

Botany - Section A

1.

During translocation of sugars in plants from source to sink:

1. The loading of sugar at source is by active transport and unloading at the sink by passive transport.
2. The loading of sugar at source is by passive transport and unloading at the sink by active transport.
3. Both loading at the source and unloading at the sink are by active transport.
4. Both loading at the source and unloading at the sink are by passive transport.

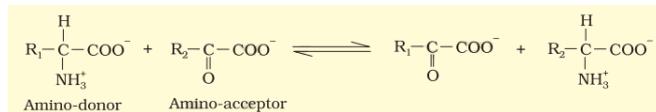
2.

Dark reactions of photosynthesis are actually not totally independent of light as:

1. The initial reactions occur in the presence of light.
2. The reaction will be inhibited by the presence of light.
3. They can occur during the day as well.
4. They utilize the products of the light reaction.

3.

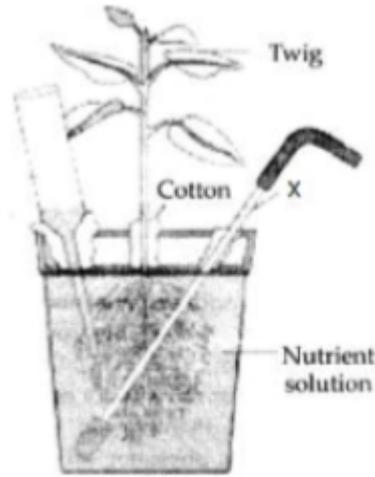
What type of reaction is shown in the given figure ?



1. Deamination
2. Reductive amination
3. Transamination
4. Nitrogenation

4.

In the given diagram of a typical set up for nutrient solution culture, the purpose of X is :



1. Addition of water
2. Addition of nutrients
3. Removal of wastes
4. Aeration

5.

The C4 plants differ from C3 plants with reference to the

1. substrate that accepts CO₂ in carbon assimilation
2. type of end product
3. type of pigment involved in photosynthesis
4. end product that will be formed

6.

Cornelius van Niel, who, based on his studies demonstrated that photosynthesis is essentially a light-dependent reaction performed his experiments on-

1. Cladophora
2. purple and green bacteria
3. green algae
4. Non sulphur bacteria

7. At any point, the rate of photosynthesis is determined by the factor which is available at----- levels.
- 1.. optimal
 2. higher than required
 3. sub-optimal
 4. won't depend
8. Which of the following are symptoms of Mn toxicity?
- P. Appearance of brown spots surrounded by chlorotic veins
- Q. Mn competes with Fe and Mg for uptake
- R. Competes with Mg for binding with enzymes
- S. Inhibits calcium translocation in the shoot apex
- T. It causes deficiency of Mg and Ca
- U. It causes Chlorosis
- V. It causes Necrosis
- W. It causes inhibition of cell division
- Which of the above are correct?
1. P, Q, R, S, T, U, V,
 2. R, S, T, U, V, W
 3. P, Q, R, S, T
 4. Q, V, W
9. In which one of the following processes CO₂ is not released?
1. Aerobic respiration in plants
 2. Aerobic respiration in animals
 3. Alcoholic fermentation
 4. Lactate fermentation
10. Which of the metabolites is common to respiration mediated breakdown of fats, carbohydrates and proteins?
1. Glucose-6-phosphate
 2. Fructose 1, 6, bisphosphate
 3. Pyruvic acid
 4. Acetyl Co-A
11. The chemiosmotic coupling hypothesis of oxidative phosphorylation proposes that Adenosine Triphosphate (ATP) is formed because
1. high energy bonds are formed in mitochondrial proteins
 2. ADP is pumped out of the matrix into the intermembrane space
 3. a proton gradient forms across the inner membrane
 4. there is a change in the permeability of the inner mitochondrial membrane toward Adenosine Diphosphate (ADP)
12. Which of the following is the connecting link between glycolysis and Krebs cycle?
1. Acetyl Co-A
 2. Oxalosuccinic acid
 3. Pyruvic acid
 4. Citric acid
13. Transport Proteins
1. can perform only passive transport
 2. perform passive transport as well as active transport
 3. are needed only in active transport
 4. may be required for simple diffusion
14. Find the incorrect statement w.r.t. Mycorrhiza.
1. Symbiotic association of a fungus with a root system.
 2. Fungal hyphae have a very large surface area.
 3. The hyphae absorb mineral ions and water from the soil from a much larger volume of soil that perhaps a root cannot do.
 4. Roots provide sugar and S-containing compounds to the mycorrhizae.

15. Phloem sap is mainly
1. Water and minerals
 2. Water and sucrose
 3. Hormones and amino acid
 4. Hormones and water
16. Most of the minerals are absorbed through active transport because
1. Minerals are charged particles
 2. Minerals are insoluble in lipid bilayer
 3. The amount of mineral is less in soil
 4. All of these
17. Which of the following statements is wrong?
1. There are techniques that are able to detect the minerals even at a very low concentration i.e. 10^{-8} g/mL.
 2. Some plant species accumulate selenium while some others gold.
 3. Some plants growing near nuclear test sites take up radioactive strontium.
 4. The criteria for essentiality of an element completely depends upon the amount of element
18. The total essential elements for plant are
1. 20
 2. 17
 3. 24
 4. 15
19. Synthesis of ATP from ADP and inorganic phosphate in the presence of light is known as-
1. phosphorylation
 2. photo-phosphorylation
 3. photorespiration
 4. photooxidation
20. First step of decarboxylation in cellular respiration occurs in
1. Cytoplasm
 2. Mitochondrial membranes
 3. Mitochondrial Matrix
 4. Peri mitochondrial space
21. Which one of the following is an integral membrane protein complex that forms the channel through which the protons cross the inner membrane?
1. $F_0 - F_1$
 2. F_0
 3. F^+ and F^-
 4. CF_1
22. Which of the following is incorrect statement?
1. Closely packed imbibant will imbibe more water than loosely packed one
 2. During plasmolysis water is first lost from cytoplasm and then from vacuole
 3. ψ_s is always less than zero in solutions
 4. Transpiration maintains the shape and structure of the plants by keeping cells turgid

23.

Pyruvate dehydrogenase complex, responsible for Pyruvate decarboxylation in cellular respiration in eukaryotes, is found in

- 1 Cytoplasm
- 2 Perimitochondrial space
- 3 Mitochondrial matrix
- 4 Inner mitochondrial membrane

24.

All given statements are **correct** w.r.t. chemiosmotic hypothesis of photosynthesis, except

1. Photolysis of water produces H^+ ions that accumulate within the lumen of thylakoid
2. Protons are transported across the membrane from lumen of thylakoid to stroma side of chloroplast, which is carried out by primary acceptor of electrons
3. Conversion of $NADP^+$ to $NADPH + H^+$ removes protons from the stroma side of chloroplast
4. ATP production occurs towards stroma side of chloroplast due to movement of protons from lumen side through CF_0 - CF_1 complex

25.

Select the incorrect statement

- 1 All living organisms have enzymatic machinery to partially oxidise glucose without oxygen
- 2 In plants, glucose is derived from sucrose which is the end product of photosynthesis
- 3 2ATP are produced as net gain by direct phosphorylation during glycolysis
- 4 One dehydrogenation and one decarboxylation step occur during EMP pathway

26.

Select the odd one w.r.t. developmental plasticity

- 1 Buttercup
- 2 Cotton
- 3 Larkspur
- 4 Coriander

27.

Read the statements a, b, c and d and select the **correct** choice w.r.t. gibberellins (GAs)

- a They delay senescence
 - b Promote bolting just prior to vegetative growth
 - c They are isolated from fungi only
 - d Induce flowering in LDP
- 1 a, b & c are correct
 - 2 b, c & d are incorrect
 - 3 a & d are correct
 - 4 b, c & d are correct

28.

A : The N_2 -fixing bacteria become anaerobic during fixing events.

R : The enzyme nitrogenase is highly sensitive to the molecular oxygen.

- 1 If both Assertion & Reason are true and the reason is the correct explanation of the assertion, then mark (1).
- 2 If both Assertion & Reason are true but the reason is not the correct explanation of the assertion, then mark (2).
- 3 If Assertion is true statement but reason is false, then mark (3).
- 4 If both Assertion and Reason are false statements, then mark (4).

29. Read the following statements w.r.t. antenna molecules.
- a The LHC are made up of hundreds of pigment molecules bound to proteins.
- b Water splitting complex is associated with the PS-II.
- 1 Only b is correct
 - 2 Both a & b are incorrect
 - 3 Only a is correct
 - 4 Both a & b are correct
30. Choose the correct one :-
1. SDPs = light < CPP = Flowering
 2. LDPs = light > CPP = Flowering
 3. DNP = No co-relation with light for flowering
 4. All of the above
31. How many statements are correct with respect to ETS ?
- (1) ETS is helpful restoration of NAD^+ & FAD^+
 - (2) O_2 is terminal e^- acceptor in electron transport system
 - (3) Ubiquinone & FMN are hydrogen carrier and helpful in movement of H^+ from matrix to space.
 - (4) Complex IV is also known as cytochrome C oxidase.
 - (5) Movement of e^- in ETS is due to variable valency of metal ions present in carrier complexes
1. 3
 2. 4
 3. 5
 4. 2
32. Find the incorrect match w.r.t. transport in plants
1. Simple diffusion – Do not require special membrane protein
 2. Active transport – Do not show uphill transport
 3. Facilitated transport – Transport saturation can occur
 4. Active transport – Highly selective nature
33. Which of the following statements is incorrect?
1. RuBisCO is a bifunctional enzyme
 2. In C_4 plants, the site of RuBisCO activity is mesophyll cell
 3. The substrate molecule for RuBisCO activity is a 5-carbon compound
 4. RuBisCO action requires ATP and NADPH
34. It takes very long time for pineapple plants to produce flowers. Which combination of hormones can be applied to artificially induce flowering in pineapple plants throughout the year to increase yield?
1. Cytokinin and Abscisic acid
 2. Auxin and Ethylene
 3. Gibberellin and Cytokinin
 4. Gibberellin and Abscisic acid
35. The apoplast in plants is continuous throughout except at:
1. Pericycle of the root
 2. Xylem vessels
 3. Tracheids
 4. Casparian strips in root endodermis

Botany - Section B

36.

Crops such as tomatoes and bell pepper, allowed to grow in a carbon dioxide rich environment, show higher yields because:

1. They show an increased rate of photosynthesis at higher carbon dioxide concentrations
2. They can respond to high carbon dioxide conditions even in low light conditions.
3. They show C_4 pathway for carbon fixation at high carbon dioxide is the limiting factor in such plants.
4. Only carbon dioxide is the limiting factor in such plants

37.

The _____ in the leaves, have a large number of _____, which align themselves along the walls of the _____, such that they get the _____ quantity of the incident light.

1. chloroplasts, chlorophyll, chloroplasts, optimum
2. mesophyll cells, chlorophyll, mesophyll cells, optimum.
3. mesophyll cells, chloroplasts, mesophyll cells, optimum.
4. mesophyll cells, chloroplasts, mesophyll cells, minimum.

38.

The order of the three steps of Calvin cycle is-

1. Carboxylation- Reduction-Regeneration
2. Reduction-Regeneration- Carboxylation
3. Regeneration-Carboxylation- Reduction
4. Reduction- Carboxylation –Regeneration

39.

Find the wrong statement about Electron Transport system.

1. Release and utilize the energy stored in NADH and FADH₂
2. Oxidizes NADH and reduces FADH₂
3. Electrons are passed on to oxygen resulting in the formation of water
4. The metabolic pathway through which electron passes from one carrier to another

40.

Which statement is wrong for Krebs' cycle?

1. There are three points in the cycle where NAD^+ is reduced to $NADH + H^+$
2. There is one point in the cycle where FAD^+ is reduced to $FADH_2$
3. During conversion of succinyl Co-A to succinic acid, a molecule of GTP is synthesised
4. The cycle starts with condensation of acetyl group (acetyl Co-A) with pyruvic acid to yield citric acid

41.

Aerobic respiratory pathway is appropriately termed

1. catabolic
2. parabolic
3. amphibolic
4. anabolic

42.

Which one is correct sequence occurring in glycolysis?

1. G-6-P → PEP → 3-PGAL → 3-PGA
2. G-6-P → 3-PGAL → 3-PGA → PEP
3. G-6-P → PEP → 3-PGA → 3-PGAL
4. G-6-P → 3-PGA → 3-PGAL → PEP

43.

Identify the incorrectly matched pair:

	Mineral	Functions in plants
(1)	Potassium	Opening and closing of stomata, Activation of enzymes
(2)	Magnesium	Maintenance of ribosome structure, Structure of chlorophyll
(3)	Boron	Pollen germination, Carbohydrate translocation
(4)	Molybdenum	Water splitting in photosynthesis, Nitrogen metabolism

44.

The difference in development of proton gradient in photosynthesis and respiration is-

1. Photosynthesis has thylakoid membrane across which proton gradient is generated
2. Proton accumulation is inside the membrane of thylakoid.
3. both a and b
4. Mitochondrial membrane is involved

45.

The _____ acceptor of _____ which is located towards the _____ side of the membrane transfers its electron not to an electron carrier but to an _____. Fill in the blank according to the causes of the proton gradient in photosynthesis.

1. Primary, proton, inner, proton carrier
2. Primary, electron, outer, H carrier
3. Terminal, proton, outer, proton carrier
4. Primary, electron, inner, H carrier

46.

The rise in respiration rate of fruit is called

1. Respiratory quotient
2. Respiratory climactic
3. Respiratory incision
4. Respiratory succulence

47.

Water potential will be minimum in case of

1. Pure water
2. 2% $NaNO_3$
3. 2% glucose
4. 5% KCl

48.

Certain features of different transport mechanisms are given below, among these the common feature between active transport and facilitated diffusion are

- a. Involvement of membrane proteins
- b. Uphill transport
- c. Saturation kinetics
- d. Highly selective nature
- e. ATP requirement

1. a, c & d
2. a, b & d
3. a, c, d & e
4. b, c & d

49.

Which plant hormone is used to prepare weed free lawns?

- 1 Kinetin
- 2 2,4-D
- 3 Zeatin
- 4 Dormin

50.

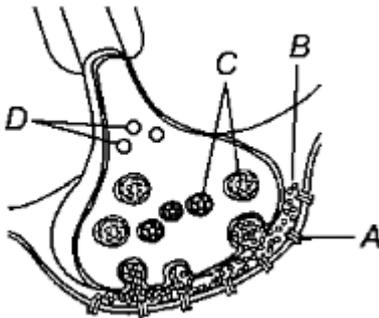
Select the incorrect statement w.r.t. plant growth regulators.

1. 2, 4-D (2, 4-dichlorophenoxyacetic acid) is a synthetic auxin
2. Spraying sugarcane crop with gibberellins increases the length of the stem
3. Cytokinins promote the apical dominance
4. Ethylene is a gaseous hormone

Zoology - Section A

51.

A diagram showing axon terminal and synapse is given. Identify correctly A-D.



1. A- Receptor C-synaptic Vesicles
2. B-Synaptic connection D- K^+
3. A-Neurotransmitter B-Synaptic cleft
4. C-neurotransmitter D- Ca^{2+}

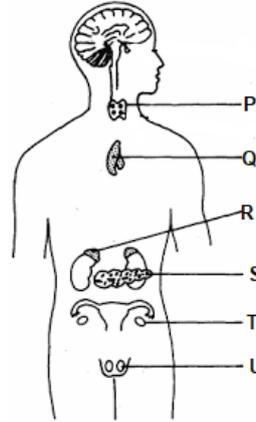
52.

Which one of the following is the correct statement for respiration in humans?

1. Cigarette smoking may not lead to inflammation of bronchi
2. Neural signals from pneumotoxic centre in pons region of brain can increase the duration of inspiration
3. Workers in grinding and stone breaking industries may suffer, from lung fibrosis
4. About 90% of carbon dioxide (CO_2) is carried by haemoglobin as carbamino haemoglobin

53.

Study the given figure showing various human endocrine glands. Select the correct statement(s) regarding these.



- (i) Gland P is stimulated to secrete its hormones by thyrotropin secreted by anterior lobe of pituitary gland.
- (ii) Gland R is associated with the secretion of hormones corticosteroids, epinephrine and norepinephrine.
- (iii) Glands T and U represent the sex glands, which are derived from the mesoderm of embryo.
- (iv) Gland Q is derived from mesoderm of the embryo and its increased size results in ageing.
- (v) Gland S secretes the hormone glucagon which stimulates the liver to convert glucose into glycogen.

1. (i) and (ii)
2. (ii) and (iv)
3. (i), (ii) and (iii)
4. All are correct

54.

Which of the following is wrong with respect to digestion?

1. The sight, smell or presence of food in the oral cavity stimulates secretion of saliva
2. Hormonal signals cannot stimulate gastric and intestinal secretions.
3. The muscular activities of different parts of the alimentary canal can be moderated by neural mechanisms.
4. Hormones control the secretion of digestive juices.

55. The invertebrates have which of the following excretory structures?
1. Simple Tubular forms
 2. Complex tubular organs
 3. Kidneys
 4. Interstitial lamina

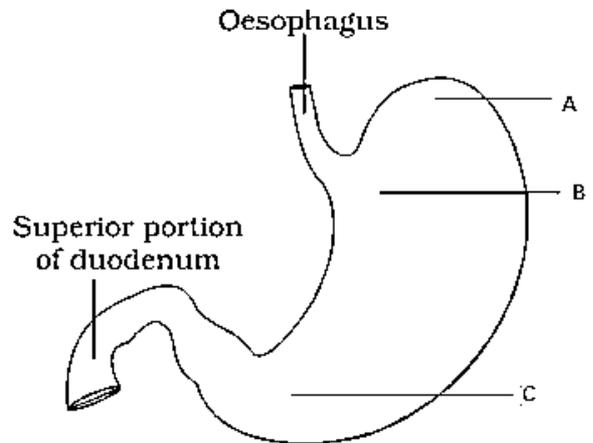
56. How many times can human urine be concentrated in counter-current mechanism?
1. Four times
 2. Five times
 3. Three times
 4. Two times

57. The JG cells are activated by
1. A fall in Glomerular blood flow
 2. A fall in Glomerular blood pressure
 3. A fall in GFR
 4. All of these

58. Which of the following is not true for cerebrum?
1. Forms the major part of the human brain
 2. A deep cleft divides transversely into two halves
 3. Cerebral hemispheres are longitudinal halves
 4. The hemispheres are connected by a tract of nerve fibres called corpus callosum

59. The receive signals fromand transmit it vianerve root
1. Afferent neurons, sensory organs, dorsal
 2. Afferent neurons, effector organs, ventral
 3. Efferent neurons, sensory organs, ventral
 4. Efferent neurons, effector organs, dorsal

60. In the given diagram showing anatomical regions of the human stomach, A, B and C respectively represent:



1. Fundus, Cardia and Pylorus
2. Cardia, Pylorus and Fundus
3. Fundus, Pylorus and Cardia
4. Pylorus, Cardia and Fundus

61. Five events in the transmission of nerve impulse across the synapse -
- A. Opening of specific ion channels allows the entry of ions, a new action potential is generated in the post-synaptic neuron
 - B. Neurotransmitter binds to the receptor on post-synaptic membrane.
 - C. Synaptic vesicle fuses with pre-synaptic membrane, neurotransmitter releases into synaptic cleft
 - D. Depolarization of pre-synaptic membrane
 - E. Arrival of an action potential at the axon terminal

In which sequence do these events occur?

1. E → D → C → B → A
2. A → B → C → D → E
3. A → B → D → C → E
4. E → D → C → A → B

62.

Anxiety and eating spicy food together in an otherwise normal human, may lead to

1. Indigestion
2. Jaundice
3. Diarrhoea
4. vomiting

63.

Match the source gland with its respective hormone as well as the function.

	Source gland	Hormone	Function
(a)	Posterior pituitary	Vasopressin	Stimulates reabsorption of water in the distal tubules in the nephron
(b)	Corpus luteum	Prolactin	Supports pregnancy
(c)	Thyroid	Thyroxine	Regulates blood calcium level
(d)	Anterior pituitary	Oxytocin	Contraction of uterus muscles during childbirth

1. (a)
2. (b)
3. (c)
4. (d)

64.

Given ahead is an incomplete table about certain hormone, their source glands and one major effect of each on the body in humans. Identify the correct option for the three blanks A, B and C

Gland	Secretion	Effect on Body
A	Oestrogen	Maintenance of secondary sexual characters
Alpha cells of islets of Langerhans	B	Raises blood sugar level
Anterior pituitary	C	Oversecretion leads to gigantism

1. A B C
 Placenta Insulin Vasopressin
2. A B C
 Ovary Insulin Calcium
3. A B C
 Placenta Glucagon Calcitonin
4. A B C
 Ovary Glucagon Growth hormone

65.

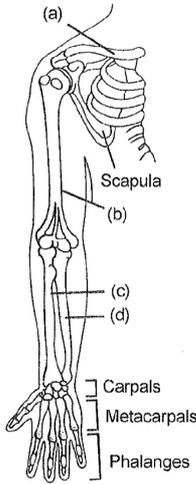
The cells that produce the smallest formed elements of the blood are called

1. erythroblasts
2. megakaryocytes
3. myeloblasts
4. thrombocytes

66. SAN is present in ----- while AVN is present in -----.
1. Right upper corner and left lower corner of both the atria.
 2. Right upper corner and left lower corner of right atrium.
 3. Right upper corner and left lower corner of left atrium.
 4. Right upper corner and left median corner of left atrium.
67. For a detailed evaluation of the heart's function, multiple leads are attached to:
1. Wrist and arms
 2. Abdomen
 3. Chest region
 4. All the fingers
68. The cleared blood is pumped back to the body through a after adding to it.
1. Vein, Heparin
 2. Vein, Anti-Heparin
 3. Artery, Heparin
 4. Artery, Anti-Heparin
69. Which of the following statements is wrong?
1. Movement is one of the significant features of living beings
 2. Streaming of protoplasm in the unicellular organisms like Amoeba is a simple form of movement
 3. Animals and plants exhibit a wide range of movements
 4. Movement of cilia, flagella, and tentacles is limited to few organisms
70. A neural signal reaching the neuromuscular junction releases which generates an action potential in the
1. Acetylcholine, Sarcolemma
 2. Inositol, Sarcolemma
 3. GABA, Sarcoplasmic reticulum
 4. GABA, Sarcoplasm
71. Find the incorrect statement.
1. The bony labyrinth is a series of channels.
 2. The membranous labyrinth is filled with a fluid called endolymph
 3. Bony labyrinth is surrounded by a fluid called perilymph.
 4. The coiled portion of the labyrinth is called cochlea.
72. Find out the incorrect statement with respect to the metabolism of calcium in the human body
1. High level of Ca^{2+} in the blood stimulates the thyroid gland's parafollicular cells to release calcitonin
 2. Calcitonin promotes deposition of Ca^{2+} into bone matrix to reduce blood Ca^{2+} level
 3. Hypersecretion of PTH causes a deficiency of Ca^{2+} in the blood which increases the excitability of nerves and muscles and causes sustained muscular contractions (Tetany)
 4. Calcitriol hormone released from kidneys stimulates the absorption of Ca^{2+} in the gastrointestinal tract

73.

The following diagram represents the right pectoral girdle and upper arm. The letters a, b, c and d represent which bones?



1. a: Acromion process
b: Humerus,
c: Radius,
d: Ulna,
2. a: Clavicle,
b: Humerus,
c: Radius,
d: Ulna,
3. a: Clavicle,
b: Humerus,
c: Ulna,
d: Radius,
4. a: Clavicle,
b: Femur,
c: Radius,
d: Ulna

74.

Which of the following sex hormones produces anabolic synthetic effects on protein and carbohydrate metabolism?

1. Testosterone
2. Estrogen
3. Progesterone
4. Relaxin

75.

Mark the feature which not associated with white muscle fibres

1. Lighter in color
2. These muscles have a fast rate of contraction but for a short period
3. They depend mainly on glycolysis for energy production and soon get fatigued
4. Less sarcoplasmic reticulum compared to red muscle fibres

76.

Presence of which of the following conditions in urine is indicative of Diabetes Mellitus:

1. Uremia and Renal Calculi
2. Ketonuria and Glycosuria
3. Renal Calculi and Hyperglycaemia
4. Uremia and Ketonuria

77.

The anaerobic contraction of skeletal muscle causes deposition or accumulation of

1. Gluconic acid
2. Lactic acid
3. Pyruvic acid
4. Hydrochloric acid

78. Match the following columns and select the correct option :

Column - I	Column - II
(a) Rods and cones photoreceptor cells	(i) Absence of Cones
(b) Blind Spot	(ii) Cones are densely packed
(c) Fovea	(iii) Photoreceptor cells
(d) Iris of the eye	(iv) Visible coloured portion of the eye

1. (a)-(iii), (b)-(i), (c)-(ii), (d)-(iv)
2. (a)-(ii), (b)-(iii), (c)-(i), (d)-(iv)
3. (a)-(iii), (b)-(iv), (c)-(ii), (d)-(i)
4. (a)-(ii), (b)-(iv), (c)-(iii), (d)-(i)

79. Which of the following stimulates the secretion of gastric juice :

1. Gastrin
2. Enterogasterone
3. Secretin
4. Hepatocinin

80. Sphincter of oddi is present at :

1. Gastro-oesophageal junction
2. Junction of jejunum and duodenum
3. Ileo-caecal junction
4. Junction of hepato-pancreatic duct and duodenum

81. Select the correct match

1. Zona reticularis – inner layer of adrenal medulla
2. Zona fasciculata – middle layer of adrenal cortex
3. Zona glomerulosa – outer layer of adrenal medulla
4. Zona fasciculata – middle layer of adrenal medulla

82. Which of the following neurons are usually found in the embryonic stage?

1. Multipolar
2. Unipolar
3. Bipolar
4. Pseudounipolar

83. How much amount of air is inspired or expired per minute during normal breathing by an adult man?

1. 500 - 800 ml
2. 1000 - 1100 ml
3. 6000 -8000 ml
4. 2500 - 3000 ml

84. Match the following columns and select the correct match

Column - I	Column-II
(a) Heart attack	(I) Heart stops beating
(b) Cardiac arrest	(II) Not enough oxygen is reaching heart muscles leading to chest pain
(c) Heart failure	(III) Heart is not pumping blood effectively to meet the body's demand
(d) Angina	(IV) Heart muscles suddenly damaged by the inadequate blood supply

- | | (a) | (b) | (c) | (d) |
|----|------|-------|-------|-------|
| 1. | (IV) | (I) | (II) | (III) |
| 2. | (IV) | (I) | (III) | (II) |
| 3. | (I) | (IV) | (III) | (II) |
| 4. | (I) | (III) | (II) | (IV) |

85. The diameter of pupil is regulated by

1. Ciliary body
2. Iris muscle fibres
3. Lens itself
4. Ligaments attached to ciliary body

Zoology - Section B

86.

The number of incorrect statements amongst the given statements is:

- I. The tongue is attached to the roof of the oral cavity by the frenulum.
- II. The structural and functional units of the human liver are the hepatic lobules.
- III. Lysozyme present in saliva acts as an antibacterial agent that prevents infection.
- IV. Brunner's glands are located in the submucosa of the duodenum.
- V. No significant digestive activity occurs in the large intestine.

1. 1
2. 3
3. 4
4. 5

87.

Arrange the following events in a proper sequence.

- i) Increased ventricular pressure
- ii) Attempted backflow of blood into the atria
- iii) Ventricular systole
- iv) Closure of AV valves

1. i)-ii)-iii)-iv)
2. ii)-i)-iii)-iv)
3. iii)-i)-ii)-iv)
4. i)-iii)-ii)-iv)

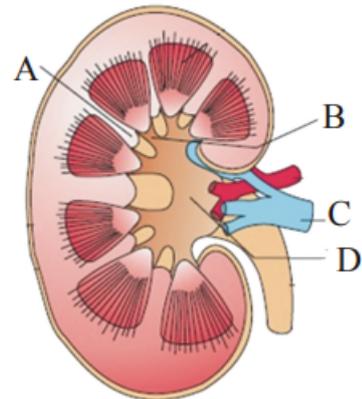
88.

Which of the following sequence is correct in terms of abundance?

1. Neutrophils>Lymphocytes> Monocytes> Eosinophils> Basophils
2. Neutrophils>Lymphocytes< Monocytes> Eosinophils> Basophils
3. Neutrophils<Lymphocytes> Monocytes> Eosinophils> Basophils
4. Neutrophils>Lymphocytes> Monocytes <Eosinophils> Basophils

89.

In the given diagram, the columns of Bertini are represented by the letter:



1. A
2. B
3. C
4. D

90.

Which of the following is true regarding photoreceptor cells?

1. Have light-sensitive glycoproteins
2. Photopic vision is a function of rods
3. Scotopic vision is a function of cones
4. Color vision is a function of cones

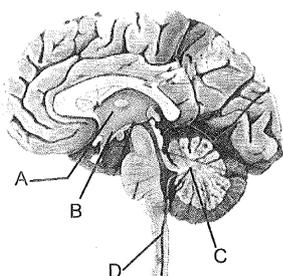
91.

Which of the following hormone is related to the pigmentation of skin?

1. MSH
2. ACTH
3. LH
4. FSH

92.

Given below are the statements related with the functioning of different parts of human brain w.r.t. the labelled structure in the diagram showing sagittal section of human brain



- a. A is a major coordinating centre for sensory and motor signalling.
- b. B controls body temperature, urge for eating and drinking.
- c. C along with amygdala and hippocampus involved in regulation of sexual behaviour, expression of emotional reaction.
- d. D converts short term memories into long term memories.

How many statements are correct?

1. One
2. Two
3. Three
4. Four

93.

Fill in the blanks in different columns of the table given below w.r.t. regulation of kidney function.

	Hormone	Factor stimulating its release	Function
(i)	<u>A</u>	An excessive loss of fluid from the body	Prevents diuresis and caused increase in blood pressure
(ii)	Renin	<u>B</u>	Converts angiotensinogen in blood to angiotensin I
(iii)	<u>C</u>	An increase in blood flow to atria	Vasodilation decrease in blood pressure
(iv)	Angiotensin II	Fall in B.P. and blood volume	<u>D</u>

The correct option for all the four blanks is

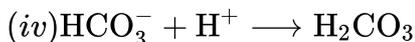
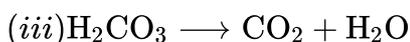
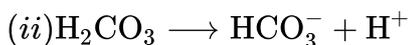
	A	B	C	D
1.	A.N.F.	Increase in blood volume	ADH	Stimulates the release of aldosterone
2.	Vasopressin	Increase in blood pressure	ANF	Vasoconstrictor
3.	ADH	Fall in glomerular B.P.	ANF	Vasoconstrictor
4.	Vasopressin	Increase in blood volume and blood pressure	ANF	Vasodilator

94.

Following is a tabular representation of differences between Juxtamedullary and Cortical nephron. Find out the correct difference.

	Feature	Juxtamedullary nephron	Cortical nephron
1.	Size	Smaller	Larger
2.	Loop of Henle	Longer	Short
3.	Presence	85% of total nephrons	15% of total nephrons
4.	Function	Control plasma volume when water supply is normal	Control plasma volume when water supply is short

95. Which of the following reactions are facilitated by the enzyme carbonic anhydrase?



1. (i) & (iv) only
2. (ii) & (iii) only
3. (i) & (iii) only
4. (i), (ii), (iii), (iv)

96. Thoracic chamber is formed

- (i) Dorsally by vertebral column
- (ii) Ventrally by sternum
- (iii) Laterally by ribs
- (iv) Lower side by diaphragm

1. (i), (iii) only
2. (i), (ii), (iii) only
3. (ii), (iii), (iv) only
4. (i), (ii), (iii), (iv)

97. Which of the following disease is characterized by the proliferation of fibrous connective tissue in the upper part of the lungs?

1. Asthma
2. Emphysema
3. Bronchitis
4. Occupational respiratory disease

98. Choose the correct sequence on the basis of their decreasing toxicity.

1. Uric acid - Urea - Ammonia
2. Ammonia - Uric acid - Urea
3. Uric acid - Ammonia - Urea
4. Ammonia - Urea - Uric acid

99. Which is not correct about muscle?

1. It is mesodermal in origin
2. 40-50% of body weight is formed by it
3. They have properties like excitability and contractibility
4. They are classified on the basis of reception of a type of stimulus

100. Hormones can be described by all the given features except

1. Non-nutrient chemicals
2. Produced in traces
3. Act as intercellular messenger
4. Always work by suppressing gene expression

Chemistry - Section A

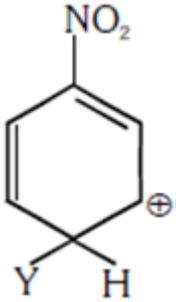
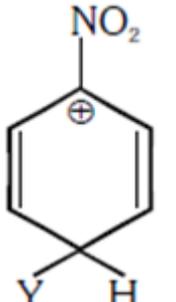
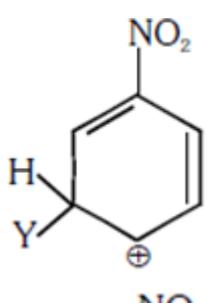
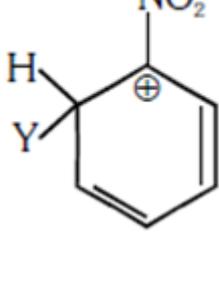
101.

Alkali metal ions are-

1. Diamagnetic and coloured.
2. Diamagnetic and colourless.
3. Paramagnetic and coloured.
4. Paramagnetic and colourless.

102.

Which of the following carbocations is expected to be most stable?

1. 
2. 
3. 
4. 

103.

Two possible stereo-structures of $\text{CH}_3\text{CHOH}\cdot\text{COOH}$, which are optically active, are called

1. Diastereomers
2. Atropisomers
3. Enantiomers
4. Mesomers

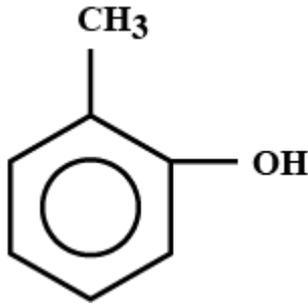
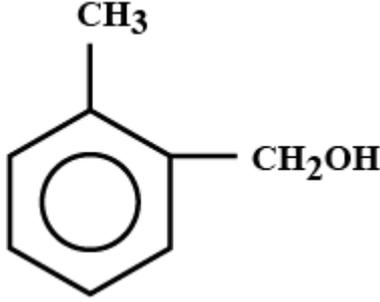
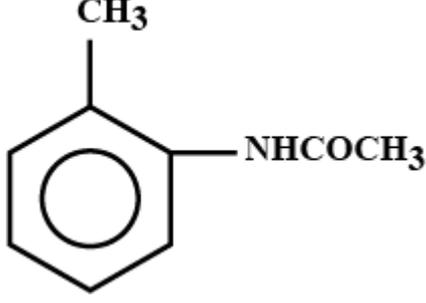
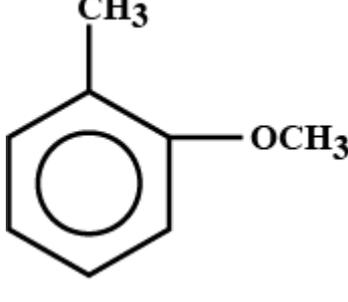
104.

The correct order of increasing bond length of C-H, C-O, C-C and C=C is-

1. $\text{C} - \text{C} < \text{C} = \text{C} < \text{C} - \text{O} < \text{C} - \text{H}$
2. $\text{C} - \text{O} < \text{C} - \text{H} < \text{C} - \text{C} < \text{C} = \text{C}$
3. $\text{C} - \text{H} < \text{C} - \text{O} < \text{C} - \text{C} < \text{C} = \text{C}$
4. $\text{C} - \text{H} < \text{C} = \text{C} < \text{C} - \text{O} < \text{C} - \text{C}$

105.

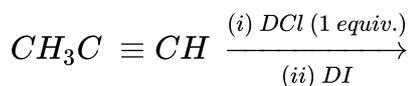
The most reactive compound towards electrophilic reagent among the following is-

1. 
2. 
3. 
4. 

106. H^+ ions always get associated with other atoms or molecules due to -
1. Ionisation enthalpy of hydrogen resembles that of alkali metals
 2. Its reactivity is similar to halogens
 3. It resembles both alkali metals and halogens
 4. Loss of an electron from hydrogen atom results in a nucleus of very small size as compared to other atoms or ions. Due to small size it cannot exist free
107. The least basic metal hydroxide among the following is-
1. $Mg(OH)_2$
 2. $Ca(OH)_2$
 3. $Sr(OH)_2$
 4. $Ba(OH)_2$
108. A substance which gives brick red flame and breaks down on heating to give oxygen and a brown gas is
1. Magnesium nitrate
 2. Calcium nitrate
 3. Barium nitrate
 4. Strontium nitrate
109. Boric acid is an acid because its molecule
1. Contains replaceable H^+ ion
 2. Gives up a proton
 3. Accepts OH^- from water releasing proton
 4. Combines with proton from water molecule
110. The incorrect statements about classical smog among the following is
1. Its main components are produced by the action of sunlight on emissions of automobiles and factories
 2. Produced in a cold and humid climate
 3. It contains compounds of reducing nature
 4. It contains smoke, fog, and sulfur dioxide
111. Consider the following four compounds.
- (I) $CH_3-CH_2-CH_2-CH_2-\overset{\overset{O}{\parallel}}{C}-H$
- (II) $CH_3-CH_2-\overset{\overset{O}{\parallel}}{C}-CH_3$
 $CH_3-CH_2-\overset{\overset{O}{\parallel}}{C}-CH_2-CH_3$
- (III) $CH_3-\underset{\underset{CH_3}{|}}{CH}-CH_2-\overset{\overset{O}{\parallel}}{C}-H$
- (IV) $CH_3-\underset{\underset{CH_3}{|}}{CH}-CH_2-\overset{\overset{O}{\parallel}}{C}-H$
- Which of the following pairs are position isomers?
1. I and II
 2. II and III
 3. II and IV
 4. III and IV
112. In chromatography, which of the following statements is incorrect for R_f ?
1. R_f value depends on the type of chromatography.
 2. Higher R_f value means higher adsorption.
 3. R_f value is dependent on the mobile phase.
 4. The value of R_f can not be more than one.

113.

The major product in the following reaction is-



1. $\text{CH}_3\text{CD}(\text{Cl})\text{CHD}(\text{I})$
2. $\text{CH}_3\text{CD}_2\text{CH}(\text{Cl})(\text{I})$
3. $\text{CH}_3\text{CD}(\text{I})\text{CHD}(\text{Cl})$
4. $\text{CH}_3\text{C}(\text{I})(\text{Cl})\text{CHD}_2$

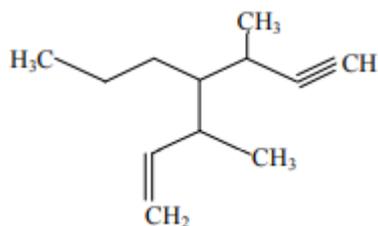
114.

The correct set of species responsible for the photochemical smog is:

1. NO , NO_2 , O_3 and hydrocarbons
2. N_2 , NO_2 and hydrocarbons
3. CO_2 , NO_2 , SO_2 , and hydrocarbons
4. N_2 , O_2 , O_3 and hydrocarbons

115.

The IUPAC name for the following compound is :



1. 3,5-Dimethyl-4-propylhept-1-en-6-yne
2. 3-Methyl-4-(3-methylprop-1-enyl)-1-heptyne
3. 3-Methyl-4-(1-methylprop-2-enyl)-1-heptene
4. 3,5-Dimethyl-4-propylhept-6-en-1-yne

116.

The volume strength of 8.9 M H_2O_2 solution calculated at 273 K and 1 atm is-

($R = 0.0821 \text{ L atm K}^{-1} \text{ mol}^{-1}$) rounded off to the nearest integer)

1. 100
2. 80
3. 120
4. 60

117.

An alkaline earth metal 'M' readily forms water-soluble sulphate and water-insoluble hydroxide. Its oxide MO is very stable to heat and does not have rock-salt structure. The alkaline earth metal M is-

1. Mg
2. Be
3. Sr
4. Ca

118.



Choose the correct option.

1. H_2O_2 acts as a reducing and oxidising agent respectively in equations (A) and (B)
2. H_2O_2 acts as an oxidising agent in equations (A) and (B)
3. H_2O_2 acts as a reducing agent in equations (A) and (B)
4. H_2O_2 acts as oxidizing and reducing agent respectively in equations (A) and (B)

119.

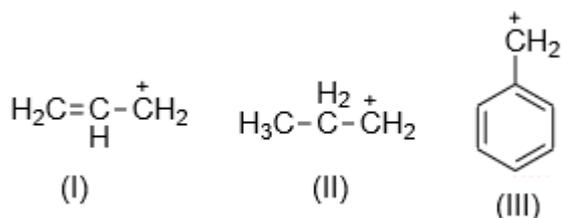
Match the following compounds (Column-I) with their uses (Column-II):

S.NO.	Column-I	S.NO.	Column-II
(I)	Ca(OH) ₂	(A)	Casts of statues
(II)	NaCl	(B)	Whitewash
(III)	CaSO ₄ · $\frac{1}{2}$ H ₂ O	(C)	Antacid
(IV)	CaCO ₃	(D)	Washing soda preparation

- (I)-(D), (II)-(A), (III)-(C), (IV)-(B)
- (I)-(B), (II)-(C), (III)-(D), (IV)-(A)
- (I)-(C), (II)-(D), (III)-(B), (IV)-(A)
- (I)-(B), (II)-(D), (III)-(A), (IV)-(C)

120.

The order of stability of the following carbocations is-



- I > II > III
- III > I > II
- III > II > I
- II > III > I

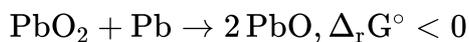
121.

Identify the incorrect statement from the following is-

- Ozone absorbs the intense ultraviolet radiation of the sun
- Depletion of ozone layer is because of its chemical reactions with with chlorofluorocarbon.
- Ozone absorbs infrared radiation.
- Oxides of nitrogen in the atmosphere can cause the depletion of ozone layer

122.

In view of the signs of $\Delta_r G^\circ$ for the following reactions :



The oxidation states more characteristic for lead and tin are respectively:

- For lead +2, for tin +2
- For lead +4, for tin +4
- For lead +2, for tin +4
- For lead +4, for tin +2

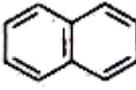
123.

The products obtained on heating LiNO₃ will be :

- Li₂O + NO₂ + O₂
- Li₃N + O₂
- Li₂O + NO + O₂
- LiNO₂ + O₂

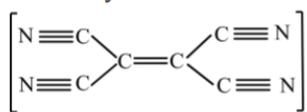
124.

The non-aromatic compound among the following is :

- 
- 
- 
- 

125.

The number of σ and π -bonds in the molecule of tetracyanoethylene is-



1. 9σ and 9π
2. 5σ and 9π
3. 9σ and 7π
4. 5σ and 8π

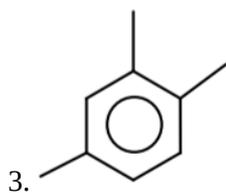
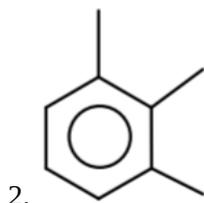
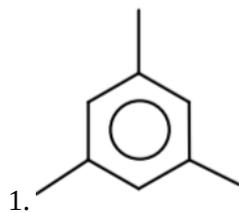
126.

The following do/does not cause water pollution:

1. Heavy metals such as Cd, Pb, Hg
2. Detergents
3. Polychlorobiphenyls
4. Freons

127.

Propyne on passing through red hot iron tube gives-



4. None of the above

128.

The strongest *ortho/para* directing group is-

1. $-\text{NH}_2$
2. $-\text{CH}_3$
3. $-\text{Cl}$
4. $-\text{C}_2\text{H}_5$

129.

In silicon dioxide:

1. There are double bonds between silicon and oxygen atoms
2. Silicon atom is bonded to two oxygen atoms
3. Each silicon atom is surrounded by two oxygen atoms and each oxygen atom is bonded to two silicon atoms
4. Each silicon atom is surrounded by four oxygen atoms and each oxygen atom is bonded to two silicon atoms

130.

The structure of Al_2Cl_6 contains-

1. Four 2c-2e bonds and two 3c-2e bonds
2. Four 2c-2e bonds and four 3c-3e bonds
3. Four 2c-2e bonds and two 3c-4e bonds
4. Two 2c-2e bonds and four 3c-4e bonds

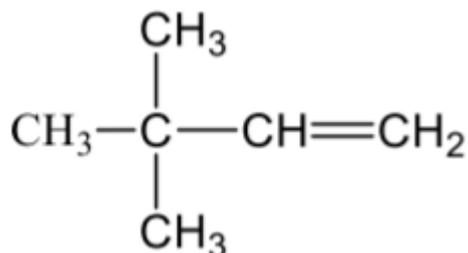
131.

An alkene on reductive ozonolysis gives 2-molecules of $\text{CH}_2(\text{CHO})_2$. The alkene is-

1. 2,4-Hexadiene
2. 1,3-Cyclohexadiene
3. 1,4-Cyclohexadiene
4. 1-Methyl-1, 3-cyclopentadiene

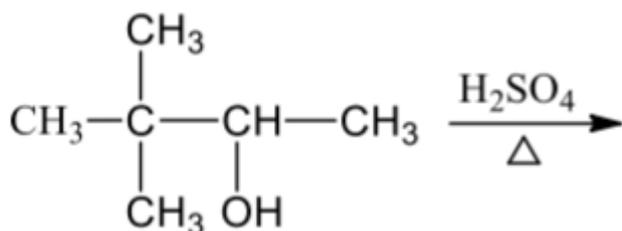
132.

Which of the following reactions are not expected to give

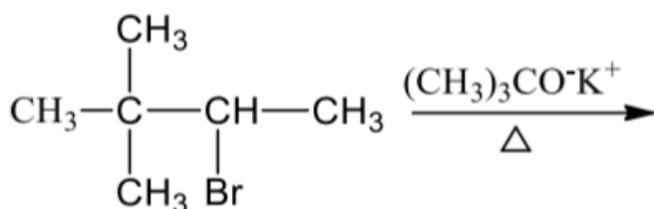


In yields of more than 50%?

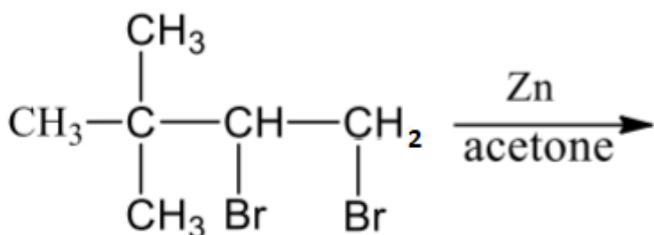
1.



2.



3.



4. None of the above

133.

Beryllium and aluminum exhibit many properties which are similar. But, the two elements differ in:

1. Exhibiting maximum covalency in compounds
2. Forming polymeric hydrides
3. Forming covalent halides
4. Exhibiting amphoteric nature in their oxides

134.

The compound does not have sp^2 hybridized carbon among the following is-

1. Acetone
2. Acetic acid
3. Acetonitrile
4. Acetamide

135.

Geometrical isomerism is not shown by :

1. 1,1-Dichloro-1-pentene
2. 1,2-Dichloro-1-pentene
3. 1,3-Dichloro-2-pentene
4. 1,4-Dichloro-2-pentene

Chemistry - Section B

136.

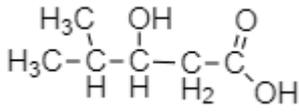
Green chemistry means such reactions that :

1. Produce colour during reactions.
2. Reduce the use and production of hazardous chemicals.
3. Are related to the depletion of ozone layer.
4. Study the reactions in plants.

137.

1,2-dibromopropane on treatment with X moles of NaNH_2 followed by treatment with ethyl bromine gave a pent-2-yne, the value of X is -

1. 1
2. 2
3. 3
4. 4

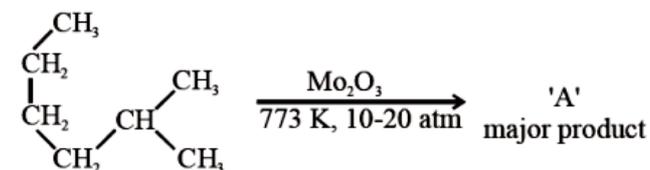
138. The oxide that gives H_2O_2 on treatment with dilute H_2SO_4 is
1. PbO_2
 2. $\text{BaO}_2 \cdot 8\text{H}_2\text{O} + \text{O}_2$
 3. MnO_2
 4. TiO_2
139. Chemical A is used for the preparation of washing soda to recover ammonia. When CO_2 is bubbled through an aqueous solution of A, the solution turns milky. It is used in whitewashing due to its disinfectant nature. The chemical formula of A is-
1. $\text{Ca}(\text{HCO}_3)_2$
 2. CaO
 3. $\text{Ca}(\text{OH})_2$
 4. CaCO_3
140. The correct order of Ionization enthalpy ($\Delta_i H \text{ kJ mol}^{-1}$) for the elements of group 13 among the following is-
1. $\text{B} > \text{Al} > \text{Ga} > \text{In} > \text{Tl}$
 2. $\text{B} < \text{Al} < \text{Ga} < \text{In} < \text{Tl}$
 3. $\text{B} < \text{Al} > \text{Ga} < \text{In} < \text{Tl}$
 4. $\text{B} > \text{Al} < \text{Ga} > \text{In} < \text{Tl}$
141. Hyperconjugation involves delocalization of -
- (a) Electrons of carbon-hydrogen bond of an alkyl group directly attached to an atom of unsaturated system.
 - (b) Electrons of carbon-hydrogen bond of alkyl group directly attached to the positively charged carbon atom.
 - (c) π -electrons of carbon-carbon bond
 - (d) Lone pair of electrons.
- Choose the correct option
1. (a, b)
 2. (b, c)
 3. (c, d)
 4. (a, c)
142. The IUPAC name of the following compound is -
- 
1. 4,4-Dimethyl-3-hydroxybutanoic acid
 2. 2-Methyl-3-hydroxypentan-5-oic acid
 3. 4-Methyl-3-hydroxypentanoic acid
 4. 3-Hydroxy-4-methylpentanoic acid
143. Two elements A and B have similar chemical properties. They don't form solid hydrogencarbonates, but react with nitrogen to form nitrides. A and B, respectively, are :
1. Na and C
 2. Li and Mg
 3. Cs and Ba
 4. Na and Rb

144.

- Among the statements (I – IV), the correct ones are :
- (I) Be has a smaller atomic radius compared to Mg.
 (II) Be has higher ionization enthalpy than Al.
 (III) Charge/radius ratio of Be^{2+} is greater than that of Al^{3+} .
 (IV) Both Be and Al form mainly covalent compounds.
- (I), (II), and (III)
 - (I), (II), and (IV)
 - (I), (III), and (IV)
 - (II), (III), and (IV)

145.

Identify A in the given chemical reaction.



-
-
-
-

146.

Statement I: A mixture of chloroform and aniline can be separated by simple distillation.

Statement II: When separating aniline from a mixture of aniline and water by steam distillation aniline boils below its boiling point.

The correct option is-

- Statement I is false but Statement II is true
- Both Statement I and Statement II are false
- Statement I is true but Statement II is false
- Both Statement I and Statement II are true

147.

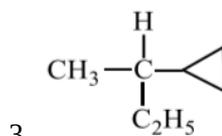
29.5 mg of an organic compound containing nitrogen was digested according to Kjeldahl's method and the evolved ammonia was absorbed in 20 mL of 0.1 M HCl solution. The excess of the acid required 15 mL of 0.1 M NaOH solution for complete neutralization. The percentage of nitrogen in the compound is-

- 29.5
- 23.7
- 47.4
- 59.0

148.

The optically active alkane with the lowest molecular weight is :

- $\text{CH}_3\text{CH}_2\text{C}\equiv\text{CH}$
-



- $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$

149. The false statement among the following is-
1. Water gas is a mixture of water vapor and hydrogen
 2. Producer gas is a mixture of carbon monoxide and nitrogen
 3. Water gas is a mixture of hydrogen and carbon monoxide
 4. Natural gas consists of methane, ethane, and gaseous hydrocarbons

150. The compound has a minimum boiling point among the following is
1. n-Butane
 2. Isobutene
 3. 1-Butene
 4. 1-Butyne

Physics - Section A

151. A simple pendulum has some time period T. What will be the percentage change in its time period if its amplitude is decreased by 5%?

1. 6%
2. 3%
3. 1.5%
4. It will remain unchanged

152. A simple harmonic wave having amplitude A and time period T is represented by the equation $y=10 \sin \pi (t+5)$ m. The value of A (in m) and T(in s) are:

1. A = 5; T = 2
2. A = 10; T = 1
3. A = 5; T = 1
4. A = 10; T = 2

153. A body which is just floating in a liquid (of same density), is pressed slightly and released. It will

1. Start oscillations
2. sink to the bottom
3. come back to its initial position immediately
4. not come back to its initial point

154. A body executes simple harmonic motion. The potential energy (PE), kinetic energy (KE) and total energy (TE) are measured as a function of displacement x. Which of the following statements is true?

1. TE is zero when $x = 0$
2. PE is maximum when $x = 0$
3. KE is maximum when $x = 0$
4. KE is maximum when x is maximum

155. The differential equation of SHM for a particle is given by $a \frac{d^2x}{dt^2} + bx = 0$. The ratio of the maximum acceleration to the maximum velocity of the particle is

1. $\frac{b}{a}$
2. $\frac{a}{b}$
3. $\sqrt{\frac{a}{b}}$
4. $\sqrt{\frac{b}{a}}$

156. A transverse sinusoidal wave of amplitude a, wavelength λ and frequency f is traveling on a stretched string. The maximum speed of any point on the string is $V/10$, where V is the speed of propagation of the wave. If $a = 10^3$ m and $V = 10 \text{ ms}^{-1}$ then λ and f are given by:

1. $\lambda = \pi \times 10^{-2} \text{ m}$
2. $\lambda = 10^{-3} \text{ m}$
3. $f = 10^{-3} / (2\pi) \text{ Hz}$
4. $f = 10^4 \text{ Hz}$

157. A wave is represented by the equation $y = A \sin \left(10\pi x + 15\pi t + \frac{\pi}{3} \right)$ where x is in meters and t is in seconds. The expression represents:

1. a wave traveling in the positive x-direction with a velocity 1.5 m/s
2. a wave traveling in the negative x-direction with a velocity 2.5 m/s
3. a wave traveling in the negative x-direction having a wavelength 0.2 m
4. a wave traveling in the positive x-direction having a wavelength 0.2 m

158. Two identical straight wires are stretched so as to produce 6 beats per sec when vibrating simultaneously. On changing the tension slightly in one of them the beat frequency remains unchanged. Denoting T_1 and T_2 as the higher and the lower initial tensions in the strings, then it could be said that while making the above change in tension-

1. T_2 was decreased
2. T_1 was increased
3. T_2 remains same
4. T_1 was decreased

159. A string is stretched between fixed points separated by 75.0 cm. It is observed to have resonant frequencies of 400 Hz and 300 Hz. There are no other resonant frequencies between these two. The frequency of first overtone is-

1. 100 Hz
2. 200 Hz
3. 300 Hz
4. 400 Hz

160. Two open organ pipes of fundamental frequencies n_1 and n_2 are joined in series. The fundamental frequency of the new pipe so obtained is-

1. $n_1 + n_2$
2. $\frac{n_1 n_2}{n_1 + n_2}$
3. $\frac{n_1 n_2}{n_1 - n_2}$
4. $\sqrt{n_1^2 + n_2^2}$

161. An air column in a pipe which is closed at one end will be in resonance with a vibrating tuning fork of frequency 330 Hz if the length of the column is (Speed of the sound in air is 330 m/s)

1. 50 cm
2. 75 cm
3. 150 cm
4. 100 cm

162. A car sounding its horn at 480 Hz moves towards a cliff at 20 m/s. The driver of the car hears (velocity of sound = 320 m/s)

1. no beats
2. beats at a frequency of 64 Hz
3. beats at a frequency of 30 Hz
4. beats at a frequency of 32 Hz

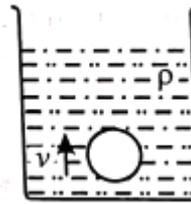
163. The root mean square speed of an ideal gas at constant pressure varies with density (d) as

1. d^2
2. d
3. $\frac{1}{\sqrt{d}}$
4. \sqrt{d}

164. Four one-liter flasks are separately filled with the gases hydrogen, helium, oxygen, and ozone at the same room temperature and pressure. The ratio of total number of atoms of these gases present in different flasks would be

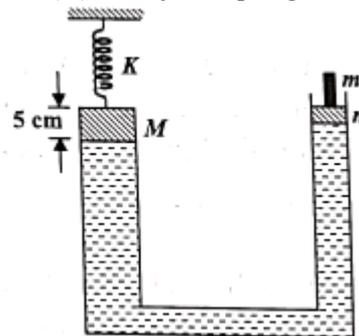
1. 1:1:1:1
2. 1:2:2:3
3. 2:1:2:3
4. 3:2:2:1

165. An air bubble of radius r rises steadily through a liquid of density ρ at the rate of v . Neglecting density of air, the coefficient of viscosity of liquid is



1. $\frac{2}{9} \frac{r^2 \rho g}{v}$
2. $\frac{1}{3} \frac{r^2 \rho g}{v}$
3. $\frac{1}{9} \frac{r^2 \rho g}{v}$
4. $\frac{1}{4} \frac{r^2 \rho g}{v}$

166. For the system shown in the figure, the cylinder on left has a mass (M) of 25 kg and cross-sectional area of 20 cm^2 and is connected to a spring of spring constant 1400 N/m. The piston on the right has mass m ($= 5$ kg) and cross-sectional area 4 cm^2 . The minimum mass m' to be kept on m so that water spills out from the left is ($g = 10 \text{ m/s}^2$) (initially the spring is relaxed).



1. 1 kg
2. 1.4 kg
3. 0.7 kg
4. 2.5 kg

167. n moles of ideal monoatomic gas undergoes a process in which the temperature changes with volume as $T = KV^2$. If the temperature of the gas changes from T_0 to $4T_0$, then the change in internal energy is-

1. $3nRT_0$
2. $9nRT_0$
3. $\frac{3}{2}nRT_0$
4. $\frac{9}{2}nRT_0$

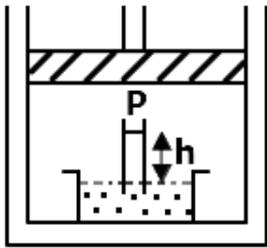
168. Which one of the following cannot be explained on the basis of Bernoulli's theorem?

1. Blowing off of light roofs when strong winds blow.
2. Curved path followed by a spinning ball
3. Working of an atomizer
4. Rise of liquid through a capillary

169. A glass capillary tube of radius 0.20 mm and length 6 cm is dipped 2 cm vertically in water. The height of the water column raised in the tube above water level will be: (Surface tension of water = 0.075 N/m, contact angle of water with glass = 0, density of water = 1000 kg/m³, acceleration due to gravity $g = 10 \text{ m/s}^2$)

1. 40 mm
2. 50 mm
3. 75 mm
4. 100 mm

170. In the adjacent figure, pressure inside the piston is P, and the height of water in the capillary is h. Now if the pressure P is increased, choose the correct graph from the following.

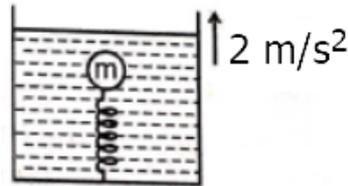


- 1.
- 2.
- 3.
- 4.

171. The frequency of a sonometer wire is f . The frequency becomes $f/2$ when the mass producing the tension is completely immersed in water. The relative density of the mass is

1. 1.5
2. 1.33
3. 3
4. 2

172. A ball of mass 10 kg and density 1 gm/cm³ is attached to the base of a container having a liquid of density 1.1 gm/cm³, with the help of a spring as shown in the figure. The container is going up with an acceleration 2 m/s². If the spring constant of the spring is 200 N/m, the elongation in the spring is



1. 2 cm
2. 4 cm
3. 6 cm
4. 8 cm

173. 2 gm of ice at 0°C is mixed with 1 gm of water at 80°C. The mixture temperature is,

1. -40°C
2. 0°C
3. 10°C
4. 40°C

174. A body cools from 85 °C to 80 °C in 10 minutes, when the temperature of the surrounding is 32.5 °C. How much time will it take to cool down by the same amount (i.e. from 85 °C to 80 °C) if the temperature of the surroundings is 57.5 °C? Assume that Newton's law of cooling is valid.

1. 20 min
2. 5 min
3. $\frac{20}{3}$ min
4. 40 min

175. A sample of an ideal diatomic gas is first expanded isobarically till it reaches double its initial temperature and then further expanded adiabatically till it comes back to its original temperature. Which of the following statements is incorrect?

1. The above process is not physically possible for the given data
2. In the overall process heat supplied to the gas is converted to mechanical work (work done by the gas)
3. The net change in internal energy of the gas will be zero for the entire process
4. The 'Average' kinetic energy of the gas molecules will first increase and then decrease back to initial state as the process is completed

176. A gas of adiabatic exponent γ is supplied heat at a constant pressure. What is the ratio between dQ , dW and dU in the process?

1. $\gamma:\gamma-1:\frac{1}{\gamma}$
2. $1:1:\gamma-1$
3. $\gamma:\gamma-1:1$
4. $\gamma:1:\gamma-1$

177. An ideal gas has initial volume V and pressure P . In doubling its volume the minimum work done will be in the following process (of given processes)

1. Isobaric process
2. Isothermal process
3. Adiabatic process
4. Combination of isobaric and isothermal

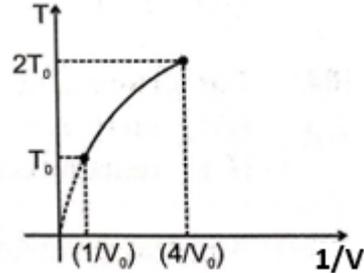
178. A rod of length 40 cm has the coefficient of linear expansion $\alpha_1 = 6 \times 10^{-6} / ^\circ C$. Another rod of length l has the coefficient of linear expansion $\alpha_2 = 4 \times 10^{-6} / ^\circ C$. If the difference in the lengths of the two rods always remain same at all temperatures, then the value of l is

1. 26 cm
2. 60 cm
3. 80 cm
4. 32 cm

179. 600 J of heat is added to a monoatomic gas in a process in which the gas performs a work of 150 J. The molar heat capacity for the process is

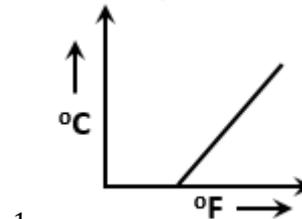
1. $3R$
2. $4R$
3. $2R$
4. $6R$

180. Figure shows a parabolic graph between T and $\frac{1}{V}$ for a mixture of gas undergoing an adiabatic process. What is the ratio of v_{rms} and speed of the sound in the mixture?

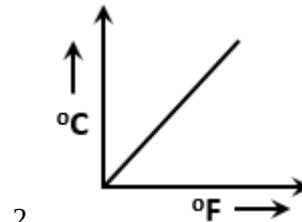


1. $\sqrt{\frac{3}{2}}$
2. $\sqrt{2}$
3. $\sqrt{\frac{2}{3}}$
4. $\sqrt{3}$

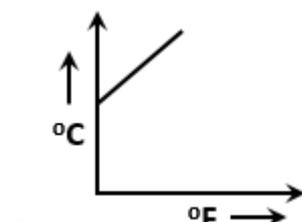
181. A graph between the temperature read on the Celsius Scale and that on the Fahrenheit scale, when plotted, gives the following



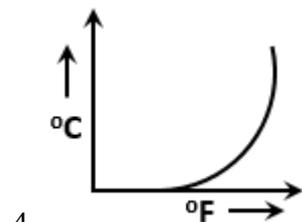
1.



2.



3.

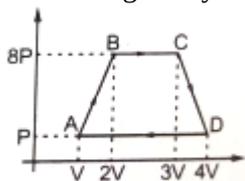


4.

182. For an adiabatic compression (for an ideal gas) the quantity PV

1. increases
2. decreases
3. remains constant
4. depends on γ

183. An ideal monoatomic gas is taken around the cycle ABCDA as shown in the P-V diagram (see fig.). The work done during the cycle is



1. $14 PV$
2. $7 PV$
3. $3 PV$
4. $8 PV$

184. For ideal diatomic gases at normal temperature, choose the correct statement/statements

- (1) Molar heat capacity at constant pressure of all diatomic gases is same
- (2) The specific heat capacity at constant pressure of all diatomic ideal gas is same

1. Only (1) is correct
2. Only (2) is correct
3. Both (1) and (2) are correct
4. None of them are correct

185. A simple pendulum of length L has been set up inside a railway wagon sliding down a frictionless inclined plane having an angle of inclination θ with the horizontal. What will be its period of oscillation as recorded by an observer inside the wagon?

1. $2\pi\sqrt{L/g \cos \theta}$
2. $2\pi\sqrt{L/g}$
3. $2\pi\sqrt{L/g \sin \theta}$
4. $2\pi\sqrt{L \cos \theta/g}$

Physics - Section B

186. The quantity PV/kT (k = Boltzmann's constant) represents:

1. number of moles of the gas
2. total mass of the gas
3. number of molecules in the gas
4. density of the gas

187. One mole of an ideal monoatomic gas is heated at a constant pressure of one atmosphere from 0°C to 100°C . Then, the change in the internal energy is:

1. 6.56 joule
2. 8.32×10^2 joule
3. 12.48×10^2 joule
4. 20.80×10^2 joule

188. During adiabatic process, pressure P versus density ρ equation is:

1. $P\rho^\gamma = \text{const}$
2. $P\rho^{-\gamma} = \text{const}$
3. $P^\gamma\rho^{1+\gamma} = \text{const}$
4. $P^{1/\gamma}\rho^\gamma = \text{const}$

189. During the melting of a slab of ice at 273 K at atmospheric pressure:

1. positive work is done by the ice-water system on the atmosphere
2. positive work is done on the ice-water system by the atmosphere
3. internal energy of ice-water system decreases
4. none of the above

190. The displacement function of a oscillating body is given by $x=0.3 \sin\left(10\pi t + \frac{\pi}{6}\right)$ where x and t are measured in meter and second respectively

1. the period of oscillation is 5 s
2. the body starts its motion from the equilibrium
3. the minimum time the body takes to reach the equilibrium is $(1/12)$ s
4. all of these

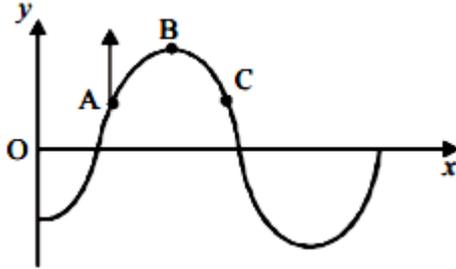
191. Two particles execute simple harmonic motion of the same amplitude and frequency along close parallel lines. They pass each other moving in opposite directions each time their displacement is zero. Their phase difference is-

1. $\frac{5\pi}{6}$
2. $\frac{4\pi}{6}$
3. $\frac{\pi}{6}$
4. $\frac{2\pi}{2}$

192. The wire of a sonometer 180 cm long is divided into three parts by two bridges. The fundamental frequencies of the parts are in the ratio 3:4:6. The positions of bridges are

1. 41.5, 97 cm
2. 80 and 140 cm
3. 50 and 120 cm
4. 30 and 140 cm

193. A wave is travelling along a stretched string. At an instant, shape of the string is as shown in the figure. At this instant, point A is moving upwards. Which one of the following statements is correct?



1. The wave is travelling to the right.
2. The wave is travelling to the left.
3. At this instant of time velocity of C is also directed along positive y-axis.
4. The phase difference between A and C is π

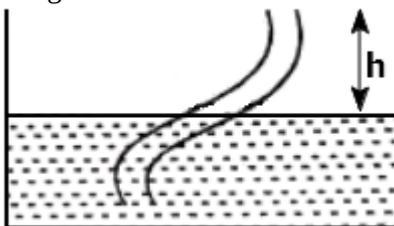
194. The first overtone of an open organ pipe and the fundamental tone of a closed organ pipe give 5 beats per second when sounded together. If the length of the closed pipe is 25 cm, what is the length of the open organ pipe, given that frequency of open pipe is less? [$v_{\text{sound}} = 340$ m/s]

1. 90 cm
2. 98.5 cm
3. 100 cm
4. 102 cm

195. A large open tank has two holes in the wall. One is a square hole of side L at a depth y from the top and the other is a circular hole of radius R at a depth $4y$ from the top. When the tank is completely filled with water the quantities of water flowing out per second from both the holes are the same. Then R is equal to

1. $2\pi L$
2. $\frac{L}{\sqrt{2\pi}}$
3. L
4. $\frac{L}{2\pi}$

196. A straight capillary tube is immersed in water and the water rises to 5 cm. If the capillary is bent as shown in the figure then the height of the water column will be-



1. 5 cm
2. less than 5 cm
3. greater than 5 cm
4. cannot be found with this information

197. A stone is placed inside a container. The normal reaction between the stone and the container is N_1 . Now a liquid is poured inside the container such that normal reaction between stone and the container is N_2 then (Assume no liquid between stone and container at the contact surface)

1. $N_2 < N_1$
2. $N_2 > N_1$
3. $N_2 = N_1$
4. Any of them is possible

198. The absolute temperature of a star increases from T to $2T$ while the radius of the star shrinks from R to $R/2$. As a result, the total power radiated by the star,

1. increases by a factor of 16
2. decreases by a factor of 4
3. remains constant
4. increases by a factor of 4.

199. The phase difference between the instantaneous velocity and acceleration of a particle executing simple harmonic motion is:

1. π
2. 0.707π
3. zero
4. 0.5π

200. If the pressure in a closed vessel is reduced by drawing out some of the gas, the mean free path of two molecules:

1. is increased
2. is decreased
3. remains unchanged
4. increases or decreases according to the nature of the gas

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