0.26	(117)
Les Trois Pigeons, Valangin		0.24	(80)
Come Girard, Locle		0.26	(80)
Vioulou, Paturage, Locle		0.37	(80)
Eplatures		0.15	(80)

ASIA

Source	t°C	mμCl^{-1}, Water
INDIA (122)		
Kaira District, Bombay		
Hot Spring	67	33.0 to 62.1
Cold Spring	28	33.9

Source	t°C	mμCl^{-1} Water	mμCl^{-1} Gas
JAPAN (42)			
Kami-no-yu, Tamatsukuri	64	1.08	10.18
Kami-no-yu, Misasa	71	51.69	
Kabu-yu, Misasa	45	3.72	22.82
Kaminoyu, Dogo	47	1.45	8.5
Tama-no-i, Dogo	cold	0.39	
Hirano, Tansan-sen	26	0.07	0.21
Gosho-no-yu, Kinosaki	60	3.06	
Ko-no-yu, Kinosaki	57	0.94	
Furosen, Beppu	58	0.07	
Kamigawara No. 1, Masutomi	22	301.2	
Kuridaira No. 1, Masutomi	16	214.7	550.6
Yunosawa-Onsen, Innai-Yunosawa	41	0.43	
Takinoyu, Noboribetsu	72	0.074	
Yojo-Kwan-no-yu No. 1, Togo	50	1.12	
Jizo-no-yu, Kusatsu	57	0.057	0.065
Akakura-Onsen, Akakura	62	0.43	
Ji-no-yu, Isobe	9	1.55	0.74
Arima-Onsen, Arima	52	0.92	
Maruyama-Kosen, Arima	19	3.01	
Zui-hoji-Onsen, Arima	31	13.8	
Arifuku-Onsen, Arifuku	43	0.80	
Kizu-no-yu, Asama	44	0.51	
O-yu, O-yu	57	1.13	trace
Kami-no-yu, Oyu	58	0.4	
Shimo-jyaya-no-yu, Sekigane	44	10.95	
Soto-no-yu, Katsura	29	0.31	
Yuatsumi-no-yu, Atsumi		0.40	
Awazu-Onsen, Awazu	54	0.35	
Kami-no-moto-yu, Bobata	14	4.35	
Goshiki-Onsen No. 2, Goshiki	39	0.80	
Tsubataya-uchi-yu, Shibu	48	0.11	
Hie-no-yu, Kaminoyana	62	0.86	5.5
Shiotsu-no-Tsubo, Katayamazu	79	0.47	8.79
Gosho-no-yu A, Kinosaki	63	2.67	
Koyabara-Onsen, Koyabara	38	1.37	2.95
Murasugi-Kosen No. 1	26	18.04	
Osakaya-no-yu, Musashi	45	1.17	11.8
Shirataki-no-yu, Nakabusa	60	0.59	
Tsuru-no-yu, Mikko-Yumoto	62	0.85	
Shin-yu, Unzen	38	0.85	

Source	t°C	mμCl^{-1}	
		Water	Gas
Ogawa-Onsen No. 2	49	1.01	
Omaki-Onsen, Omaka	49	0.48	
Taki-no-yu, Onogawa	70	2.37	
Umeka-no-yu, Owani	62	4.21	
Shigaku-Onsen, Shigaku	47	0.43	0.64
Ena-Kosen, Takayama	10	102.2	
Takarazuka-Tansan-sui, Takarazuka	19	1.20	0.72
Tochiomata-no-yu, Tochiomata	39	9.40	
Wakazaki-no-yu No. 1, Wakura	93	2.52	33.9
Yamanaka-Onsen, Yamanaka	45	0.62	
Yamashiro-Onsen	69	0.25	
Tottori-Onsen, Yoshikata	48	1.19	
Kasuga-Onsen, Teramadu	29	0.22	0.88
Kabu-yu, Yudani	32	1.54	8.65
Sento, Yukiku	67	0.23	3.34
Kabu-yu, Yummra	91	0.31	
Sagi-no-yu, Yunogo	38	0.31	1.95
Taki-no-yu, Yunokawa	50	0.74	8.23
Shinyu, Yunotsu	4	1.8	0.49

Source	t°C	mμCl^{-1} Water	Lit.
Philippine Islands			
Sibul Springs, Bulacan		1.28	(135)
Pansol Springs, Laguna		none	(135)
Bambangan Spr., Laguna		0.15	(135)
Adukpung Spr., Kiangan		1.33	(37)
Artesian Well, Batangas		2.11	(135)
Sinaba Spring, Laguna		1.3	(37)
Mairut Salt Spr., Bontoc	100	none	(37)
Salinas Salt Spring, Nueva Vizcaya	31	0.095	(37)

Africa

Source	t°C	mμCl^{-1} Water
Algeria (85)		
Bains de la Reine, near Oran	50	13.1
Louise, A Hammam Bou Hadjar	44	22.4
Hotel de Vichy, A Bou Hanifia	55	1.3
d'Alma T'zoumoulal	17	5.3

THE LITHOSPHERE

Uranium and Thorium Radioactive Minerals

The numbers following the name of the mineral represent weight percent of U, resp. Th. The qualitative chemical composition is indicated in parentheses ( ), the locality in brackets [ ], R = "rare earths;" aq. = "hydrous."

A. Aeschynite: U 0.3, Th 0–20 ($RNbTiO_x$). *Auerlite:* Th 61 ($ThSiPO_x$). *Autunite:* U 50 ($UCaPO_x$aq.).

B. Becquerelite: U 70 (UO_3aq.) [Belg. Congo] (111). *Blomstrandite:* U 22 ($TaNbUO_x$).

C. Calciothorite: Th 53 ($RCaSiO_x$aq.). *Carnotite:* U 53 ($KUVO_x$aq.). *Chalcolite:* (See Torbernite). *Cleveite:* U 60; Th 4 ($UThYO_x$). *Curite:* U 73 ($UPbO_x$aq.) [Belg. Congo] (106).

D. Dewindtite: U 50 ($PbUPO_x$aq.) [Belg. Congo](108). *Dumontite:* U 56 ($PbUPO_x$aq.) [Belg. Congo] (114).

E. Ebigite: *Flutherite* (See Uranothallite). *Eliasite:* also Pittinite (See Gummite). *Erdmanite:* Th 9 ($FeCaThBSiO_x$). *Euxenite:* (Polycrase) U 5–15 ($RNbTaO_x$aq.).

F. Fergusonite: (Bragite, Tyrite, Yttrotantalite) U 1–7, Th 2–5 ($RNbTaO_x$). *Freyalite:* Th 24 ($RThSiO_x$aq.). *Fritzscheite:* ($UMnVO_x$aq.).

G. Gadolinite: Th < 1 ($RO_x.SiO_y$). *Gummite:* (Eliastite, Pittinite) U 60 ($UPbCaSiO_x$aq.).

H. Hatchettolite: U 13 ($UCaNbTaO_x$). *Hokutolite:* ($PbBaSO_4$) [Japan] (42).

J. Johannite: U 56 ($CuUSO_4$.aq.).

K. Kasolite: U 40 ($PbUSiO_x$aq.) [Belg. Congo] (107). *Kochelite:* (See Fergusonite).

L. Liebigite: U 31 ($UCaCO_3$aq.).

M. Mackintoshite: U 20; Th 42 ($RUThSiO_x$aq.). *Medjidite:* (A variety of Uranopilite). *Mendeleeffite:* U 20 ($UNbTiO_x$) [Transbaikalia] (129). *Microlite:* U 1.6 ($CaTaO_x$). *Monazite:* Th 7–20 (RPO_x).

N. Naëgite: U 2.5; Th 45 ($ZrRSiO_x$) [Japan] (42). *Nivenite:* (See Uraninite). *Nohlite:* (See Samarskite).

O. Orangite: U 1–10; Th 65 (A variety of Thorite).

P. Parsonite: U 32 ($PbUPO_x$) [Belg. Congo] (112). *Phosphuranylite:* U 60 (UO_2PO_4aq.). *Pilbarite:* ($PbUThSiO_x$aq.). *Plumboniobate:* U 12 ($PbUYNbO_x$). *Pitchblende:* (See Uraninite). *Polycrase:* (See Euxenite). *Priorite:* (See Blomstrandite). *Pyrochlore:* Th 0–6 ($RCaNbO_x$).

R. Randite: (See Voglite). *Rowlandite:* U 0.4 ($YSiO_x$). *Rutherfordine:* U 65 (UO_2CO_3). *Rutherfordite:* (A variety of Fergusonite).

S. Samarskite: U 1–3 ($RUNbTaO_x$). *Schoepite:* (UO_2CO_3) [Belg. Congo]. *Schrockingerite:* (A variety of Voglite). *Sipylite:* U 3 ($ErNbO_x$). *Soddite:* U 71 ($USiO_x$aq.) [Belg. Congo] (110). *Stasite:* U 50 ($PbOPO_x$aq.) [Belg. Congo] (109). *Skaldowskite:* U 55 ($MgUSiO_x$aq.) [Belg. Congo] (113).

T. Thorogummite: U 18; Th 36 ($UThPbSiO_x$). *Thorianite:* U 12; Th 65 ($RThUO_x$). *Tritomite:* Th 5–8 (Th, Ce, Ca, Ta, B, F, SiO_x). *Torbernite:* U 50 ($UCaPO_x$aq.). *Trögerite:* U 53 ($UAsO_x$aq.). *Tscheffkinite:* Th 1–17 ($RFeSiTiO_x$). *Thysonite:* U 65 ($U(OH)_xSO_4$).

U. Uraninite: (Pitchblende) U 65–80; Th 1–8 (UO_2RUPbO_x). *Uranochalcite:* (A variety of Uranopolite). *Uraconite:* (A variety of Uranopolite). *Uranocircite:* U 47 ($BaUPO_x$aq.). *Uranophane:* U 55 ($UCaSiO_x$aq.). *Uranopolite:* U 64 (UO_2CaSO_4aq.). *Uranosphaerite:* U 42 (UO_2BiOUO_xaq.). *Uranospite:* U 49 ($UCaAsO_x$aq.). *Uranothallite:* U 32 ($CaUCO_3$aq.). *Uranothorite:* U 8; Th 52 ($ThSiO_x$).

V. Voglianite: (A variety of Uranopolite). *Voglite:* U 34 ($CaCuUCO_3$aq.).

W. Walpurgite: U 16 ($BiUAsO_x$aq.).

X. Xenotime: U 3; Th 0–2 (YPO_4).

Y. Yttrocrasite: U 2; Th 0–8 ($YTiO_x$). *Yitrotantalite:* U 0.5–2 ($YNbTaO_x$).

Z. Zuenerite: U 50 ($CuUAsO_x$aq.).

RADIOACTIVITY OF ROCKS

Ra unit = 10^{-12} g Ra (element) per g. Th unit = 10^{-6} g Th (element) per g

Igneous Rocks

Name and locality	No. specimens	Ra mean	Lit.
Acidic Intrusives			
Charnockite			
Mysore State, India	3	0.09	(121)
Granite			
Mysore State, India	11	1.03	(121)
Dutch East Indies	5	4.9	(13)
Eisenach, Germany	1	3.5	(67)
Germany	7	9.8	(13)
France(1) Holland(2)	3	8.8	(13)
St. Francois Co., Mo., U. S. A.	1	1.5	(100)
Ireland	10	2.0	(46)
Leinster, Ireland	28	1.7	(28)
Th mean =	28	7.0	

Name and locality	No. speci-mens	Ra mean	Lit.
Antartic region	2	0.4	(29)
Th mean =	2	2.6	
South Sea Islands	2	1.76	(26)
Sumatra(1) Bohemia(1)	2	26.1	(35)
Loetschberg Tunnel, Switz	7	2.3	(83)
Various localities	63	2.7	(48)
	1	1.63	(62)
	11	2.56	(123)
Th mean =	86	20.5	(82)
Monzonite			
Bella Monte, Tyrol, Austria	1	3.5	(13)
Pegmatite			
Mysore State, India	2	4.17	(121)
Porphyry			
Campbell Is., New Zealand	1	2.8	(26)
Various localities	10	2.8	(13)
Quartz			
Germany	3	16.0	(13)
Sumatra	1	1.3	(13)
Syenite			
Borneo and Molucca Island	13	1.58	(13)
Mount Royal, Canada	1	1.1	(25)
Vosges, France	1	13.2	(36)
Norway	3	2.46	(123)
Various localities	8	8.3	(13)
	23	3.9	(48)
Tinguaite			
Mount Royal, Canada	2	3.65	(25)
Tinguaite porphyry			
Germany	2	8.2	(13)
Basic Intrusives			
Diabase			
Borneo	2	0.85	(13)
Diabases and dolerites	8	1.0	(48)
New Zealand	1	0.43	(26)
Diabase and gabbro			
Germany	5	2.8	(13)
Diorite			
Borneo and Sumatra	4	0.78	(13)
Various localities	8	1.6	(48)
Dolerite			
Isle of Canna, Scotland	1	0.57	(123)
New Zealand	2	0.66	(26)
Dunite			
Loch Scavaig, Scotland	1	0.31	(123)
Essexite			
Mount Royal, Canada	1	0.26	(25)
Gabbro			
New Zealand	2	0.34	(26)
Gabbro and Norite	5	1.3	(48)
Greenstone			
Garrick Du, St. Ives, Eng	1	0.52	(123)
Hypersthenite	1	0.06	(121)
Peridotite			
Isle of Rum, Scotland	1	0.63	(123)
Porphyry			
New Zealand	1	0.99	(26)

Name and locality	No. speci-mens	Ra mean	Lit.
Acid Extrusives			
Ash			
Krakatoa near Sumatra Th mean =	1	9.0	(82)
Kenyte			
Antartic region	4	2.29	(29)
Th mean =	4	12.0	
Lavas			
Various localities	18	3.4	(43)
Th mean =	15	24.0	
Liparite	2	4.7	(13)
Phonolite			
Kirchberg, Germany	1	0.9	(13)
Pitchstone			
Auckland Island, New Zealand	1	1.9	(26)
Dutch East Indies	2	0.6	(13)
Isle of Eigg, Scotland	1	1.53	(123)
Meissen, Germany	1	3.0	(13)
Rhyolite			
Yellowstone Park, U. S. A	6	2.21	(104)
Trachite			
Mt. Erebus, Antartic region	3	2.16	(29)
Th mean =	3	13.0	
Continental Europe	2	3.4	(13)
New Zealand	3	2.11	(26)
Transandine Tunnel	7	0.58	(27)
Th mean =	7	4.4	
Various localities	18	3.0	(48)
Tuff	2	2.9	(46)
Transandine Tunnel	12	0.92	(27)
Th mean =	10	5.87	
Basic Extrusives			
Anamesite			
Germany	2	1.8	(13)
Andesite			
Borneo and Molucca Is	13	1.58	(13)
Basalt			
Deccans and Antartic	14	2.0	(48)
Mt. Erebus, Antartic region	1	2.13	(29)
Th mean =	1	14.5	
Hebrides (mainly)	11	0.5	(48)
New Zealand	2	1.21	(26)
Various localities	6	0.47	(123, 125)
	6	2.2	(46)
	4	0.35	(126)
Lava			
Antartic region	7	0.58	(29)
Th mean =	7	4.7	
Vesuvius (1631–1906)	7	12.6	(43, 46)
Th mean =	6	53.4	(82)
Limburgite			
Germany	1	2.9	(67)
Melaphyre			
Oberstein, Germany	1	1.9	(13)
Tepharite	3	8.7	(67)
Trap			
Mysore State, India	43	0.21	(121)

Metamorphic Rocks

Name and locality	Ra No. specimens	Ra Mean	Th No. specimens	Th Mean	Lit.
Amphibolite India					
Mysore State	1	0.82			(121)
Gneiss					
Freiburg, Ger.	1	2.9			(67)
Various localities	14	2.1	14	8.7	(48, 82)
Gneiss (granitic)					
Tauern Tunnel	11	3.41	7	17.7	(62)
Gneiss (porphyritic)					
Tauern Tunnel	9	4.34	9	41.0	(62)
Quartzite					
Various localities			6	3.4	(45)
Villnos Gulch, Austria	1	54.7	1	5.79	(133)
Schist					
Lustre, Simplon Tunnel			1	10.4	(45)
St. Gothard Tunnel	33	3.4	33	11.6	(47)
Schist (chlorite)					
Mysore St., India	1	0.27			(121)
Schist (hornblende)					
Mysore St., India	11	0.19			(131)
From mines, Mysore St., India	17	0.25			(121)
Slate					
England	2	1.17			(124)
European			10	13.5	(45)
Germany	2	1.3			(13)
Tauern Tunnel	3	2.53	3	24.3	(62)
Slate (mica)					
From well boring, Beachville, Can.	1	1.6			(25)

Sedimentary Rocks

Name and locality	No. specimens	Ra mean	Th mean	Lit.
Clay				
Montreal, Canada	2	1.17		(24)
England	3	0.79		(124)
England(1), Germany(1)	2		10.2	(45)
Coal				
Alabama, U. S. A.	11	0.166		(55)
Lens, France	1	0.97	3.3	(74)
Frankenholz	1	0.04	0.3	(74)
Coal ash				
Alabama coals	11	2.15		(55)
Lens, France	1	8.8	30.	(74)
Frankenholz	1	2.0	15.	(74)
Flint				
Terling, Essex, Eng.	1	0.49		(124)
Grauwacke				
Wipperfurth, Germany	1		24.	(45)
Limestone				
Beachville, Ont., Can.	6	1.02		(25)
Montreal, Canada	2	0.91		(25)
Deccan, India	1	0.25		(124)
England	7	1.13		(124)
Germany(2), Ireland(1)	3		2.3	(44)
New Zealand	2	0.37		(26)
Various localities	30		0.4	(44)
Limestone (oölithic)				
Yellowstone Park, U. S. A.	2	2.9		(104)
Marble and limestone				
Various localities	8	1.3		(13)
Sand (Saxicava)				
Montreal, Canada	1	0.16		(24)
Sandstone	2	1.04		(124)
From 850 ft. borehole, Baarlo, Limburg, Holland	8	1.66		(13)
Beachville, Canada	1	0.50		(25)
Various localities	8		6.3	(45)

Oceanic Deposits

Name and locality	No. specimens	Ra mean	Lit.
Blue mud			
1240 fa. E. coast N. Amer.	1	3.1	(138)
Calcareous mud			
2225 fa. E. of Society Islands	1	22.2	(138)
Globergina ooze			
1990 fa. Middle S. Atlantic	2	6.5	(138)
1825 fa. Pacific W. of South America	1	7.4	(138)
570 fa. W. coast Ireland	2	6.3	(138)
2042 fa. Central Pacific	2	7.6	(138)
Radiolarian ooze			
Central Pacific	4	43.9	(138)
Red clay			
2740 fa. N. Atlantic, coast of Africa	4	17.6	(138)
2350 fa. Central Pacific	3	47.4	(138)
"Salt Lime" (gypsum from evap. sea water)	1	0.016	(130)
Sea Salt	1	0.07	(124)
From evap. water of high seas	15	none	(40)

Soils

Gravel—fine siftings			
Terling, Essex, Eng.	2	0.65	(124)
Surface loams			
7 localities in E. and S. parts of U. S.	7	1.97	(69)
Th mean =	5	4.5	(69)
Subsoils of above	7	1.52	(69)

Highest value for surface soils, 2.88; Lowest, 0.93 (69)
Highest value for subsoil, 3.8; Lowest 0.93 (69)
Loess, Heidelberg, 10.4×10^{-6} g Th per g (45)
Mark, Ireland, 1.4×10^{-6} g Th per g (45)

Rocks from Tunnels

Rock and section of tunnel	No. of specimens	Units: 10^{-12} g Ra per g	Units: 10^{-6} g Th per g
The St. Gothard (47)			
Granites and gneiss			
Finsteraarhorn Massif	20	6.7	21.5
Altered sediments			
Unsernmulde	18	3.8	13.4
Tessinmulde	18	2.7	4.8
Schists, etc.			
St. Gothard Massif	33	3.4	11.6
The Tauern, Austria (62)			
Granitic gneiss	Ra 10, Th 7	3.41	17.7
Porphyritic granitic gneiss	Ra 13, Th 9	4.34	41.0

ROCKS FROM TUNNELS.—(*Continued*)

Rock and section of tunnel	No. of specimens	Units: 10^{-12} g Ra per g	Units: 10^{-6} g Th per g
Slate	Ra 3, Th 3	2.53	24.3
The Loetschberg, Bernese Oberland, Switzerland (83)			
Anhydrite	2	3.4	
Aplete	2	2.5	
Granite	7	2.3	
Limestone	16	1.5	
Quartz porphyry	1	2.5	
Quartz sandstone	1	4.3	
Schists			
Feldspathic	3	2.7	
Hornblende	2	3.1	
Lustre	2	3.4	
Mica	2	2.1	
Quartz	12	2.4	
Talc	16	1.5	
(Unclassified)	16	2.5	
The Transandine, Argentine-Chile (27)			
Andesites	Ra 2, Th 1	0.71 0.79	4.1 5.6
Mean Ratio, Th-Ra = 7×10^6			
Feldspathic Tuff	2	1.24	3.0
Trachytes	7	0.58	4.4
Tuff	Ra 8, Th 7	0.90	6.94

SPRING DEPOSITS

Country, name of spring, location	No. of specimens	Ra content*	Th content†	Remarks	Lit.
Austria					
Elizabethstollen, Gastein	1	2920	3970	Reissacherite	(62)
Rudolphstollen, Gastein	1	447, 300	4988		(62)
Vilnos Gulch	4	75	37.7	A sinter	(133)
England					
Hot Springs, Bath	1	381			(124)
France					
Chomel, Vichy	1	250		Ferruginous	(52)
Hôpital, Vichy	1	700		Black	(52)
Carnot, Santenay	1	1500			(52)
Neris	1	950	5100	Black	(52)
Luxeuil	1	660	1100	Manganous	(52)
Germany					
Badochquelle	1	4		Surface scum	(67)
Ems, Hessen-Nassau	4	0.63	35		(133)
Johanngeorgenstadt, Saxony	3	681	89	Mainly hydromorphite; Range of Ra content, 10–1300	(4)
Italy					
Fiuggi	1	5		Tufa	(84)
Russia	2	13.9	147		(14)
Borzhom Spring	2	13.9	147		(14)
United States					
Hatborn No. 1, Saratoga Springs, N. Y.	1	769			(71)
Geyser, Saratoga Springs, N. Y.	1	17			(71)
Pump Well No. 4, Saratoga Springs, N. Y.	1	63			(71)
Palace Spring, Hot Springs, Arkansas	1	1724			(99)
Avenue Spring, Hot Springs, Arkansas	1	140			(99)
Horseshoe Spring, Hot Springs, Arkansas	1	2.3			(99)
Various springs, Hot Springs, Arkansas	11	175			(99)
Main Springs, Mammoth Hot Springs, Yellowstone	1	8.8		Travertine	(104)
Hot River, Mammoth Hot Springs, Yellowstone	1	8.1			(104)
Bench Springs, Upper Geyser Basin, Yellowstone	1	0.95			(104)
Fish Cone, West Thumb, Yellowstone	1	0.19			(104)
Fire Hole Lake, Lower Geyser Basin, Yellowstone	1	6.7			(104)
Doughty Springs, Delta Co., Colorado	2	1654			(100)

* Unit, 10^{-12}g Ra per g.
† Unit, 10^{-6}g Th per g.

METEORITES

Class and locality	Ra in 10^{-12} g per g	Remarks	Lit.
Stony			
Dhurmsala, India	0.53		(123)
Coahuila, Coahuila, Mex.	7.69	Normal hexahydrite	(87)
Toluca, Xiquepelco, Mex.	0.21	Medium octahedrite	(87)
Iron			
Augusta Co., Va., U. S. A.	0.0022		(125)
	none	2 specimens	(123)
Stone			
Various localities	0.75	Mean of 16 Range 2.17–0.073	(87)
Iron			
Various localities	0.69	Mean of 2	(87)
	none	Mean of 3	(87)

NATURAL GASES

Source and Locality	No. samples	Millimicro-Curies (10^{-9} Curies) Ra per liter	Lit.
Canada			
Medicine Hat, Alberta	3	0.064	(97)
Suffield-Brooks Calgary	6	0.064	(97)

Source and Locality	No. samples	Millimicro-Curies (10^{-9} Curies) Ra per liter	Lit.
3 British Columbia wells		0.47	(97)
Brant, Anondoga, Ontario	4	0.42	(97)
Tilbury, Ontario		0.016	(97)
England			
Marsh gas, environs of Cambridge	10	0.3	(95)
France			
Alsace		7.1	(17)
Germany			
Nuengamme, Hamburg		0.24	(17)
Hungary			
Well No. 14, Bazna		0.043	(17)
Japan			
Well No. 22, Takiya		0.035	(42)
Rumania			
Well No. 103, Campina			(17)

LITERATURE

(For a key to the periodicals see end of volume)

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AGES OF MINERALS AND ROCKS BASED ON RADIOACTIVE CHANGES

Roger C. Wells

There are a number of ways of estimating the ages of minerals by combining chemical and radioactive data, all based on the assumption that the law of each radioactive change is expressed by its constant, λ, over the periods and for the quantities of each element involved. The two principal methods employ the ratios of helium to uranium and thorium and of lead to uranium and thorium. The helium ratio is admitted to give minimum values on account of the loss of helium with lapse of time; and the lead ratio involves the assumption, or actual proof by means of an atomic weight determination, that the lead is wholly of radioactive origin. Associated rocks are generally assumed to be as old or older than the minerals found in them. Attempts have also been made to calculate the ages of rocks from determinations on bulk samples (Russell).

For the two methods mentioned the fundamental changes and data are:

$$U(238.17) \rightarrow Pb_U(206.06) + 8He(4.00)$$
$$Th(232.15) \rightarrow Pb_{Th}(208.00) + 6He(4.00)$$

One gram of uranium in equilibrium with its products gives 9.4×10^4 alpha particles per sec (15) or 1.96×10^{-11} gram He and 1.26×10^{-10} gram Pb_U per year.

One gram of thorium in equilibrium with its products gives 2.7×10^4 alpha particles per sec, or 5.5×10^{-12} gram He and 4.8×10^{-11} gram Pb_{Th} per year.

The ages of minerals may be calculated from the analytical data and the preceding information by simple proportion in the case of helium (equation 1) and also in the case of lead with sufficient accuracy for most purposes (equation 2), but if the percentage of lead is relatively large the theoretical relation is given by equation 3, where U, Th, Pb = percentage U, Th, Pb in the mineral.

$$(1) \quad \text{Age} = \frac{\text{cm}^3\ \text{He/g}}{U + 0.28Th} \times 910 \text{ million years}$$

(2) $\text{Age} = \dfrac{\text{Pb}}{\text{U} + 0.38\text{Th}} \times 7900$ million years

(3) $\text{Age} = \dfrac{\log(\text{U} + 0.38\text{Th} + 1.156\text{Pb}) - \log(\text{U} + 0.38\text{Th})}{6.5 \times 10^{-5}}$

million years

Thorium minerals with Th/U greater than 3 are secondary and younger than uranium minerals from the same geologic horizon[19]. Low lead ratios have little significance on account of the ease with which certain minerals abstract lead from circulating natural waters. The atomic weight of the lead should be determined whenever possible in order to make certain that the lead is of radioactive origin. In general, only primary minerals are suitable for age determinations.

Ages of Minerals from Helium Ratios by Equation (1)

(The values in parenthesis are calculated from the lead ratios for comparison)

Mineral	Geologic horizon	He cm³/g	U Percent	Th Percent	Age million years	Lit.
Phosphatic shark's teeth, Florida	Pliocene	1.7×10^{-6}	0.021	0	0.07	(23)
Phosphatic shark's teeth, Felixtowe, Eng	Pliocene	1.6×10^{-6}	0.013	0	0.11	(23)
Phosphatic nodules, Felixtowe, Eng	Pliocene	1.0×10^{-6}	0.0041	0	0.22	(23)
Carnotite, Montrose Co., Colo	Post Tertiary	0.01	2.53	0	3.6	(23)
Zircon, Campbell I., New Zealand	Tertiary	8.1×10^{-5}	0.029	0.07	1.5	(23)
Pitchblende, Joachimsthal		0.107	62.4	0	1.6	(23)
Sphaerosiderite, Germany	Oligocene	1.65×10^{-6}	0.00015	0.00017	7.6	(23)
Zircon, Mayen, Eifel	Tertiary	1.14×10^{-4}	0.0108	0.00073	9.4	(23)
Hematite, Co. Antrim, Ireland	Eocene	1.21×10^{-5}	0.00022	0.00073	26	(23)
Zircon, Auvergne	Tertiary	2.12×10^{-4}	0.031	0	6.2	(23)
Phosphatic nodules, Cambridge, Eng	Upper Cretaceous	3.0×10^{-5}	0.0091	0	3.0	(23)
Phosphatic nodules, Bedfordshire	Lower Cretaceous	2.1×10^{-5}	0.0049	0	3.9	(23)
Zircon, Cheyenne Canon, Colo	Paleozoic	0.0193	0.109	0.10	128	(23)
Hematite, Cumberland, Eng	Above Carboniferous	1.6×10^{-4}	0.0011	0	130	(23)
Limonite, Forest of Dean	Carboniferous	1.5×10^{-4}	0.00087	0.00043	140	(23)
Sipilite, Little Frier Mt., Va	Carboniferous (?)	0.59	2.42	4.33	147	(23)
Euxenite, Arendal, Norway	Pre-Cambrian	0.73	2.41	2.39	210(1240)	(23)
Samarskite, Mitchell Co., N. C	Carboniferous (?)	1.5	8.73	1.28	160	(23)
Phosphatic nodules, Bala, England	Silurian	1.5×10^{-4}	0.0028	0	49	(23)
Phosphatic limestone, Chirbury, Shropshire, Eng	Silurian	5.6×10^{-5}	0.0067	0	76	(23)
Uraninite, Katanga	Pre-Silurian	8.88	77.76	0	104(665)	(4)
Zircon, Brevig, Norway	Post-Devonian	0.0099	0.113	0.288	46	(23)
Hematite, Caen	Devonian	9.8×10^{-5}	0.00037	0.0013	120	(23)
Zircon, Green River, N. C	Paleozoic	0.0255	0.11	0.264	126	(23)
Zircon, Ural Mts	Paleozoic	0.030	0.0538	0.408	160	(23)
Uraninite, Colo	Tertiary	0.15	72.62		18(58)	(11)
Uraninite, N. C	Post-Cambrian	2.96	77.0	2.44	34(380)	(11)
Thorianite, Sab. Province, Ceylon	Pegmatite in Charnokite Series	1.5	9.87	63.54	50(460)	(5)
Thorianite, Galle Province, Ceylon	Pegmatite in Pre-Cambrian	9.3	20.6	57.55	230(400)	(23)
Uraninite, Ånneröd	Pre-Cambrian (?)	9.4	66.2	5.27	120(890)	(11)
Uraninite, Portland, Conn	Devonian (?)	19.2	72.0	8.79	230(290)	(11)
Uraninite, Branchville, Conn	Silurian (?)	21.0	74.3	5.72	250(400)	(11)
Microlite, Amelia Court House, Va	Carboniferous (?)	0.05	1.60	0	280	(23)
Cuprouranite, Cornwall	Devonian	0.10	50.9	0	1.8	(23)
Orangite, Brevig, Norway	Middle Devonian	0.11	0.85	42.6	7.9(22)	(23)
Zircon, Ural Mts	Paleozoic	0.030	0.053	0.409	160	(23)
Thorianite, Ceylon	Balangoda series	8.9	11.0	67.7	270(500)	(23)
Zircon, Kimberly	Paleozoic	0.032	0.091	0.012	310	(23)
Phosphatic nodules, Loch Broom	Pre-Cambrian	8.3×10^{-6}	0.084	0	9.0	(23)
Gadolinite, Ytterby	Pre-Cambrian (?)	2.43	2.50	7.56	480	(23)
Aeschynite, Ural Mts		0.98	2.12	7.19	210	(23)
Cyrtolite, Llano Co., Texas	Pre-Cambrian (?)	1.15	3.11	4.44	240	(23)
Uraninite, S. Dak	Pre-Cambrian (?)	4.35	66.90	1.89	59(540)	(4)
Zircon, Ceylon	Ancient	0.0283	0.086	0.010	290	(23)
Zircon (?), Renfrew Co., Ontario	Archaean	0.0114	0.0155	0.0008	660	(23)
Aeschynite, Hitteroe, Norway		1.09	7.98	1.11	1200	(23)

Ages of Minerals from Lead Ratios by Equation (3)

Mineral	Geologic horizon	Pb Percent	U Percent	Th Percent	Th/U	Age million years	Lit.
Carnotite, Montrose Co., Colo	Tertiary	0.17	45.6			29	(12)
Johannite, Colo	Tertiary	0.76	47.2			123	(18)
Brannerite, Idaho	Tertiary	0.18	46.97	4.1	0.11	29	(9)
Uraninite, Gilpin Co., Colo	Tertiary	0.65	72.60			69	(11)
Thorite, Ceylon	Young mineral in pegmatite in Pre-Cambrian	2.86	72.00	8.79	0.12	280	(11)
Hatchettolite, Hybla, Ont	Pre-Cambrian (?)	0.50	13.72	0.46	0.03	270	(24)
Polycrase, Brazil	Pre-Devonian	0.59	5.49	4.59	0.84	600	(8)
Allanite, Blueberry Mtn., Mass	Young mineral in pegmatite	0.036	0.11	2.01	18.3	310	(17)
Freyalite, Brevig, Norway	Post-Devonian (Lawson)	0.0028	0.0526	6.330	120.3	8.8	(19)
Tritomite, Brevig, Norway	Post-Devonian (Lawson)	0.0026	0.0631	5.150	81.6	9.9	(19)
Thorite, Brevig, Norway	Post-Devonian (Lawson)	0.0196	0.4072	29.20	71.7	13.3	(19)
Thorite, Brevig, Norway	Post-Devonian (Lawson)	0.0810	0.7200	49.43	68.6	32.0	(19)
Thorite, Brevig, Norway	Post-Devonian (Lawson)	0.0760	0.7000	47.25	67.5	31.4	(19)
Orangite, Brevig, Norway	Post-Devonian (Lawson)	0.0570	1.2437	49.44	39.7	22.1	(19)
Orangite, Brevig, Norway	Post-Devonian (Lawson)	0.0542	1.1825	45.03	38.1	22.8	(19)
Homolite, Brevig, Norway	Post-Devonian (Lawson)	0.0121	0.2442	2.900	11.9	69.1	(19)
Mosandrite, Brevig, Norway	Post-Devonian (Lawson)	0.0024	0.0432	0.287	6.64	112	(19)
Eudidymite, Brevig, Norway	Middle Devonian	0.0007	0.0090	0.036	7.00	230	(19)
Eucolite, Brevig, Norway	Middle Devonian	0.0012	0.0170	0.040	2.35	280	(19)
Thorite, Brevig, Norway	Middle Devonian	0.4279	10.1040	14.20	1.41	210	(19)
Zircon, Brevig, Norway	Middle Devonian	0.0055	0.1460	0.114	0.78	220	(19)
Zircon, Brevig, Norway	Middle Devonian	0.0085	0.1941	0.082	0.42	280	(19)
Pyrochlore, Brevig, Norway	Middle Devonian	0.0093	0.1855	0.075	0.40	330	(19)
Aegerine, Brevig, Norway	Middle Devonian	0.0015	0.0253	0.007	0.28	400	(19)
Zircon, Brevig, Norway	Middle Devonian	0.0370	0.9310	0.141	0.15	280	(19)
Biotite, Brevig, Norway	Middle Devonian	0.0069	0.1602	0.017	0.11	310	(19)
Uraninite, Spruce Pine, N. C	Post-Cambrian (?)	3.90	77.01	2.44	0.03	380	(11)
Thorianite, Galle Province, Ceylon	Pegmatite in Pre-Cambrian	2.41	24.13	55.95	2.32	400	(19)
Betafite, Madagascar	Pegmatite, uncertain	0.35	22.58	0.98	0.04	120	(16)
Thorianite, Sa. Province, Ceylon	Pegmatite in Pre-Cambrian	2.09	9.87	63.54	6.45	460	(5, 19)
Uraninite, Branchville, Conn	Silurian (?)	4.03	73.00	6.09	0.81	400	(11)
Uraninite, Katanga	Pre-Silurian	6.51	77.76	0		620	(4)
Polycrase, Slättåkra, Sweden		0.85	8.45	3.08	0.36	650	(2)
Uraninite, Ånneröd, Norway	Pre-Cambrian (Moss district)	8.39	66.21	5.28	0.08	890	(11)
Uraninite, Elvestad	Pre-Cambrian (Moss district)	9.35	65.82	7.46	0.11	970	(11)
Ånnerödite	Pre-Cambrian (Moss district)	2.22	15.25	2.08	0.14	990	(2)
Mackintoshite, Llano Co., Tex	Pre-Cambrian (?)	3.47	19.75	39.83	2.02	730	(1)
Yttrocrasite, Llano Co., Tex	Pre-Cambrian (?)	0.45	2.28	7.69	3.38	640	(1)
Uraninite, Llano Co., Tex	Pre-Cambrian	9.43	56.45	6.65	1.18	1130	(1)
Uraninite, Llano Co., Tex	Pre-Cambrian	9.35	55.18	5.88	1.07	1150	(1)
Yttrialite, Llano Co., Tex	Pre-Cambrian	0.74	1.45	9.53	6.5	1040	(1)
Yttrialite, Llano Co., Tex	Pre-Cambrian	0.79	0.69	10.55	15.3	1190	(1)
Fergusonite, Ytterby, Sweden	Middle Pre-Cambrian	0.18	1.06			1200	(1)
Gadolinite, Ytterby, Sweden	Middle Pre-Cambrian	0.36	2.41			1100	(1)
Zircon, Ceylon	Pre-Cambrian	0.092	0.56	0.01	0.02	1150	(14)
Uraninite, Villeneuve, Quebec	Middle Pre-Cambrian	10.46	64.74	6.41	1.00	1110	(11)
Uraninite, Parry Sound, Ontario	Middle Pre-Cambrian	10.83	69.19	2.83	0.04	1090	(6)
Uraninite, Arendal, Norway	Pre-Cambrian (Arendal district)	10.16	61.27	3.65	0.06	1150	(11)
Uraninite, Black Hills, S. Dak	Pre-Cambrian	15.24	66.90	1.89	0.03	1540	(4)

LITERATURE

(For a key to the periodicals see end of volume)

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(11) Hillebrand, *12*, **42**: 390; 91. *156*, No. **78**; 91. (12) Hillebrand and Ransome, *12*, **10**: 120; 00. (13) Holmes, *5*, **85A**: 248; 11. (14) Holmes and Lawson, *3*, **28**: 823; 14. (15) Kovarik and McKeehan, *337*, No. **51**; 25. (16) Lacroix, *Mineralogie*, **V**: 93. (17) Lane, *Trans. Lake Superior Mining Inst.*, Aug., 1925. (18) Larsen and Brown, *328*, **2**: 75; 17. (19) Lawson, *75*, **126**: 721; 17. (20) Russell, *Introduction to the Chemistry of Radioactive Substances*, Murray, London, 1922.

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SELECTED PHYSICAL PROPERTIES OF STARS AND NEBULAE

Alfred H. Joy

Contents.—(*A*) Classification of stellar and nebular spectra; (*B*) Stellar temperatures, masses, and densities; (*C*) Stellar diameters. (Data pertaining to the solar spectra will be found with other spectroscopic data; consult index.)

A. CLASSIFICATION OF STELLAR AND NEBULAR SPECTRA

The system[1] is that developed at Harvard College Observatory, as used by Miss Cannon in the Henry Draper Catalogue. Except where the exact nature of the spectral changes is not fully understood, decimal sub-classes, representing progressive steps toward the succeeding class, are used. In denoting objects by their catalogue numbers, the following abbreviations are used: B. D. = Bonn Durchmusterung; C. D. M. = Cordoba Durchmusterung; I. C. = Dreyer's Index Catalogue of nebulae and clusters; N. G. C. = New General Catalogue by Dreyer. The number, or numbers, following the abbreviation is the catalogue designation of the object.

Class P includes practically all the gaseous nebulae. Its unique characteristic is the appearance of lines from an unknown origin (nebulium). In addition there are many lines of H, He, C, He+, C+, and N+. All lines are bright and usually sharp. (The order of the Harvard (2) subdivisions should probably be reversed to indicate decreasing intensity of radiation.)

Class	Typical object	Spectral criteria
Pa	I. C. 418	λ5007 and λ4959 faint, λ3869 not seen
Pb	Orion nebula	λ5007 and λ4959 stronger
Pc	I. C. 4997	λ4363 conspicuous
Pd	N. G. C. 6826	λ5007 and λ4959 strong
Pe	N. G. C. 7662	λ4686 present
Pf	N. G. C. 40	λ4686 strong

Wright (11) has divided these spectra into three classes: Class I, having λ4686 present, Class II, with λ4686 absent but λ3869 present, and Class III with both λ4686 and λ3869 absent.

Class O is distinguished by the presence of the Pickering series of ionized helium, upon a strong continuous spectrum with maximum intensity far in the violet. The elements present are H, He, He+, C+, N+, Mg+, O+, CIII, NIII, SiIII, OIII, SiIV. Broad emission bands occur in the earlier subdivisions. Few absorption lines are found in sub-classes Oa, Ob, Oc, which make up the group known as Wolf-Rayet stars. (The Harvard subclasses Od, Oe, and Oe5 which have absorption lines and in some cases narrow emission lines as well, are included in the subclasses O5 to O9 as suggested by H. H. Plaskett (7), the basis of classification being the absorption lines.)

[1] Adopted by International Astronomical Union. It defines a temperature scale which is linear within the present errors of measurement.

Class	Typical object	Spectral criteria
Oa	B. D. +35° 4013	Band λ4648 stronger than λ4686
Ob	B. D. +35° 4001	λ4686 stronger than λ4648
Oc	C. D. M. −41° 10972	Bands narrower. λ4686 twice λ4638
O5	B. D. +4° 1302	Pickering series very strong. H lines weak, λ4634 and λ4640 (NIII) present
O6	B. D. +44° 3639	Neutral helium appears
O7	9 Sagittae	λ4471 (He), 1.4 × λ4541. λ4089 (SiIV), 0.8 × λ4097 (NIII)
O8	λOrionis	λ4481 (Mg+) appears
O9	10 Lacertae	H stronger, He weak. λ4471, 2.7 × λ4541. λ4089, 1.4 × λ4097

Class B is characterized by the presence of helium, which has its maximum intensity in B2. The principal elements are those of class O, with the addition, in the later sub-classes, of lines of the ionized atom of several of the metals, such as Sr, Ba, and Fe. The H and K lines of calcium are found in increasing strength in this class. The hydrogen lines increase through the sub-classes, reaching a strong maximum at Ao of the following class.

Class	Typical object	Spectral criteria
B0	ζ Orionis	Pickering series weak, λ4649 (OII), λ4116 (SiIV), and λ4089 (SiIV) maximum intensity
B1	β Canis Majoris	He more prominent than O and Si.
B2	γ Orionis	λ4116 not seen. λ4089 and λ4649 faint
B3	η Aurigae	Strongest lines are helium
B5	*q* Tauri	λ4128 and λ4131 (SiII) stronger than λ4121 (He). λ4481, 0.7 × λ4471
B8	β Orionis	λ4481 equal to λ4471
B9	λ Aquilae	H strong. He weak. Several prominent enhanced metallic lines

Classes A, F, G, K and M, which contain the largest numbers of the stars, show a gradual increase in the number and intensity of the lines of neutral metallic elements of the lower atomic weights, and a decrease in the intensity of lines due to ionized elements. Compounds produce bands in the later classes. The sun's spectrum is Go, and is intermediate between that of the white and the red stars.

Class	Typical object	Spectral criteria
Ao	α Lyrae	H maximum strength. Very few other lines except λ4481 (Mg+)
A5	ρ Sagittarii	K (Ca+) stronger than Hδ. λ4290 well marked. λ4481 weaker
Fo	σ Bootis	K 3.0 × Hδ and equal to H + Hε

Class	Typical object	Spectral criteria
F5	α Canis Minoris	Fraunhofer band G first seen. Numerous solar lines
Go	α Aurigae	Solar type. H not conspicuous. G band well defined, Hδ = λ4226.
G5	η Piscium	Hγ fainter than λ4325
Ko	α Bootis	G band conspicuous, λ4226 strong. Hydrogen weaker
K5	α Tauri	λ4226 very wide. λ4254 and λ4274 (Cr) strong. Titanium bands very faint
Mo	β Andromedae	Titanium bands well marked
M5	α Herculis	Titanium bands very stong. Metallic lines fewer

Class R and N stars show the carbon bands in increasing strength. The more advanced stars of class N have very little light in the violet or blue portions of the spectrum. They are the reddest stars known. Typical stars: Class R, B. D. −10° 5057; Class N, 19 Piscium.

Class S spectra resemble those of class K5 except for the presence of bands of zirconium, and other peculiarities in the region near λ4650. The line λ4554 of Ba + is conspicuous.

Class Q stars are the novae. Near maximum of outburst their spectra are characterized by numerous wide emission bands of hydrogen and helium, and by absorption lines of ionized elements, especially titanium and iron. As the star decreases in light, both absorption and emission lines of N and O become more prominent. In the later stages, bright nebular bands appear; these are ultimately superseded by the bright bands of the Wolf-Rayet spectrum.

B. STELLAR TEMPERATURES, MASSES, AND DENSITIES

Giant stars are characterized by large mass, low density, and great total luminosity. Dwarf stars have smaller mass, higher density, and less total luminosity. Both are found in all classes, but the greatest contrasts between the two are found in the cooler stars of classes K and M. The continuous spectrum of dwarfs has its maximum shifted towards the violet, as compared with that of giants of the same spectral class, indicating that their absolute temperature is about 15% higher than that of the giants. Even with small dispersion, pronounced differences between giants and dwarfs may be noticed in the distribution of intensity in their line spectra. These differences probably arise from differences in the density gradients; they show a correlation with the absolute magnitude and mass of the stars. The low densities of giants favor the enhancement of those lines (absorption) which are produced under conditions of high excitation, such as the spark lines of the metals; the high density of dwarfs favor those produced by low excitation, such as the resonance lines of neutral atoms. The lines λ4077, λ4215 (ionized Sr) are much strengthened in giants, and weakened in dwarfs; the reverse is true of λ4226 (Ca), λ4454 (Ca), λ4607 (Sr).

STELLAR TEMPERATURES, MASSES AND DENSITIES

Units: Temperature, 1000°C abs.; Mass, Mass of Sun; Density, g/cm³.

Class	Effective temperature (giants*)					Mean mass (9)		Mean density (9)	
	A†	P‡	C§	S‖	F¶	Giants	Dwarfs	Giants	Dwarfs
Oa		23		23					
O5					30	50 (6)			
Bo		20	13	18	19	10			
B3					16	9		0.22	
B8	16					7.3		0.24	
Ao	14	11	8	12	10	7.0	6.0	0.16	0.36
A5		9				5.6	4.0	0.071	0.40
Fo		7.5		9	7.5	4.3	2.5	0.025	0.40
F5	6	7.2	6			3.2	1.5	0.0078	0.39
Go	5.8	6.5	6	7	6	2.6	1.0	0.0025	0.68
G5		4.5				2.8	0.76	0 000 87	1.2
Ko		3.7	4		4.5	3.0	0.68	0.000 18	1.3
K5	3	3.5	3.5		3.9	2.6	0.62	0.000 026	1.4
Mo		3	3	5	3	2.0	0.59	0.000 0096	5.4
M5	2.5	2.95		4					
N		2.3							

* Temperatures of dwarfs are 10 % to 20 % higher than giants of same class (indirect methods).

† Abbot (1). By radiometer.

‡ Potsdam observations. Wilsing *et al.* (10).

§ Coblentz (3). By thermocouple.

‖ Saha (8). Calculated from initial appearance of certain spectral lines under pressure of 0.1 atmosphere. (See note ¶.)

¶ Fowler and Milne (4). Calculated from maximum intensity of certain spectral lines under pressure of 1.31×10^{-4} atmospheres, assuming 10 000° corresponds to maximum of Balmer lines of H. These temperatures, and those of Saha, are for the reversing layer; true effective temperature is somewhat higher.

STELLAR DIAMETERS

Unit: Linear Diameter, 10^6 km.

Star	Class	Parallax	Diameter	
			Angular*	Linear
α Tauri	K5	0.055″	0.022″	60
α Orionis	M2	0.019	0.044	347
α Bootis	Ko	0.088	0.022	37
α Scorpii	M1	0.017	0.040	353

* Measured by means of interferometer (5).

LITERATURE

(For a key to the periodicals see end of volume)

(1) Abbot, *21*, **60**: 105; 24. (2) Cannon, *Harvard College Obs. Annals*, **76**: 19; 16. (3) Coblentz, *31A*, **17**: 725; 22. (4) Fowler and Milne, *Monthly Notices, R. A. S.*, **83**: 403; 23. (5) Michelson and Pease, *21*, **53**: 249; 21. Pease, *Publ. Ast. Soc. Pacific*, **33**: 171, 204; 21. **34**: 346; 22. (6) J. S. Plaskett, *Publ. Domin. Astrop. Obs.*, **2**: 298; 24. (7) H. H. Plaskett, *Ibid.*, **1**: 366; 22. (8) Saha, *5*, **99**: 151; 21. (9) Seares, *21*, **55**: 202; 22. (10) Wilsing, Scheiner and Münch, *Publ. Astrop. Obs. Potsdam*, **24**: 21; 19. (11) Wright, *Publ. Lick Obs.*, **13**: 262; 18.

DISTRIBUTION OF STARS

FREDERICK H. SEARES

Restriction.—No account is here taken of globular star clusters nor of stars included in spiral nebulae, many of which contain objects whose essentially stellar character can no longer be doubted.

Apparent Distribution and Number.—Statistically considered, the stars are distributed over the face of the sky with a high degree of regularity, their numbers gradually increasing as the Milky Way is approached from either side. The Milky Way defines what is very nearly a plane of symmetry, and for a first approximation, systematic difference between the two hemispheres, progressive changes in galactic longitude, and all local irregularities can be ignored. The resulting mean distribution, as found by Seares and van Rhijn, is shown in Table 1.

To apparent magnitude (see p. 39) $m = 13.5$ the results depend on data covering a large portion of the sky. From $m = 13.5$ to 18.5 they are derived from counts of stars on photographs of the 139 Selected Areas of Kapteyn between the North Pole and declination $-15°$. For still higher values of m, the values of $\log N_m$ are extrapolated, but the uncertainty consequent to the extrapolation itself is probably small. Excepting in low galactic latitudes, there is little or no systematic uncertainty arising from the particular choice of fields used for the counts. To $m = 16$ the magnitude scale is the mean of several closely accordant determinations made at different observatories, and is probably accurate within a few hundredths of a magnitude. Below this limit the scale depends wholly upon observations made at the Mount Wilson Observatory. Although this part of the scale has not been confirmed by independent measures made elsewhere, it has been established by methods successfully used for the brighter stars.

The indicated total, to the twenty-first photographic magnitude, of all stars in the sky is 890 000 000, and to the twentieth visual magnitude, 1 000 000 000. Barring losses of light by absorption, scattering etc., the increase in $\log N_m$ for a uniform distribution of stars throughout space would be 0.6 per unit of magnitude. The observed increase nowhere attains this value; the stars thin out with increasing distance from the sun, and at great distances they thin out more rapidly than near the sun; these changes are most pronounced in the direction of the poles of the Milky Way. If the law of decreasing space density indicated by the stars accessible to observation holds for those beyond present telescopic reach, the total number of luminous stars in the galactic system must be of the order of 3×10^{10}.

Table 1.—Logarithms of Numbers (N_m) of Stars, of Magnitudes Less than m, per Square Degree in Different Galactic Latitudes (1)

Units: Last column; m = visual magnitude; average $N_m = 1$, if $m = 8$. Other columns; m = international photographic magnitude (2); $N_m = 1$, if $m = 8$, Lat. = 0. Galactic pole: R. A. $12^h41^m20^s$, Dec. $+27° 21'$ (1875) (Gould).

m	$\log_{10} N_m$ at latitude														$\log_{10}$ (average N_m) between latitudes				
	0°	5°	10°	15°	20°	25°	30°	35°	40°	50°	60°	70°	80°	90°	0°–20°	20°–40°	40°–90°	0°–90°	0°–90° (v)
4.0	$\bar{2}.19$	$\bar{2}.17$	$\bar{2}.12$	$\bar{2}.05$	$\bar{3}.99$	$\bar{3}.93$	$\bar{3}.87$	$\bar{3}.82$	$\bar{3}.78$	$\bar{3}.74$	$\bar{3}.71$	$\bar{3}.69$	$\bar{3}.67$	$\bar{3}.66$	$\bar{2}.12$	$\bar{3}.88$	$\bar{3}.73$	$\bar{3}.94$	$\bar{2}.11$
4.5	$\bar{2}.42$	$\bar{2}.40$	$\bar{2}.35$	$\bar{2}.28$	$\bar{2}.22$	$\bar{2}.16$	$\bar{2}.10$	$\bar{2}.05$	$\bar{2}.01$	$\bar{3}.97$	$\bar{3}.94$	$\bar{3}.92$	$\bar{3}.90$	$\bar{3}.88$	$\bar{2}.35$	$\bar{2}.11$	$\bar{3}.96$	$\bar{2}.17$	$\bar{2}.35$
5.0	$\bar{2}.65$	$\bar{2}.63$	$\bar{2}.58$	$\bar{2}.51$	$\bar{2}.45$	$\bar{2}.39$	$\bar{2}.33$	$\bar{2}.28$	$\bar{2}.24$	$\bar{2}.20$	$\bar{2}.17$	$\bar{2}.15$	$\bar{2}.13$	$\bar{2}.12$	$\bar{2}.58$	$\bar{2}.34$	$\bar{2}.19$	$\bar{2}.40$	$\bar{2}.60$
5.5	$\bar{2}.88$	$\bar{2}.86$	$\bar{2}.80$	$\bar{2}.74$	$\bar{2}.68$	$\bar{2}.62$	$\bar{2}.56$	$\bar{2}.51$	$\bar{2}.47$	$\bar{2}.43$	$\bar{2}.40$	$\bar{2}.38$	$\bar{2}.36$	$\bar{2}.34$	$\bar{2}.80$	$\bar{2}.57$	$\bar{2}.41$	$\bar{2}.63$	$\bar{2}.83$
6.0	$\bar{1}.11$	$\bar{1}.08$	$\bar{1}.03$	$\bar{2}.97$	$\bar{2}.90$	$\bar{2}.84$	$\bar{2}.79$	$\bar{2}.74$	$\bar{2}.70$	$\bar{2}.65$	$\bar{2}.62$	$\bar{2}.60$	$\bar{2}.58$	$\bar{2}.57$	$\bar{1}.03$	$\bar{2}.80$	$\bar{2}.64$	$\bar{2}.85$	$\bar{1}.07$
6.5	$\bar{1}.33$	$\bar{1}.31$	$\bar{1}.26$	$\bar{1}.19$	$\bar{1}.13$	$\bar{1}.07$	$\bar{1}.01$	$\bar{2}.97$	$\bar{2}.92$	$\bar{2}.88$	$\bar{2}.85$	$\bar{2}.83$	$\bar{2}.80$	$\bar{2}.79$	$\bar{1}.26$	$\bar{1}.03$	$\bar{2}.86$	$\bar{1}.08$	$\bar{1}.31$
7.0	$\bar{1}.56$	$\bar{1}.53$	$\bar{1}.48$	$\bar{1}.42$	$\bar{1}.35$	$\bar{1}.29$	$\bar{1}.24$	$\bar{1}.19$	$\bar{1}.15$	$\bar{1}.10$	$\bar{1}.07$	$\bar{1}.05$	$\bar{1}.02$	$\bar{1}.01$	$\bar{1}.48$	$\bar{1}.25$	$\bar{1}.09$	$\bar{1}.30$	$\bar{1}.54$
7.5	$\bar{1}.78$	$\bar{1}.76$	$\bar{1}.70$	$\bar{1}.64$	$\bar{1}.57$	$\bar{1}.52$	$\bar{1}.46$	$\bar{1}.41$	$\bar{1}.37$	$\bar{1}.32$	$\bar{1}.29$	$\bar{1}.27$	$\bar{1}.24$	$\bar{1}.23$	$\bar{1}.70$	$\bar{1}.47$	$\bar{1}.31$	$\bar{1}.52$	$\bar{1}.77$
8.0	0.00	$\bar{1}.98$	$\bar{1}.92$	$\bar{1}.86$	$\bar{1}.79$	$\bar{1}.74$	$\bar{1}.68$	$\bar{1}.64$	$\bar{1}.59$	$\bar{1}.54$	$\bar{1}.51$	$\bar{1}.48$	$\bar{1}.46$	$\bar{1}.44$	$\bar{1}.92$	$\bar{1}.69$	$\bar{1}.53$	$\bar{1}.74$	0.00
8.5	0.23	0.20	0.14	0.08	0.01	$\bar{1}.95$	$\bar{1}.90$	$\bar{1}.85$	$\bar{1}.81$	$\bar{1}.76$	$\bar{1}.73$	$\bar{1}.69$	$\bar{1}.67$	$\bar{1}.65$	0.14	$\bar{1}.91$	$\bar{1}.74$	$\bar{1}.96$	0.23
9.0	0.45	0.42	0.36	0.29	0.22	0.17	0.12	0.07	0.03	$\bar{1}.98$	$\bar{1}.94$	$\bar{1}.90$	$\bar{1}.88$	$\bar{1}.86$	0.36	0.13	$\bar{1}.96$	0.18	0.45
9.5	0.67	0.64	0.57	0.50	0.44	0.38	0.33	0.28	0.24	0.19	0.15	0.11	0.08	0.06	0.58	0.34	0.16	0.39	0.68
10.0	0.89	0.85	0.79	0.72	0.65	0.59	0.54	0.50	0.45	0.40	0.35	0.30	0.28	0.26	0.79	0.55	0.37	0.60	0.90
10.5	1.10	1.07	1.00	0.93	0.86	0.80	0.75	0.70	0.66	0.60	0.55	0.50	0.47	0.45	1.00	0.76	0.57	0.81	1.11
11.0	1.32	1.28	1.21	1.14	1.06	1.01	0.96	0.91	0.86	0.80	0.74	0.69	0.65	0.64	1.22	0.96	0.76	1.02	1.32
11.5	1.53	1.49	1.42	1.34	1.27	1.21	1.16	1.11	1.06	0.99	0.92	0.87	0.84	0.82	1.43	1.17	0.95	1.22	1.53
12.0	1.74	1.70	1.63	1.54	1.47	1.41	1.36	1.30	1.25	1.18	1.11	1.05	1.01	1.00	1.63	1.36	1.14	1.42	1.74
12.5	1.96	1.91	1.83	1.75	1.67	1.61	1.55	1.49	1.44	1.36	1.28	1.23	1.18	1.17	1.84	1.56	1.32	1.62	1.94
13.0	2.16	2.12	2.04	1.95	1.87	1.80	1.74	1.68	1.62	1.54	1.46	1.39	1.35	1.33	2.04	1.75	1.50	1.82	2.14
13.5	2.37	2.32	2.24	2.14	2.06	1.99	1.92	1.86	1.80	1.71	1.62	1.56	1.51	1.49	2.24	1.93	1.67	2.01	2.34
14.0	2.57	2.52	2.43	2.34	2.24	2.17	2.10	2.03	1.97	1.88	1.78	1.72	1.67	1.65	2.44	2.11	1.83	2.20	2.52
14.5	2.77	2.72	2.63	2.52	2.43	2.34	2.27	2.20	2.14	2.04	1.94	1.87	1.82	1.80	2.63	2.29	1.99	2.38	2.71
15.0	2.96	2.91	2.82	2.71	2.60	2.51	2.44	2.36	2.30	2.19	2.09	2.01	1.96	1.94	2.82	2.45	2.14	2.56	2.89
15.5	3.15	3.10	3.01	2.89	2.77	2.68	2.60	2.52	2.45	2.34	2.24	2.15	2.10	2.08	3.01	2.62	2.29	2.73	3.07
16.0	3.33	3.28	3.19	3.07	2.94	2.84	2.75	2.67	2.60	2.48	2.37	2.29	2.23	2.21	3.19	2.77	2.43	2.90	3.24
16.5	3.51	3.46	3.37	3.24	3.10	2.99	2.90	2.81	2.74	2.61	2.50	2.42	2.36	2.34	3.37	2.92	2.56	3.07	3.40
17.0	3.68	3.64	3.54	3.41	3.26	3.14	3.04	2.95	2.87	2.74	2.63	2.54	2.48	2.46	3.54	3.07	2.69	3.23	3.56
17.5	3.85	3.81	3.71	3.57	3.41	3.28	3.17	3.08	3.00	2.86	2.75	2.66	2.60	2.57	3.70	3.20	2.81	3.39	3.71
18.0	4.01	3.97	3.87	3.73	3.56	3.42	3.30	3.20	3.12	2.98	2.86	2.77	2.71	2.68	3.86	3.34	2.93	3.54	3.86
18.5	4.16	4.12	4.03	3.88	3.70	3.55	3.42	3.32	3.23	3.08	2.97	2.88	2.82	2.79	4.02	3.46	3.04	3.68	4.00
19.0	4.32	4.28	4.18	4.02	3.84	3.67	3.54	3.43	3.34	3.19	3.08	2.98	2.92	2.89	4.17	3.59	3.14	3.82	4.13
19.5	4.46	4.42	4.32	4.16	3.97	3.79	3.65	3.53	3.44	3.29	3.17	3.07	3.01	2.98	4.31	3.70	3.24	3.96	4.26
20.0	4.60	4.56	4.46	4.29	4.09	3.90	3.75	3.63	3.53	3.38	3.26	3.16	3.10	3.07	4.45	3.81	3.33	4.09	4.38
20.5	4.74	4.69	4.59	4.42	4.21	4.01	3.85	3.72	3.62	3.46	3.34	3.25	3.18	3.15	4.58	3.91	3.42	4.21	
21.0	4.87	4.82	4.72	4.54	4.33	4.11	3.94	3.81	3.70	3.54	3.42	3.33	3.26	3.22	4.71	4.01	3.50	4.33	

Distribution of Intrinsic Brightness.—The range in intrinsic brightness among stars is enormous—at least twenty magnitudes, corresponding to an intensity ratio of 100 000 000 to 1. A knowledge of the frequencies of different luminosities among the stars in a given volume of space is essential (unless questionable assumptions are to be introduced) for the calculation of the space distribution of the stars. It is, however, difficult to obtain, and, at present, the frequencies are but imperfectly known. By assuming that the mean parallaxes of stars of apparent magnitude m and proper motion μ can be represented by a linear function of m and $\log \mu$ supposed to be valid for all magnitudes and proper motions, Kapteyn and van Rhijn derived for the distribution of the absolute magnitudes a Gaussian error curve whose ordinates are given in the second column of Table 2. Seares (4) has shown that their adopted mean parallax formula does not represent the distances of the stars of large motion and faint apparent magnitude, all of which are of low luminosity. A revision of the parallax formula, still only provisionally determined, and a recalculation of the luminosity function from about 500 stars of large proper motion leads to the frequencies in the third column of Table 2.

TABLE 2.—APPROXIMATE LUMINOSITY FUNCTION

$\phi(M)$ = number of stars, absolute magnitude M, per cubic parsec in the neighborhood of the sun. Unit of distance for M is 10 parsecs. 1 parsec = 3.26 light years = 30.8×10^{12}km.

M	$10 + \text{Log}_{10}\,\phi(M)$		Diff.
	Kapteyn v. Rhijn (3)	Seares (4)	
−4.64	2.61		
−3.64	3.42		
−2.64	4.17		
−1.64	4.85		
−0.64	5.46	5.58	0.12
+0.36	6.00	6.16	0.16
1.36	6.47	6.66	0.19
2.36	6.88	7.05	0.17
3.36	7.21	7.34	0.13
4.36	7.47	7.58	0.11
5.36	7.67	7.74	0.07
6.36	7.80	7.84	0.04
7.36	7.85	7.87	0.02
8.36	7.84	7.86	0.02
9.36	7.76	7.88	0.12
10.36	7.61	7.92	0.31
11.36	7.39	8.06	0.67
12.36	7.10	8.11	1.01
13.36	6.75	8.11	1.36
14.36	6.3	8.13	1.8

For the stars of low luminosity, the departure of Seares' curve from the error curve, shown by the differences in the fourth column, is important and must be accepted as real, although quantitatively the results are still very uncertain. The possibility of a maximum within the range of absolute magnitude considered is not excluded, but any such maximum must be well below the Kapteyn–van Rhijn limit, $M = 7.7$. Since the frequencies of stars of very low luminosity are still unknown, it is impossible at present to express the luminosity function as a true frequency function.

Space Distribution of Stars.—The space distribution is defined by a density function, preferably in a form expressing the total number of stars per unit volume at different distances from the sun. At present, however, we must be content with so expressing the number of stars which are brighter than some limit of absolute magnitude.

Analytically, the problem is to determine the density function, $\Delta(\rho)$, from the integral equation

$$\frac{dN_m}{dm} = \omega \int_0^\infty \phi(M)\Delta(\rho)\rho^2 d\rho$$

where the left hand member can be found from the data in Table 1; ω is a constant, ρ = distance from sun. Since $\phi(M)$, for $M > 8$, is still very uncertain, the general solution cannot be found at present. Values of the density for the neighborhood of the sun (Table 3) can, however, be calculated incidentally in deriving the data in Table 2. Results in the second column of Table 3 (M = 7.86) are in good agreement with similar results by Kapteyn and van Rhijn; the other tabular values indicate what is to be expected for lower limiting values of M. The uncertainty of the luminosity function for $M > 8$ scarcely justifies the effort required to complete the table.

TABLE 3.—AVERAGE NUMBER OF STARS, BRIGHTER THAN ABSOLUTE MAGNITUDE M, PER CUBIC PARSEC AT DISTANCE ρ FROM SUN (4)

Unit of ρ is 1 parsec; of distance for M, 10 parsecs. 1 parsec = 3.26 light years = 30.8×10^{12} km.

$\text{Log}_{10}\rho$ \ M	7.86	8.86	9.86	10.86	11.86	12.86	13.86	14.86
0.9	0.028	0.035	0.042	0.050	0.060	0.073	0.087	0.098
1.1	.026	.033	.040	.048	.058	.069	.078	
1.3	.024	.030	.035	.041				
1.5	.023	.028	.033					
1.7	.022							
1.9	.020							
2.1	.017							
2.3	.014							
2.5	.011							
2.7	.008							
2.9	.004							

(Values based upon $\phi(M)$ for stars near the sun, and on the assumption that the relative frequencies of M are the same at all distances.)

Average densities for the whole sky give a very imperfect picture of the real distribution in space, as the latter varies greatly with galactic latitude. Broadly speaking, the surfaces of equal space density are concentric, and approximately similar, ellipsoids of revolution, similarly situated, with axes in the ratio of about 5 to 1. See Table 4.

TABLE 4.—RADII OF EQUIDENSITY ELLIPSOIDS(6)

$\Delta(\rho)$ = number of stars per cubic parsec at distance ρ from sun. (Values require revision for recent star counts (Table 1) and for error in luminosity function (*cf.* Table 2)).

Unit of radius = 1 parsec. 1 parsec = 3.26 light years = 30.8×10^{12} km. Latitude is galactic.

$\Delta(\rho)$	Latitude	
	90°	0°
1.00	0	0
0.63	118	602
0.40	198	1010
0.25	296	1510
0.16	413	2106
0.100	553	2820
0.063	717	3656
0.040	902	4600

Size of the Galactic System.—At present we have no certain indication as to the distance of the most remote stars belonging to the galactic system; but if ordinary blue stars of absolute magnitude zero occur among the faintest objects listed in Table 1, the diameter of the system cannot be less than a million light years. Such objects are not to be expected in high galactic latitudes, where the stars of very faint apparent magnitude are almost certainly all dwarfs; but their occurrence in the Milky Way is by no means excluded. We have, indeed, strong, though not conclusive, evidence of the existence in the Milky Way of stars of zero absolute magnitude among those of the sixteenth apparent magnitude. The corresponding diameter of the system is a hundred thousand light years. This value may be accepted with some assurance as a lower limit for the size of the system in the plane of the Milky Way, exclusive of such objects as globular star clusters and spiral nebulae, whose relation to the general stellar system about us is not yet clearly defined.

Position of the Sun.—The symmetrical distribution of stars adopted in Table 1 tacitly assumes the sun to be at the center of the system. This is not actually the case, as is shown by systematic deviations from the adopted mean distribution. Shapley's (5) value for the distance of the sun from the galactic plane is about 60 parsecs, to the north, which is certainly of the right order of magnitude. The sun's distance from the center is much less certain, and different estimates range from a few hundred to many thousand parsecs, according to the underlying assumptions and the method of attack. The question is much complicated by the fact that the sun lies within a local cluster whose members form a considerable fraction of the stars of the brighter apparent magnitudes, and a final answer must await the detailed discussion of the distribution of faint stars in galactic longitude.

LITERATURE

(For a key to the periodicals see end of volume)

(1) Seares and van Rhijn, *197*, **11**: 358; 25; a more detailed account appears in *21*, **62**: 320; 25. (2) *Trans. Internat. Astronomical Union*, **1**: 69; 22. (Standard magnitudes of stars.) (3) Kapteyn and van Rhijn, *21*, **52**: 23; 20. (4) Seares, *21*, **59**: 310; 24. (5) Shapley, *21*, **49**: 333, 19. (6) Kapteyn, *21*, **55**: 302; 22.

DISTRIBUTION OF NEBULAE

Frederick H. Seares

The term nebula is applied to objects of such diversity of form, size, distance, and physical characteristics that any study of their distribution presupposes a consideration of the question of classification. The following general classification by Hubble provides for two mutually exclusive divisions, characterized by position in the sky as well as by physical peculiarities, and five sub-classes representing physical differences.

A GENERAL CLASSIFICATION OF NEBULAE

I. **Galactic nebulae,** characterized by (1) tendency to concentrate about the Milky Way, (2) conspicuous association with individual stars from which they probably derive their luminosity, (3) early-type spectra, either emission or absorption, depending upon the spectral type of the associated stars, and (4) smooth and cloudy or wispy texture. They include
   - (*a*) *Planetaries,* distinguished by symmetrical distribution of nebulosity about central stars, sharply defined edges, and emission spectra.
   - (*b*) *Diffuse nebulae,* clouds in low galactic latitudes, usually associated with early-type stars. This type ranges from luminous to dark and from semi-transparent to opaque. Subdivided into predominantly luminous, predominantly obscure, and conspicuously mixed.

II. **Non-galactic nebulae,** characterized by (1) tendency to avoid the Milky Way, (2) no conspicuous association with stars, (3) late-type absorption spectra, and (4) usually a rotational symmetry about dominating non-stellar nuclei. They include
   - (*a*) *Elliptical nebulae,* amorphous objects whose forms can be represented as successive stages of an original globular mass flattening under the influence of increasing rotation.
   - (*b*) *Spirals of two kinds, logarithmic and barred,* which, once formed, appear to develop along parallel lines, the arms unwinding and the granulation of the material becoming more and more conspicuous.
   - (*c*) *Irregular nebulae,* including a few non-galactic objects having no dominating nuclei and, significantly, showing no rotational symmetry.

Physically, the planetaries and diffuse nebulae, Ia and Ib, are distinct and apparently without genetic relationship, except that the planetaries, which, in some cases at least, seem to be late stages in the development of novae, may represent the catastrophic consequences of the penetration of a star within a nebulous cloud of the diffuse sub-class. The spirals IIb, on the other hand, are apparently an evolutionary development from elliptical nebulae, IIa, although it does not follow that all elliptical nebulae will necessarily become spirals. The few irregular nebulae, IIc, present features that might be expected in the case of spirals in the absence of or through the neutralization of dominating dynamical characteristics.

The distribution of the various classes of nebulae is not in general easily shown in tabular form. The following summary for each of the important sub-classes includes, however, references to diagrams which exhibit the main features of the distribution.

Ia. Planetary Nebulae.—In the whole sky only about 150 of these objects are known, many of which are so small as to be recognizable only from their gaseous emission spectra. The smallest objects are closely associated with the Milky Way, and show a marked concentration in the Aquila-Sagittarius region. With increasing size the mean galactic latitude increases, and the largest known objects, to the extent of a dozen or so, are scattered over the sky with some approach to uniformity (3, 6, 11). This suggests that the linear distances of planetaries from the galactic plane are relatively small and that their angular diameters are correlated with their distances from the sun. Very small nebulae thus appear in low galactic latitudes because their distances from the sun are many times their distances from the galactic plane.

The actual distances of planetary nebulae are still very uncertain. Van Maanen (15) has measured the parallaxes of about 20 of these objects and finds distances ranging from 50 to a few hundred parsecs; but, as he points out, these values are in conflict with the fact that the radial velocities average about 30 km/sec, while the proper motions are apparently small, of the order of the parallaxes themselves.

Ib. Diffuse Nebulae.—The distant star clouds of the Milky Way define the galactic circle. A secondary galaxy, inclined some 12° to the galactic circle proper, is outlined by the bright helium stars of the much-flattened local cluster immediately surrounding the sun, most of whose members are within 500 parsecs (14). The diffuse nebulae outside the Magellanic Clouds, some hundreds in all,[1] are closely associated with the primary and secondary galactic circles (7). Since the mean galactic latitude of those following the primary galaxy is only about 2°, and since the space within the two circles is not well filled, the inference is that these nebulae are directly connected either with the Milky Way star clouds or with the local cluster, and that few are to be found in the intervening regions. We thus have a group of diffuse nebulae whose members are within a few hundred parsecs of the sun; the others, forming a widely scattered group associated with the Milky Way, are at distances probably to be counted in thousands of parsecs (10). Both groups include both luminous and dark nebulae; the luminous members of the two groups present somewhat different physical characteristics, most marked in their spectra, which may be either emission, or predominantly continuous or absorption in type. The continuous and absorption spectra occur mostly among the nearer objects connected with the local cluster. The luminous diffuse nebulae are conspicuously associated with stars of high temperature from which they derive their luminosity, either by excitation or reflection.

II. Non-galactic Nebulae.—The members of this class, consisting chiefly of the related sub-classes, elliptical nebulae (IIa) and spirals (IIb), are far more numerous than the galactic nebulae. On the whole, the elliptical nebulae out number the spirals many times; but if only bright objects are considered, the spirals are the more numerous. The distribution in galactic latitude is shown in

[1] Less than 200 luminous ones known; no complete list published (*v.* 7, 8). Most complete list of dark nebulae (182 small objects) is given by Barnard (1).

Table 1, which gives to limiting magnitude 18.6 on the international photographic scale the average number per square degree at various latitudes in each hemisphere. The data are compiled from Fath's list (4), based on Mount Wilson photographs (exposure time 1 hour with 60-inch reflector) of the 139 Selected Areas between the North Pole and declination −15°. That part of the northern galactic hemisphere within which nebulae are frequent is wholly covered. About one-half the southern hemisphere is included, but not the south pole itself. Fath's counts have been corrected for losses caused by poor definition in the corners of the negatives (13).

TABLE 1.—NON-GALACTIC NEBULAE: NUMBER PER SQUARE DEGREE(4)

Average number; international photographic magnitude ≦18.6; *cf.* Table 2 .

Galactic latitude	Hemisphere	
	N	S
5°	0.2	0.0
15	0.8	0.4
25	2.5	5.4
35	13.2	8.2
45	10.3	5.8
55	12.2	7.0
65	22.2	11.9
74	31	
83	(68)	

Fath's list includes all classes of nebulae, but the galactic nebulae are relatively so infrequent that it is practically one of non-galactic nebulae alone. These objects begin to appear at about 20° latitude and increase rapidly in the interval 20° to 35°. From 40° to 70° the numbers increase slowly. The concentration near the north galactic pole is very pronounced. Below latitude 70° the numbers in the southern hemisphere average about three-fourths those of the northern. The assumption of a similar ratio for the regions 70° to 90° leads to integrated totals of 170 000 and 128 000 for the northern and southern hemispheres, a round total of 300 000 for the whole sky (limiting phot. mag. for stars 18.6).

The summary in Table 2 emphasizes the dependence of the distribution on galactic latitude. The uncertainty in the average number per square degree in the region 70°–90° is considerable, and since the number of nebulae in this region is large (29% or 50 000 in the northern hemisphere), the total given for the whole sky is in doubt by many thousand. Curtis (2) has estimated the total (to an undetermined limiting magnitude) to be over 700 000. The difference in the estimates may arise from a difference in magnitude limits or from the fact that the fields counted by Curtis are not certainly representative of the sky as a whole.

TABLE 2.—DISTRIBUTION OF NON-GALACTIC NEBULAE

Lat. = interval in galactic latitude. Sky = % area of sky. Neb. = % number of nebulae. N = northern, S = southern hemisphere.

Lat.	Sky	Neb.	
		N	S
0°–30°	50	7	15
30 –70	44	64	56
70 –90	6	29	29

The distribution of non-galactic nebulae is not, however, simply one of galactic latitude. Data collected by Hardcastle and Hinks (5) and by Reynolds (12) show marked irregularities in longitude, which seem to depend on the angular diameters of the nebulae. Thus objects with diameters >10′ are almost all in the hemisphere including galactic longitudes 50° to 230°. For diameters 5′ to 10′ the northern galactic hemisphere shows high frequencies in longitude 110° and 260°–270°, which become even more marked for diameters 2′ to 5′. For still smaller nebulae, the distribution is again different. Fath's counts, including mostly very small and faint nebulae, show a band of high frequency crossing the northern galactic hemisphere approximately in longitudes 50° and 220°, with other irregularities suggesting a very complicated distribution.

Nothing is known directly of the distances of elliptical nebulae, but their relationship with the spirals is so intimate that the distances of the two sub-classes must be regarded as of the same order. Van Maanen's measures (16) of internal motion in spirals suggest distances of the order of 3000 to 30 000 light years. The application of Shapley's period-luminosity relation by Hubble (9) to numerous typical Cepheid variables discovered by him in the spirals Messier 31 (the Andromeda nebula) and Messier 33 leads to distances of about a million light years for these two objects. The applicability of the period-luminosity relation is assumed, but several lines of corroborative evidence strongly support the larger value of the distance. It is probable, however, that the zero point of the period-luminosity relation requires revision by an amount which would reduce these distances by about 40%.

LITERATURE

(For a key to the periodicals see end of volume)

(1) Barnard, *21*, **49**: 1; 19 (also consult index of other volumes). (2) Curtis, *Publ. Lick Obs.* **13**: 15; 18. (3) Curtis, *Ibid.*, **13**: 60; 18. (4) Fath, *Astronom. Jour.* **28**: 75; 14. (5) Hardcastle and Hinks, *Monthly Notices, R. A. S.* **74**: 699; 14. (6) Hinks, *Ibid.*, **71**. 694; 11. (7) Hubble, *21*, **56**: 162; 22. (8) Hubble, *21*, **56**: 400; 22. (9) Hubble, *Pop. Astronomy* **33**: 252; 25. *Observatory* **48**: 139; 25.

(10) Lundmark, *Publ. Astron. Soc. Pacific*, **34**: 40; 22. (11) Perrine, *21*, **46**: 177; 17. (12) Reynolds, *Monthly Notices, R. A. S.* **81**: 129; 20. **83**: 147; 23. **84**: 76; 23. (13) Seares, *21*, **62**: 168; 25. (14) Shapley, *21*, **49**: 311; 19. (15) van Maanen, *Mt. Wilson Contribs.* Nos. **237** (1922), **270** (1923), **280** (1925). (16) van Maanen, *21*, **57**: 274; 23.

MOTIONS OF THE STARS AND NEBULAE

GUSTAF STRÖMBERG

The *proper motion* of a star is defined as the angular motion, per year, referred to a certain fundamental system of apparently bright stars distributed uniformly over the sky. The *radial motion* is determined by the Doppler shift for spectral lines of known wave-length. If the distance to a star is known, the three velocity-components of its *space-velocity* can be determined. Proper motions and radial velocities are in general referred to the sun as origin, by correction for the periodic changes due to the earth's motion. The proper motions are in general very small; for the majority of the stars they are below 0.1″ per year. The largest proper motion is that of Barnard's star R. A. 17^h 53.0^m, Dec. +4° 28′, (1900.0), which moves 10.27″ per year. The radial velocities are mostly below 40 km/sec, the largest being that of the variable star V X Herculis, which approaches the sun with a velocity of 390 km/sec. The spiral nebulae have even higher velocities, the highest being 1800 km/sec, recession, (N. G. C. 584).

SOLAR MOTION

The sun's motion relative to the stars can be determined either from proper motions, from radial velocities, or from space-velocities. The point in the sky towards which the sun is moving is called the sun's *apex*.

Table 1.—Solar Apex and the Sun's Velocity
(Referred to apparently bright stars. Unit: velocity, km/sec)

R. A. 1900	Dec. 1900	Velocity	Method	No. of stars	Lit.
18^h 03^m	+34.3°		Proper Motions P. G. C.*	5413	(2)
18 11	+31.6		Proper Motions m<6.0†	4041	(5)
17 56	+32.3		Proper Motions P. G. C.	5943	(8)
17 54	+25.3	19.5	Rad. Vel. Lick Obs.	1193	(3)
18 2	+28.6	19.8	Rad. Vel. B to M	1596	(6)
18 4	+29.2	21.5	Rad. Vel. F to M	1405	(9)
18 11	+36.9	18.8	Space Vel. Giants	800	(10)
18 43	+29.5	31.7	Space Vel. Dwarfs	415	(10)
18 40	+32	29	Space Vel. of nearby stars	83	(7)

* Preliminary General Catalogue by L. Boss, Washington, 1910.
† Stars brighter than the 6th magnitude (apparent).

Although the agreement between the different determinations is fairly good, a detailed study shows that the sun's motion can not be regarded as a constant vector. The A stars and giant stars in general give a small velocity for the sun; and dwarf stars, a much higher velocity.

AVERAGE PECULIAR MOTIONS OF THE STARS

After the effect of the sun's motion has been removed, the residual or "peculiar" velocities show certain regularities. The average peculiar velocities are different for stars of different spectral types, and vary also with the intrinsic brightness of the stars.

Table 2.—Average Residual Radial Velocities (θ) of Stars of Different Spectral Classes (Sp) and Absolute Magnitudes (M)

Unit of θ = 1 km/sec

Sp	M*	θ	Lit.	Sp	M*	θ	Lit.
O5 to O9	−3	20.7	(11)	K	+1	18.4	(1)
B	−1	6.5	(3)	K	+6	27.0	(1)
A	+1	11.0	(11)	M	+1	21.6	(1)
F	+2	15.8	(1)	M	+9	29.6	(11)
G	+1	18.0	(1)	Me†	0	40.1	(11)
G	+5	26.3	(1)	P‡	–	28.6	(11)

* The apparent magnitude as observed from a distance of 10 parsecs.
† Contains M stars with bright hydrogen-lines; all are variable stars of long period.
‡ Bright-line nebulae.

PREFERENTIAL MOTION

The peculiar velocities of the stars are not distributed at random. In general the stars show a tendency to move parallel to the galactic plane. To describe the distribution of the peculiar velocities, a distribution-function is adopted, which gives the relative numbers of stars moving in different directions and with different velocities. The simplest distribution-function is the spherical distribution-law,

$$F(xyz) = \frac{N}{(2\pi)^{\frac{3}{2}}\sigma^3} e^{-\frac{x^2+y^2+z^2}{2\sigma^2}}$$

where x, y, and z are the velocity-components referred to the "centroid" of the group. N is the number of stars in the group, and σ is the dispersion or the square-root of the mean of the squares of the velocity-components. The number of stars of velocity-components between $x \pm \frac{1}{2}dx, y \pm \frac{1}{2}dy, z \pm \frac{1}{2}dz$ is then given by $F(xyz)\,dxdydz$. In a spherical distribution, the frequency of a velocity is independent of its direction and only dependent upon its size. Spherical velocity-distributions occur for several classes of stars, but in general the distribution in velocity-space is either flattened (B stars) or elongated (A, F, and dwarf stars). Two functions have been used to describe the elongated distribution. Kapteyn and Eddington have used a sum of two spherical functions and have regarded the stars as belonging to two intermingled systems, "two stream hypothesis." Schwarzschild has introduced the ellipsoidal distribution defined by the distribution-function

$$F(xyz) = \frac{N}{(2\pi)^{\frac{3}{2}}abc} e^{-\left(\frac{x^2}{2a^2}+\frac{y^2}{2b^2}+\frac{z^2}{2c^2}\right)}$$

with three principal dispersions a, b, and c, which define the three axes of the "velocity-ellipsoid." The velocity-components x, y, and z are here projected on the principal axes of this ellipsoid. The major axis of the velocity-ellipsoid corresponds to the line joining the two centers in the two stream theory. The direction of this fundamental axis, which is common in the two theories, is about R. A. 6^h 6^m, Dec. + 9°, (true vertex). The dwarf stars give a somewhat higher declination for the true vertex.

In the analysis of proper motions, the two stream theory gives two vertices, which correspond to the directions of motion of the two streams relative to the sun. The coordinates of these vertices are R. A. 6^h 14^m, Dec. −13° (first stream) and R. A. 19^h 16^m, Dec. −60° (second stream).

Analyzing stellar motions on the basis of the two stream theory, we find a number of stars which cannot be regarded as belonging to either of the two streams. The B stars and stars of spectral class M, for instance, have a group-motion intermediate between the two streams. For this reason Halm has introduced a third stream (0 stream). But these streams taken together can be fairly well represented by an ellipsoidal distribution using a smaller number of parameters.

Charlier (4) has introduced a generalization of the ellipsoidal theory which makes it possible to take into account deviations from a strictly ellipsoidal distribution, but it is only when these deviations are small that this generalization is practicable.

MOVING CLUSTERS OR GROUPS

Several stars move nearly parallel to one another, the best known example being 5 of the 7 bright stars in the constellation Ursa Major. Another moving group or cluster is the Hyades in the constellation Taurus (Taurus Group). The proper motions of the stars belonging to such a group converge towards a point in the sky, the "convergent point," whose position in the sky gives the direction of motion of the group relative to the sun. The convergent point for 17 stars belonging to the Ursa Major Group is R. A. 20^h 30^m, Dec. −40°; for the Taurus Group (39 stars) R. A. 6^h 7^m, Dec. + 7°. A number of other moving groups are known.

THE GENERAL DISTRIBUTION OF COSMIC VELOCITIES

When the sun's motion is referred to different clases of objects it has been found that this motion is not a constant vector but varies greatly, from about 12 km/sec for the A stars and the Cepheids of long period up to 300 km/sec for the fast moving objects, the globular clusters and the spiral nebulae. A general relationship between group-motion and dispersion exists, which, according to Strömberg (11), holds for all classes of objects, but with a small deviation for the B star system. This variation in group-motion produces an asymmetry in the velocity distribution, in such a way that all fast moving objects move, relative to the sun, towards the same hemisphere. This asymmetry defines an axis along which the group-motion increases with increasing internal velocity-dispersion. The direction of this axis is R. A. 8^h 39^m, Dec. −57°, and the motion of objects with small velocity-dispersion relative to those of high velocity-dispersion is about 300 km/sec in the opposite direction. The group-motion of objects with high velocity-dispersion is approximately the same as that of the globular clusters and spiral nebulae.

The general distribution of cosmic velocities can be approximately represented by a product of two symmetrical distributions S_1 and S_2. The first of these is a sum of concentric and co-axial ellipsoidal distributions, the velocity of the sun relative to the center of the distribution S_1 being 14.8 km/sec in the direction R. A. 17^h 43^m, Dec. +22°. The sun's motion relative to the second distribution, S_2, is 300 km/sec in the direction R. A. 20^h 28^m, Dec. +56°. The first distribution can be regarded as the velocity-distribution in our local system of stars, the second as a velocity-restriction in a universal world-frame of enormous dimensions. Other interpretations, however, may be possible.

LITERATURE

(For a key to the periodicals see end of volume)

(1) Adams, Strömberg and Joy, *21*, **54**: 9; 21. (2) Boss, *326*, **26**: 111; 10. (3) Campbell, *Lick Obs. Bull.* No. **196**; 11. (4) Charlier, *Lund Observatorium, Meddelanden*, **II**: No. 13; 15. (5) Charlier and Wicksell, *Ibid.*, **II**: No. 12: 45; 15. (6) Gyllenberg, *Ibid.*, **II**: No. 13; 15. (7) Luyten, *Annals Harvard College Obs.* **85**: No. 5; 23. (8) Raymond, *326*, **30**: 191; 17. (9) Strömberg, *21*, **47**: 7; 18.
(10) Strömberg, *21*, **56**: 265; 22. (11) Strömberg, *21*, **61**: 363; 25.

TIME

Chronological Eras

Gregorian Calendar

Era	Year	Begins, 1925 A. D.
Byzantine¶	7434	September 14
Diocletian¶	1642	September 11
Grecian*¶	2237	September 14 / October 14
Hegira	1344‡	July 21
Japanese	2585†	January 1
Jewish	5686‡	September 18
Julian calendar	1925	January 14
Julian period	6638§	January 14
Mohammedan	1344‡	July 21
Nabonassar¶	2674	May 12
Rome¶	2678‖	January 14
Seleucidae¶	2237	(See Grecian)

* In present-day usage of Syrians, begins in September or October depending upon the sect. In ancient usage of Damascus and Arabia Petraea, began with vernal equinox.
† The 14th year of period Taisho.
‡ Begins at sunset.
§ Julian day number of January 1, 1925 (Gregorian) is 2 424 152.
‖ Since foundation of Rome, according to Varro.
¶ Based upon Julian calendar.

Time

Interval	Days*
Year:	
Tropical†	365.2422
Sidereal	365.2564
Anomalistic	365.2596
Month:	
Synodical†	29.530 59
Tropical	27.321 58
Sidereal	27.321 66
Day:	
Sidereal	0.997 2696

* Mean solar days. † Ordinary.

Equation of Time*

(Δ = mean − apparent)

Unit of Δ is minute. Time is Greenwich mean noon

Date	Δ	Date	Δ	Date	Δ
I 1	+ 3.4	V 11	−3.8	IX 18	− 5.6
6	5.8	16	−3.8	23	− 7.3
11	7.8	21	−3.7	28	− 9.0
16	9.7	26	−3.3	X 3	−10.7
21	11.3	31	−2.6	8	−12.2
26	12.6	VI 5	−1.8	13	−13.5
31	13.6	10	−1.0	18	−14.6
II 5	14.1	15	0.0	23	−15.5
10	14.4	20	+1.1	28	−16.1
15	14.3	25	2.2	XI 2	−16.3
20	14.0	30	3.2	7	−16.3
25	13.3	VII 5	4.2	12	−15.9
III 2	12.4	10	5.0	17	−15.1
7	11.4	15	5.6	22	−14.0
12	10.0	20	6.1	27	−12.5
17	8.7	25	6.3	XII 2	−10.7
22	7.2	30	6.3	7	− 8.8
27	5.7	VIII 4	6.0	12	− 6.5
IV 1	4.2	9	5.4	17	− 4.1
6	2.7	14	4.7	22	− 1.6
11	1.2	19	3.7	27	+ 0.9
16	+ 0.0	24	2.5	31	+ 2.8
21	− 1.2	29	+1.1		
26	− 2.2	IX 3	−0.4		
V 1	− 2.9	8	−2.1		
6	− 3.4	13	−3.8		

* Δ is the amount by which mean time exceeds apparent time when it is noon at Greenwich; it is the excess of the right ascension of the actual sun over that of the mean sun at that instant. It varies continuously with the time, and does not exactly repeat its values in successive years; those given are average values for Greenwich mean noon of an ordinary year, and will seldom differ from the actual values for that time by as much as 0.2 min., except in January and December, when the difference may amount to 0.3 min. In leap years, all dates in the table after February must be reduced by one day.

SOLAR SYSTEM

Orbital Data; Solar System (1925)

Units: Distance, 10^6 km; period, tropical year

Planet	Distance*	Eccentricity	Inclination†	Mean longitude: Node‡	Mean longitude: Perihelion	Sidereal period
☿ Mercury	57.9	0.2056	7° 0′ 12.0″	47° 26′ 32.1″	76° 17′ 18.9″	0.24085
♀ Venus	108.1	0.0068	3 23 38.0	76 0 16.7	130 30 56.8	0.61521
⊕ Earth	149.5	0.01674			101 39 2.3	1.00004
♂ Mars	227.8	0.0933	1 51 0.6	48 58 45.0	334 40 42.2	1.88089
♃ Jupiter	778	0.0484	1 18 26.4	99 41 26.3	13 6 51.4	11.862
♄ Saturn	1426	0.0558	2 29 28.7	113 0 5.7	91 34 42.0	29.458
⛢ Uranus	2869	0.0471	0 46 22.1	73 36 57.7	169 26 56.8	84.015
♆ Neptune	4496	0.00855	1 46 36.7	130 57 13.3	43 58 27.9	164.788

* Mean distance.
† Angle between plane of orbit and plane of ecliptic.
‡ Ascending node.

Characteristics of Members of Solar System

Units: Linear diameter, 1000 km; density, g/cm³; time, mean solar

Name	Diameter: Linear	Diameter: Angular*	Mass† × 10^6 / Mass sun	Density	Sidereal rotation	Number satellites
Mercury	4.84	10.90″	0.1670	5.6		0
Venus	12.19	1′ 0.80	2.451	5.1		0
Earth	12.76§		3.036‡	5.52	23 hr 56.07 min	1
Mars	6.78	17.88	0.3233	3.9	24 37.4	0
Jupiter	142.7§	46.86§	954.8	1.4	9.8 hr	7
Saturn	120.8§	19.52§	285.6	0.7	10.2 hr	9
Uranus	49.7	3.76	43.7	1.3+		4
Neptune	53.0	2.52	50.8	1.3		1
Sun‖	1391	31 59.26	1 001 341	1.4	25.3 da	
Moon	3.48	31 5.16¶	0.037**	3.3	27.32 da	

* At distance = difference mean distance sun to object and mean distance sun to Earth; nearly at distance of nearest approach to Earth.
† Includes satellite (or planetary) system, if any.
‡ Mass of Earth alone = 2.999 × 10^{-6} mass of sun.
§ Equatorial diameter. Polar diameter: Earth = 12.71; Jupiter = 133.2, 43.74″; Saturn = 108.1, 17.46″. Diameter of sphere of volume = Earth, is 12.74.
‖ At mean distance of Earth, gravitational acceleration due to Sun is k^2 = 2.9592 × 10^{-4} (mean distance) per day² = 0.5926 cm per sec². For solar spectrum etc., see index.
¶ At mean distance from Earth. Apparent diameter varies, with distance, from 29.5′ to 33.5′.
** Moon alone. Mass Moon = 0.01227 mass Earth.

Solar Data

Inclination of equator to ecliptic, about.... 7°
Longitude of ascending node of equator.... 74.5°
Period of rotation, about.................. 28 da*
Sun spot period, about.................... 11 yr

Terrestrial and Lunar Data†

General precession (retrograde)............. 50.2564″ + 0.000222″(t − 1900) per yr
Obliquity of the ecliptic..... 23° 27′ 8.26″ − 0.4684″(t − 1900)

* From observations of sun spots near latitude 45°; spots near equator rotate in about 24 da; those near lat. 80°, in 30 da.
† For geodetic and geophysical data, see p. 393.

Constant of notation......... 9.21″ } Paris conference values
Constant of aberration....... 20.47″ } Paris conference values
Solar parallax................ 8.80″ } Paris conference values
From parallax measurements.......................... 8.806″
From velocity of light.............................. 8.781
From mass of Earth.................................. 8.762
From motion of Moon................................. 8.773
Equatorial horizontal parallax of Moon*..... 57′ 2.70″ (Brown)
Mean distance Earth to Moon................ 384 403 km
Inclination of Moon's equator to ecliptic..... 1° 32.1″
Inclination of Moon's orbit to ecliptic, about 5°
Eccentricity of Moon's orbit (average)........ 0.055
Revolution of Moon's nodes (retrograde)...... 18.6 yr

* Mean of greatest and least values; actual values vary from 53′ to 61′ *ca.*

COMPOSITION OF THE ATMOSPHERE

W. J. Humphreys

Table 1.—Composition of Dry Air at Sea-level ([4, 5])

v = volume of the gas in volume V of dry air

Gas........	N_2	O_2	A	CO_2	H_2*	Ne	He	Kr	Xe
$10^4 v/V$.....	7803	2099	94	3	1	0.123	0.04	0.005	0.0006

* Values found by analysis vary; the one here given is that accepted by Hann and the Recueil de Constantes Physiques.

Table 2.—Composition of Atmosphere at Various Levels

Computed from data of Table 1 on the assumptions: (1) at surface, H_2O vapor supplies 1.2% of the total number of gas molecules, (2) absolute humidity decreases rapidly to a negligible amount at about 10 km, (3) temperature = 11°C at sea-level, decreases normally (6°C per km) to −55°C at 11 km, remains constant above 11 km, (4) relative proportions of the gases, water vapor excepted, remains constant up to 11 km, (5) above 11 km, distribution is in accordance with their molecular weights ([3]). The amount of H_2 is in doubt (see note Table 1), especially above 11 km; it may become oxidized to H_2O before reaching the upper atmosphere.

v = volume of the gas contained in volume V of atmosphere. Unit of height = 1 km = 0.621 mi.; of pressure = 1 mm of Hg

Height	$100v/V$							Total pressure
	N_2	O_2	H_2O	A	CO_2	H_2	He	
140	0.01					99.15	0.84	0.0040
130	0.04					99.00	0.96	0.0046
120	0.19					98.74	1.07	0.0052
110	0.67	0.02	0.02			98.10	1.19	0.0059
100	2.95	0.11	0.05			95.58	1.31	0.0067
90	9.78	0.49	0.10			88.28	1.35	0.0081
80	32.18	1.85	0.17			64.70	1.10	0.0123
70	61.83	4.72	0.20	0.03		32.61	0.61	0.0274
60	81.22	7.69	0.15	0.03		10.68	0.23	0.0935
50	86.78	10.17	0.10	0.12		2.76	0.07	0.403
40	86.42	12.61	0.06	0.22		0.67	0.02	1.84
30	84.26	15.18	0.03	0.35	0.01	0.16	0.01	8.63
20	81.24	18.10	0.02	0.59	0.01	0.04		40.99
15	79.52	19.66	0.01	0.77	0.02	0.02		89.66
11	78.02	20.99	0.01	0.94	0.03	0.01		168.00
5	77.89	20.95	0.18	0.94	0.03	0.01		405.
0	77.08	20.75	1.20	0.93	0.03	0.01		760.

Table 3.—Masses of the Atmosphere and Its Constituents

Based upon Table 1, the assumptions of Table 2, and the assumption that the average atmospheric pressure at the surface of the earth = 73.7 cm and at base of stratosphere = 14.5 cm ([1, 2]). Area of earth is taken as 51×10^{17} cm².

Total mass $M = m \times 10^n$ kg; 1000 kg = 1.102 tons (of 2000 lb.)

Gas	All	N_2	O_2	A	H_2O	CO_2	H_2	Ne	Kr	He	Xe
m	511	387	116	624	133	217	129	471	64	63	116
n	16	16	16	14	14	13	12	11	11	11	10

LITERATURE

(For a key to the periodicals see end of volume)

([1]) Hann, *Lehrbuch der Meteorologie* (3rd ed.). ([2]) Humphreys, *Monthly Weather Review*, **49**: 341; 21. ([3]) Humphreys, *Physics of the Air*, p. 69; 20. ([4]) Ramsay, *5*, **80**: 599; 08. ([5]) Various authorities.

MISCELLANEOUS GEODETIC DATA

W. D. Lambert

With certain exceptions which are especially noted, those of the following data which depend upon the dimensions of the earth have been calculated strictly in accordance with the International Ellipsoid of Reference, adopted by the Section of Geodesy of the International Geodetic and Geophysical Union, meeting at Madrid, October 6 and 7, 1924. This ellipsoid is based upon the results obtained by J. F. Hayford (Supplementary Investigation in 1909 of the Figure of the Earth and Isostasy, Washington, 1910), but is not absolutely identical with Hayford's ellipsoid. (For some of the other spheroids that are used for geographical purposes, see Special Publication #100, U. S. Coast and Geodetic Survey. Recent attempts have been made to show that the actual figure of the earth can be represented more closely by an ellipsoid of three unequal axes, than by one of revolution, systematic departures from the latter being of the order of 100 to 200 meters in elevation and depression.)

If the positions of the two ends of a line are determined geodetically for any assumed spheroid of reference, the uncertainty in the length of the line as measured along the earth depends almost entirely upon the errors in the survey; for geodetic surveys of the highest class, the uncertainty is a little less than one in 100 000 and for an ordinary fair survey it is about four times as great. The proportional error in the straight-line distance is greater, mainly because the geoid does not coincide with the ellipsoid; these additional errors are not serious for a short line, but for two points almost diametrically opposite may amount to 100 or 200 meters.

If the end points are determined astronomically, the principal error in the computed length is due to the difference in the deflection of the plumb-line at the two points; unless the measured line is short, the *average* uncertainty so introduced is of the order of 200 meters, but may be much more, especially in rugged country.

Latitude.—The latitude of a place is defined as the angle which some line of reference makes with the equatorial plane. Four lines of reference, defining four distinct kinds of latitude, are used. Three of these lines pass through the place considered; *viz.*, (1) The plumb-line, defining the *astronomical* latitude, (2) the normal to the spheroid of reference, defining the *geographical* latitude, and (3) the line to the center of the earth, defining the *geocentric* latitude. The fourth line of reference passes through the center of the earth and that point which is upon the circumscribed sphere (radius = equatorial radius of the spheroid) and at the same distance from the axis of rotation as is the point on the spheroid representing the place considered; this defines the *parametric*, or *reduced*, latitude.

Gravity.[1]—If the earth's sea-level surface were accurately represented by the International Ellipsoid of Reference, and if no attracting matter projected above this surface, then the variation of gravity at sea-level (γ_o) would be represented by the equations

$$\gamma_o = \gamma_e(1 + 0.005\,288 \sin^2\varphi - 0.000\,006 \sin^2 2\varphi)$$
$$= \gamma_{45}(1 - 0.002\,637 \cos 2\varphi + 0.000\,006 \cos^2 2\varphi)$$

[1] The resultant acceleration arising from the gravitational attraction and the rotation of the earth.

where φ is the geographic latitude, and γ_e, γ_{45} are the values of γ_o at the equator and at latitude 45°, respectively. These equations differ slightly from that used in computing the table on p. 396; the latter corresponds to an ellipticity of 1/297.4.

Table 1.—Form and Size of the Earth

Based upon International Ellipsoid of Reference; accepted constants, from which the others are computed, are a = 6 378 388 meters, ellipticity $[=(a-b)/a]$ = 1/297. The indicated uncertainties are estimates, by Lambert, based upon a consideration of systematic errors as well as of internal discordances.

a = semi-major axis	=	6 378 388(±60)m
b = semi-minor axis	=	6 356 911.946 m
Radius of sphere of same area	=	6 371 227.7 m
Radius of sphere of same volume	=	6 371 221.3 m
Length of equatorial quadrant	=	10 019 148.4 m
Length of meridonal quadrant	=	10 002 288.3 m
f = ellipticity = $\left(\frac{a-b}{a}\right)$	=	0.003 367 0034
$\frac{1}{f}$ = reciprocal of ellipticity	=	297.0(±0.4)
e^2 = (eccentricity)^2 = $f^2\left(\frac{2}{f}-1\right) = \frac{a^2-b^2}{a^2}$	=	0.006 722 6700
Area of the ellipsoid	=	510 100 934 km²
Land area	=	148 847 000 km²
Ocean area	=	361 254 000 km²
Volume of the ellipsoid	=	1 083 319.78 × 10⁶ km³
Mass of the ellipsoid* (d = 5.527 g/cm³, p. 395)	=	5.988 × 10²⁴ kg
Principal moments of inertia ($A = B < C$)†:		
A‡ = B‡	=	0.332 35 Ea^2
C‡	=	0.333 44 Ea^2
$C - A$	=	0.001 0921 Ea^2
$\left(\frac{C-A}{C}\right) = \left(\frac{1}{305.12}\right)$§	=	0.003 2774

* For discussion of variation of density with depth below surface, *see* Adams and Williamson, Smithsonian Annual Report, 1923, p. 241.

† E = mass of earth.

‡ Computed values vary but little with any admissible assumption regarding the constitution of the interior of the earth. Values are based upon computations of De Sitter (*64V*, **27**: 233; 24); ellipticity taken as 1/296.92.

§ Deduced from precession of equinoxes; involves no hypothesis regarding constitution of interior of earth.

Table 2.—Distances upon Surface of the International Ellipsoid of Reference

M = length of meridian from equator to geographic latitude φ; S_m = length of meridian from latitude $(\varphi - \frac{1}{2}\Delta\varphi)$ to $(\varphi + \frac{1}{2}\Delta\varphi)$; S_p = length of arc of parallel for 1° of longitude at latitude φ. These may be computed by means of the equations: $M = a\varphi - b \sin 2\varphi + c \sin 4\varphi - d \sin 6\varphi$; $S_m = a\Delta\varphi - b \sin \Delta\varphi \cos 2\varphi + c \sin 2\Delta\varphi \cos 4\varphi - d \sin 3\Delta\varphi \cos 6\varphi$; S_m (for $\Delta\varphi = 1°$) $= a - b \cos 2\varphi + c \cos 4\varphi - d \cos 6\varphi$; $S_p = a \cos \varphi - b \cos 3\varphi + c \cos 5\varphi$; where the coefficients and their logarithms have the following values:

Unit of length = 1 meter; of angle = 1°

	M*		S_m*	
	Value	$\log_{10}$	Value	$\log_{10}$
a	111 136.537	5.045 856 86	111 136.537	5.045 856 86
b	16 107.035	4.207 015 6	32 214.069	4.508 045 6
c	16.976	1.229 84	33.952	1.530 87
d	0.022	$\bar{2}$.348	0.045	$\bar{2}$.649

	S_m* for $\Delta\varphi$ = 1°		S_p*	
	Value	$\log_{10}$	Value	$\log_{10}$
a	111 136.537	5.045 856 86	111 417.657	5.046 954 02
b	562.213	2.749 901	93.904	1.972 686
c	1.185	0.073 7	0.119	$\bar{1}$.074 6
d	0.002	$\bar{3}$.37		

* Owing to uncertainty regarding the actual size of the earth, actual distances upon the earth at sea-level may differ from these computed distances by about 2 in 100 000 near the equator or the poles, by somewhat less in middle latitudes.

Table 3.—Excess of Geographic Latitude (φ) over Geocentric (φ') and Parametric (θ) Latitudes

$$\varphi - \varphi' = a \sin 2\varphi - b \sin 4\varphi + c \sin 6\varphi$$
$$= a \sin 2\varphi' + b \sin 4\varphi' + c \sin 6\varphi'$$
$$\varphi - \theta = a' \sin 2\varphi - b' \sin 4\varphi + c' \sin 6\varphi$$
$$= a' \sin 2\theta + b' \sin 4\theta + c' \sin 6\theta$$

where the coefficients and their logarithms have the following values:

Unit of coefficients = 1″

	Value	$\log_{10}$		Value	$\log_{10}$
a	695.6635	2.842 3992	a'	347.8327	2.541 3704
b	1.1731	0.069 34	b'	0.2933	$\bar{1}$.467 29
c	0.0026	$\bar{3}$.421	c'	0.0003	$\bar{4}$.52

Table 4.—Miscellaneous Terrestrial Data

Angular velocity of rotation	72.921 × 10⁻⁶ radians/sec*
Rotational energy	2.160 × 10³⁶ ergs
Rotational energy lost by tidal friction	1.1 × 10¹⁹ ergs/sec†
Work required to dissipate the material of the earth to infinity	2.46 × 10³⁹ ergs
Mean elevation of land above sea-level	825 m
Mean depth of the oceans	3681 m
Mean effective viscosity is not known, but perhaps between	10²⁰ and 10²⁵ poises‡

* Mean solar second.

† Jeffreys, *62*, **221A**: 239; 20; *The Earth, Its Origin, History and Physical Constitution*, 205–237,; 24. Heiskanen, *175*, **18A**: 1; 21.

‡ Schweydar, *Veröffentl. des Preuss. Geodät. Inst.*, No. **79**; 19; Jeffreys, *Monthly Notices, Roy. Ast. Soc.*, **75**: 648; 15. **76**: 84; 16. **77**: 449; 17; also *The Earth, its Origin, History, and Physical Constitution*, 222; 1924.

Rigidity (μ). From the yielding of the solid portions (revealed by observations with horizontal pendulums), and on assumption of incompressibility, Schweydar (Zentralbureau Int. Erdmes., Neue Folge No. 38, 1921) deduces $\mu = 30.8\,(1 - 0.90r^2/a^2) \times 10^{11}$ dynes/cm², and mean effective rigidity = 17.6 × 10¹¹ dynes/cm² (r = distance from center, a = mean radius). To allow for compressibility, these values must be increased by about 20% (Lambert, preliminary, unpublished computations); even then the value computed for the outer shell of half-radius thickness is much less than that deduced from earthquake data. (*See* Adams and Williamson, Smithsonian Annual Report, 1923.) The discrepancy may arise from Schweydar's assumption of high rigidity in the central portions, which may possibly behave as a fluid. (*See* Knott, *68*, **39**: 157; 19; Sieberg, *Geologische, physikalische und angewandte Erdbebenkunde*, 364; 23.)

GRAVITY DATA

CLARENCE H. SWICK

This section includes: (A) The value of the gravitation constant; (B) the absolute determination upon which the tabulated values of the acceleration of gravity[1] rest; (C) values of the acceleration of gravity (g) at numerous stations well distributed over the surface of the earth, together with a table giving the values of g at sea-level and at various latitudes; and (D) means for computing the variation in g with the distance of the station above, or below, either the surface of the earth or sea-level. In preparing the data, valuable assistance was received from several colleagues. In particular should be mentioned Mr. W. D. Lambert's assistance with section D, and Miss Sarah Beall's and Mr. H. S. Rappleye's assistance with section C.

A. GRAVITATION CONSTANT

The best determinations of the gravitation constant (G)[2] are considered to be those by C. V. Boys (7) and by K. Braun (8). Each used an improved form of the Cavendish apparatus; and they obtained almost identical results, the final values of the two determinations being the same to the fourth significant figure. They found

$$G = 6.658 \times 10^{-8}\ \text{cm}^3\, g^{-1}\, \text{sec}^{-2}$$

which requires that the mean density of earth = 5.527 g/cm^3.

B. BASIS OF REFERENCE

The observed values of gravity in Tables 1 and 2 are relative determinations in the Potsdam system, that is, they are based on the value of 981.274 cm/sec^2 for the pendulum room of the Geodetic Institut in Potsdam, Germany. This value for Potsdam is the result of a large number of careful absolute determinations extending over a series of years. The degree of uncertainty in such absolute determinations is well illustrated by the fact that a similar series of absolute determinations at Vienna, Austria, gave a value 0.016 cm/sec^2 greater than the one above when referred to Potsdam by relative determinations.

All determinations of gravity should be based on the Potsdam system by means of relative determinations with some station already accurately based on that system. A table of 20 base stations on the Potsdam system is given in *Comptes Rendus l'Association Geodesique Internationale* for 1909, III:25. Most of these stations are included in Table 1.

C. ACCELERATION OF GRAVITY AT SELECTED STATIONS

The stations included in Table 1 are grouped (1) in the order America, Europe, Asia, Africa, Australia, and Oceanic; (2) generally, alphabetically according to countries (United States of America, first); (3) in each subdivision, the stations are arranged alphabetically. Numerals in parentheses, following the name of a subdivision or station refer to the bibliography, and indicate the source from which the data were obtained. If the effect of topography and of isostatic compensation has been computed on the uniform basis of compensation extending to a depth of 113.7 km, the amount of this computed effect is given in the column TC. This effect is the amount by which the actual value of the acceleration would exceed that obtained from Table 2, after correction for elevation by means of equation (1), if there were complete isostatic compensation and if the local distribution of matter were not anomalous.

[1] Throughout this section the term *acceleration of gravity*, or, briefly, *gravity*, is used, in its commonly accepted sense, to denote the resultant acceleration arising from the gravitational attraction and the rotation of the earth. It is this resultant which is denoted by g.

[2] The force (f) of gravitational attraction between two masses (m, m_1) separated by the distance r is $f = G\frac{mm_1}{r^2}$.

TABLE 1.—ACCELERATION (g) OF GRAVITY, POTSDAM SYSTEM

(The effect of topography and of isostatic compensation = TC)

Units: Elevation (h), meters: g, cm/sec^2; TC, cm/sec^2

Station	Latitude	Longitude	h	g	TC
AMERICA					
United States ([5, 6])					
Albany, N. Y. (Public School No. 24)	42° 39.1′	73° 46.1′	61	980.344	−0.006
Apalachicola, Fla. (Weather Bureau)	29 43.5	84 58.8	4	979.322	+0.015
Asheville, N. C. (Postoffice)	35 35.9	82 33.3	670	979.603	+0.026
Atlanta, Ga. (State Capitol)	33 45.0	84 23.3	324	979.524	+0.014
Austin, Tex. (University)	30 17.2	97 44.2	189	979.283	−0.001
Baltimore, Md. (Johns Hopkins University)	39 17.8	76 37.3	30	980.097	+0.006
Bismarck, N. Dak. (Will School)	46 48.5	100 47.0	516	980.625	−0.005
Boise, Idaho (High School)	43 37.2	116 12.3	821	980.212	−0.042
Calais, Me. (High School)	45 11.2	67 16.9	38	980.631	+0.010
Cambridge, Mass. (Harvard College Observatory)	42 22.8	71 7.8	14	980.398	+0.010
Charleston, W. Va. (High School)	38 20.9	81 37.7	184	979.936	−0.010
Charleston, S. C. (S. C. Military Academy)	32 47.2	79 56.0	6	979.546	+0.016
Charlottesville, Va. (University of Virginia)	38 2.0	78 30.3	166	979.938	+0.002
Chicago, Ill. (Univ. of Chicago)	41 47.4	87 36.1	182	980.278	+0.007
Cincinnati, Ohio (Cincinnati Observatory)	39 8.3	84 25.3	245	980.004	+0.002
Cleveland, Ohio (Adelbert College)	41 30.4	81 36.6	210	980.241	0.000
Colorado Springs, Colo. (Colorado College)	38 50.7	104 49.0	1841	979.490	−0.007
Denver, Colo. (University of Denver)	39 40.6	104 56.9	1638	979.609	−0.015
Dover, Del. (Wilmington Conference Academy)	39 9.7	75 32.0	12	980.099	+0.013
El Paso, Tex. (High School)	31 46.3	106 29.0	1146	979.124	+0.001
Galveston, Tex. (Ball High School)	29 18.2	94 47.5	3	979.272	+0.007
Georgetown, Tex. (Southwestern University)	30 38.0	97 40.1	231	979.298	+0.002
Goldfield, Nev. (High School)	37 42.2	117 14.5	1716	979.456	+0.027
Hartford, Conn. (Jarvis Laboratory of Trinity College)	41 44.8	72 41.8	37	980.336	+0.008
Hinsdale, Mont. (Public School)	48 23.8	107 5.3	661	980.739	−0.017
Hoboken, N. J. (Stevens Institute of Technology)	40 44	74 2	11	980.269	+0.008
Indianapolis, Ind. (Postoffice)	39 45.9	86 8.8	217	980.090	+0.003
Ithaca, N. Y. (Cornell University)	42 27.1	76 29.0	247	980.300	+0.005
Kansas City, Mo. (Franklin School)	39 5.8	94 35.4	278	979.990	−0.001
Key West, Fla. (Postoffice)	24 33.6	81 48.4	1	978.970	+0.035
Lancaster, N. H. (High School)	44 29.5	71 34.3	261	980.486	+0.007
Las Vegas, N. Mex. (Normal School)	35 35.8	105 12.1	1960	979.204	+0.017
Little Rock, Ark. (Postoffice)	34 45.0	92 16.4	89	979.721	+0.001
Madison, Wis. (University of Wisconsin)	43° 4.6′	89° 24.0′	270	980.365	+0.003
Minneapolis, Minn. (University of Minnesota)	44 58.7	93 13.9	256	980.597	−0.005
Mount Hamilton, Calif. (Lick Observatory)	37 20.4	121 38.6	1282	979.660	+0.120
New Orleans, La. (City Hall)	29 57.0	90 4.2	2	979.324	+0.013
New York, N. Y. (Columbia University)	40 48.5	73 57.7	38	980.267	+0.011
Norris Geyser Basin, Wyo. (Yellowstone Park)	44 44.2	110 42.0	2276	979.950	+0.031
Pembina, N. Dak. (Public School)	48 58.1	97 14.9	243	980.917	−0.009
Philadelphia, Pa. (University of Pennsylvania)	39 57.1	75 11.7	16	980.196	+0.009
Pierre, S. Dak. (High School)	44 21.9	100 20.8	454	980.427	−0.013
Pittsburgh, Pa. (Second Ward School)	40 27.4	80 0.6	235	980.118	0.000
Point Isabel, Tex.	26 4.7	97 12.4	8	979.076	+0.015
Portland, Oreg. (Custom House)	45 31.4	122 40.7	8	980.646	−0.016
Potsdam, N. Y. (Clarkson School of Technology)	44 40.1	74 58.8	130	980.571	−0.004
Princeton, N. J. (Princeton University)	40 21.0	74 39.5	64	980.178	+0.013
Richmond, Va. (Postoffice)	37 32.2	77 26.1	30	979.960	+0.010
St. Louis, Mo. (Washington University)	38 38.0	90 12.2	154	980.001	+0.001
Salt Lake City, Utah (Temple Block)	40 46.1	111 53.8	1322	979.803	−0.041
San Francisco, Calif. (Davidson Observatory)	37 47.5	122 25.7	114	979.965	+0.045
Sandpoint, Idaho (Farmington Central School)	48 16.4	116 33.3	637	980.680	−0.044
Seattle, Wash. (Washington State University)	47 39.6	122 18.3	58	980.733	−0.020
Springfield, Ill. (Edwards Public School)	39 47.7	89 39.5	183	980.089	+0.005
State College, Pa. (Chemistry Physics Building)	40 47.9	77 51.8	358	980.124	+0.010
Terre Haute, Ind. (Rose Polytechnic Institute)	39 28.7	87 23.8	151	980.072	+0.001
Washington, D. C. (U. S. C. and G. S., base station)	38 53.2	77 0.5	14	980.112	+0.004
Washington, D. C. (Bureau of Standards)	38 56.3	77 4.0	103	980.095	+0.012
Wilmington, N. C. (Court House)	34 14.2	77 56.6	9	979.663	+0.023
Worcester, Mass. (Worcester Polytechnic Institute)	42 16.5	71 48.5	170	980.324	+0.018
Yavapai, Ariz. (Yavapai Point)	36 3.9	112 7.1	2179	979.192	+0.034
Alaska ([4])					
Fort Egbert, Eagle City	64 47.4	141 12.4	269	982.183	−0.042
Percy Islands, Southeast Alaska	54 55.8	131 35.3	4	981.524	−0.013

Station	Latitude	Longitude	h	g	TC
Point Young, Southeast Alaska	58° 11.5′	134° 33.4′	7	981.757	−0.054
Quiet Harbor, Southeast Alaska	56 14.1	132 39.6	4	981.624	−0.034
St. Michael	63 28.5	162 2.4	1	982.192	−0.004
St. Paul Island	57 7.3	170 16.6	10	981.726	+0.041
Canada (6, 20, 21, 22)					
Arctic Red River, N. W. Ter.	67 26.6	133 44.2	41	982.434	−0.026
Banff, Alta	51 10.9	115 34.5	1376	980.753	−0.012
Calgary, Alta	51 2.7	114 3.8	1044	980.823	−0.022
Charlottetown, P. E. I.	46 13.9	63 7.5	8	980.733	+0.013
Chipewyan, Alta	58 42.7	111 8.8	229	981.723	−0.012
Good Hope, N. W. Ter	66 15.3	128 38.2	59	982.340	−0.029
Halifax, N. S.	44 40.8	63 33.8	9	980.574	+0.008
Kenora, Ont	49 46.0	94 30.0	330	980.974	+0.018
Kingston, Ont. (City Hall)	44 14.6	76 28.8	79	980.530	+0.008
Liard River, B. C.	59 58.7	123 47.5	160	981.790	−0.059
Moose Jaw, Sask	50 23.4	105 31.8	541	980.943	+0.003
Norman, N. W. Ter.	64 54.0	125 34.2	87	982.214	−0.036
Ottawa, Ont. (Dominion Observatory, base station)	45 23.6	75 43.0	83	980.618	0.000
Peace River, Alta	56 14.1	117 17.2	324	981.482	−0.038
Port Arthur, Ont. (Masonic Building)	48 26.0	89 13.0	189	980.820	−0.014
Providence, N. W. Ter	61 21.2	117 39.2	156	981.955	−0.018
Resolution, N. W. Ter.	61 10.1	113 40.5	152	981.942	−0.009
Revelstoke, B. C.	50 59.8	118 11.8	453	980.903	−0.080
St. Jérôme (Chateau Larose)	45 46.6	74 0.0	107	980.681	+0.006
St. John, N. B. (Meteorological Observatory)	45 16.0	66 5.0	33	980.663	+0.016
Sault Ste. Marie, Ont. (City Hall)	46 30.4	84 19.2	186	980.680	−0.005
Simpson, N. W. Ter.	61 51.6	121 20.8	132	982.004	−0.023
Sydney, N. S.	46 8.4	60 11.8	12	980.731	+0.014
Vancouver, B. C.	49 16.8	123 6.8	6	980.949	−0.046
Winnipeg, Man	49 54.4	97 8.0	231	980.990	+0.002
Woodstock, N. B. (Armoury)	46 9.0	67 34.5	56	980.699	+0.008
Woodstock, Ont. (Market)	43 8.6	80 47.0	299	980.352	−0.002
Central and South America (2)					
Bahía Blanca, Argentina	38 47.1 S.	62 15.9	2	980.061	
Buenos Aires, Argentina	34 36.5 S.	58 22.2	2	979.669	
Bahia, Brazil	12 58.5 S.	38 31.0	4	978.331	
Panama, Canal Zone	8 54.9	79 31.9	6	978.243	
Valdivia, Chile	39 53.4 S.	73 28.3	10	979.920	
Valparaiso, Chile	33 1.8 S.	71 38.5	60	979.609	
Callao, Peru	12 4.1 S.	77 15.8	1	978.375	
Acajutla, Salvador	13 34.7	89 50.4	12	978.303	
Montevideo, Uruguay	34 54.5 S.	56 12.9	4	979.772	
Kanada *see* Canada.					
EUROPE					
Allemagne, *see* Germany.					
Angleterre, *see* Great Britain.					
Austria (2, 6)					
Brenner	47 0.3	11 30.5 E.	1372	980.353	
Dalaas	47 8	9 59 E.	838	980.454	
Grafenstein	46 37	14 28 E.	417	980.614	
Mixnitz	47 19.8	15 22 E.	445	980.657	
Ober-Drauburg	46 45	12 58 E.	617	980.555	
Stilfserjoch (Stelvio Pass)	46 31.8	10 27.4 E.	2760	980.045	0.152
Vienna (base station)	48 12.7	16 21.5 E.	183	980.860	
Waidhofen	47 57.7	14 46.7 E.	352	980.750	
Wien (base station)	48 12.7	16 21.5 E.	183	980.860	
Wolfsthal	48 8.3	17 0.5 E.	146	980.904	
Belgium (2)					
Brussels	50 51.0	4 22 E.	102	981.112	
Czechoslovakia (2)					
Böhmerwald	49 40.1	12 59.3 E.	537	980.921	
Cebon	50 0.9	13 0.4 E.	822	980.906	
Karlowitz	49° 21.9′	18° 18.7′E.	510	980.890	
Mount Hora	49 10.3	15 42.4 E.	710	980.845	
Rosenau	48 39.1	20 32 E.	281	980.871	
Denmark (2)					
Copenhagen (Sternwarte, base station)	55 41.2	12 34.7 E.	14	981.559	
Frederikshavn	57 27.1	10 32.2 E.	15	981.740	
Magleby	54 47.3	10 43.0 E.	14	981.502	
Peders Kirke	55 1.6	14 58.8 E.	42	981.533	
Trige	56 15.2	10 9.5 E.	91	981.618	
Vinding	55 40.3	9 34.5 E.	78	981.575	
Deutschland, *see* Germany.					
England, *see* Great Britain.					
Espagna, *see* Spain.					
Finland (2)					
Helsingfors (Observatory)	60 9.7	24 57.3 E.	29	981.912	
Uleåborg	65 1.2	25 29.1 E.	9	982.262	
Viborg (Viipurin)	60 42.9	28 43.7 E.	12	981.928	
Fiume (2)	45 20.0	14 25.8 E.	10	980.630	
France (2, 3)					
Arcachon	44 39.6	1 10.4	24	980.586	
Aurillac, Lyceum	44 56.8	2 26.6 E.	640	980.483	
Bayonne	43 29.7	1 28.0	3	980.475	
Bordeaux (Observatoire)	44 50.1	0 31.4	72	980.572	
Coutras	45 2.5	0 7.9	13	980.591	
Jonzac	45 26.7	0 26.0	35	980.647	
Langon	44 32.7	0 15.3	25	980.561	
Lihons	49 50.0	2 45 E.	106	981.038	
Lyon	45 41.0	4 47 E.	286	980.629	
Marseille (Observatoire)	43 17.9	5 23 E.	61	980.482	
Metz	49 7.0	6 10.7 E.	175	980.957	
Meudon (Observatoire)	48 48.3	2 13.9 E.	130(?)	980.919	
Mont Blanc (Observatoire)	45 50	6 52 E.	4807	979.401	
Mont-Louis	42 31.0	2 7 E.	1620	979.996	
Nice (Observatoire)	43 42.8	7 18 E.	367	980.471	
Paris (Observatoire, base station)	48 50.2	2 20.3 E.	61	980.943	
Port-Vendres	42 50.9	3 6 E.	25	980.456	
Rosendaël-les-Dunk.	51 2.9	2 24 E.	20	981.170	
Soulac	45 31.0	1 7.4	8	980.655	
Strasbourg (base station)	48 35.0	7 46.1 E.	137	980.904	
Valence	44 56	4 53 E.	125	980.562	
Germany (2, 6)					
Alter Bruch	50 45.7	15 44.6 E.	917	980.930	+0.060
Bremen	53 5.0	8 49.2 E.	0	981.341	
Brocken	51 48.0	10 37 E.	1140	981.015	+0.088
Coburg	50 16.0	10 58 E.	290	981.015	
Göttingen (Sternwarte)	51 32.0	9 57 E.	162	981.176	
Grimmen	54 6.9	13 2.7 E.	11	981.434	
Hamburg (Seewarte)	53 32.8	9 58.3 E.	24	981.375	
Helgoland	54 10.8	7 53.1 E.	51	981.410	
Immenstaad	47 40.0	9 22.1 E.	403	980.709	
Jena	50 55.6	11 35.2 E.	154	981.123	
Karlsruhe	49 0.7	8 24.7 E.	114	980.967	
Kiel (Sternwarte)	54 20.5	10 9 E.	41	981.464	
Kirchhain	51 38.3	13 33.5 E.	98	981.235	
Kolberg	54 11.3	15 35.8 E.	8	981.453	
Königsberg (Sternwarte)	54 42.8	20 29.8 E.	22	981.477	
Leipzig	51 20.1	12 23.5 E.	115	981.180	
Lüdenhausen	52 4.3	9 0.0 E.	205	981.242	
Munich	48 8.7	11 36.6 E.	525	980.733	
Münster	51 57.9	7 37.9 E.	62	981.233	
Neumünster	54 4.4	10 0 E.	25	981.427	
Potsdam (Geodetic Institute, base station)	52 22.9	13 4.1 E.	87	981.274	
Scharfenstein	51 50.0	10 36.0 E.	623	981.130	+0.041
Schneekoppe	50 44.2	15 44.6 E.	1605	980.776	+0.110
Schlsgrund	52 52.8	15 48.0 E.	109	981.278	
Stuttgart	48 46.9	9 10.5 E.	247	980.901	
Waldsee	47 55	9 45.3 E.	590	980.706	

Station	Latitude	Longitude	h	g	TC
Great Britain (2)					
Edinburgh, Scotland (Observatory)	55° 57.4′	3° 9.4′	104	981.584	
Glasgow, Scotland (University)	55 51.5	4 14.0	61	981.605	
Greenwich, England (Observatory)	51 28.6	0 0.0	48	981.184	
Kew, England (Observatory)	51 28.1	0 19	5	981.144	
Plymouth, England	50 22.2	4 8.4	43	981.148	
Holland, *see* Netherlands					
Hungary (2)					
Budapest	47 29.5	19 3.6 E.	108	980.852	
Kis-Komárom	46 32.9	17 10.7 E.	115	980.745	
Italy (2, 6)					
Alba	44 42.0	8 2.3 E.	169	980.444	
Arona	45 45.8	8 34.1 E.	210	980.629	
Bologna (Universitá)	44 29.8	11 21.3 E.	51	980.450	
Brenner (*see* Austria)					
Catania, Sicily	37 30.2	15 4.7 E.	43	980.065	
Castellammare di Stabia	40 41.6	14 28.7 E.	4	980.321	
Domo d'Ossola	46 7.0	8 18.4 E.	276	980.598	
Florence	43 46.8	11 15.2 E.	48	980.510	
Genoa (Instituto Idrografico)	44 25.1	8 55.3 E.	93	980.573	
Livorno (Leghorn)	43 32.0	10 18.5 E.	6	980.534	−0.018
Milan (Osservatorio)	45 28.0	9 11.5 E.	141	980.569	
Padua (Osservatorio, base station)	45 24.0	11 52.3 E.	19	980.658	
Palermo, Sicily	38 6.9	13 22.0 E.	20	980.069	
Pola	44 51.8	13 50.7 E.	28	980.626	
Pracchia	44 3.0	10 54.3 E.	627	980.378	
Romagnano	45 38.1	8 23.8 E.	266	980.620	
Rome	41 53.5	12 29.7 E.	49	980.367	−0.012
San Remo	43 49.1	7 46.5 E.	23	980.505	
Stilfserjoch, *see* Austria					
Stromboli, Lipari Is.	38 48.2	15 14.1 E.	48	980.212	
Turin	45 4.1	7 41.8 E.	233	980.549	
Jugoslavia, *see* Yugoslavia					
Netherlands (24)					
Amsterdam (Université)	52 21.9	4 54.7 E.	0	981.288	
Bergen op Zoom (Cathédrale)	51 29.7	4 17.3 E.	10	981.212	
Breda (Académie Militaire)	51 35.5	4 46.5 E.	1	981.213	
De Bilt (Institut Météorologique, base station)	52 6.2	5 10.7 E.	2	981.267	
Delft (Institut Géodésique)	52 0.6	4 22.1 E.	2	981.264	
Gronigen (Université)	53 13.2	6 34.0 E.	5	981.348	
Hollander (Sanatorium Hellendoorn)	52 24.2	6 25.0 E.	11	981.296	
Leeuwarden (Friesche Levensverzekering)	53 12.3	5 48.3 E.	1	981.348	
Leiden (Observatoire)	52 9.4	4 29.1 E.	2	981.273	
Maastricht (Hôtel de Ville)	50 51.2	5 41.6 E.	49	981.140	
Middelburg (États Prov.)	51 30.0	3 36.8 E.	6	981.215	
Oldenzaal (Église Plechelmi)	52 18.8	6 55.8 E.	47	981.282	
Schoorl (École primaire)	52 42.1	4 41.6 E.	9	981.312	
Sittard (Ambachtsschool)	50 59.8	5 51.6 E.	48	981.148	
Sleen	52 46.5	6 48.1 E.	16	981.318	
Terschelling (École Navale)	53 21.6	5 12.9 E.	6	981.376	
Ubagsberg	50 51.0	5 57.2 E.	191	981.108	
Utrecht (Observatoire)	52 5.2	5 7.8 E.	5	981.263	
Weert (Église catholique)	51 15.3	5 42.5 E.	33	981.161	
Winschoten	53 8.7	7 2.4 E.	0	981.346	
Norway (2, 6)					
Bergen (Sternwarte)	60° 23.9′	5° 18.3′E.	38	981.922	
Christiansund	63 6.6	7 44.2 E.	20	982.175	
Dambaas	62 4.6	9 8.3 E.	643	981.892	
Florö	61 35.8	5 2.4 E.	10	982.071	
Langenaes	69 1.2	15 8.7 E.	8	982.640	
Laredal	61 6.3	7 27.9 E.	7	981.942	
Mehavn	71 1.3	27 47 E.	10	982.688	
Osla (Christiania) (Sternwarte, base station)	59 54.7	10 43.5 E.	28	981.927	
Oxö	58 4.3	8 3.5 E.	10	981.763	
Rörvik	64 51.9	11 14.3 E.	10	982.313	
Sand	59 29.1	6 15.7 E.	14	981.853	
Sannesjöen	66 1.3	12 38.8 E.	12	982.351	
Sörvaagen	67 53.6	13 2 E.	19	982.622	+0.0
Stavanger	58 58	5 44.3 E.	11	981.845	
Triset	59 25.8	8 10.8 E.	115	981.795	
Österreich, *see* Austria.					
Olanda, *see* Netherlands.					
Paési Bássi, *see* Netherlands.					
Pays-Bas, *see* Netherlands.					
Poland (2)					
Bedzin	50 19.3	19 8.7 E.	256	981.058	
Kraków (Sternwarte)	50 3.9	19 57.6 E.	205	981.054	
Lwów (Lemberg)	49 50.2	24 0.0 E.	314	980.911	
Tuchla	48 55.2	23 29 E.	540	980.789	
Portugal (18)					
Camposancos	41 53.2	8 49.0	9	980.383	
Lisbon	38 42.5	9 11.3	75	980.088	
Oporto	41 8.2	8 36.1	94	980.290	
Praia da Rocha	37 7.0	8 32.7	17	980.005	
Rumania (2)					
Bocsa	46 56.9	22 42 E.	379	980.711	
Bucharest (Bucuresti)	44 24.6	26 6.8 E.	83	980.553	
Elesd	47 2.5	22 22 E.	225	980.794	
Maros-Ludas (Ludos)	46 28.1	24 6 E.	281	980.715	
Russia and Siberia (2, 11)					
Alexandropol	40 47.0	43 49.7 E.	1519	979.785	
Archangel	64 34	40 31.0 E.	5	982.278	
Astrakhan	46 21.0	48 2.7 E.	−21	980.774	
Byelgorod	50 36.1	36 35.9 E.	203	981.038	
Dagarskoje (Lake Baikal), Siberia	55 42.2	109 54 E.	465	981.32	
Erivan	40 10.7	44 32.8 E.	990	979.880	
Gorjätschinskoi, Siberia	52 59.4	108 18.0 E.	470	981.178	
Irkutsk, Siberia (Meteorological Observatory)	52 16.5	104 16.5 E.	470	981.096	
Kazan (Observatory)	55 47.4	49 7.3 E.	70	981.572	
Kingisepp	59 22.5	28 35.7 E.	16	981.858	
Leningrad, *see* St. Petersburg.					
Lenkoran	38 45.6	48 51.5 E.	−20	980.092	
Listvinichnoe, Siberia	51 51.0	104 52.5 E.	465	981.051	
Moscow (Observatory)	55 45.3	37 34.3 E.	139	981.562	
Novgorod	58 31.4	31 17.3 E.	48	981.780	
Odessa	46 26.4	30 46.4 E.	43	980.769	
Pulkova (base station)	59 46.3	30 19.7 E.	71	981.899	
St. Petersburg (Leningrad)	59 56.5	30 17.7 E.	3	981.929	
Schaitanskij	56 54.8	59 57.0 E.	310	981.641	
Simbirsk	54 19.0	48 24.2 E.	181	981.469	
Staraya Russa	57 59.4	31 22 E.	23	981.747	
Tartu (Dorpat, Yuriev), (Observatory)	58 22.8	26 43.2 E.	50	981.793	
Tiflis (Physical Observatory)	41 43.1	44 47.8 E.	412	980.176	
Tver	56 51.2	35 50.9 E.	136	981.607	
Verevye	58 40.8	32 42.0 E.	113	981.794	
Volkhovo	59 4.2	31 46.2 E.	21	981.826	
Vyshniy Volochok	57 35.1	34 33.1 E.	164	981.695	
Vologda	59 13	39 53.0 E.	118	981.837	
Schweden, *see* Sweden					
Schweiz, *see* Switzerland					
Scotland, *see* Great Britain					

Station	Latitude	Longitude	h	g	TC
Spain (18)					
Alcázar de San Juan	39° 24.0′	3° 12.0′	648	979.933	
Andújar	38 3.0	4 3.0	207	979.943	
Aranda de Duero	41 40.0	3 40.0	801	980.086	
Arbas	43 0.9	5 45.0	1329	980.132	
Badajoz	38 53.0	6 58.0	188	980.050	
Barcelona	41 25.0	2 7.0 E.	407	980.240	
Baza	37 30.0	2 45.0	858	979.669	
Cortegana	37 54.0	6 47.0	765	979.895	
Daroca	41 7.0	1 25.0	770	980.038	
Lérida	41 37.0	0 38.0 E.	165	980.260	
Llansá	42 22.0	3 9.0 E.	6	980.431	
Málaga	36 43.0	4 25.2	61	979.918	
Plasencia	40 2.0	6 3.0	369	980.073	
Puigcerdá	42 25.0	1 54.7 E.	1190	980.055	
Roncal	42 49.0	0 59.6	675	980.228	
Salamanca	40 58.0	5 39.0	805	980.057	
Salou	41 4.0	1 9.0 E.	2	980.268	
San Fernando	36 28.0	6 12.3	44	979.843	
Santander	43 29.1	3 49.0	10	980.503	
Seville	37 23.0	5 59.0	11	979.965	
Tarita	36 0.0	5 37.0	29	979.748	
Toledo	39 51.0	4 1.0	520	980.015	
Torrejón	38 0.1	0 39.1	2	980.032	
Valencia	39 29.0	0 23.0	6	980.127	
Valladolid	41 39.0	4 43.0	695	980.111	
Vivero	43 39.0	7 35.0	12	980.553	
Suede, *see* Sweden.					
Suisse, *see* Switzerland.					
Svezia, *see* Sweden.					
Svizzera, *see* Switzerland.					
Sweden (2)					
Haparanda	65 49.7	24 9.6 E.	4	982.337	
Hernösand	62 37.8	17 57.0 E.	25	982.082	
Lund (Sternwarte)	55 41.9	13 11.3 E.	32	981.564	
Stockholm (Sternwarte, base station)	59 20.6	18 3.5 E.	45	981.843	
Upsala (Sternwarte)	59 51.5	17 37.6 E.	20	981.910	
Switzerland (6, 23)					
Basel (base station)	47 33.6	7 34.8 E.	277	980.788	
Bern (Landestopographie)	46 56.5	7 26.8 E.	522	980.622	
Bironico	46 7.4	8 55.7 E.	473	980.580	
Brusio	46 15.3	10 7.7 E.	721	980.429	
Burgdorf (Technikums)	47 3.5	7 37.2 E.	558	980.633	
Chanrion (Klubhütte)	45 56.3	7 22.9 E.	2435	980.107	+0.113
Eggishorn (Hotel Jungfrau)	46 25.2	8 6.8 E.	2187	980.169	+0.086
Frauenfeld (Kantonsschule)	47 33.3	8 54.2 E.	431	980.703	
Fribourg (Universität)	46 47.6	7 9.4 E.	633	980.584	
Gornergrat	45 59.0	7 46.8 E.	3016	979.992	+0.165
Grand St. Bernard	45 52.1	7 10.4 E.	2473	980.072	+0.131
Geneva (Sternwarte)	46 12.0	6 9.2 E.	402	980.592	
Gsteig (Hotel Sanetsch)	46 23.2	7 56.2 E.	1185	980.396	−0.001
Landquart (Schulhaus)	46 57.8	9 32.6 E.	520	980.523	
Lausanne (Ecole de Chimie et de Physique)	46 31.5	6 38.2 E.	531	980.599	
Les Verrières	46 54.3	6 28.8 E.	928	980.573	
Lungern (Schulhaus)	46 47.1	8 9.6 E.	714	980.515	
Luzern (Kantonsschule)	47 3.0	8 18.2 E.	434	980.626	
Neuchatel (Sternwarte)	47 0.1	6 57.3 E.	487	980.653	−0.026
Rivera	46 7.4	8 55.7 E.	473	980.580	
St. Maurice (Hotel du Simplon)	46 13.0	7 0.2 E.	422	980.512	−0.130
Simplonhospiz	46 14.9	8 1.9 E.	1998	980.202	+0.076
Sion (Collège)	46 14.1	7 21.5 E.	514	980.480	−0.082
Stilfserjoch, *see* Austria.					
Truns (Schulhaus)	46 44.6	8 59.4 E.	859	980.432	
Zermatt	46 1.5	7 45.0 E.	1603	980.250	−0.007
Zernez (Schloss)	46 42.0	10 5.8 E.	1473	980.308	
Zürich	47 22.7	8 33.1 E.	463	980.676	
Tcheco-Slovaquie, *see* Czechoslovakia.					

Station	Latitude	Longitude	h	g	TC
Ungarn, *see* Hungary.					
Ungheria, *see* Hungary.					
Yugoslavia (2)					
Marburg (Maribor)	46° 34′	15° 39′ E.	270	980.708	
Ragusa (Dubrovnik)	42 38.6	18 6 E.	47	980.394	
Serajevo	43 48.2	18 19.7 E.	511	980.382	
ASIA					
Giappône, *see* Japan.					
China (2)					
Hankow	30 35.5	114 17.5 E.	73(?)	979.369	
Hongkong	22 18.2	114 10.5 E.	33	978.771	
Port Arthur	38 47.9	121 22.3 E.	1	980.128	
Shasi	30 18.1	112 14.8 E.	122(?)	979.303	
Weihaiwei	37 30.0	122 11.0 E.	1	979.993	
Zikawei, Observatory	31 11.6	121 25.8 E.	4	979.437	
India (6, 9)					
Agra	27 10.3	78 1.1 E.	163	979.058	−0.018
Allahabad	25 25.9	81 55 E.	88	978.945	−0.021
Badnur	21 54.2	77 54.2 E.	641	978.609	+0.018
Chatra	24 12.7	88 23.4 E.	20	978.880	−0.019
Colaba	18 53.8	72 48.8 E.	10	978.633	0.000
Cuttack	20 29.1	85 52.0 E.	28	978.661	0.000
Dehra Dun	30 19.5	78 3.2 E.	682	979.065	−0.080
Dolhpur	26 42.0	77 54.8 E.	176	979.001	−0.015
Gesupur	28 33.0	77 42.0 E.	211	979.127	−0.025
Jacobabad	28 16.6	68 27.1 E.	56	979.188	−0.024
Jalpaiguri	26 31.3	88 44.2 E.	82	978.924	−0.093
Jubbulpore	23 8.9	79 59 E.	447	978.721	−0.002
Kalianpur	24 7.2	77 39.3 E.	537	978.779	+0.011
Madras	13 4.1	80 14.9 E.	6	978.281	+0.040
Majhauli	26 17.8	83 58 E.	67	978.930	−0.037
Mian Mir	31 31.6	74 22.5 E.	216	979.385	−0.033
Moghal Sarai	25 17.0	83 6 E.	78	978.921	−0.024
Montgomery	30 39.8	73 6.3 E.	170	979.323	−0.019
Mussoorie (Camel's Back)	30 27.6	78 4.5 E.	2110	978.795	+0.032
Muzaffarpur	26 7.1	85 25 E.	55	978.936	−0.038
Quetta	30 12.2	67 0.7 E.	1682	978.853	+0.024
Raipur	21 13.9	81 41 E.	304	978.614	+0.001
Rajpur	30 24.2	78 5.8 E.	1012	979.004	−0.066
Sandakphu Peak	27 6.1	88 0.2 E.	3586	978.192	+0.141
Yercaud	11 46.9	78 12.5 E.	1369	977.910	+0.116
Japan (2, 6)					
Aomori	40 49	140 45 E.	1	980.325	
Chofu	34 0	131 0 E.	6	979.691	
Fukushima	37 45	140 27 E.	67	980.022	
Fukuyama	34 30	133 22.5 E.	3	979.711	
Hachinohe	40 31	141 30 E.	21	980.359	+ .049
Hamada	34 54	132 6 E.	3	979.768	
Hamamatsu	34 42.9	137 43 E.	31	979.750	
Himeji	34 50.1	134 42 E.	16(?)	979.754	
Kamakura	35 19.2	139 34 E.	13	979.779	
Kofu	35 39	138 35 E.	270	979.719	
Kurume	33 19.3	130 31.6 E.	11	979.618	
Kyoto	35 1.6	135 47.1 E.	55	979.727	
Matsue	35 30	133 3 E.	23	979.812	
Matsuyama	33 50	132 45 E.	19	979.607	
Mizusawa	39 8.1	141 8 E.	61	980.159	
Nagasaki	32 44.7	129 52.3 E.	30	979.594	
Nagoya	35 10.4	136 53 E.	14	979.756	
Nikko	36 44	139 38 E.	649	979.780	
Okazaki	34 57.4	137 10 E.	25	979.764	
Shizuoka	34 58.4	138 23 E.	23	979.753	
Tokyo (base station)	35 42.6	139 46.0 E.	18	979.801	
Tsukuba	36 13.4	140 5.8 E.	870	979.781	
Uwajima	33 13	132 34.5 E.	2	979.597	
Wakayama	34 14.2	135 11.0 E.	3	979.704	
Yamada	34 29.6	136 42.8 E.	4	979.727	
Yamagata	38 15	140 16 E.	153	980.027	
Siam (2, 3, 6)					
Bankok	13 43.9	100 29.4 E.	7	978.278	
Siberia, (*see* Russia, p. 398).					
Turkestan (2, 6)					
Derbent, Bokhara	38 12.0	67 3.2 E.	1012	979.672	
Kala Khum, Bokhara	38 27.3	70 46.5 E.	1345	979.462	−0.086
Samarkand	39 39.1	66 58.7 E.	719	979.883	
Sultan-Bend	37 7.5	62 28.0 E.	272	979.798	
Tashkent	41 19.5	69 17.7 E.	478	980.086	
Chardzhui (International Latitude Station)	39 6.2	63 36.1 E.	192	980.01[illegible]	

Station	Latitude	Longitude	h	g	TC
AFRICA					
Egypt and Anglo-Egyptian Sudan (10)					
Abu Hamed	19° 32.0′	33° 19.9′E.	339	978.538	
Aswan	24 5.1	32 53.1 E.	97	978.879	
Atbara	17 41.9	33 58.9 E.	354	978.421	
Helwan	29 51.5	31 20.4 E.	104	979.295	
Khartum	15 36.6	32 32.9 E.	383	978.308	
Luxor	25 43.1	32 39.3 E.	82	978.982	
Minia	28 5.8	30 45.5 E.	42	979.155	
Wadi Halfa	21 55.8	31 19.9 E.	126	978.728	
Red Sea (2)					
Aden	12 47.3	44 59.3 E.	5	978.327	
Harmil Island, Dahlak Archipelago Eritrea	16 28.8	40 8.7 E.	4	978.465	
St. John Island (Zebirget)	23 35.8	36 12.0 E.	6	979.026	
Mersa Dhiba	25 20.2	34 44.3 E.	2	979.007	
Sherm Sheikh (Sinai)	27 51.1	34 16.9 E.	2	979.174	
Suez	29 56.0	32 33.4 E.	3	979.307	
Sudan, *see* Egypt.					
Miscellaneous (2, 3)					
Algiers (Observatory)	36 44.8	3 3 E.	213	979.905	
Bizerta, Tunisia	37 16.4	9 52.5 E.	7	979.975	
Biskra, Algeria	34 50.9	5 43 E.	137	979.617	
Cape Town, U. S. Af. (Observatory)	33 56.1 S.	18 28.7 E.	11	979.657	
Dar-es-Salaam, Tanganyika Ter.	6 49.0 S.	39 18.0 E.	7	978.117	
Domjo Ndorobbo	3 08.8 S.	35 13.2 E.	1715	977.549	
Freetown, Sierre Leone	8 29.4	13 14.3	65	978.200	
E. Uasso Nyiro, Kenya	1 53.1 S.	36 8.2 E.	676	977.737	
Johannesburg, U. S. Af. (Observatory)	26 10.9 S.	28 4.5 E.	1805	978.553	
Kampo, Cameroons, Fr. Equat. Af.	2 21.2	9 49.6 E.	3	978.040	
Laghwat, Algeria	33 47.7	2 53 E.	755	979.356	
Langenburg, U. S. Af.	9 35.8 S.	34 8.6 E.	477	977.907	
Libreville, Gabon, Fr. Equat. Af.	0 22.3	9 27.2 E.	2	977.999	
Loanda, Angola, Portuguese W. Af.	8 48.6 S.	13 14.1 E.	4	978.212	
Lourenço Marques, Mozambique, Portuguese E. Af. (Observatory)	26 2.5 S.	32 19.8 E.	55	979.068	
Lüderitz Bay, Southwest Af.	26 38.8 S.	15 9.7 E.	2	979.103	
Monrovia, Liberia	6 19.0	10 48.8	41	978.165	
Mozambique, Portuguese E. Af.	15 2.1 S.	38 25 E.	3	978.451	
Ouled Rhamoun, Algeria	36 10.8	6 41 E.	687	979.709	
Pangani, Tanganyika Ter.	5 25.8 S.	38 58.8 E.	7	978.039	
Rio del Rey, Nigeria	4 43.5	8 38.3 E.	2	978.087	
Tangier, Morocco	35 46.5	5 48.6	63	979.737	
AUSTRALIA (2, 3, 19)					
Brisbane (Observatory)	27 28.0 S.	153 1.6 E.	40	979.148	
Hobart, Tasmania (Observatory)	42 53.6 S.	147 22.0 E.	58	980.441	
Melbourne (Observatory)	37 49.9 S.	144 58.5 E.	26	979.987	

Station	Latitude	Longitude	h	g	TC
Perth	31° 57.1′S.	115° 50.5′E.	58	979.378	
Sydney	33 51.7 S.	151 12.7 E.	43	979.680	
OCEANIC					
Atlantic Ocean and Mediterranean Sea (2, 3, 6, 18)					
Bastia, Corsica	42 41.2	9 27 E.	20	980.519	
Bridgetown, Barbados	13 4.3	59 36.5	2	978.340	
Catania, Sicily	37 30.2	15 4.7 E.	43	980.065	
Fornells, Balearic Islands	40 3.4	4 7.9 E.	7	980.283	
Ibiza, Balearic Islands	38 54.3	1 26.1 E.	3	980.146	
Jamestown, St. Helena	15 55 S.	5 43.7	10	978.712	+0.177
Karajak Glacier, Greenland	70 26.9	50 19.8	20	982.534	
Kingston, Jamaica	17 57.7	76 47.3	2	978.591	
Las Palmas, Canary Islands	28 7.0	15 26.0	8	979.385	
Palermo, Sicily	38 6.9	13 22.0 E.	20	980.069	
Palma de Mallorca, Balearic Islands	39 34.5	2 39.1 E.	23	980.179	
Ponta Delgada, Azores	37 43.8	25 40.8	4	980.143	
Reykjavik, Iceland	64 8.5	22 0.3	39	982.273	
St. George, Bermuda	32 21	64 40	2	979.806	+0.218
Santa Cruz de la Palma, Canary Islands	28 41.0	17 46.0	12	979.459	
Stromboli, Lipari Islands	38 48.2	15 14.1 E.	48	980.212	
Whales Point, Spitsbergen	77 30.4	20 58.8 E.	458(?)	982.899	
Valetta, Malta	35 53.8	14 31.3 E.	62	979.887	
Indian Ocean, *see* Pacific Ocean.					
Mediterranean Sea, *see* Atlantic Ocean.					
Pacific and Indian Oceans (2, 3, 6)					
Auckland, New Zealand	36 50.9 S.	174 46.2 E.	3	979.962	
Batavia, Java (Observatory)	6 11.0 S.	106 49.8 E.	7	978.178	
Hobart, Tasmania (Observatory)	42 53.6 S.	147 22.0 E.	58	980.441	
Honolulu, Territory of Hawaii (Observatory)	21 18.1	157 51.8	6	978.946	+0.162
Kudat, British North Borneo	6 53.0	116 50.7 E.	2	978.149	
Makassar, Celebes	5 7.3 S.	119 24.5 E.	2	978.138	
Manila, Philippines	14 34.7	120 38.6 E.	3	978.360	
Marau-Sound, Solomon Islands	9 49.1 S.	160 48.5 E.	3	978.349	
Mauna Kea, Hawaiian Islands	19 49.2	155 28.8	3981	978.069	+0.469
Numea, New Caledonia	22 16.6 S.	166 27.8 E.	2	978.877	
Singapore, Straits Settlements	1 16.5	103 50.3 E.	21	978.082	
Port Vila, Sandwich Island, New Hebrides	17 45.0 S.	168 19.0 E.	3	978.637	
Winter Quarters, Kaiser Wilhelm II Land	66 2.2 S.	89 38.1 E.	1	982.388	

Table 2.—Acceleration of Gravity at Sea-level (g_0)

$g_0 = 978.039\,(1 + 0.005294 \sin^2 \varphi - 0.000\,007 \sin^2 2\varphi)$*; Bowie (6). φ = latitude. Unit of g_0 is cm/sec^2. Basis: Potsdam system

φ	g_0 cm/sec^2	φ	g_0 cm/sec^2	φ	g_0 cm/sec^2	φ	g_0 cm/sec^2	φ	g_0 cm/sec^2	φ	g_0 cm/sec^2	φ	g_0 cm/sec^2	φ	g_0 cm/seco	φ	g_0 cm/seco
0° 00′	978.039	10° 00′	978.194	20° 00′	978.642	30° 00′	979.328	40° 00′	980.172	50° 00′	981.071	60° 00′	981.917	70° 00′	982.608	80° 00′	983.060
10	.039	10	.199	10	.652	10	.341	10	.186	10	.086	10	.930	10	.618	10	.065
20	.039	20	.205	20	.661	20	.354	20	.201	20	.100	20	.943	20	.628	20	.070
30	.039	30	.210	30	.671	30	.368	30	.216	30	.115	30	.956	30	.637	30	.075
40	.040	40	.215	40	.681	40	.381	40	.231	40	.130	40	.969	40	.647	40	.080
50	.040	50	.221	50	.691	50	.394	50	.246	50	.145	50	.982	50	.656	50	.085
1 00	978.041	11 00	978.227	21 00	978.701	31 00	979.407	41 00	980.261	51 00	981.160	61 00	981.995	71 00	982.665	81 00	983.089
10	.041	10	.232	10	.711	10	.420	10	.276	10	.174	10	982.008	10	.675	10	.094
20	.042	20	.238	20	.721	20	.434	20	.291	20	.189	20	.020	20	.684	20	.099
30	.043	30	.244	30	.731	30	.447	30	.306	30	.204	30	.033	30	.693	30	.103
40	.043	40	.250	40	.742	40	.460	40	.321	40	.218	40	.046	40	.702	40	.107
50	.044	50	.256	50	.752	50	.474	50	.336	50	.233	50	.058	50	.711	50	.112
2 00	978.045	12 00	978.262	22 00	978.762	32 00	979.487	42 00	980.350	52 00	981.248	62 00	982.071	72 00	982.720	82 00	983.116
10	.046	10	.268	10	.773	10	.501	10	.365	10	.262	10	.083	10	.729	10	.120
20	.048	20	.274	20	.783	20	.515	20	.380	20	.277	20	.096	20	.738	20	.124
30	.049	30	.280	30	.794	30	.528	30	.395	30	.292	30	.108	30	.746	30	.128
40	.050	40	.287	40	.804	40	.542	40	.410	40	.306	40	.121	40	.755	40	.132
50	.052	50	.293	50	.815	50	.555	50	.425	50	.321	50	.133	50	.764	50	.136
3 00	978.053	13 00	978.300	23 00	978.826	33 00	979.569	43 00	980.440	53 00	981.335	63 00	982.145	73 00	982.772	83 00	983.139
10	.055	10	.306	10	.837	10	.583	10	.455	10	.350	10	.157	10	.780	10	.143
20	.056	20	.313	20	.848	20	.597	20	.471	20	.364	20	.169	20	.789	20	.147
30	.058	30	.320	30	.859	30	.611	30	.486	30	.379	30	.182	30	.797	30	.150
40	.060	40	.327	40	.870	40	.624	40	.501	40	.393	40	.194	40	.805	40	.153
50	.062	50	.334	50	.881	50	.638	50	.516	50	.407	50	.206	50	.813	50	.157
4 00	978.064	14 00	978.341	24 00	978.892	34 00	979.652	44 00	980.531	54 00	981.422	64 00	982.218	74 00	982.821	84 00	983.160
10	.066	10	.348	10	.903	10	.666	10	.546	10	.436	10	.229	10	.829	10	.163
20	.068	20	.355	20	.914	20	.680	20	.561	20	.450	20	.241	20	.837	20	.166
30	.071	30	.362	30	.926	30	.694	30	.576	30	.465	30	.253	30	.845	30	.169
40	.073	40	.369	40	.937	40	.708	40	.591	40	.479	40	.265	40	.853	40	.172
50	.076	50	.377	50	.948	50	.722	50	.606	50	.493	50	.276	50	.861	50	.175
5 00	978.078	15 00	978.384	25 00	978.960	35 00	979.736	45 00	980.621	55 00	981.507	65 00	982.288	75 00	982.868	85 00	983.177
10	.081	10	.392	10	.971	10	.751	10	.636	10	.521	10	.300	10	.876	10	.180
20	.083	20	.399	20	.983	20	.765	20	.651	20	.536	20	.311	20	.883	20	.182
30	.086	30	.407	30	.994	30	.779	30	.666	30	.550	30	.322	30	.891	30	.185
40	.089	40	.415	40	979.006	40	.793	40	.681	40	.564	40	.334	40	.898	40	.187
50	.092	50	.423	50	.018	50	.807	50	.696	50	.578	50	.345	50	.905	50	.189
6 00	978.095	16 00	978.430	26 00	979.030	36 00	979.822	46 00	980.711	56 00	981.592	66 00	982.356	76 00	982.912	86 00	983.191
10	.098	10	.438	10	.042	10	.836	10	.726	10	.606	10	.368	10	.919	10	.193
20	.102	20	.446	20	.054	20	.850	20	.741	20	.620	20	.379	20	.926	20	.195
30	.105	30	.455	30	.065	30	.865	30	.757	30	.634	30	.390	30	.933	30	.197
40	.108	40	.463	40	.077	40	.879	40	.772	40	.648	40	.401	40	.940	40	.199
50	.112	50	.471	50	.090	50	.894	50	.787	50	.661	50	.412	50	.947	50	.201
7 00	978.115	17 00	978.479	27 00	979.102	37 00	979.908	47 00	980.802	57 00	981.675	67 00	982.423	77 00	982.953	87 00	983.202
10	.119	10	.488	10	.114	10	.922	10	.817	10	.689	10	.434	10	.960	10	.204
20	.123	20	.496	20	.126	20	.937	20	.832	20	.703	20	.444	20	.967	20	.205
30	.127	30	.505	30	.138	30	.951	30	.847	30	.716	30	.455	30	.973	30	.207
40	.131	40	.514	40	.151	40	.966	40	.862	40	.730	40	.466	40	.979	40	.208
50	.135	50	.522	50	.163	50	.981	50	.877	50	.744	50	.476	50	.986	50	.209
8 00	978.139	18 00	978.531	28 00	979.175	38 00	979.995	48 00	980.892	58 00	981.757	68 00	982.487	78 00	982.992	88 00	983.210
10	.143	10	.540	10	.188	10	980.010	10	.907	10	.771	10	.497	10	.998	10	.211
20	.147	20	.549	20	.200	20	.024	20	.922	20	.784	20	.508	20	983.004	20	.212
30	.152	30	.558	30	.213	30	.039	30	.937	30	.798	30	.518	30	.010	30	.213
40	.156	40	.567	40	.226	40	.054	40	.952	40	.811	40	.528	40	.016	40	.214
50	.160	50	.576	50	.238	50	.068	50	.967	50	.825	50	.539	50	.022	50	.215
9 00	978.165	19 00	978.585	29 00	979.251	39 00	980.083	48 00	980.981	59 00	981.838	69 00	982.549	79 00	983.027	89 00	983.215
10	.170	10	.594	10	.264	10	.098	10	.996	10	.851	10	.559	10	.033	10	.216
20	.174	20	.604	20	.277	20	.113	20	981.011	20	.865	20	.569	20	.038	20	.216
30	.179	30	.613	30	.290	30	.127	30	.026	30	.878	30	.579	30	.044	30	.216
40	.184	40	.623	40	.302	40	.142	40	.041	40	.891	40	.589	40	.049	40	.217
50	.189	50	.632	50	.315	50	.157	50	.056	50	.904	50	.598	50	.055	50	.217
																90 00	983.217

* This formula differs slightly (not over one in 100 000) from that proposed by Helmert (14) and quite extensively used. A table similar to this, but based on Helmert's formula is given by Albrecht (1).

D. VARIATION OF GRAVITY WITH ELEVATION AND DEPTH

Elevation; Free Air Method.—If there were no matter projecting above the geoid and the geoid were a smooth ellipsoid of revolution, then the value (g_H) of the acceleration of gravity (cm/sec^2) at a height H meters above the surface would be related [15, 16] to that (g_0) at the surface, as indicated by equation (1), in which φ is the latitude.

$$g_H = g_0 - (0.000\,308\,55 + 0.000\,000\,22\cos 2\varphi)H + 0.000\,072\left(\frac{H}{1000}\right)^2 \quad (1)$$

This is known as the free air correction. For most purposes it is sufficient to use the approximate formula (2).

$$g_H = g_0 - 0.000\,3086\,H \quad (2)$$

If g_0 is taken from Table 2, the value of g_H obtained for any station by the use of equation (1) will agree fairly well with the true acceleration, if the surrounding topography is not too rugged. In a fairly flat country, the difference will be considerably less than 0.1 cm/sec^2, except in very rare cases; and even in a mountainous country, the difference will ordinarily be less than 0.2 cm/sec^2. For stations below sea-level, but not below the surface of the earth, the same formulae apply; but for such stations, H is negative.

More Exact Methods.—In mountainous country, the computed value will be practically as close to the true value as in flat country if an additional term is added to the right hand side of equation (1), to take account of the elevation of the place above or below the general level of the topography within a radius of, say, approximately 160 km. For every 10 m the place in question is above the general level, this term amounts to 0.001 cm/sec^2, and for every 10 m below the general level, it amounts to -0.001 cm/sec^2. In computing the height of a coast station above the general level, the water must be considered replaced by an equal mass of rock, of average surface density, resting on the bottom of the ocean.

If it is desired to obtain a somewhat better value for the computed gravity at a place, the correction term just mentioned must be replaced by a correction for topography and isostatic compensation, computed by the method of John F. Hayford [12].

A somewhat larger error should be expected in the computed values of gravity on oceanic islands than on the continents. The rocks forming these islands are evidently somewhat heavier than normal in many cases, or the ocean is over-compensated, and the observed values of gravity are therefore usually larger than the computed values. In such cases, an error of 0.3 cm/sec^2, or possibly even 0.4 cm/sec^2 in computed values may be expected.

Depth.—As the density of the crust is less than two-thirds the mean density of the earth, the acceleration of gravity increases as we advance into the crust. The mean rate of increase is 0.000 0851 cm/sec^2 per meter of depth. The actual rate at any place depends upon the density of the crustal material in that locality, and is approximately given by the formula [13, 17]

$$g_d = g_0 + (0.000\,3086 - 0.000\,0837\rho)d \quad (3)$$

where g_d = acceleration of gravity (cm/sec^2) at the depth of d m, and ρ = density (g/cm^3).

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(For a key to the periodicals see end of volume)

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AERODYNAMICS

L. J. Briggs and H. L. Dryden

Problems in aerodynamics cannot be idealized with the same readiness as problems in mechanics. The side of a building may not be regarded as a thin, flat plate for the purpose of computing the force of the wind, and data for a cylinder of a particular length cannot be directly applied for computing the wind force on a cylinder of some other length. Nearby objects exert an influence which cannot be neglected.

Results obtained for a particular object can be applied strictly only to geometrically similar (definition 6) objects in similar surroundings. Many of the apparent discrepancies among the results of different experimenters are to be attributed to departures from geometrical similarity of the models, to the effects of the supports or other nearby objects, and to differences in the fine structure (turbulence) of the approximately steady air streams, rather than to errors in measuring the force or wind speed. It is not possible to discuss these matters in detail here, and there is no complete discussion available for reference.

SYMBOLS

A	Some specified area
A_r	Aspect ratio
C	A coefficient
C_{cp}	Coefficient of center of pressure
C_d	Coefficient of drag
C_l	Coefficient of lift
C_M	Moment coefficient (*see* paragraph on air foils)
C_N	Coefficient of force normal to the plane of reference
C_P	Coefficient of power (input)
C_{P0}	Coefficient of power out-put
C_Q	Coefficient of torque
C_{Q0}	Coefficient of torque load (output)
C_T	Coefficient of force parallel to the plane of reference
C_t	Coefficient of thrust
$C. P.$	Center of pressure
c	Length of chord of air-foil
D	Diameter
F	Resultant wind force
F_d	Drag = Component of F parallel to wind
F_f	Frictional force
F_l	Lift = Component of F normal to wind and to W
F_N	Component of F normal to the plane of reference
F_T	Component of F parallel to the plane of reference
F_t	Thrust of propeller
F_x	Any component of F
L	Some linear dimension
M	Moment of F about forward (leading) edge
N. A. C. A.	National Advisory Committee for Aeronautics, U. S. A.
n	Number of revolutions per second
P_0	Power developed (output)
P_i	Power input to propeller
P. R.	Pitch ratio
p	Pressure at a point on a surface
p_s	Static pressure of the air
Q	Torque
Q_0	Torque load (output)
q	Dynamic pressure, as indicated by Pitot tube (Fig. 1)
q_0	$\rho V^2/2$(= q if there is no compression of the air)
R	Reynold's number
S	That dimension of the plane of reference which is at right angles to the wind = Span
T	Temperature
t	Thickness
V	Air speed relative to point considered
V_i	Indicated air speed
W	Width = That dimension of plane of ref-

	ence which is normal to S; *i.e.*, makes least angle with wind	μ	Viscosity
x_c	Distance in the plane of reference, from the leading edge, or its projection to *C. P.*	ρ	Density of air when undisturbed by bodies moving relatively to it.
η	Efficiency	ρ_0	Conventionally chosen "standard" value of ρ
θ_A	Angle of attack	ϕ	A definite but unspecified mathematical function

DEFINITIONS

1. Angle of Attack (θ_A) is the angle which the direction of the wind makes with the plane of reference; it is positive if the wind strikes what is the under side of this plane when the body is in its usual position.

2. Aspect ratio (A_r) $= S/W$.

3. Center of pressure (*C. P.*) of a body is that point, in the plane of reference, about which the resultant moment of the pressures is zero.

4. Chord (c). See paragraph on airfoils.

5. Coefficient of center of pressure (C_{cp}).

$$C_{cp} = x_c/W; \text{ for airfoil, } C_{cp} = x_c/c.$$

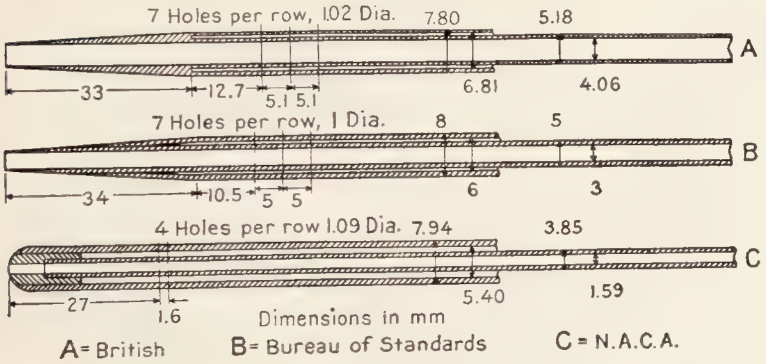


Fig. 1.—Standard Pitot-static tubes.

6. Geometrically similar systems. If two bodies together with their surroundings, are so related geometrically that one system corresponds exactly with a uniformly magnified image of the other, the two systems are said to be geometrically similar.

7. Indicated air speed (V_i) is defined by the relation $q = \rho V^2/2 = \rho_0 V_i^2/2$, where ρ_0 is the "standard" air density.

8. Mean temperature (T_m) of atmospheric air column below Z is that temperature for which the pressure at height Z in an isothermal column of air, pressure at bottom = 760 mm of mercury, would be that actually observed in the atmosphere at Z.

9. Pitch ratio $(P. R.)_x$ at any point of the blade of a propeller or of a wind-mill distant x from the axis of revolution is $(P. R.)_x = 2\pi x/D \tan \theta_x$, where D is the diameter of propeller or mill wheel, θ_x = angle which face of blade makes with plane of revolution. If $(P. R.)_x$ is independent of x, propeller has a constant pitch ratio; if θ_x is independent of x, it has a constant blade angle.

10. Reynold's number (R) $= VL\rho/\mu$, where L is some specified linear dimension. The choice of L depends upon the form of the object, and the problem. R is dimensionless.

CONSTANTS ASSUMED

Standard air density is $\rho_0 = 1.2255$ kg/m^3(= 0.002 377 slug/ft.^{3}), which is essentially that of dry air, with normal CO_2 content, at 15°C and one atmosphere.

$$\mu/\rho = 1.427 \times 10^{-5} \text{ m}^2\text{/sec } (= 1.535 \times 10^{-4} \text{ ft.}^2\text{/sec}).$$

For geometrically similar systems $F_x = qL^2\phi(R) = CAq$ [43], where ϕ is independent of the actual size of the system, and q is the value of the dynamic pressure at some specified point. C is a function only of R and of the geometrical form of the system; its value is the same in every self-consistent system of units, and is independent of the actual size of the system. The data in the following tables and graphs apply when all surrounding bodies are so far removed from the one considered that they produce no effect upon F_x.

Reduction of Observations.—To obtain true air speed from speed recorded by cup anemometer, use Table 1. Aerodynamic data are usually reduced to a standard air density (ρ_0). For q, this reduction can be effected by replacing the true air speed (V) by the indicated air speed (V_i) (definition 7), and in most cases the same procedure is amply sufficient for C. *Example:* If V = 100 ft./sec in air at 30°C and 754 mm of mercury, V/V_i = 1.030 (Fig. 2); hence V_i = 97.1 ft./sec and q_0 = 11.20 lb./ft.^{2} (Table 2). Owing to isentropic compression of air at this speed, the actual dynamic pressure (q) is 11.20/0.998 (Table 3) = 11.22 lb./ft.^{2} = 54.78 kg/m^2.

As a basis for the calibration of altimeters, and for use in the comparison of the performances of aircraft, it is assumed that (1) below a certain altitude (Z_i), the rate of decrease (a) of the temperature (T) with the altitude is a constant; (2) above Z_i, $a = 0$; (3) at $Z = 0$, pressure $= p_0$, temperature $= T_0$. The temperature at $Z_i = T_i$; the mean temperature below Z is T_m. All temperatures are reckoned from absolute zero. Then, if $Z < Z_i$, $T_m = aZ/\log_e(T_0/T)$; if $Z > Z_i$, $T_m = Z/\left(\frac{1}{a}\log_e\frac{T_0}{T_i} + \frac{Z - Z_i}{T_i}\right)$, and for any value of Z, $Z = K\frac{T_m}{T_0}\log_{10}\left(\frac{p_0}{p}\right)$.

The values of these constants define what is called the "standard" atmosphere. There is not entire agreement regarding the values which best represent the average atmospheric condition [28]. Those adopted by the governmental aeronautic organizations of the U. S. A. and by many of those of Europe are T_0 = 288°C, T_i = 218°C, p_0 = 760 mm of mercury, a = 6.500 × 10^{-3}°C/m (= 1.9812 × 10^{-3}°C/ft.), Z_i = 10769 m (= 35332 ft.), K = 19413.3 m (= 63691.8 ft.). These differ slightly from those adopted by the International Commission for Aerial Navigation (see p. 72).

Table 1.—Robinson Cup Anemometer*

True air speed = V; recorded speed = V_r. If unit is 1 mi./hr, $\log_{10} V = 0.079 + 0.9012 \log_{10} V_r$.

Unit is 1 mi./hr = 1.467 ft./sec = 0.4470 m/sec

V_r	V	V_r	V	V_r	V	V_r	V
1	1.20	26	22.6	51	41.5	76	59.4
2	2.24	27	23.4	52	42.2	77	60.1
3	3.23	28	24.2	53	42.9	78	60.8
4	4.18	29	24.9	54	43.7	79	61.5
5	5.12	30	25.7	55	44.4	80	62.2
6	6.03	31	26.5	56	45.1	81	62.9
7	6.93	32	27.3	57	45.9	82	63.6
8	7.81	33	28.0	58	46.6	83	64.3
9	8.69	34	28.8	59	47.3	84	65.0
10	9.55	35	29.5	60	48.0	85	65.7
11	10.4	36	30.3	61	48.7	86	66.4
12	11.3	37	31.1	62	49.5	87	67.1
13	12.1	38	31.8	63	50.2	88	67.8
14	12.9	39	32.6	64	50.9	89	68.5
15	13.8	40	33.3	65	51.6	90	69.2
16	14.6	41	34.1	66	52.3	91	69.9
17	15.4	42	34.8	67	53.0	92	70.6
18	16.2	43	35.6	68	53.8	93	71.3
19	17.0	44	36.3	69	54.5	94	72.0
20	17.8	45	37.1	70	55.2	95	72.7
21	18.6	46	37.8	71	55.9	96	73.4
22	19.4	47	38.5	72	56.6	97	74.0
23	20.2	48	39.3	73	57.3	98	74.7
24	21.0	49	40.0	74	58.0	99	75.4
25	21.8	50	40.7	75	58.7	100	76.1

* U. S. Weather Bureau type; diameter of cups = 4 in.; centers of cups are 6.72 in. from axis; V_r = 3 times linear speed of centers of cups [3, 82, 83].

TABLE 2.—DYNAMIC PRESSURE ($q = q_0$) FOR INDICATED AIR SPEED V_i

Air compression is negligible, and $q = q_0 = \rho_0 V_i^2/2$ if $V_i < 30$ m/sec (=100 ft./sec); for greater speeds, q exceeds q_0, see Table 3. Metric units are m, kg, sec. English units are ft., lb., sec. 1 lb./ft.^{2} = 4.882 kg/m^2; 1 ft./sec = 0.3048 m/sec.

Metric	V_i	English	Metric	V_i	English	English							
q_0		q_0	q_0		q_0	V_i	q_0	V_i	q_0	V_i	q_0	V_i	q_0
0.063	1	0.00119	42.25	26	0.8038	51	3.093	76	6.868	101	12.13	126	18.88
0.250	2	0.00476	45.56	27	0.8668	52	3.215	77	7.050	102	12.37	127	19.18
0.562	3	0.01070	49.00	28	0.9322	53	3.340	78	7.234	103	12.61	128	19.48
1.00	4	0.0190	52.56	29	0.9999	54	3.467	79	7.421	104	12.86	129	19.79
1.56	5	0.0297	56.25	30	1.070	55	3.597	80	7.610	105	13.11	130	20.09
2.25	6	0.0428	60.06	31	1.143	56	3.729	81	7.801	106	13.36	131	20.40
3.06	7	0.0583	64.00	32	1.218	57	3.863	82	7.995	107	13.61	132	20.72
4.00	8	0.0761	68.06	33	1.295	58	4.000	83	8.191	108	13.87	133	21.03
5.06	9	0.0963	72.25	34	1.374	59	4.139	84	8.390	109	14.13	134	21.35
6.25	10	0.1189	76.56	35	1.457	60	4.280	85	8.591	110	14.39	135	21.67
7.56	11	0.1438	81.00	36	1.541	61	4.424	86	8.794	111	14.65	136	21.99
9.00	12	0.1712	85.56	37	1.628	62	4.571	87	9.000	112	14.91	137	22.32
10.56	13	0.2009	90.25	38	1.717	63	4.719	88	9.208	113	15.18	138	22.64
12.25	14	0.2330	95.06	39	1.808	64	4.870	89	9.418	114	15.45	139	22.97
14.06	15	0.2675	100.0	40	1.902	65	5.024	90	9.631	115	15.72	140	23.30
16.00	16	0.3044	105.1	41	1.999	66	5.179	91	9.846	116	16.00	141	23.64
18.06	17	0.3436	110.3	42	2.097	67	5.337	92	10.06	117	16.28	142	23.97
20.25	18	0.3852	115.6	43	2.198	68	5.498	93	10.28	118	16.56	143	24.31
22.56	19	0.4292	121.0	44	2.302	69	5.661	94	10.51	119	16.84	144	24.66
25.00	20	0.4756	126.6	45	2.408	70	5.826	95	10.73	120	17.12	145	25.00
27.56	21	0.5243	132.2	46	2.516	71	5.994	96	10.96	121	17.41	146	25.34
30.25	22	0.5755	138.1	47	2.627	72	6.164	97	11.18	122	17.70	147	25.69
33.06	23	0.6290	144.0	48	2.739	73	6.336	98	11.42	123	17.99	148	26.04
36.00	24	0.6849	150.1	49	2.855	74	6.511	99	11.65	124	18.28	149	26.40
39.06	25	0.7431	156.3	50	2.973	75	6.688	100	11.89	125	18.58	150	26.75

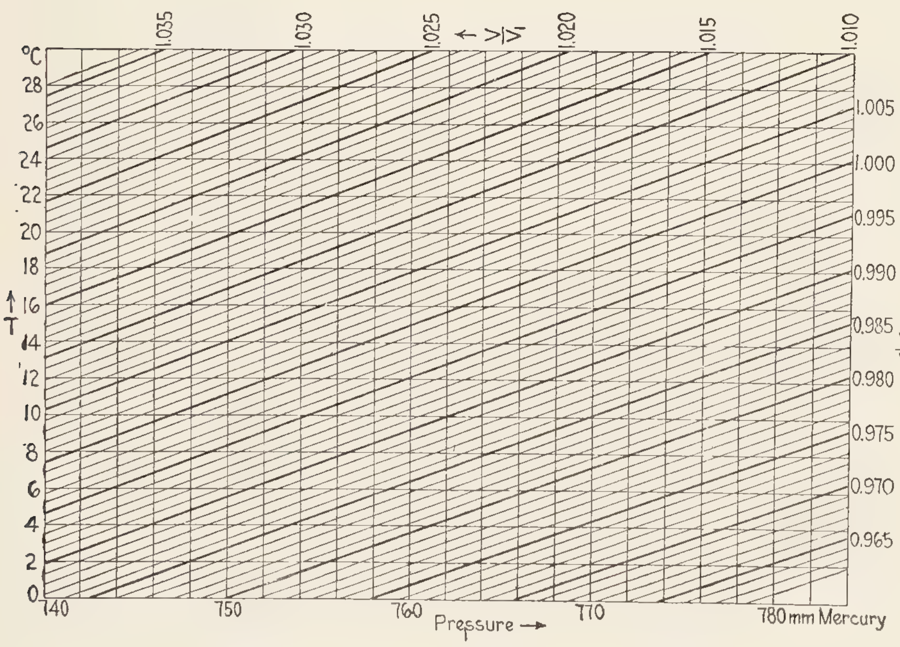


FIG. 2.—Ratio of true air speed (V) to indicated air speed (V_i).

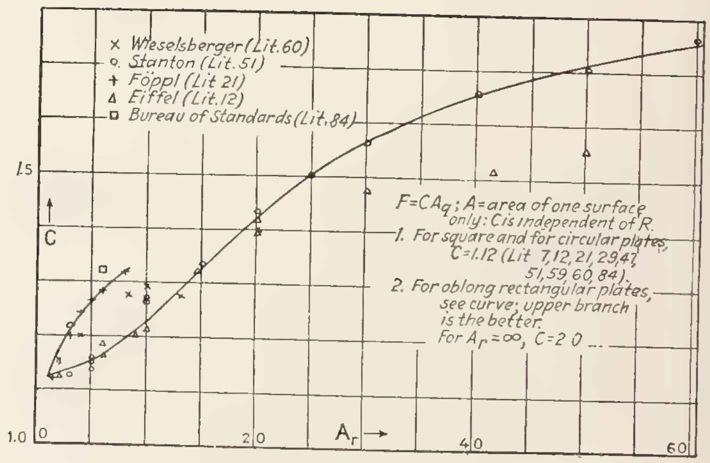


FIG. 3.—Air force: flat plates normal to wind.

TABLE 3.—CORRECTION FOR ISENTROPIC COMPRESSION (63)

Metric (M) unit of V = 1 m/sec; English (E) = 100 ft./sec

V		$\rho v^2/2q$	V		$\rho v^2/2q$
E	M	$= q_0/q$	E	M	$= q_0/q$
1	30	0.998	6	183	0.931
2	61	0.992	7	213	0.907
3	91	0.982	8	244	0.881
4	122	0.969	9	274	0.852
5	152	0.951	10	305	0.822

TABLE 4.—WIND PRESSURE ON STRUCTURES

Reference plane (see below) is normal to wind. $F_N = C_N A q$; A = area of projection of object upon reference plane

Unit of F_N/A = 1 lb./ft.^{2} = 4.88 kg/m^2

Object	C_N	F_N/A*
1. Long flat plate	2	30
2. Square flat plate	1.1	16
3. Rectangular prism (1:1:5) (75)	1.6	24
4. Long cylinder	0.8	12
5. Short cylinder	0.7	10

* For V = 76 mi. per hr (=34m/per sec) true speed = 100 mi. per hr recorded by Robinson anemometer.

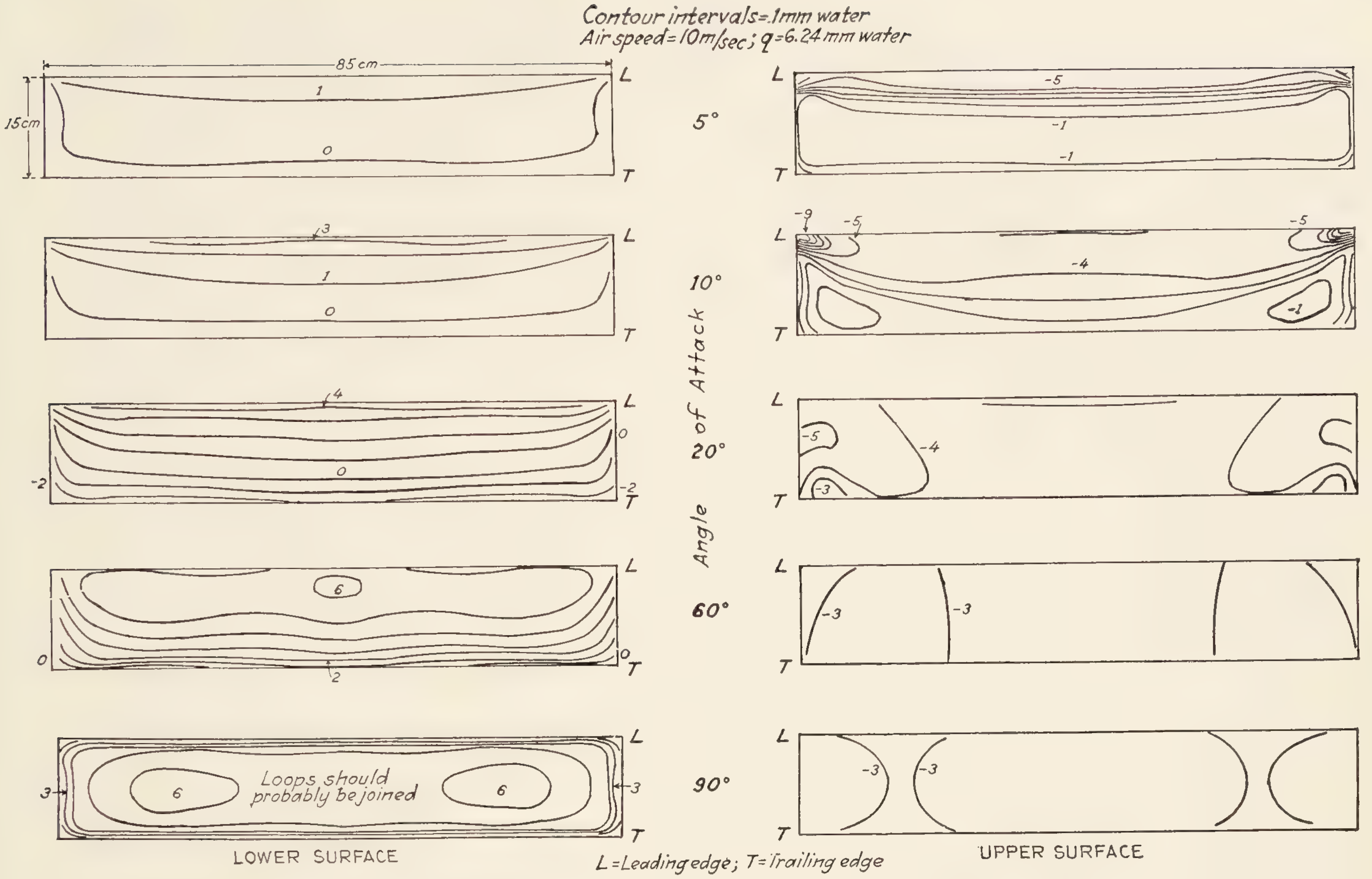


FIG. 4.—Pressure distribution: oblong, rectangular plate, inclined (12, 13).

Wind Pressure on Structures.—One must consider (1) maximum wind speed to which the structure will be subjected, (2) the value of the coefficient C_N, and (3) the effective exposed area. The first and the third depend upon local conditions; in the third, shielding effects are very important. The value of C_N should be determined from observations upon a model of the actual structure, as experiments upon flat plates are of little value for this purpose. Opinions differ regarding whether, in gusty winds, the maximum value of F_N is determined by the average or by the maximum value of V (20, 52). Approximate values of C_N for certain typical cases are given in Table 4, where reference plane for flat plate is surface of plate; for prism, its largest face; for cylinder, the plane through axis and normal to that which contains axis and direction of wind. Object (1) is comparable to such structures as wireless masts and long narrow bridge girders; (2) to thin square signboards; (3) to tall buildings; (4) to chimneys; (5) to cylindrical water tanks.

TABLE 5.—SURFACE FRICTION (F_f) ON THIN FLAT PLATES
(Standard density and viscosity)

F_f (= $\int f dA$) = 0.0375 $AqR^{-0.15} = F_0AK_wK_v$ (5,61) where A = total area (both sides) exposed to air stream, F_0 is a factor depending upon the density and viscosity of the air and upon the units employed, and K_w and K_v are numerical factors determined, respectively, by the width (W) of the plate in the direction of the stream, and by the speed (V). F_0 is independent of the ratio S/W, provided $0.5 < (S/W) < 2$; if $S/W = 30$, F_0 is 10% less than the value given in the table. For effect of roughness (it is great), and for variation of f from point to point see (22, 24, 32, 53, 54, 55, 62).

English units $F_0 = 0.0420$ lb./ft.² Unit of F_f = 1 lb.; of A = 1 ft.²; of V = 1 ft./sec				Metric units $F_0 = 0.0311$ kg/m² Unit of F_f = 1 kg; of A = 1 m²; of V = 1 m/sec			
W	K_w	V	K_v	W	K_w	V	K_v
1	1.413	10	0.014	1	1.000	10	1.000
2	1.273	20	0.051	2	0.901	20	3.605
3	1.198	30	0.108	3	0.848	30	7.633
4	1.147	40	0.184	4	0.812	40	13.00
5	1.110	50	0.277	5	0.786	50	19.64
6	1.080	60	0.389	6	0.764	60	27.52
7	1.055	70	0.517	7	0.747	70	36.60
8	1.034	80	0.662	8	0.732	80	46.85
9	1.016	90	0.823	9	0.719	90	58.26
10	1.000	100	1.000	10	0.708	100	70.80
11	0.986	110	1.193	11	0.698	110	84.45
12	0.973	120	1.401	12	0.689	120	99.19
13	0.961	130	1.625	13	0.681	130	115.0
14	0.951	140	1.864	14	0.673	140	131.9
15	0.941	150	2.117	15	0.666	150	149.9
20	0.901	160	2.386	20	0.638	160	168.9
30	0.848	170	2.669	30	0.600	170	188.9
40	0.812	180	2.967	40	0.575	180	210.0
50	0.786	190	3.279	50	0.556	190	232.1
100	0.708	200	3.605	100	0.501	200	255.2

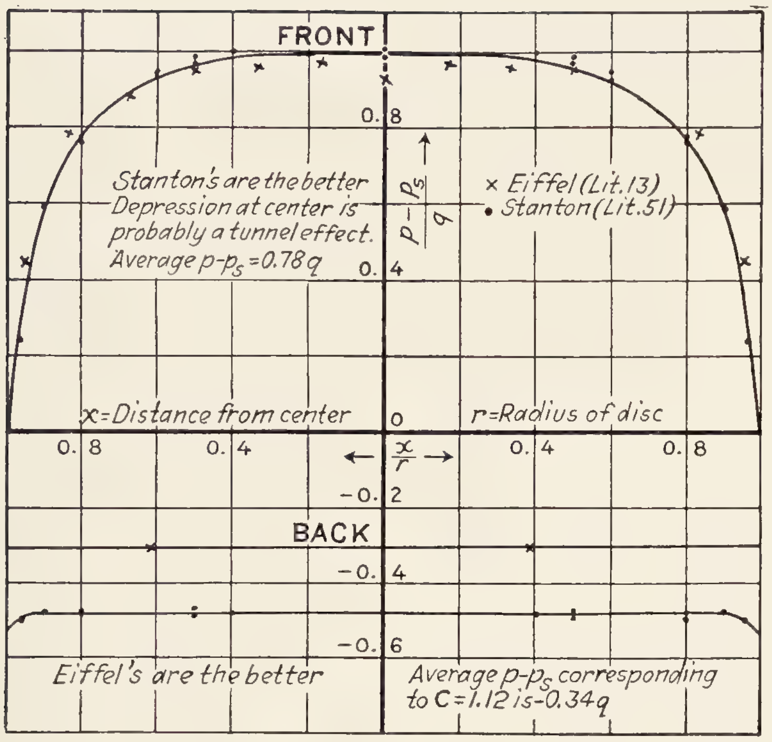


FIG. 5.—Pressure distribution: thin circular disc normal to wind.

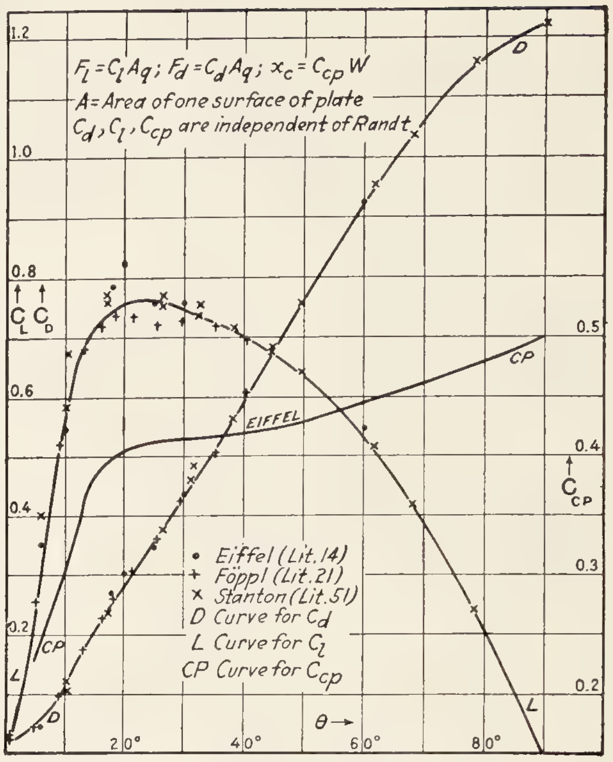


FIG. 7.—Coefficients: inclined, rectangular plates, $A_r = 3$. (See Table 6.)

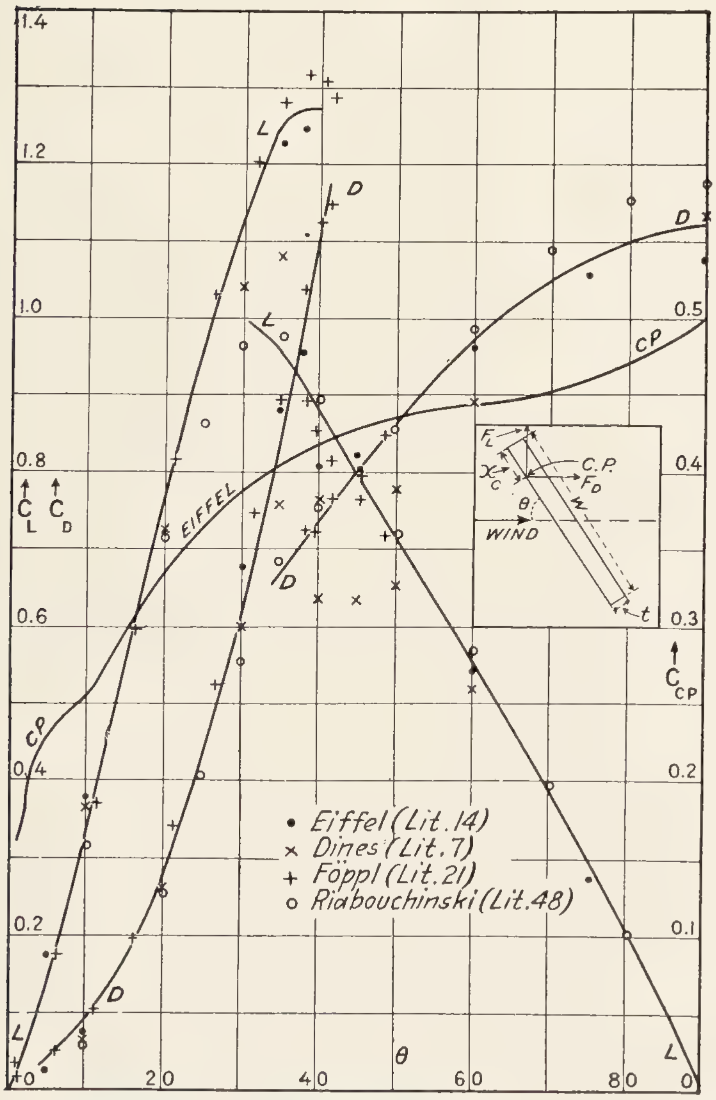


FIG. 6.—Coefficients: square, inclined plates. (See Table 6; for notation, v. Fig. 7.)

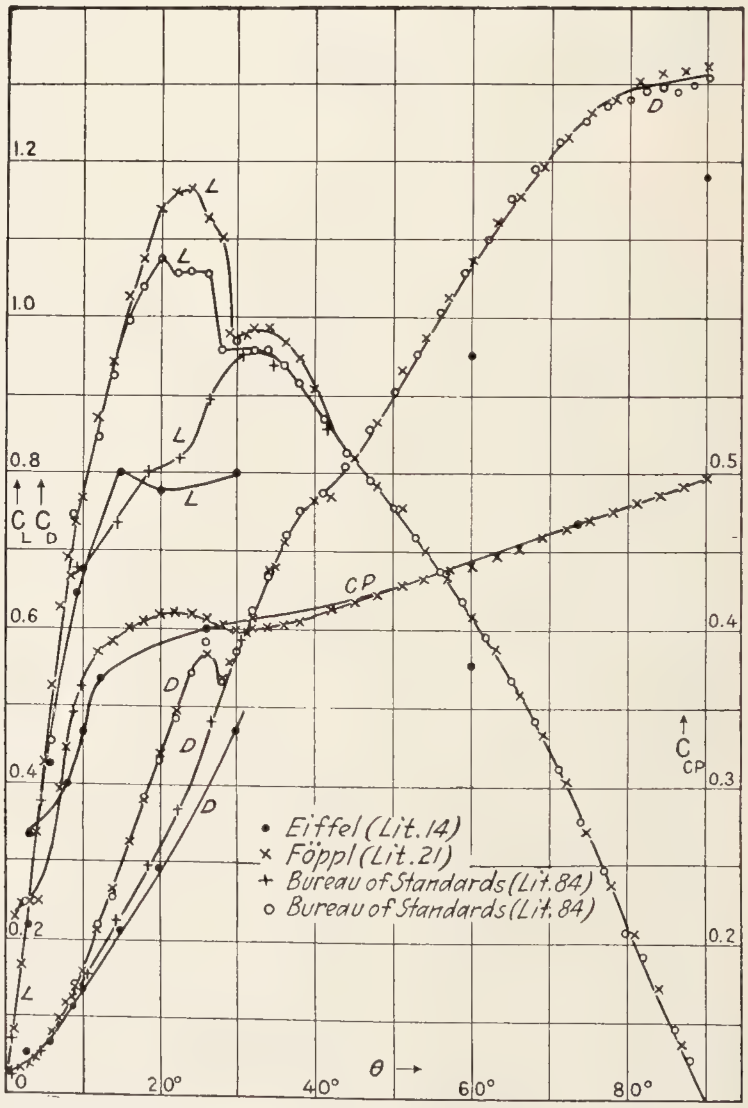


FIG. 8.—Coefficients: inclined rectangular plates, $A_r = 6$. (See Table 6; for notation, v. Fig. 7.)

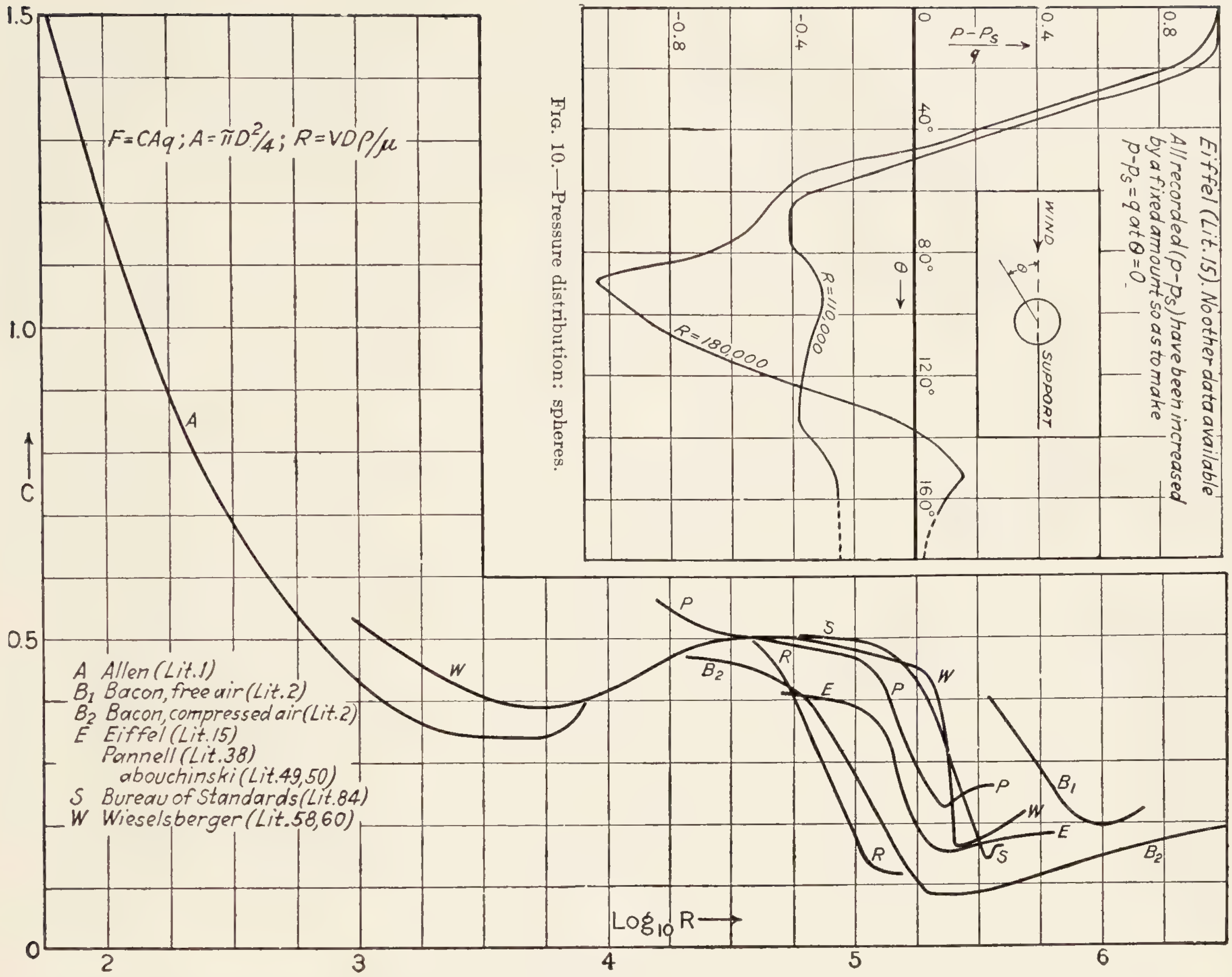


Fig. 10.—Pressure distribution: spheres.

Fig. 9.—Air force: spheres.

Table 6.—Experimental Data; Figures 6, 7, 8

Unit of S and W = 1 cm; of t = 1 mm; of TD = 1 m; of R† = 1000

	Fig. 6				Fig. 7			Fig. 8			
	.	×	+	0	.	×	+	.	×	+	0
S	25	30.5	12	12	45	7.6	36	90	30.5	72	30.5
W	25	30.5	12	12	15	2.5	12	15	5.08	12	5.08
t	3	3.18	1.7		3	0.25	1.7	3	1.17	1.7	1.29
TD*	1.5	∞	2.0	1.2	1.5	0.6	2.0	1.5	1.37	2.0	1.37
R	210	382	55	42	126	10	55	126	64	55	64

* TD = tunnel diameter.
† R is dimensionless.

The flow about a sphere is extremely sensitive to slight changes in the method of support, and to the condition of turbulence of the air stream. Changes in C are associated with changes in the locus of the points at which the smooth flow leaves the surface, forming a highly turbulent region to the rear. The location of this locus is determined solely by the irregularities in the air stream, as there are no sharp edges or other geometrical feature which might serve to fix it.

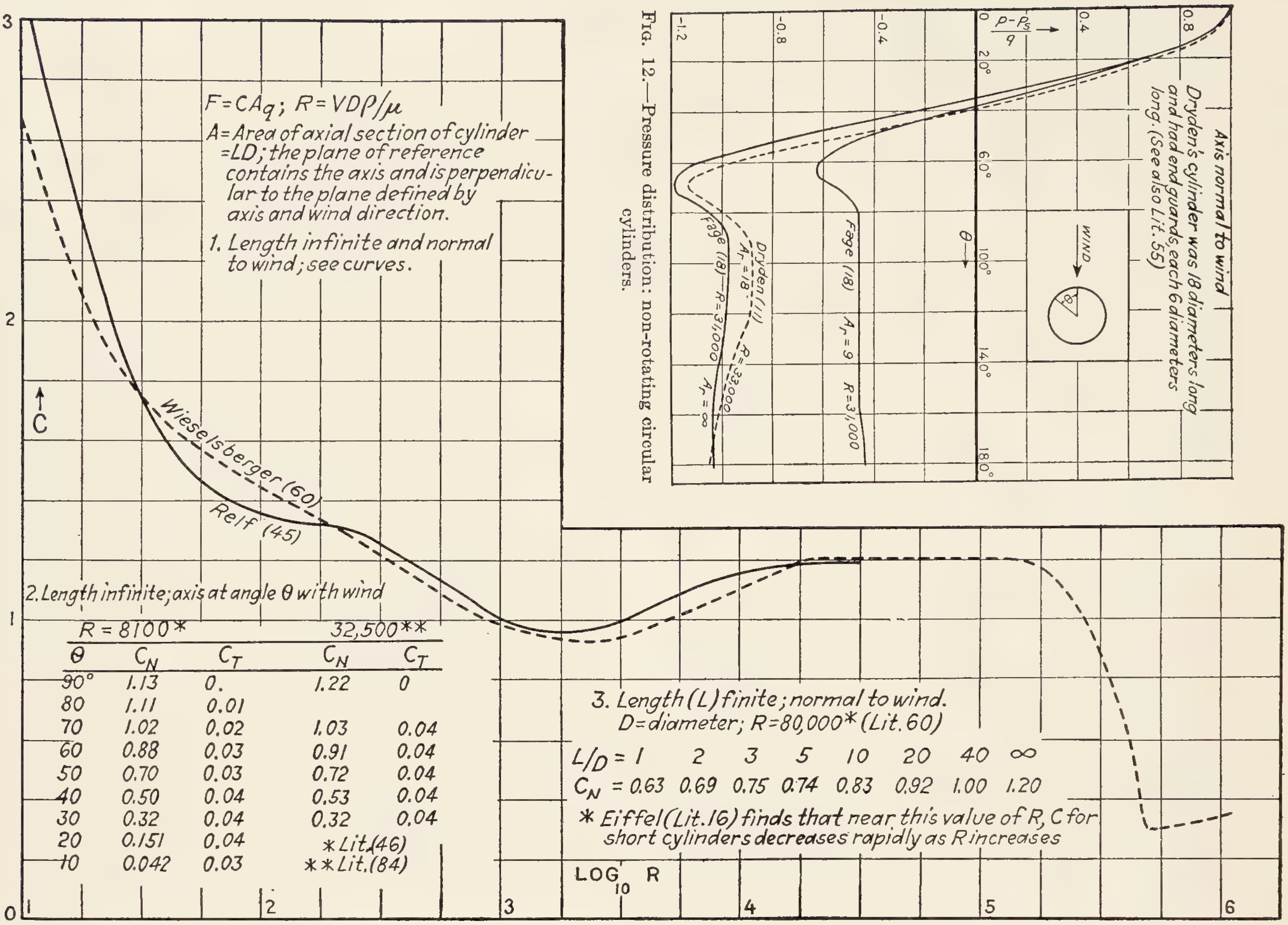
Airfoils.—Aerodynamical characteristics are specified in the same manner as are those of plates. An airfoil's area and angle of attack are conventionally defined with reference to some specified plane. The area of the airfoil is defined as that of its normal projection upon this plane of reference. The length (c) of the projection upon this plane of any fore-and-aft section of the airfoil is called the chord of that section; it is the unit in terms of which all dimensions of that section are expressed. The form of the section is specified by the rectangular coordinates of points upon its boundary; the choice of axes is immaterial, although usually one axis is in the plane of reference. The aspect ratio (A_r) of the airfoil is defined as the ratio of length of span (S) to length of the chord. In addition to the coefficients considered for plates, the moment coefficient $C_M = M/(qAc)$, and the lift-drag ratio (F_l/F_d) are also of importance.

Data are usually given for $A_r = 6$. If $A_r > 3$, then for a given C_l, $\theta_A = \theta'_A + C_l/\pi A_r$ radians, and $C_d = C'_d + C^2_l/\pi A_r$; θ'_A and C'_d are values of θ_A and C_d when $A_r = \infty$; $C_l/\pi A_r$ and $C^2_l/\pi A_r$ are called the induced angle of attack and the induced coefficient of drag, respectively [25, 26, 42, 72].

For airfoils, C_l increases slightly, and C_d decreases very appreciably, as R is increased; C_{cp} remains unchanged. The difference between the values of the coefficients for airfoils of the size used on aircraft and those for models of the size generally employed in laboratory tests, depends upon the form of the airfoil; for a thin, low cambered section (*RAF* 15), it is small; for a highly cambered section, it is large.

For the effects produced by placing one airfoil near another, as in a biplane combination see [26, 27, 36, 42, 74].

For a complete airplane, the drag introduced by the body, and the moment of tail lift, both vary appreciably with the size of the airplane [6, 67, 73].



	R = 8100*		32,500**	
θ	C_N	C_T	C_N	C_T
90°	1.13	0.	1.22	0
80	1.11	0.01		
70	1.02	0.02	1.03	0.04
60	0.88	0.03	0.91	0.04
50	0.70	0.03	0.72	0.04
40	0.50	0.04	0.53	0.04
30	0.32	0.04	0.32	0.04
20	0.151	0.04	* Lit. (46)	
10	0.042	0.03	** Lit. (84)	

Fig. 12.—Pressure distribution: non-rotating circular cylinders.

Fig. 11.—Air force: non-rotating circular cylinders.

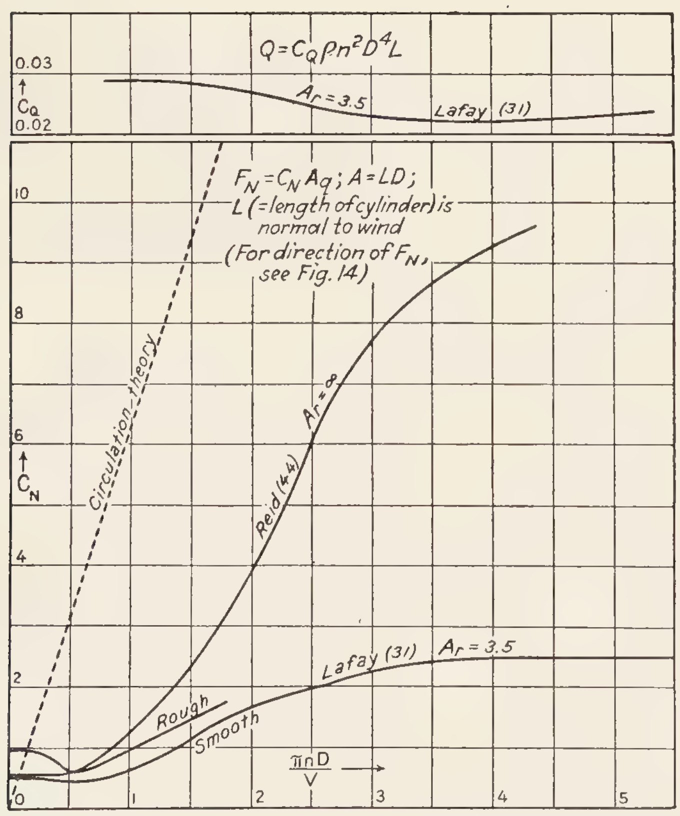


Fig. 13.—Air force: rotating circular cylinders (Magnus effect).

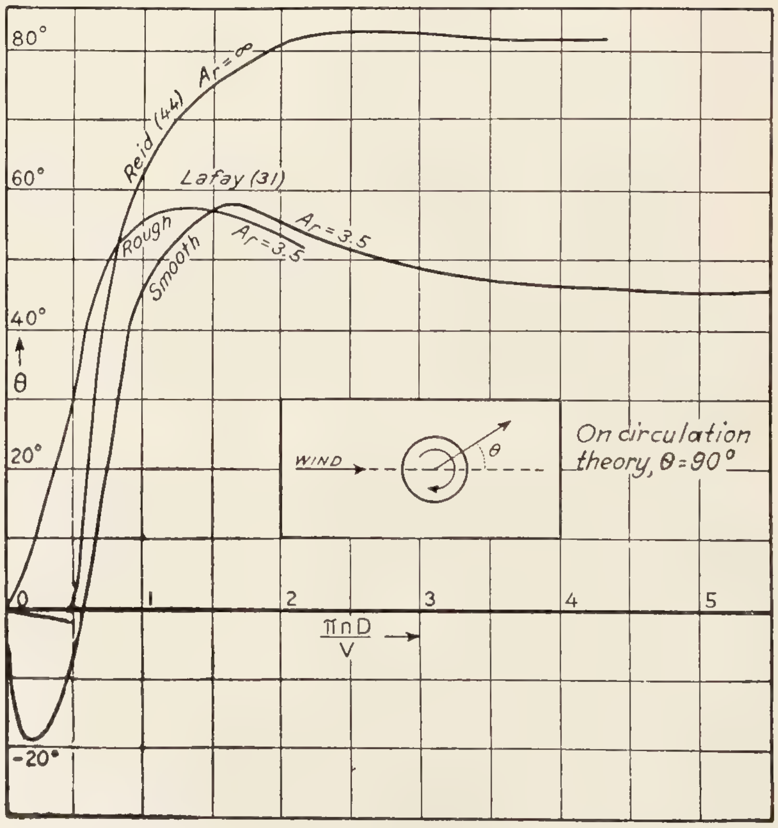


Fig. 14.—Direction of air force: rotating circular cylinders (Magnus effect).

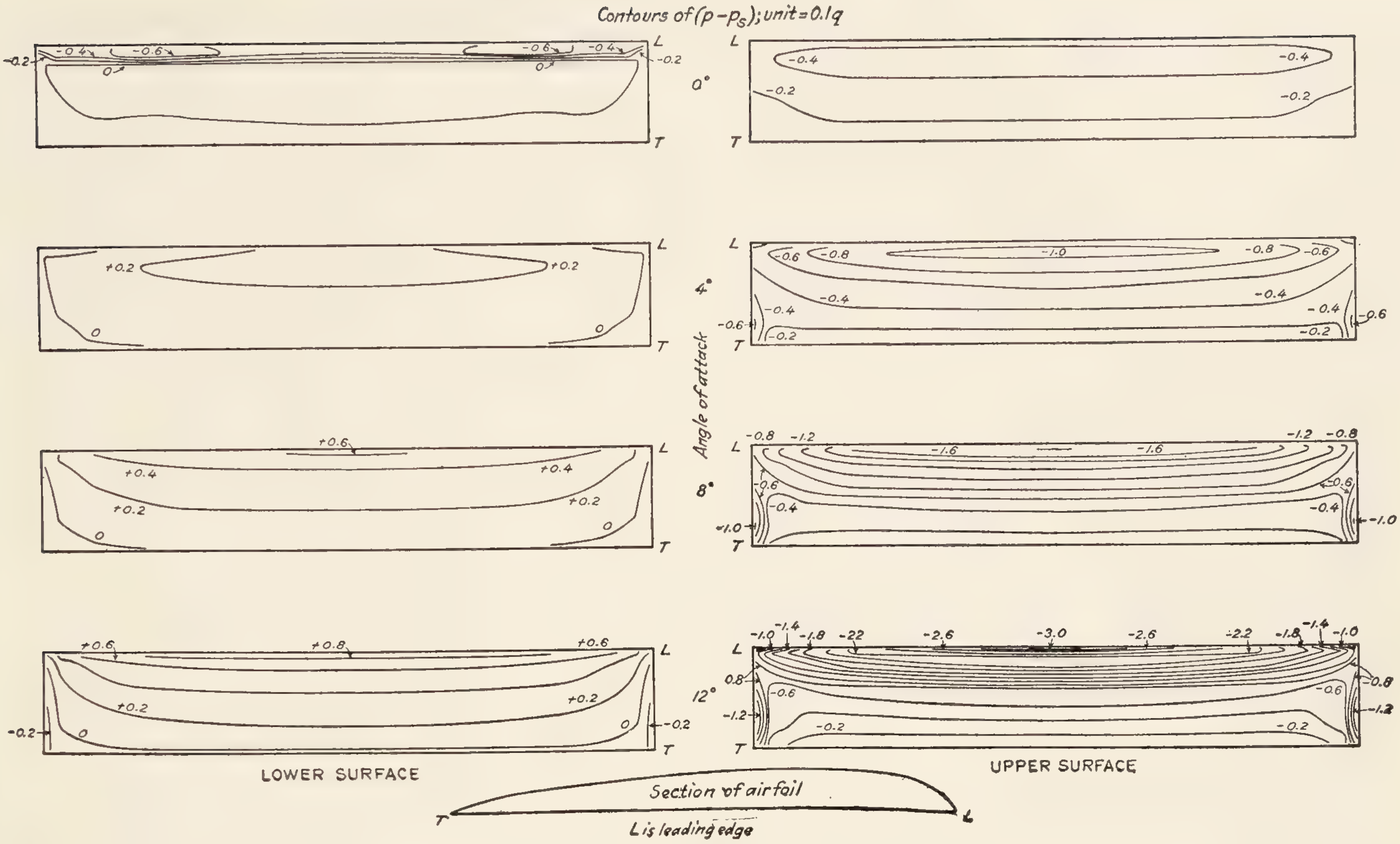


Fig. 15.—Pressure distribution: airfoil (30).

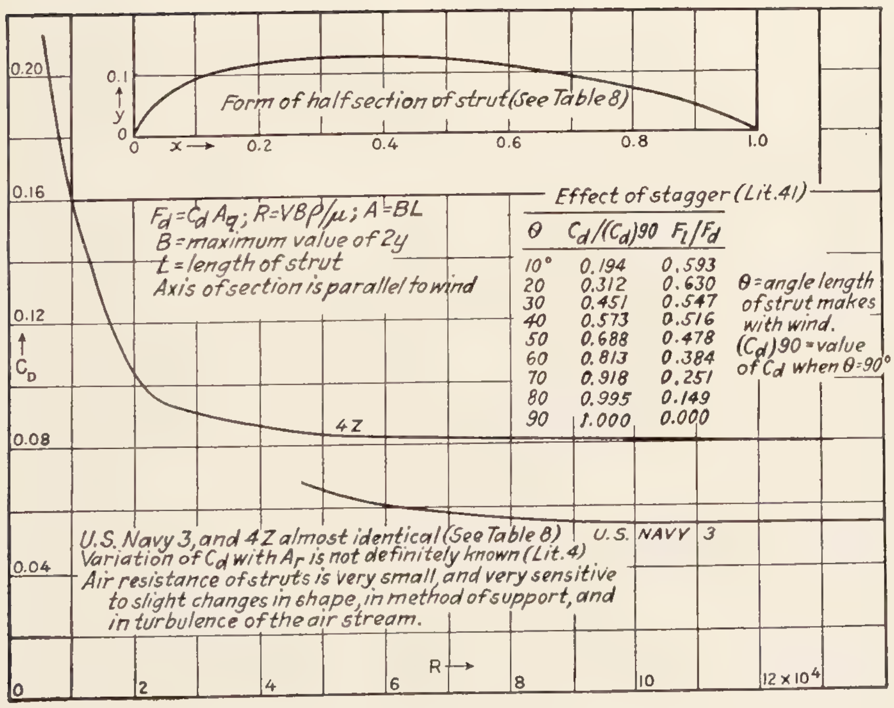


Fig. 16.—Air force on long struts (40, 64, 78, 79).

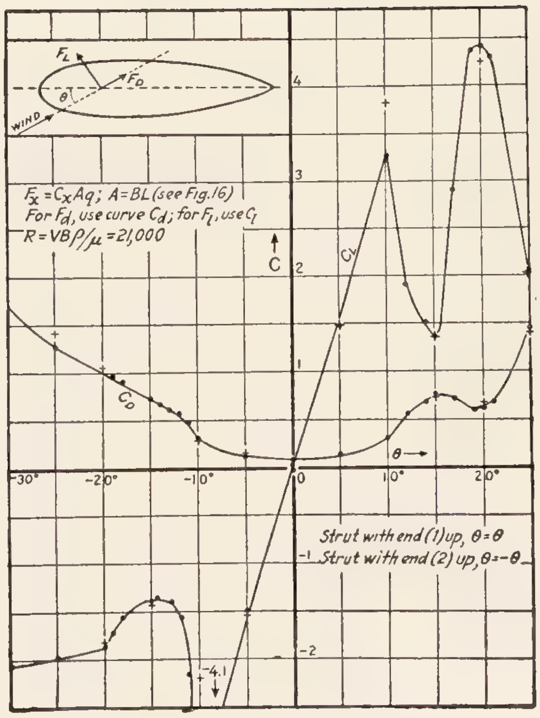


Fig. 17.—Air force on strut 4Z: inclined (85), see also (4).

TABLE 7.—CHARACTERISTICS OF AIRFOIL SECTIONS

$A_r = 6$; model 36 in. by 6 in.; $V = 40$ mi./hr; $R(= \rho Vc/\mu) =$ 181 000; tunnel diameter = 7.5 ft. (57). θ_A is measured from reference plane AB (see Figs. 22, 23, 24); x and y are rectangular coordinates of points on surface of airfoil (y_u, y_l refer to upper and lower surface, respectively); x is measured in plane AB. Unit of x and of y is 1% of chord. For additional data for these and other sections see (12, 13, 14, 34, 37, 68, 69, 70, 73, 80, 81).

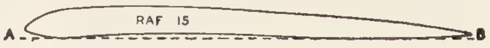


FIG. 22.

Form			Aerodynamical characteristics					
x	y_u	y_l	θ_A	C_l	C_d	F_l/F_d	x_c/c	C_M
0.00	0.30	+0.30						
1.25	1.90	−0.35						
2.50	2.85	−0.70	−4°	−0.18	0.025	−7.3	—	—
5.00	3.95	−1.05	−2°	−0.04	0.014	−2.8	—	—
7.50	4.65	−1.15	−1°	+0.03	0.013	+2.6	0.966	0.029
10.00	5.05	−1.20	0°	0.14	0.013	10.7	0.479	0.067
15.00	5.55	−0.85	1°	0.24	0.013	18.8	0.407	0.098
20.00	5.78	−0.55	2°	0.32	0.016	20.0	0.367	0.117
30.00	5.80	−0.10	4°	0.46	0.023	20.0	0.321	0.148
40.00	5.60	−0.03	6°	0.61	0.033	18.4	0.302	0.185
50.00	5.23	−0.24	8°	0.76	0.047	16.2	0.297	0.228
60.00	4.65	−0.50	10°	0.89	0.061	14.7	0.288	0.260
70.00	4.05	−0.65	12°	1.00	0.083	12.1	0.281	0.286
80.00	3.30	−0.65	14°	1.02	0.124	8.2	0.298	0.313
90.00	2.30	−0.30						
95.00	1.68	0.00						
100.00	0.65	+0.34						

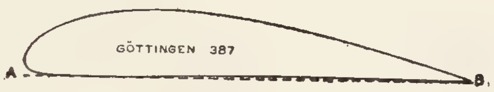


FIG. 23.

x	y_u	y_l	θ_A	C_l	C_d	F_l/F_d	x_c/c	C_M
0.00	0.00	0.00						
1.25	2.02	−1.65						
2.50	2.71	−2.45						
5.00	3.67	−3.46						
7.50	4.47	−4.10	−4°	−0.26	0.014	—	—	—
10.00	4.95	−4.57	−2°	−0.10	0.012	−8.8	—	—
15.00	5.37	−5.27	0°	+0.04	0.013	+3.1	0.197	0.008
20.00	5.69	−5.58	2°	0.18	0.015	12.4	0.224	0.040
30.00	5.69	−5.69	4°	0.33	0.020	17.2	0.229	0.076
40.00	5.32	−5.27	6°	0.50	0.028	17.5	0.241	0.121
50.00	4.68	−4.52	8°	0.65	0.040	16.2	0.242	0.159
60.00	3.72	−3.56	10°	0.78	0.054	14.6	0.244	0.193
70.00	2.61	−2.39	12°	0.88	0.076	11.6	0.246	0.220
80.00	1.60	−1.44	14°	0.73	0.170	4.3	0.234	0.181
90.00	0.69	−0.74	16°	0.70	0.239	2.9	0.382	0.293
95.00	0.37	−0.43						
100.00	0.16	−0.16						

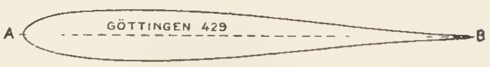


FIG. 24.

x	y_u	y_l	θ_A	C_l	C_d	F_l/F_d	x_c/c	C_M
0.00	3.61	3.61						
1.25	6.74	1.35						
2.50	7.98	0.80	−8°	−0.07	0.071	−0.9	—	—
5.00	9.86	0.35	−6°	+0.08	0.031	+2.6	1.410	0.109
7.50	11.32	0.18	−4°	0.22	0.024	9.4	0.684	0.150
10.00	12.40	0.09	−2°	0.37	0.026	14.3	0.507	0.188
15.00	13.83	0.00	0°	0.51	0.031	16.4	0.436	0.222
20.00	14.77	0.07	2°	0.66	0.039	16.9	0.396	0.261
30.00	15.36	0.21	4°	0.81	0.051	15.9	0.369	0.300
40.00	14.88	0.37	6°	0.96	0.067	14.3	0.348	0.336
50.00	13.47	0.54	8°	1.10	0.084	13.0	0.337	0.374
60.00	11.59	0.54	10°	1.23	0.104	11.8	0.323	0.403
70.00	9.27	0.54	12°	1.33	0.125	10.6	0.307	0.416
80.00	6.57	0.49	14°	1.42	0.148	9.6	0.312	0.454
90.00	3.61	0.27	16°	1.43	0.182	7.9	0.315	0.466
95.00	1.99	0.16	18°	1.42	0.213	6.7	0.327	0.486
100.00	0.36	0.00	20°	1.41	—	—		

TABLE 8.—FORM OF STRUTS; U. S. NAVY 3, BRITISH 4Z

(See Fig. 16) (These struts give as small a C_d as any)
Unit = axial length of section

x	2y U.S.N. 3	2y 4Z	x	2y U.S.N. 3	2y 4Z	x	2y U.S.N. 3	2y 4Z
0	0	0	0.250	0.240		0.700	0.184	0.182
0.025	0.092		0.300	0.247	0.250	0.750	0.164	
0.050	0.132	0.122	0.350	0.250		0.800	0.142	0.142
0.075	0.159		0.400	0.250	0.246	0.850	0.116	
0.100	0.180	0.182	0.450	0.250		0.900	0.085	0.094
0.125	0.197		0.500	0.240	0.234	0.950	0.049	
0.150	0.210		0.550	0.230		1.000	0.000	0.000
0.175	0.220		0.600	0.215	0.212			
0.200	0.229	0.240	0.650	0.201				

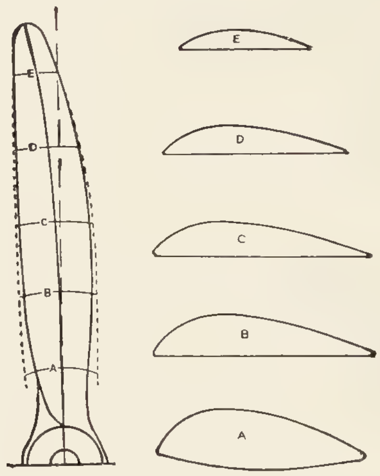


FIG. 18.—Durand's $F_2A_1S_1P_1$ propeller family. Pitch ratio constant. (Members differ only in pitch ratio.)

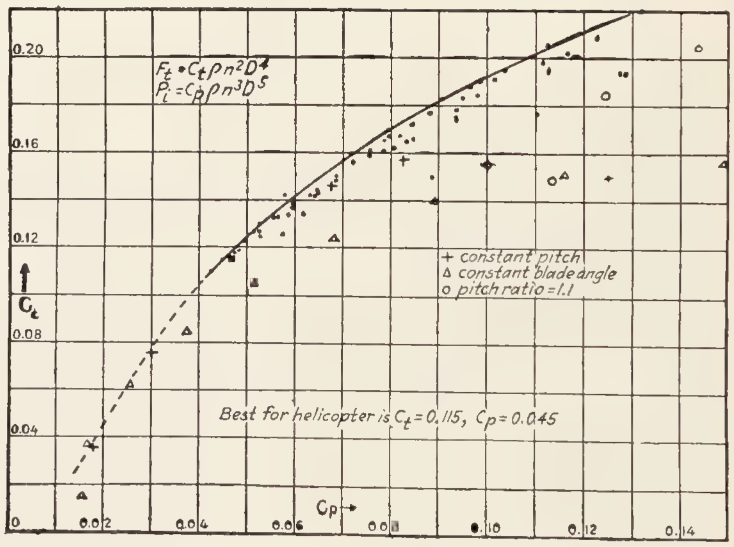


FIG. 19.—Characteristics of Durand propellers at a fixed point (8, 10).

Elongated stream-line solids of revolution have a small resultant drag, which varies greatly with turbulence of air stream, position of neighboring bodies, and slight changes in form. The area entering into the expression $F = CAq$, is generally taken either as the area of maximum section normal to the length, or as $(\text{volume})^{2/3}$. C varies with the Reynold's number. When $A = (\text{volume})^{2/3}$, the minimum value of C for large values of R, and for bodies which are 4 to 5 diameters long, is of the order of 0.014. When A = sectional area, the minimum value of C is of the order 0.03, and is obtained with bodies shorter than 4 diameters. Their equilibrium when parallel to the air stream is unstable; adding fins gives stability and greatly increases their drag (23, 35, 39).

Propellers.—Propellers are usually divided into families in which pitch-ratio and diameter are the only variables. Blade thickness and outline are usually determined largely by structural considerations; if the average thickness and width of blade are fixed, other variations have small effect upon attainable efficiency (8, 9, 15, 19, 65, 66, 71, 76, 77).

The characteristics of a propeller working at a fixed point may be expressed by two dimensionless coefficients, C_t and C_P, defined by the equations $F_t = C_t\rho n^2D^4$ and $P_i = C_P\rho n^3D^5$. For most propellers, there is, between C_t and C_P, a functional relation which is nearly independent of the design, provided large blade angles are not used (33). In Fig. 19, the curve indicates the most favorable results; marked departures from the curve occur mainly with propellers of high pitch ratio, or of constant blade angle.

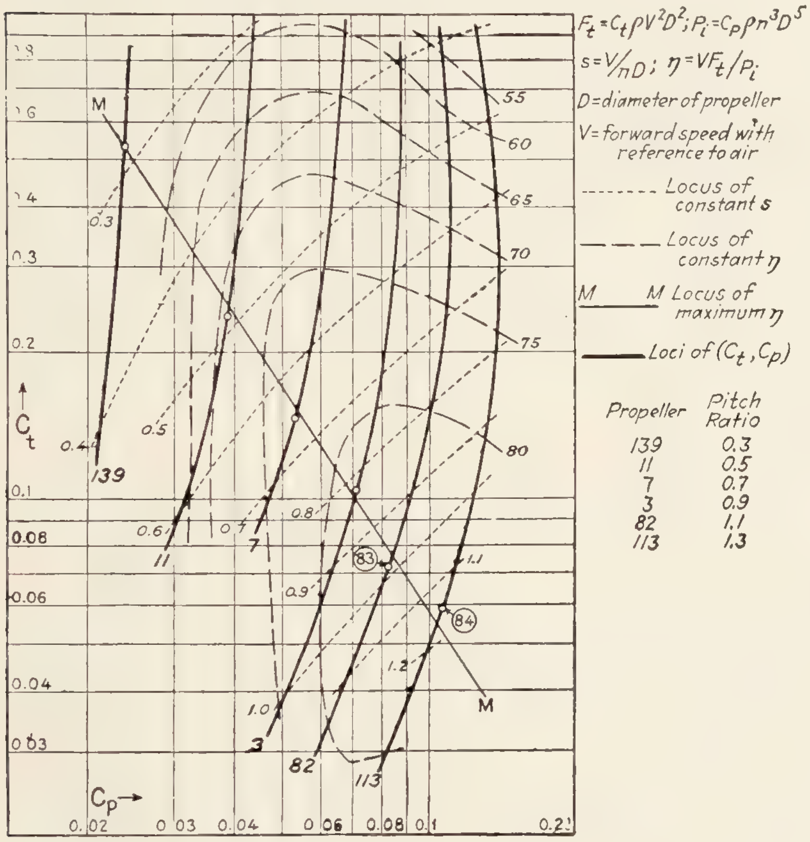


FIG. 20.—Characteristics of advancing Durand $F_2A_1S_1P_1$ propeller family (9).

The characteristics of propellers at various forward speeds (V) and speeds of rotation may be expressed by curves showing the relationships between three parameters. In Fig. 20, the parameters used are C_t, C_P, and s or η, defined by the equation $F_t = C_t\rho V^2D^2$, $P_i = C_P\rho n^3D^5$, $s = V/Dn$; $\eta = C_ts^3/C_P$, and D = diameter of the propeller. Useful range of C_t is 0.05 to 0.25; of C_P is 0.04 to 0.16. Data given are for propellers of two blades; increasing the number of blades, displaces the curves upwards and to the right.

Wind mills.—Quite different principles control the designing of wind mills which derive power from natural winds, and of those (such as the small wind mills used on airplanes for driving fuel pumps, etc.) which derive their power from the motion of a power driven craft. In the former, the controlling factor is the cost per unit of power developed; in the latter, it is the power consumed per unit of power, or torque load, developed.

LITERATURE

(For a key to the periodicals see end of volume)

(1) Allen, *3*, **50**: 323, 519; 00. (2) Bacon and Reid, *297*, No. **185.** (3) Bradfield, *299*, No. **712.** (4) Cowley, *et. al.*, *300*, No. **256.** (5) Diehl, *298*, No. **102.** (6) Diehl, *297*, No. **111.** (7) Dines, *5*, **48**: 233; 90. (8) Durand and Lesley, *297*, No. **30.** (9) *Ibid.*, No. **141.**

(10) Durand, *et. al.*, *298*, No. **4**, appx. (11) Dryden, *31*, No. **394**; 20. (12) Eiffel, *Resistance de l'air et l'aviation* (Paris, Dunod et Pinat), 2nd ed., p. 42. (13) *Ibid.*, p. 150. (14) *Ibid.*, p. 231. (15) Eiffel, *Nouvelle recherches sur la resistance de l'air et l'aviation* (Paris, Duond et Pinat), p. 37. (16) Eiffel, *Travaux Laboratorie aerodynamique Eiffel*, **1915–18**, p. 60. (17) *Ibid.*, p. 85. (18) Fage, *300*, No. **106.** (19) Fage, *Airscrews in Theory and Experiment* (London, Constable and Co.), 1920.

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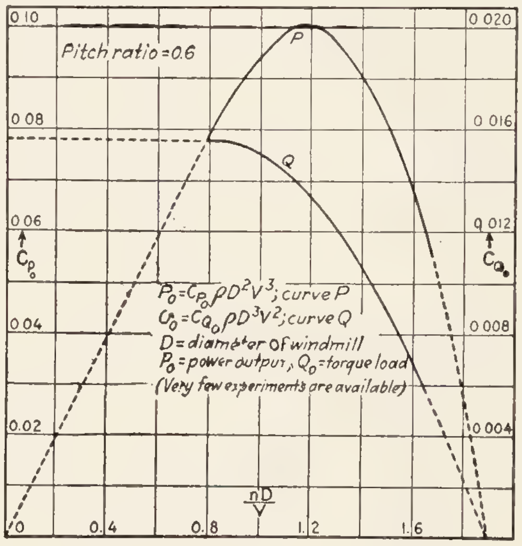

FIG. 21.—Characteristics of two blade windmill (17).

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