

Objectives

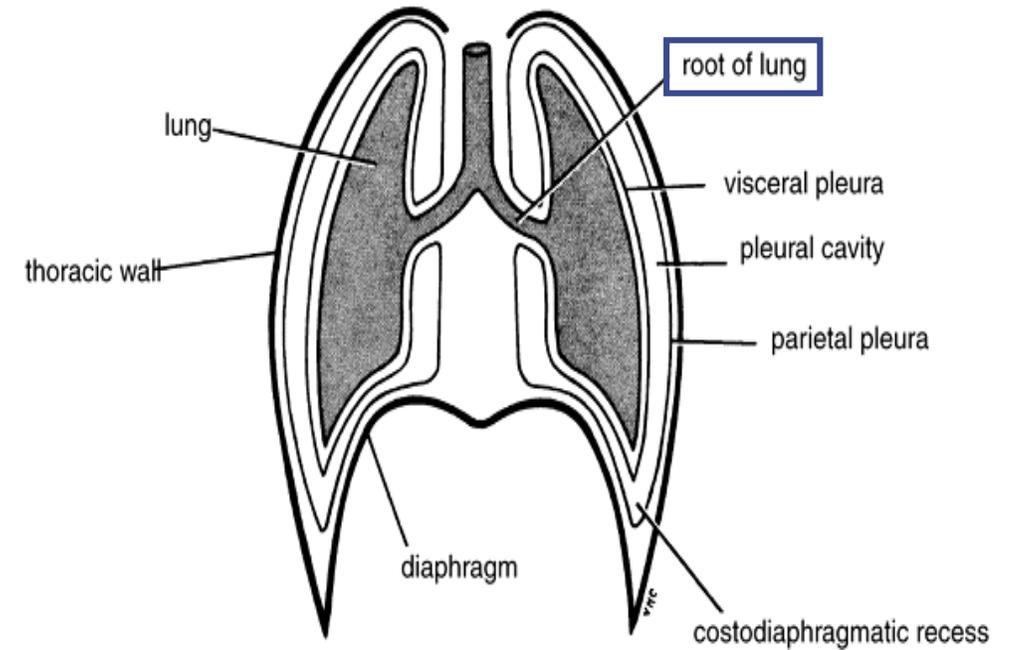
By the end of the lecture, the student should be able to :

- ✓ Describe the anatomy of the pleura:
subdivisions into parietal & visceral pleurae, nerve supply of each of them.
- ✓ List the parts of parietal pleura and its recesses.
- ✓ Describe the surface anatomy of both pleurae and lungs.
- ✓ Describe the anatomy of lungs : shape, relations, nerve supply & blood supply.
- ✓ Describe the difference between right & left lungs.
- ✓ Describe the formation of bronchopulmonary segments and the main characteristics of each segment in the lung.

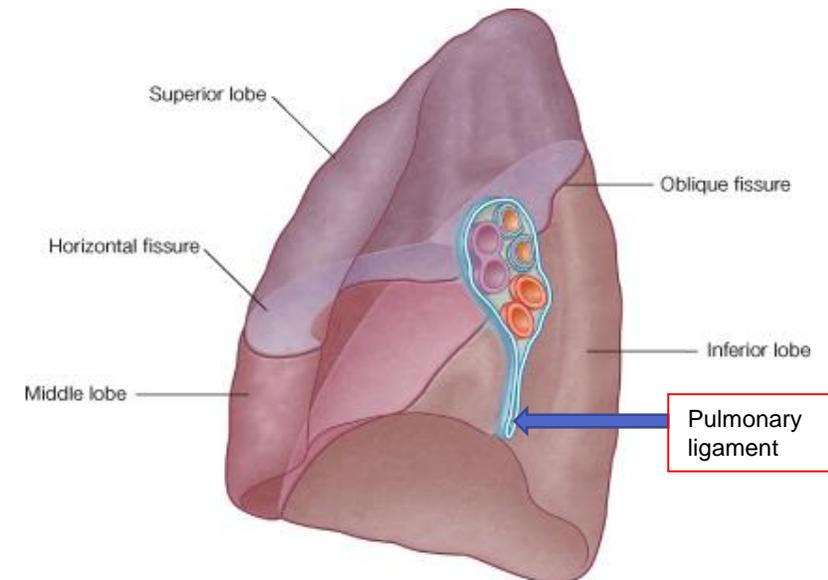
Pleura

- Double-layered serous membrane enclosing the lung.
- Has two layers:
 - **Parietal layer**, which lines the thoracic walls.
 - **Visceral layer**, which covers the surfaces of the lung.
- The two layers continue with each other around the **root of the lung**, where it forms a loose cuff hanging down called the **pulmonary ligament**.
- **The space** between the two layers, **the pleural cavity**, contains a thin film of pleural serous fluid (5-10 ml.)

When this fluid increases above normal it is called pleural effusion (will be discussed later).



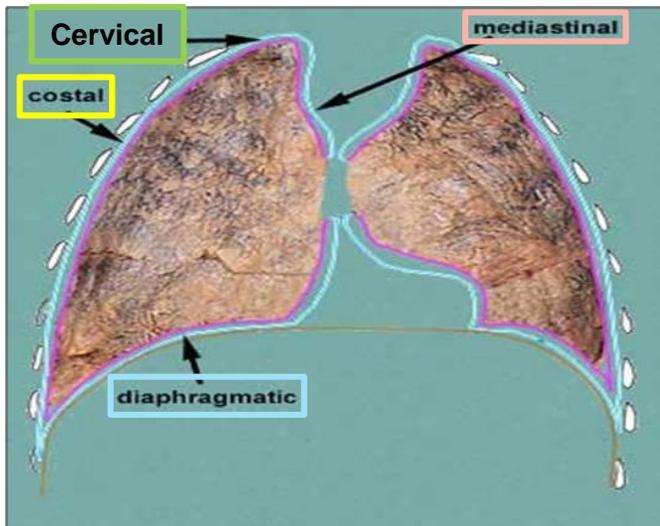
A



Parietal Pleura

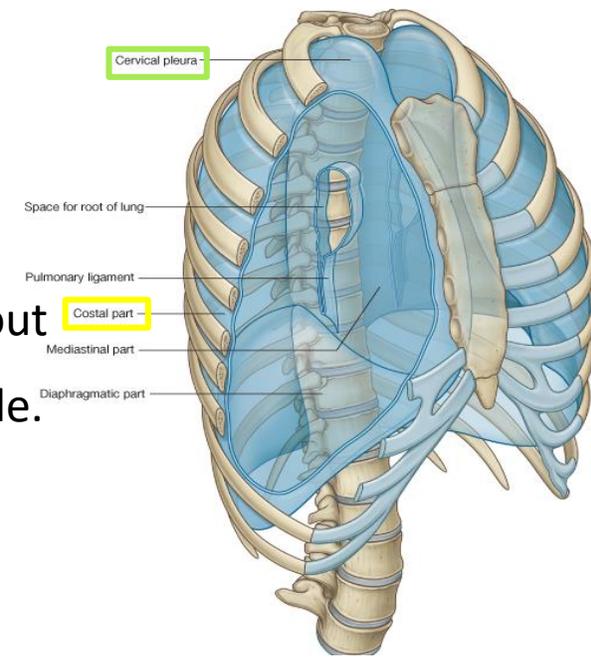
It is divided according to the region in which it lies and the surfaces it covers, into:

- 1- Cervical (or cupular)
- 2- Costal
- 3- Mediastinal
- 4- Diaphragmatic



1- Cervical Pleura:

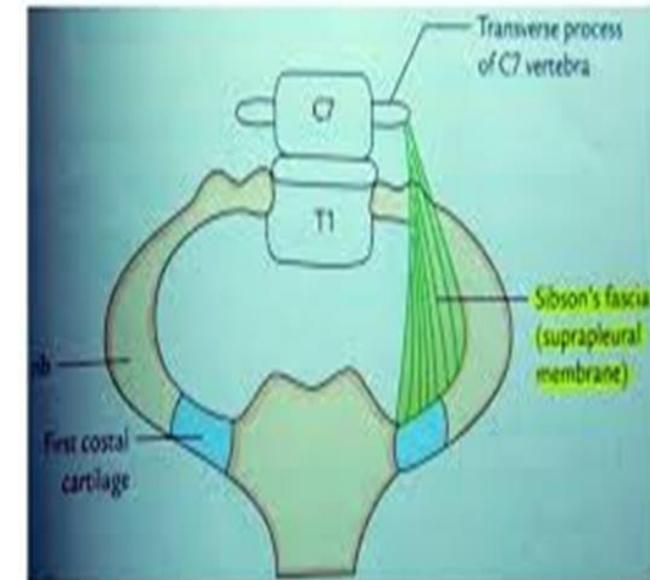
- Projects up into the root of the neck about one inch above the medial $1/3^{\text{rd}}$ of clavicle.
- It **lines** the under surface of the **suprapleural** membrane.



2- Costal pleura:

- It **lines**, the back of the:
 1. Sternum,
 2. Ribs & costal cartilages,
 3. Intercostal spaces &
 4. Sides of vertebral bodies

Suprapleural membrane/ Sibson's fascia



Parietal Pleura

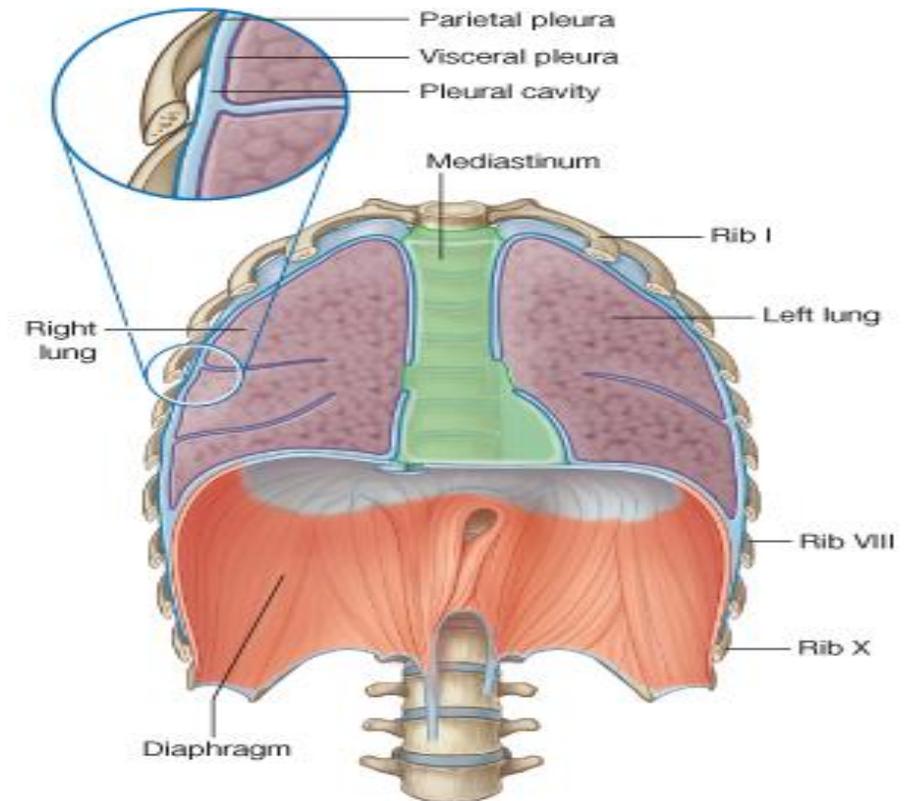
3- Mediastinal pleura:

- covers the mediastinum.
- **At the hilum**, it is reflected on to the vessels and bronchi that enter the hilum of the lung, and continuous with the visceral pleura*.

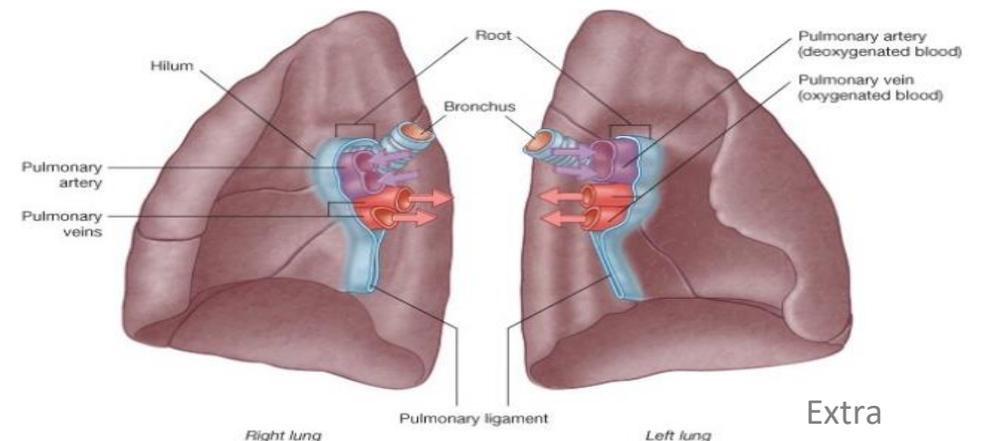
4- Diaphragmatic pleura:

- covers the thoracic (upper) surface of the diaphragm.

* The lung **root** is a collection of structures (vessels, nerves, lymphatics) that leave the lung and suspend it from the mediastinum. All these structures enter or leave the lung via the **hilum** – a wedge shaped area on its mediastinal surface. The parietal and visceral pleura meet and join around the hilum.



Hilum of lung



Pleural Recesses

Recess: a small, empty space or cavity

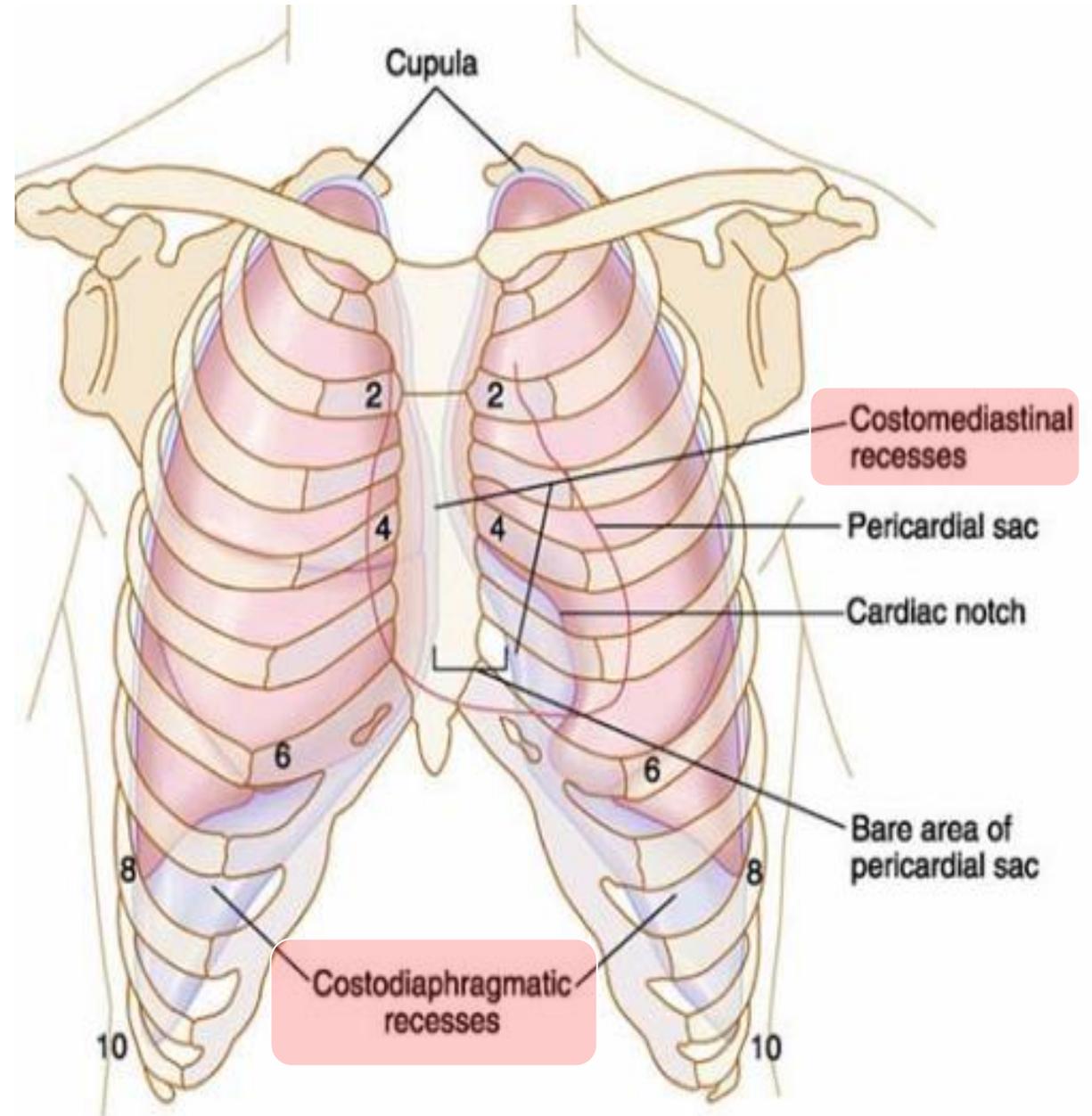
1- Costodiaphragmatic Recess:

Slit like space between costal and diaphragmatic pleurae, **along the inferior border of the lung** which enters through it in deep inspiration.

2- Costomediastinal Recess:

Slit like space between costal and mediastinal pleurae, **along the anterior border of the lung** which enters through it in deep inspiration.

These spaces allow the lung more room to expand during deep inspiration.



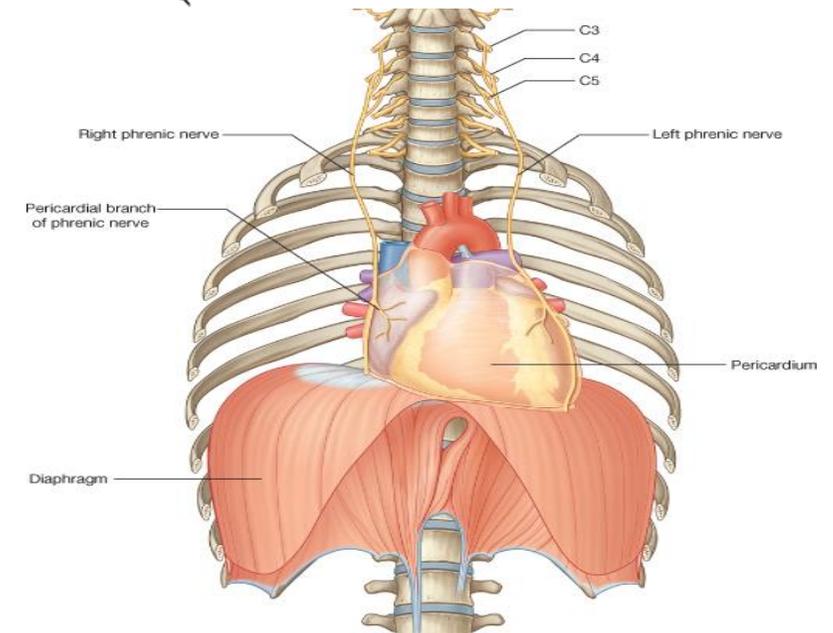
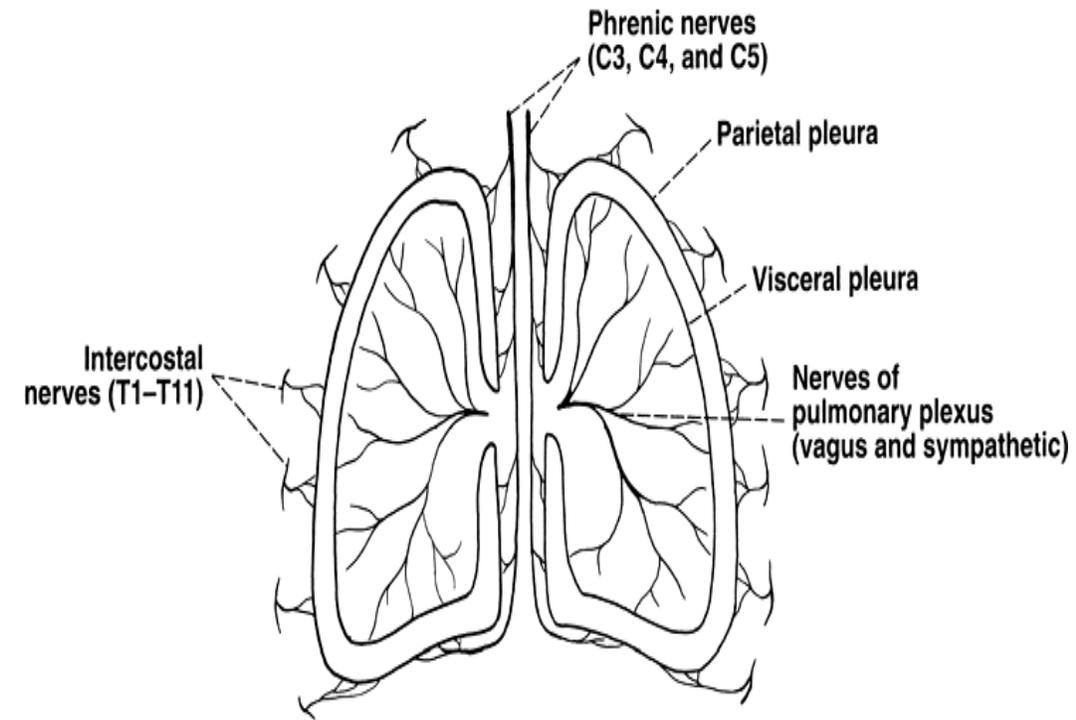
Pleura: Nerve Supply

Parietal pleura:

- It is sensitive to **p**ain, **p**ressure, **t**emperature, and **t**ouch.
- It is supplied as follows:
 - **Costal pleura** is segmentally supplied by the **intercostal nerves**.
 - **Mediastinal pleura** is supplied by **phrenic nerves**.
 - **Diaphragmatic pleura** is supplied in the central part (over the diaphragmatic domes) by **phrenic nerves**, around the periphery by **lower 6 intercostal nerves**.

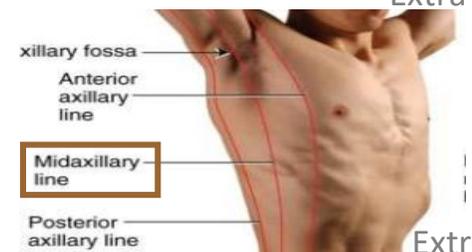
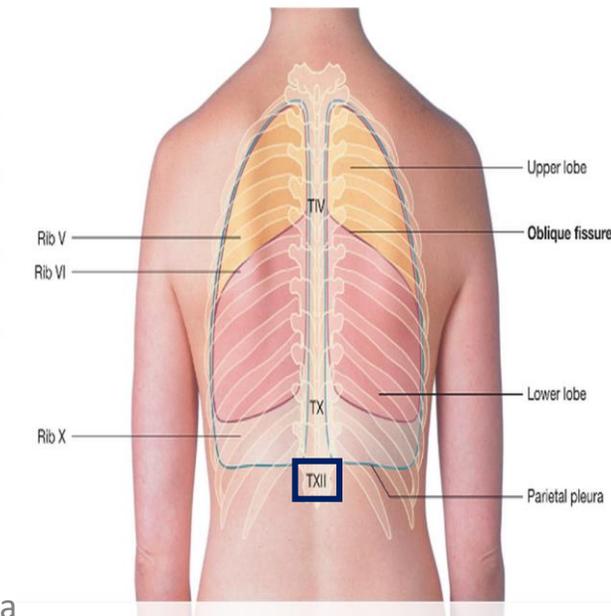
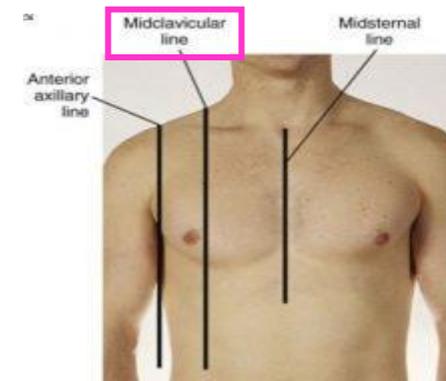
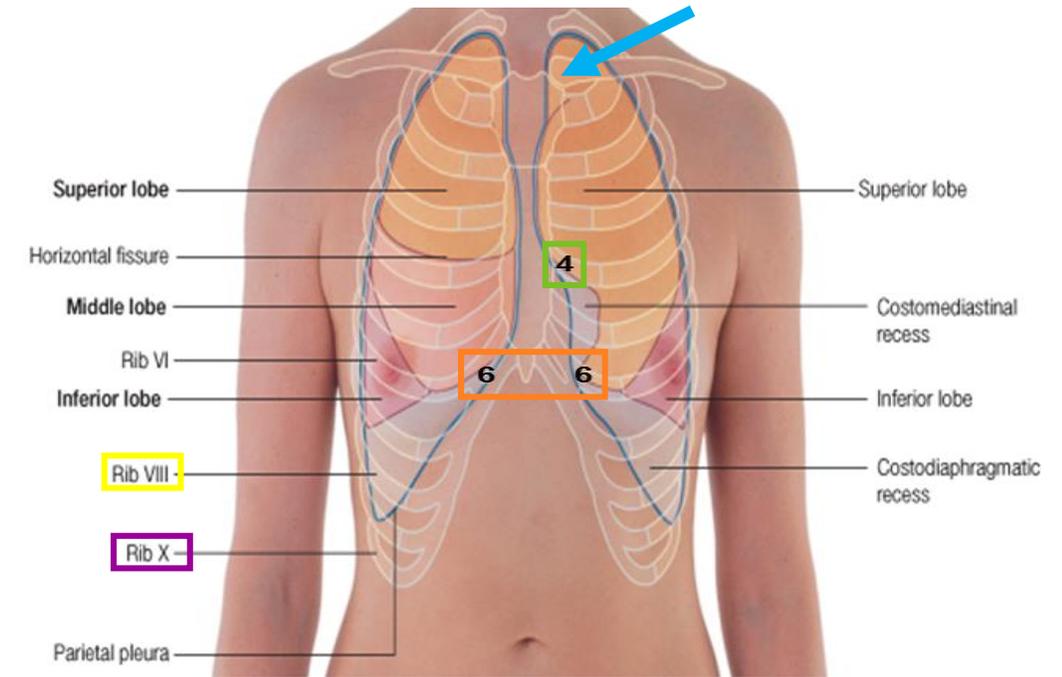
Visceral pleura:

- sensitive to **stretch** only and is supplied by the **autonomic fibers** from the **pulmonary plexus**.



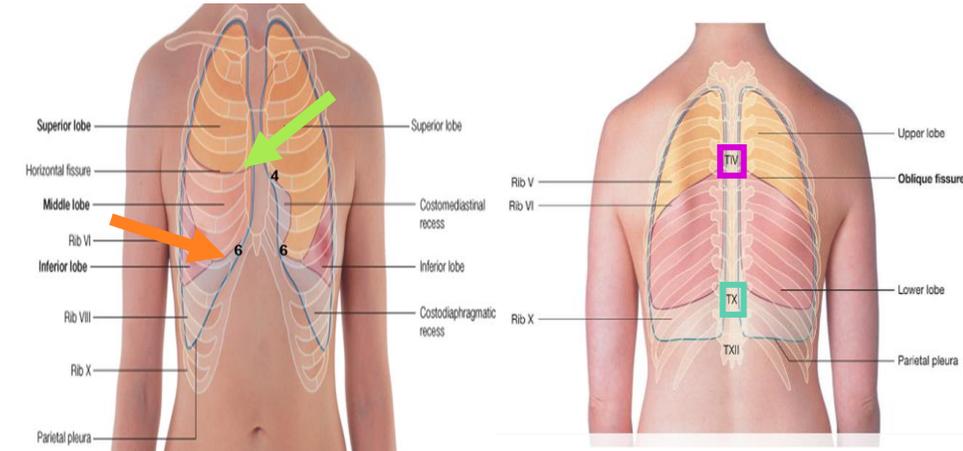
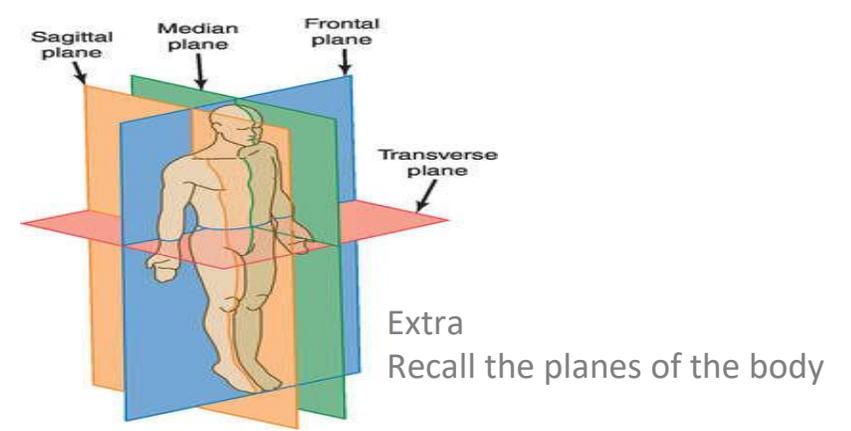
Surface Anatomy of the Pleura

- **Apex:** lies one inch above the medial 1/3 of the clavicle.
- The anterior margin:
 - **Right pleura:** The anterior margin extends vertically from sterno-clavicular joint to 6th costal cartilage.
 - **Left pleura:** The anterior margin extends from sternoclavicular joint to the 4th costal cartilage, then deviates for about 1 inch to left at 6th costal cartilage to form **cardiac notch**. Because the heart lies on the left side
- **Inferior margin:** passes around the chest wall, on the 8th rib in midclavicular line, 10th rib in mid-axillary line and finally reaching to the last thoracic spine (T12 spine). The inferior margin of lung: above in T10.
- **Posterior margin:** *along the vertebral column* from the apex to the inferior margin (T12 spine).

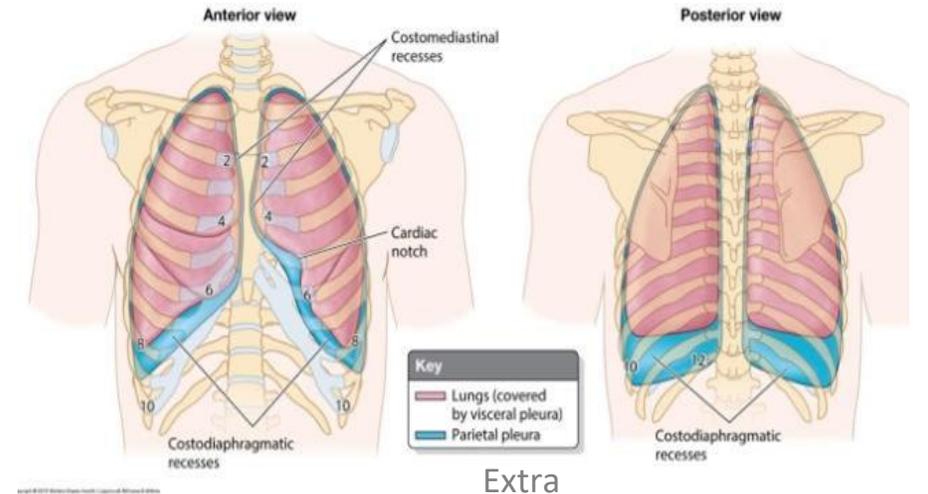
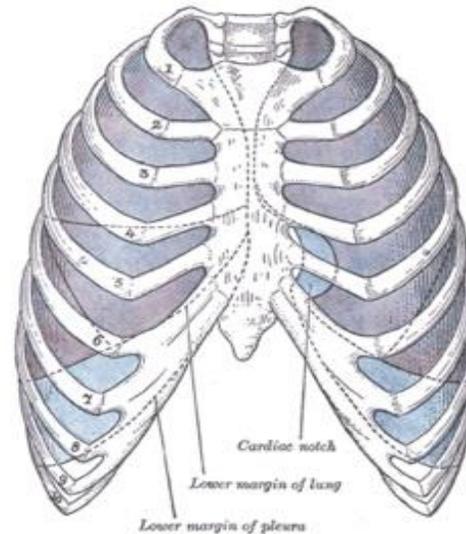
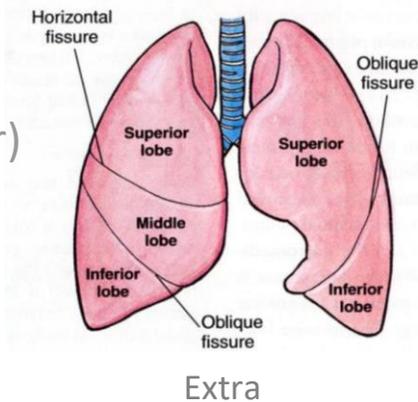


Surface Anatomy of the Lungs

- **Apex, anterior border and posterior border** correspond nearly to the lines of pleura but are slightly away from the median plane.
- **Inferior margin** : as the pleura but more horizontally and finally reaching to the **10th thoracic spine**. (The inferior margin of pleura: T12.)
- **Oblique fissure**: (both right and left lungs)
Represented by a line extending from **3rd thoracic spine**, obliquely ending at **6th costal cartilage**.
- **Transverse** (or horizontal) **fissure**: **Only in the right lung**:
Represented by a line extending from **4th right costal cartilage** to meet the oblique fissure.



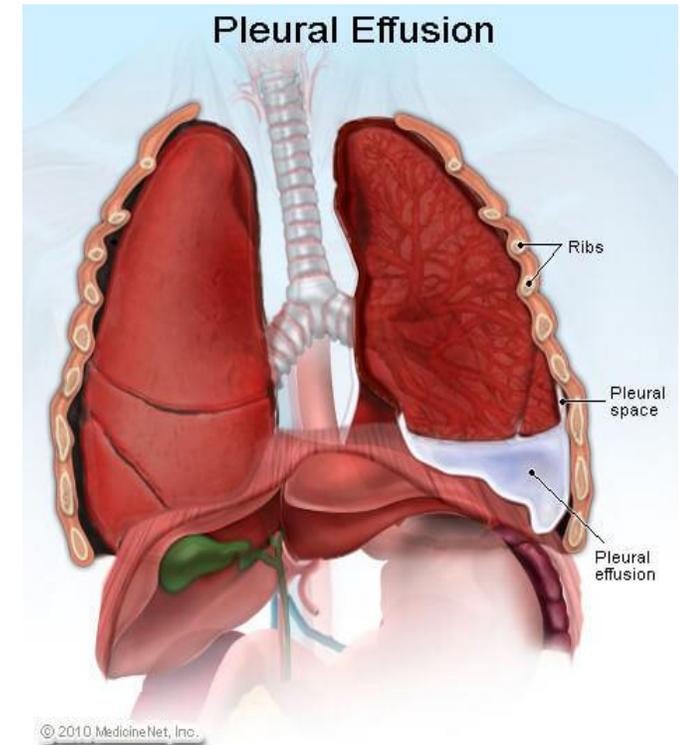
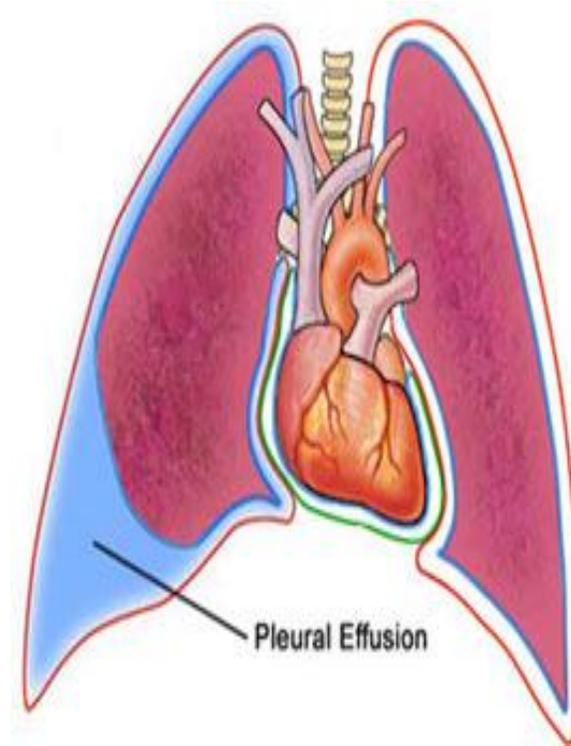
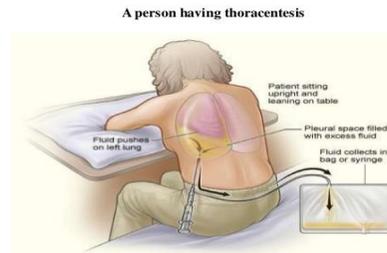
Right lung :
2 fissures & 3 lobes
(superior, middle, inferior)
Left lung :
1 fissure & 2 lobes
(superior and inferior)



Pleural Effusion

- It is an abnormal accumulation of pleural fluid about **300 ml**, in the **Costodiaphragmatic pleural recess**, (normally 5-10 ml fluid)
- Causes: inflammation, TB, congestive heart disease and malignancy.
- The lung is compressed & the bronchi are narrowed.
- Auscultation would reveal only **faint & decreased breathing sounds** over compressed or collapsed lung lobe.
- **Dullness** on percussion over the effusion.

Extra information:
Treatment of pleural effusion is aspiration of the fluid (thoracentesis).



Auscultation : is listening to the internal sounds of the body, usually using a **stethoscope**.



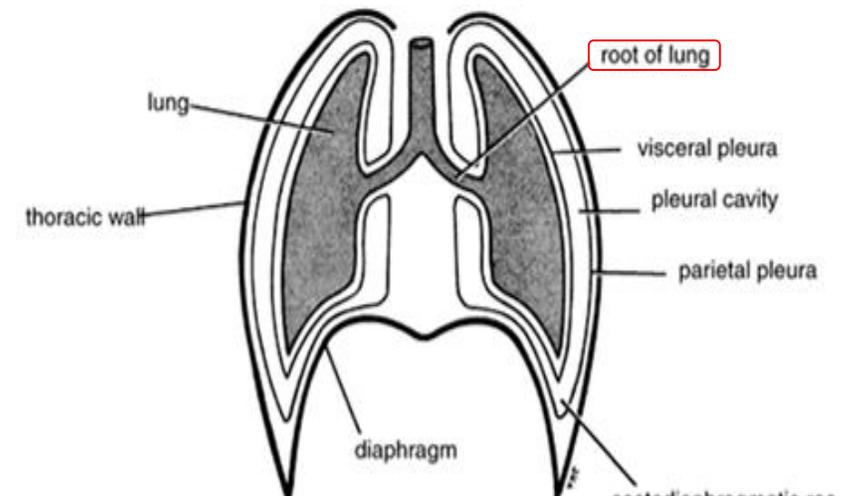
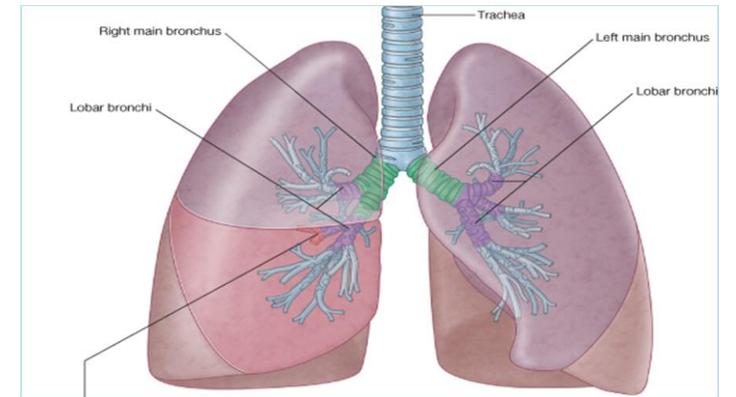
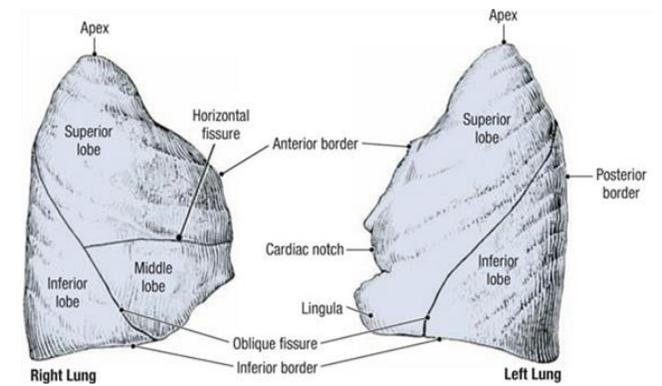
Percussion: (by the hand) the act or technique of tapping the surface of a body part to learn the condition of the parts beneath by the resulting sound.



Lungs



- Located in the **thoracic cavity**, one on each side of the mediastinum .
- **Each lung is:**
 - **Conical** in shape. (شكل مخروط)
 - **Covered** by the visceral pleura.
 - **Suspended free** in its own pleural cavity.
 - **Attached** to the mediastinum only by its root.
- **Each lung has:**
 - 1-Apex and base: identify the top and bottom of the lung, respectively.
 - 2-Costal surface: surrounded by the ribs from front & back.
 - 3-Medial surface: Where the bronchi, blood vessels, and lymphatic vessels enter the lung at the **hilum**.
- It is also related to the structures forming the **mediastinum**.



Lungs

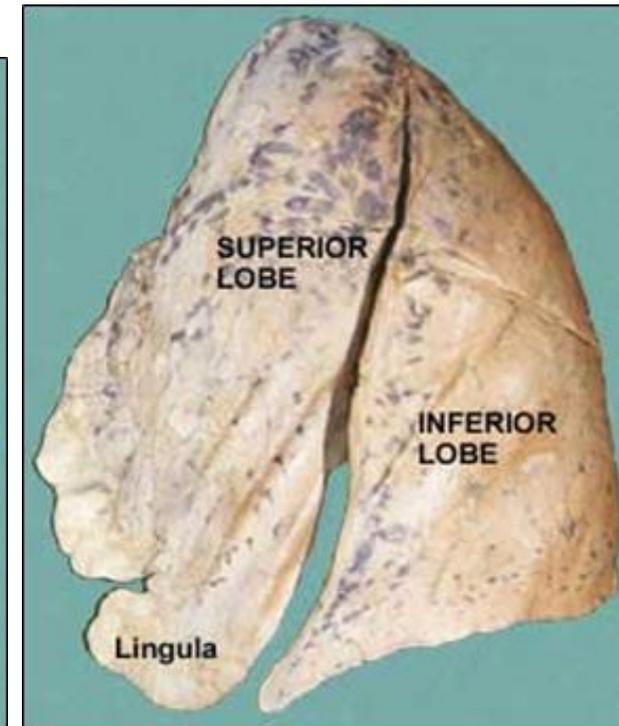
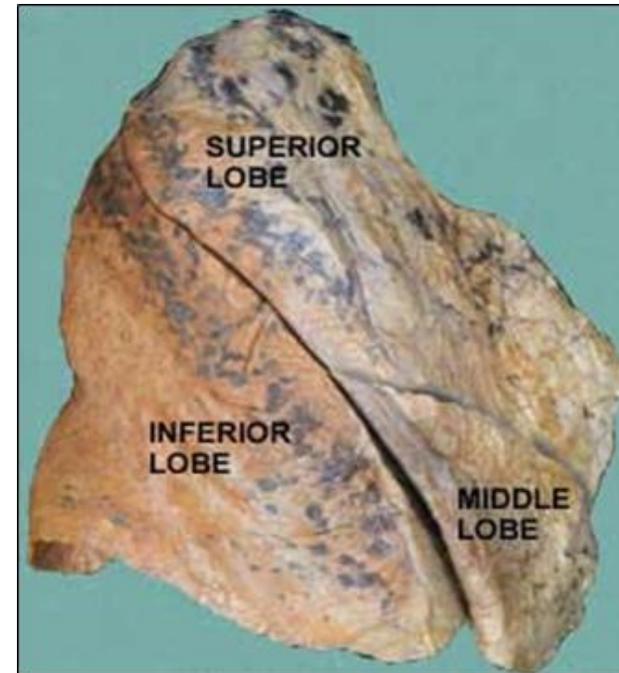
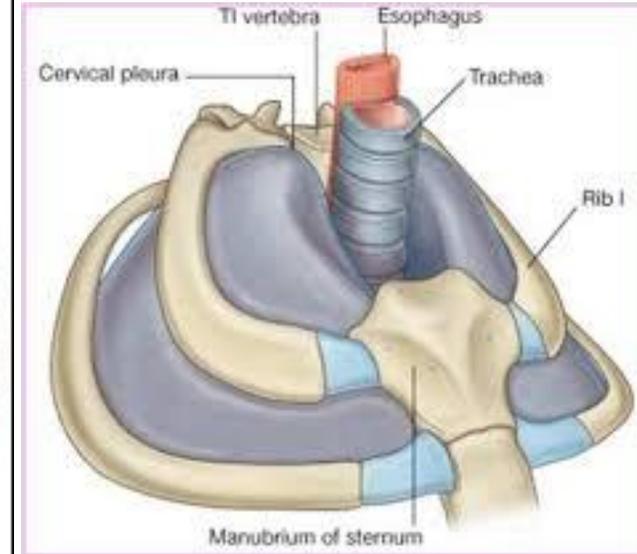
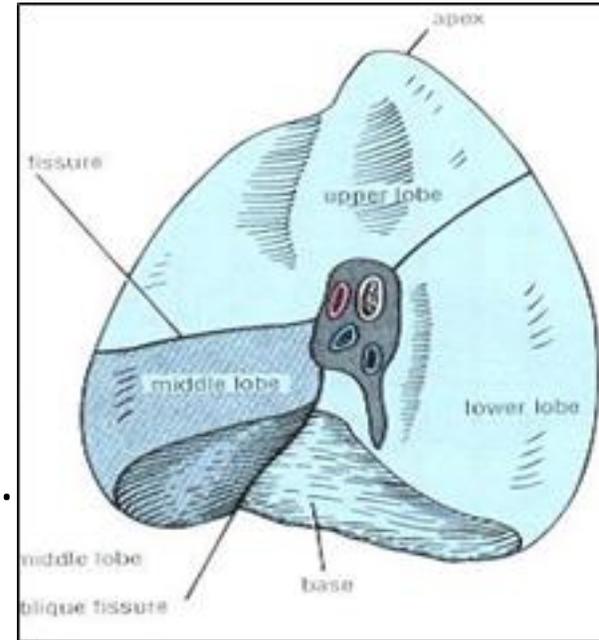
Apex and Base

Apex:

- Projects into the root of the neck
(1/2 an inch(1.27cm) above medial 1/3 of clavicle).
- It is covered by cervical pleura.
- It is grooved anteriorly by **subclavian artery**.

Base:

- inferior or diaphragmatic surface is **concave**
- and rests on the diaphragm

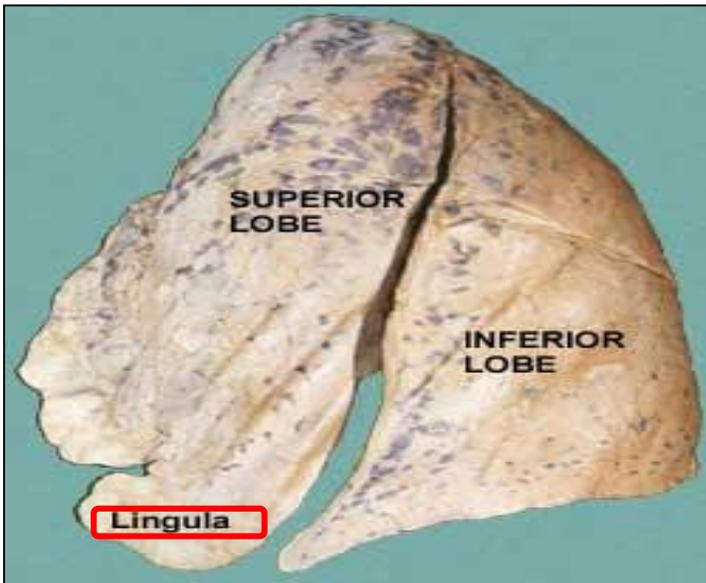


Lungs

Borders

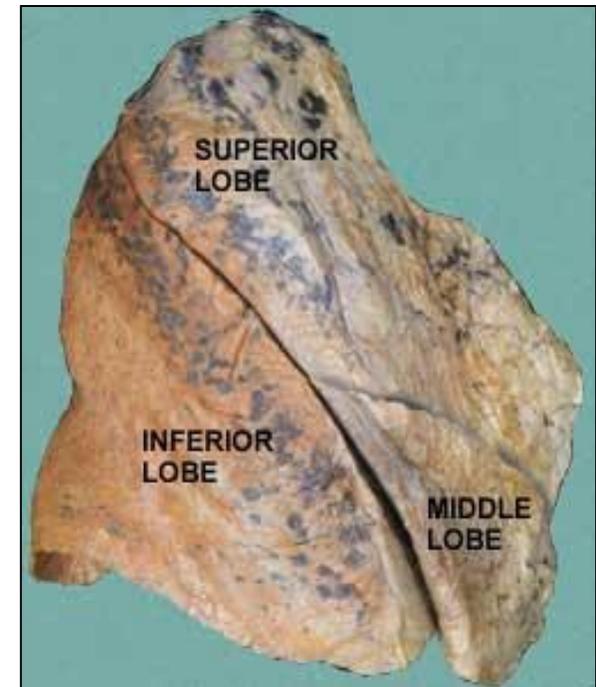
Anterior border :

- Is sharp, thin and overlaps the heart.
- Anterior border of left lung presents a **cardiac notch** at its lower end, has a thin **projection** called the **lingula** below the cardiac notch.



Posterior border :

- is rounded, thick and lies beside the vertebral column.

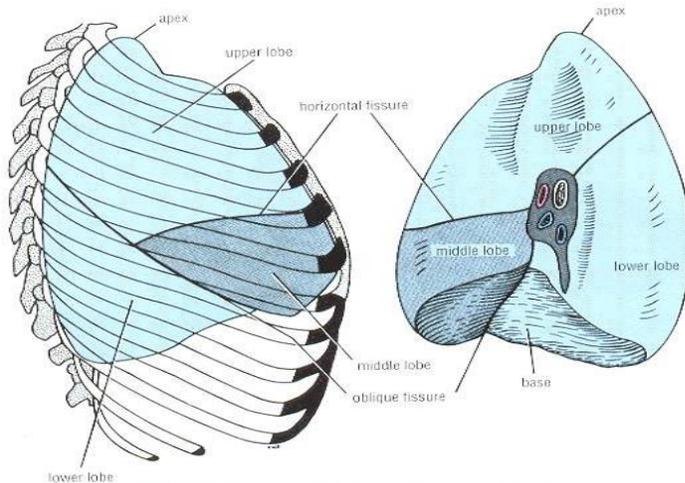


Lungs

Surfaces

Costal Surface:

- Convex.
- Covered by costal pleura which separates lung from: ribs, costal cartilages & intercostal muscles.



Lateral & medial surfaces of right lung

Mediastinal Surface:

It is divided into 2 parts:

Anterior (mediastinal) part:

Contains a hilum in the middle (it is *a depression* in which bronchi, vessels, & nerves forming the root of lung).

Posterior (vertebral) part:

It is related to:

- Bodies of thoracic vertebrae,
- Intervertebral discs,
- Posterior intercostal vessels
- Sympathetic trunk.

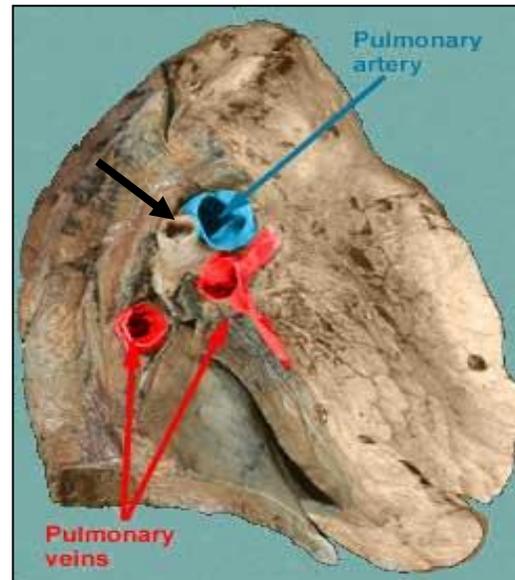
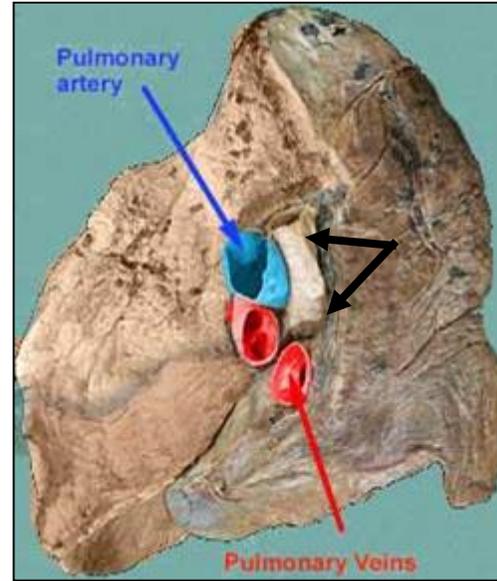
Lungs

Right Lung Root (hilum)

- **2 bronchi:** (middle & inferior lobar bronchi)
Lies most posterior.
- **Pulmonary artery:** is most superior
- **Pulmonary veins:** are inferior and anterior.

Left Lung Root (hilum)

- **One bronchus:** lies posterior
- **Pulmonary artery:** is most superior
- **Pulmonary veins:** are inferior and anterior

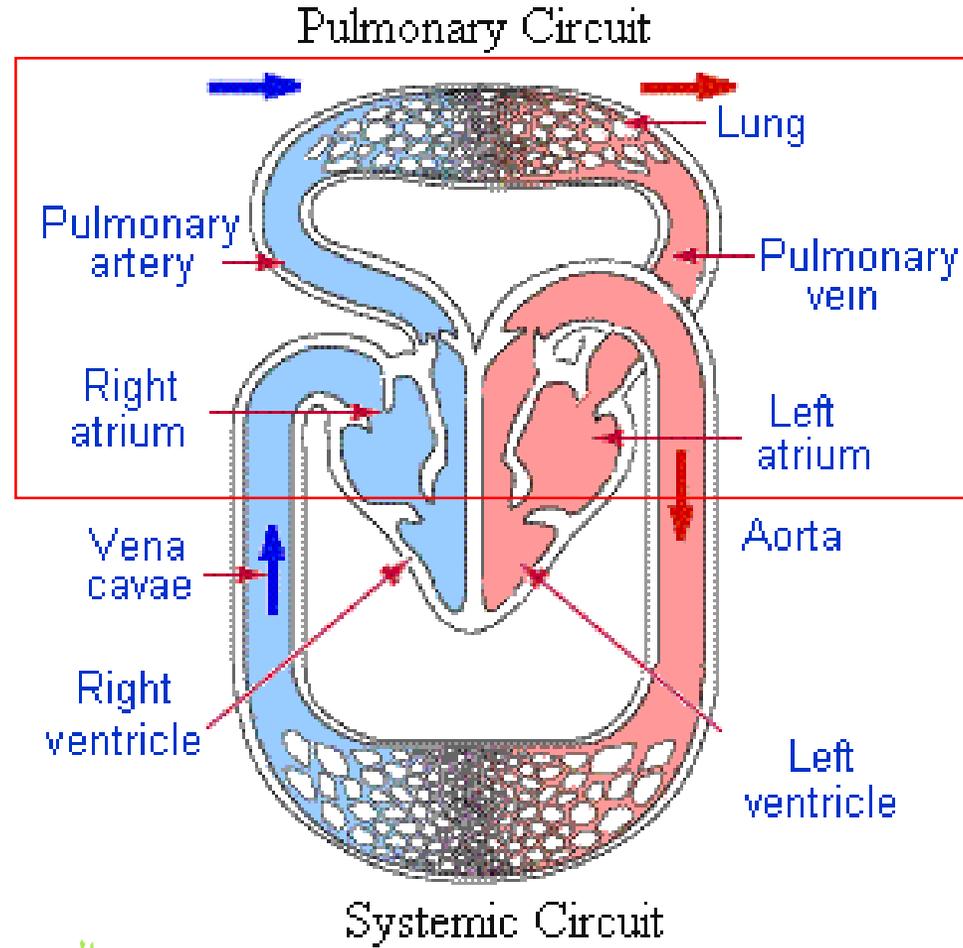


ليش هنا الشرايين هي اللي لونها أزرق و الأوردة العكس ؟

هنا الشرايين تحمل دم غير مؤكسد وعشان كذا يكون لونها أزرق مثل الأوردة ، وسميت شرايين لأنها تطلع من القلب مع أن الدم اللي فيها هو نفس نوع الدم اللي يكون داخل (الخالى من الأكسجين) الأوردة

يعني تسميتها حسب المصدر هل هو القلب (أو غيره ، مو حسب نوع الدم اللي يمشي فيها)

ملاحظة: الدكتورة نبهت على أن هذي الصور تجي كثير في امتحان OSPE وقالت مهم تعرفون الفرق بين arteries & veins

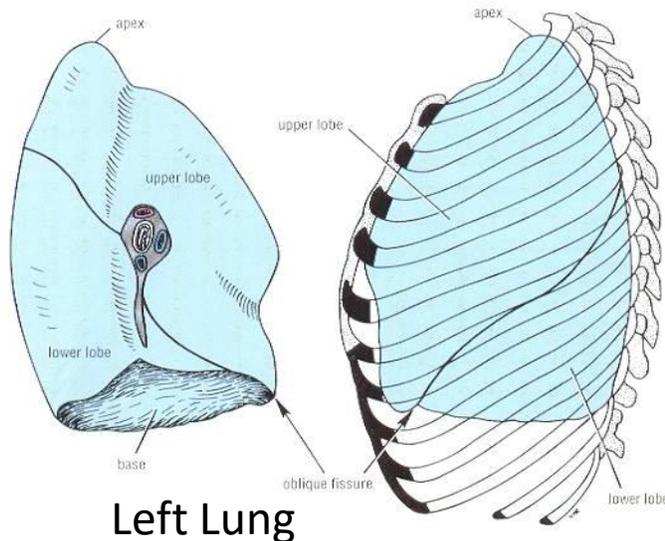
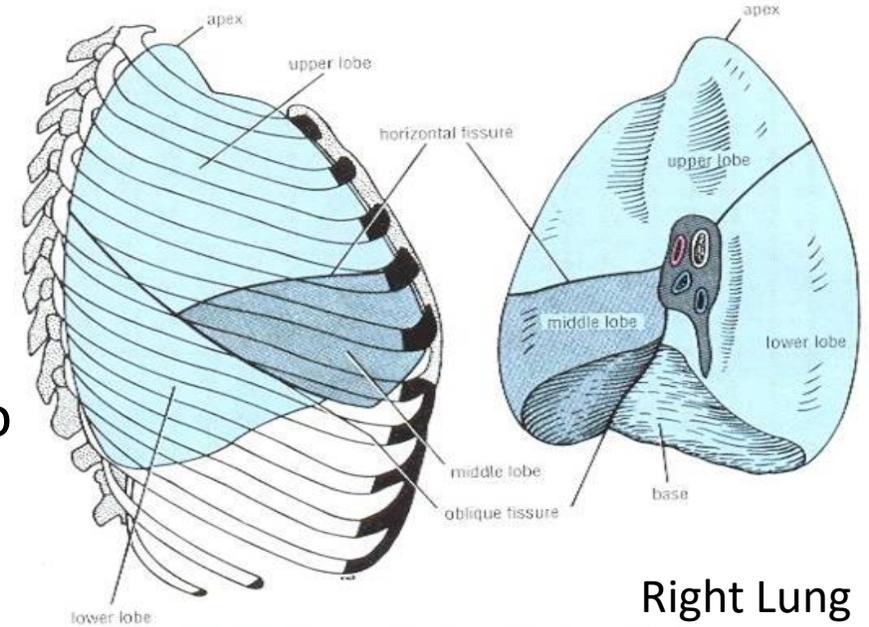


الصورة موجودة بالمحاضرة لكن الدكتور ** ركزت على هذي الأجزاء أثناء المحاضرة اعرفوا كل capillary ايش الatrium طالع منه أو داخل له

Lungs

Right lung

- Larger & shorter than left lung.
- Divided by 2 fissures (oblique & horizontal) into 3 lobes (upper, middle and lower lobes).



Left Lung

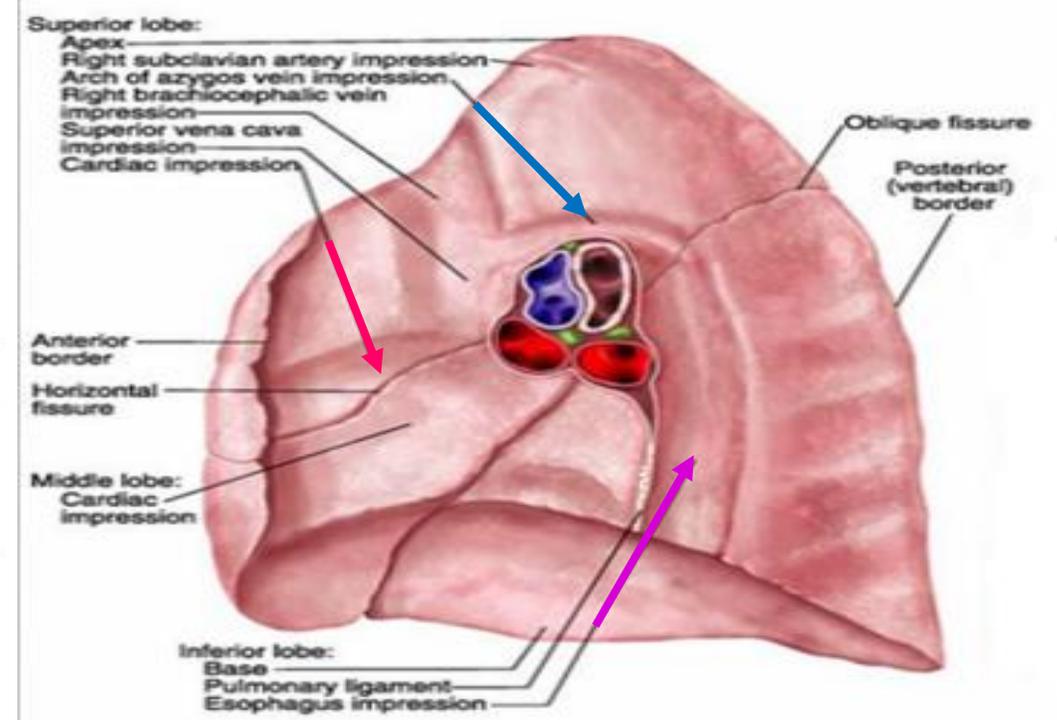
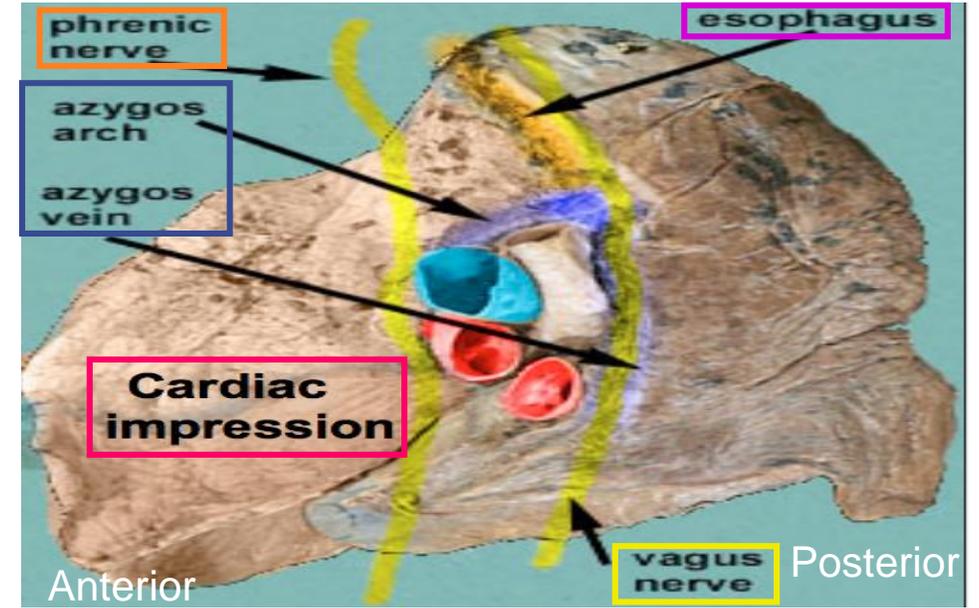
- Divided by one oblique fissure into 2 lobes, Upper and lower.
- There is No horizontal fissure.
- It has a cardiac notch at lower part of its anterior border.

Lungs

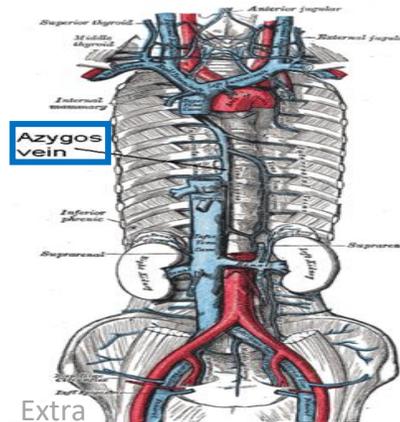
Mediastinal surface of right lung

On the mediastinal surface of the right lung, you find these structures:

- Azygos vein and its arch (*posterior and over the root of the lung*).
- Vagus nerve *posterior* to the root of the lung.
- Esophagus *posterior* to the root.
- Phrenic nerve *anterior* to the root of the lung.
- Cardiac impression: *related to right atrium*.
- *Below hilum and in front of pulmonary ligament* : groove for I.V.C. (inferior vena cava)



مبدئياً حنا نعرف ان الرئنه شكلها زي حرف C
والمنطقه المجوفه تكون في مكان يسمى
mediastinum راح ناخذ عنها محاضره
منفصله فهي تكون كذا
(< 3)
الرئتين وبينهم القلب



Lungs

Mediastinal surface of left lung

On the mediastinal surface of the left lung, you will find these structures:

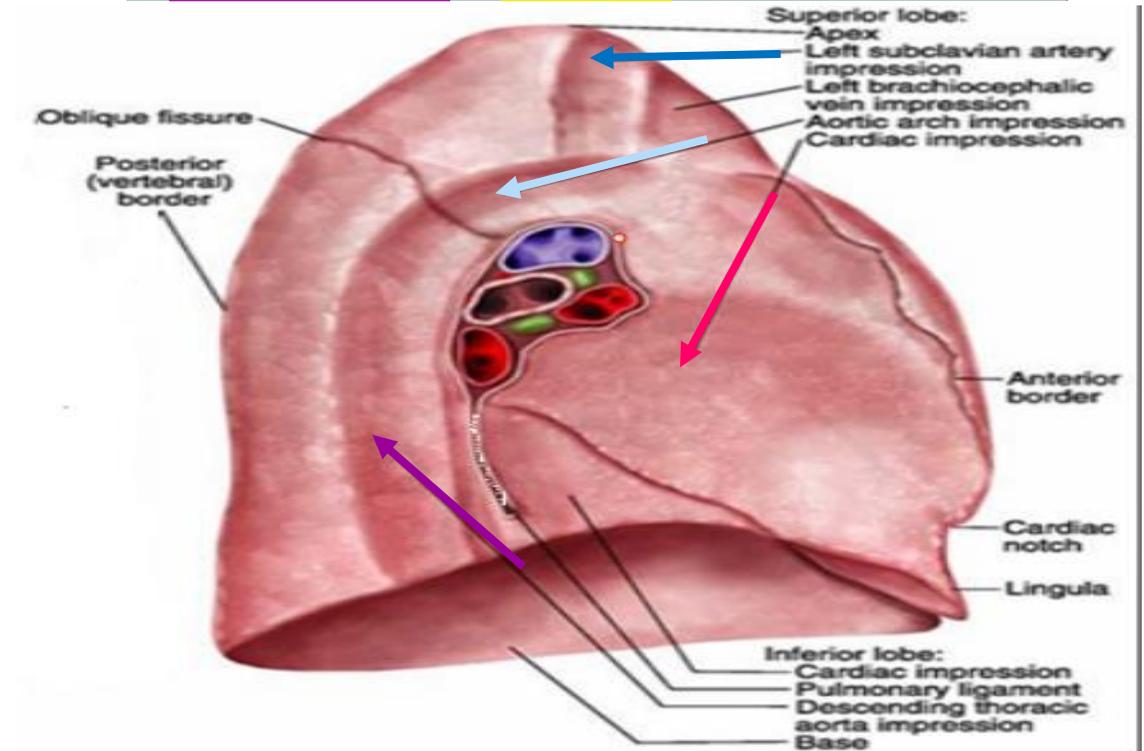
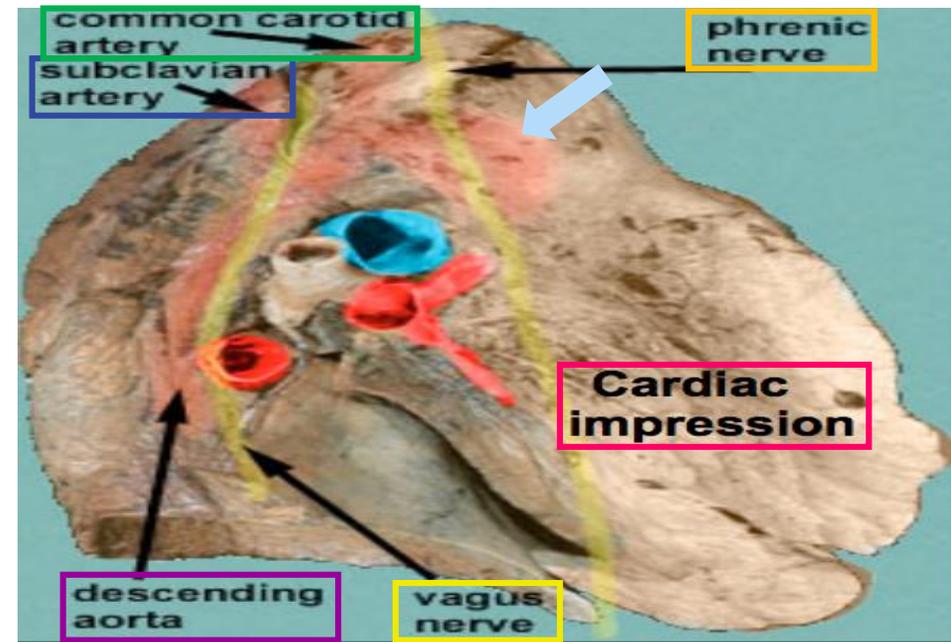
- Descending aorta *posterior* to the root.
- Vagus nerve *posterior* to the root of the lung
- Arch of the aorta *over* the root of the lung
- Groove for left common carotid and left subclavian arteries.
- Phrenic nerve *anterior* to the root of the lung
- Cardiac impression: *related to left ventricle*.

Note:

Cardiac impression:

Right lung = right atrium

Left lung = left ventricle



Lungs

Blood and Nerve Supply

- **Bronchial arteries** (From descending aorta).... It supplies *oxygenated blood* to bronchi, lung tissue & visceral pleura.
- **Pulmonary artery** which carries *non-oxygenated blood* from right ventricle to the lung alveoli.

- **Bronchial veins** : drain into azygos & hemiazygos veins.
- **2 pulmonary veins** : carry *oxygenated blood* from lung alveoli to the left atrium of the heart.

Pulmonary plexus at the root of lung...is formed of autonomic N.S. from sympathetic & parasympathetic fibers.

1- Sympathetic Fibers

From: *sympathetic trunk*

Action:

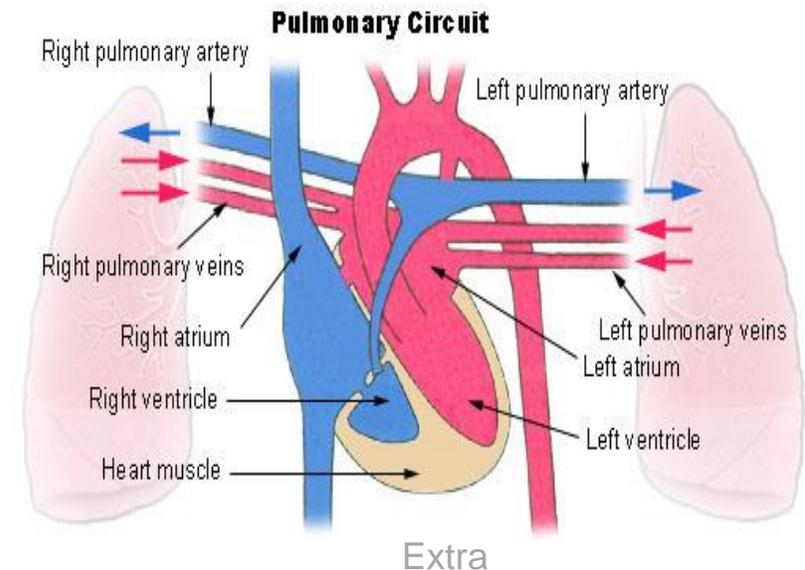
1. broncho-dilatation
2. vasoconstriction.

2- Parasympathetic Fibers

From: *Vagus nerve*

Action:

1. Broncho-constriction
2. vasodilatation
3. secretomotor to bronchial glands



Lungs

Bronchi

The trachea divides into 2 main bronchi:

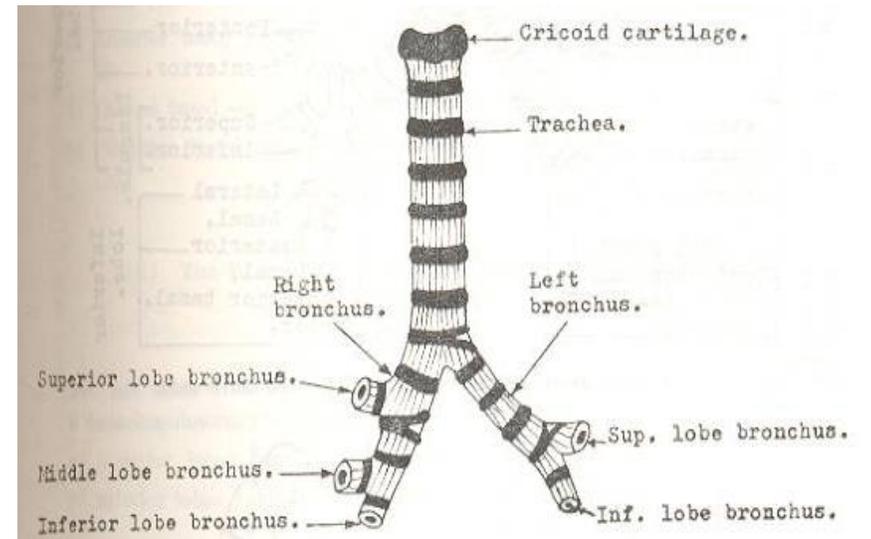
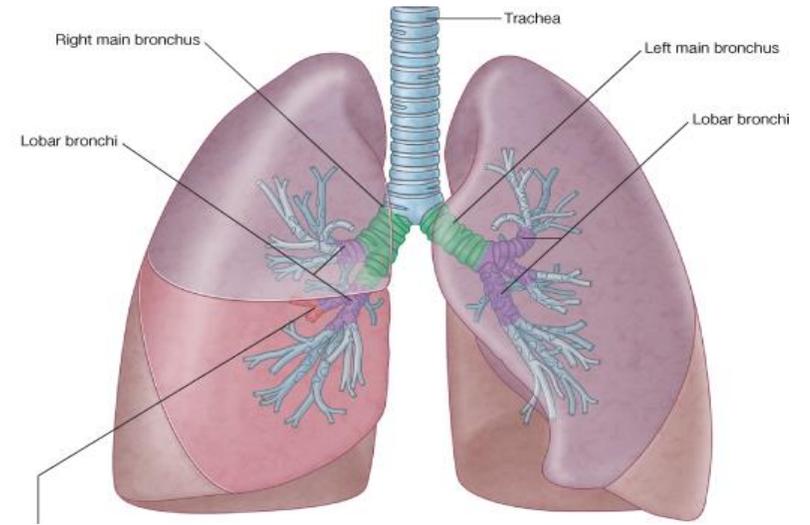
- **Right main bronchus:**

which divides before entering the hilum, it gives:
superior lobar (secondary) bronchus.

On entering hilum, it divides into **middle & inferior lobar bronchi.**

- **Left main bronchus:**

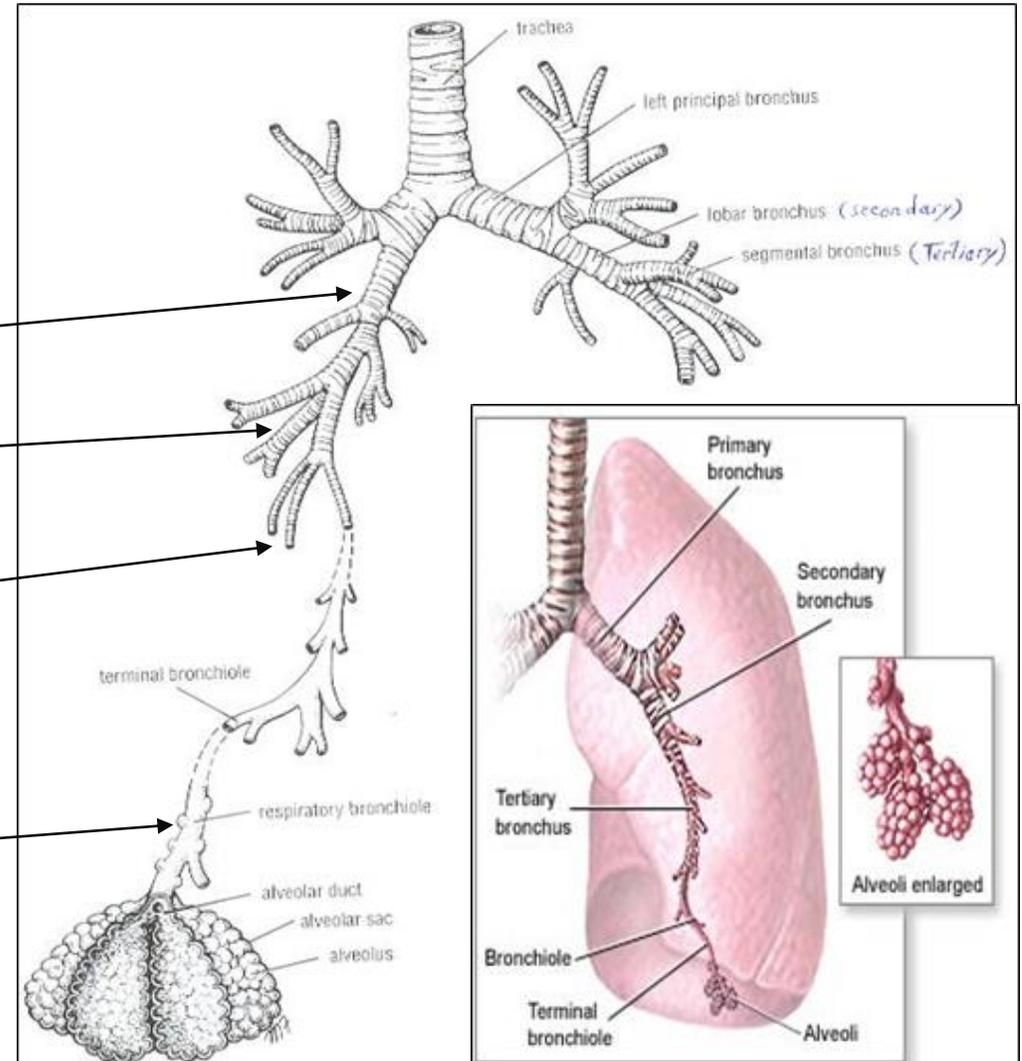
On entering hilum, it divides into **superior & inferior lobar bronchi.**



Lungs

Bronchopulmonary segments

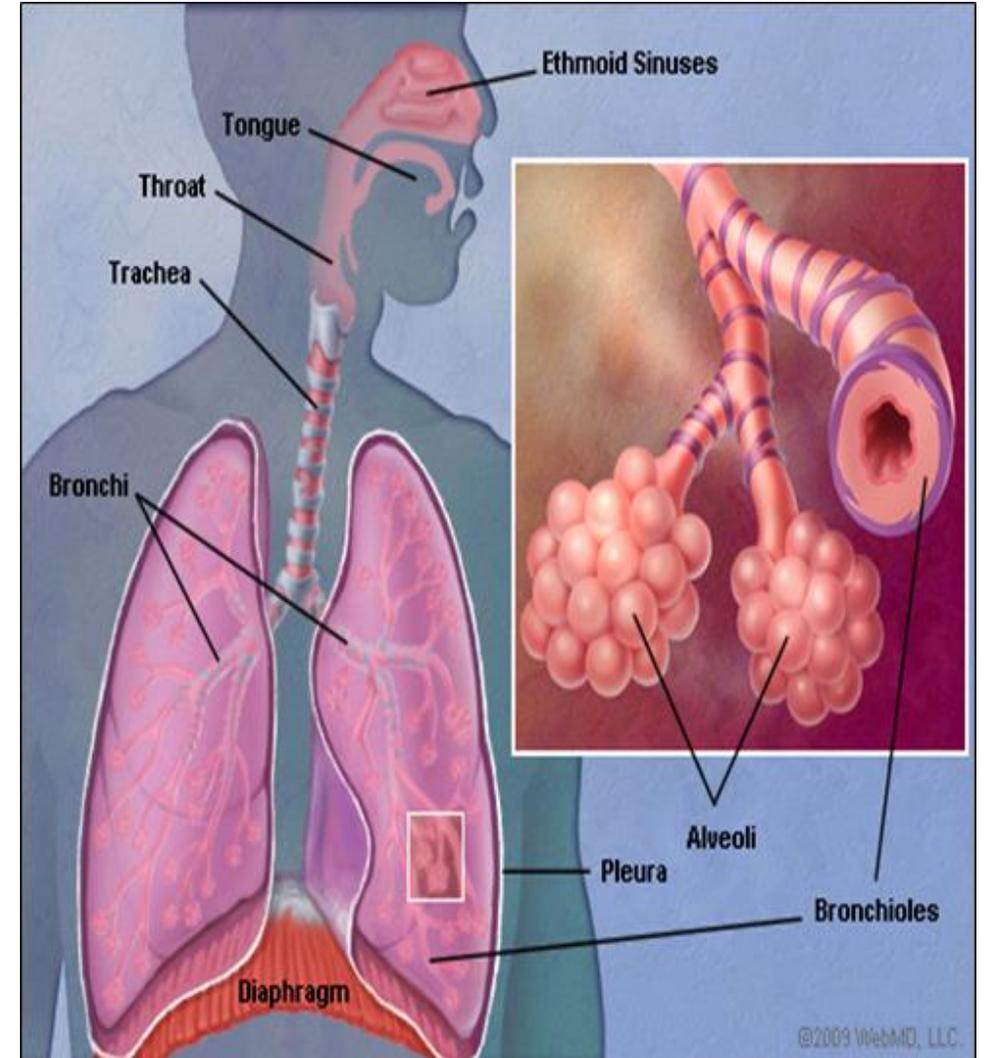
- They are the **anatomic, functional, and surgical** units of the lungs.
- Each **lobar (secondary) bronchus** gives **segmental (tertiary) bronchi**.
- Each **segmental bronchus** divides repeatedly into **bronchioles**.
- Bronchioles divide into **terminal bronchioles**, which show delicate outpouchings 'the **respiratory bronchioles**'.



Lungs

Bronchopulmonary segments

- The **respiratory** bronchioles end by branching into **alveolar ducts**, which lead into **alveolar sacs**.
- **The alveolar sacs** consist of several alveoli, **each alveolus is surrounded by** a network of blood **capillaries** for **gas exchange**.

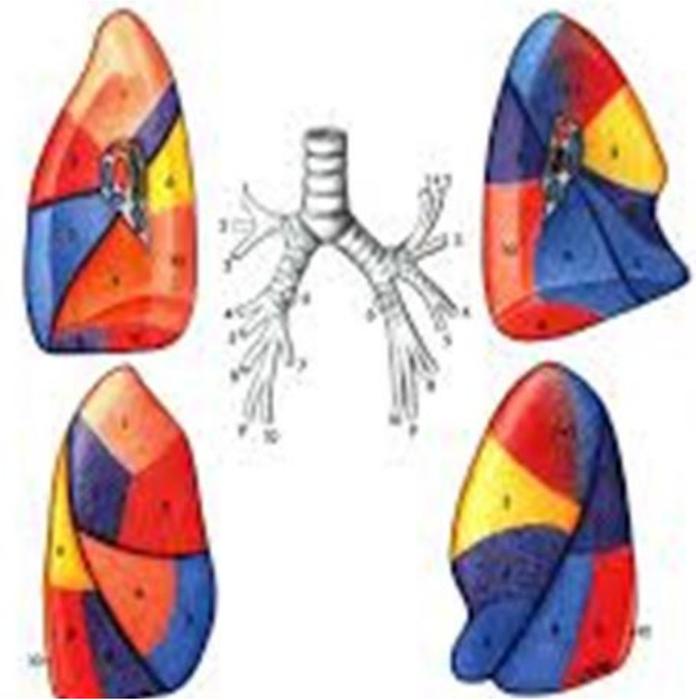


Lungs

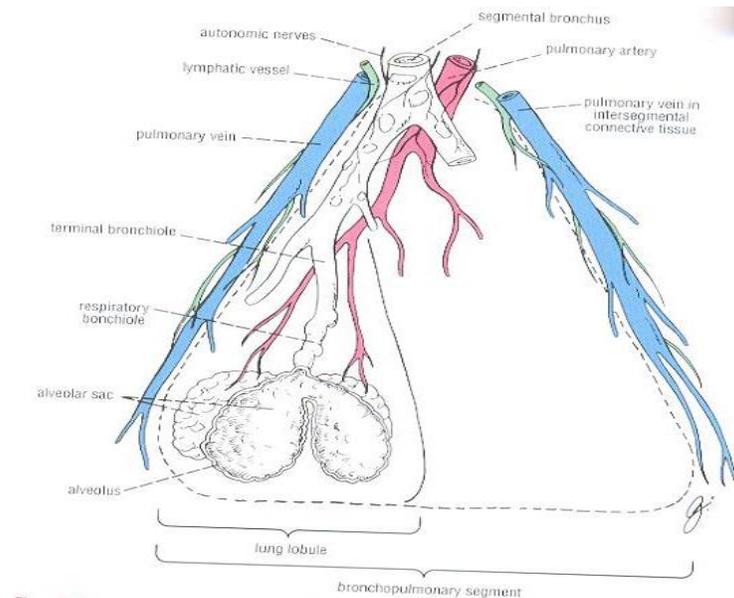
Bronchopulmonary segments

The main characteristics of a bronchopulmonary segment:

- It is a subdivision of a lung lobe.
- It is pyramidal shaped, its **apex** toward the lung root.
- It is **surrounded by** connective tissue septa.
- It has a segmental bronchus, a segmental artery, lymph vessels, and autonomic nerves.
- **The segmental vein** lies in the inter- segmental C.T. septa between the segments.
- **A diseased segment** can be removed surgically, because it is a structural unit.



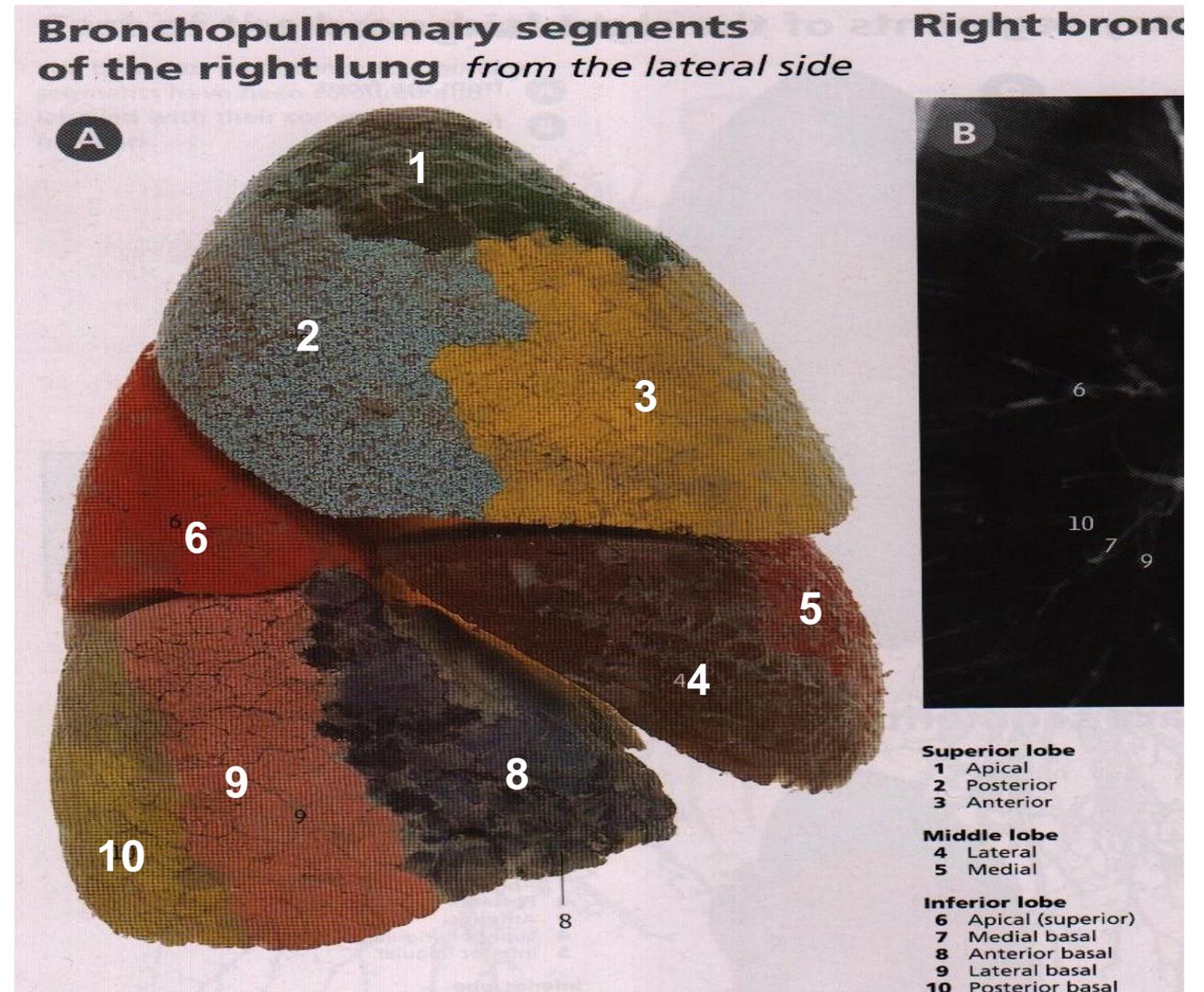
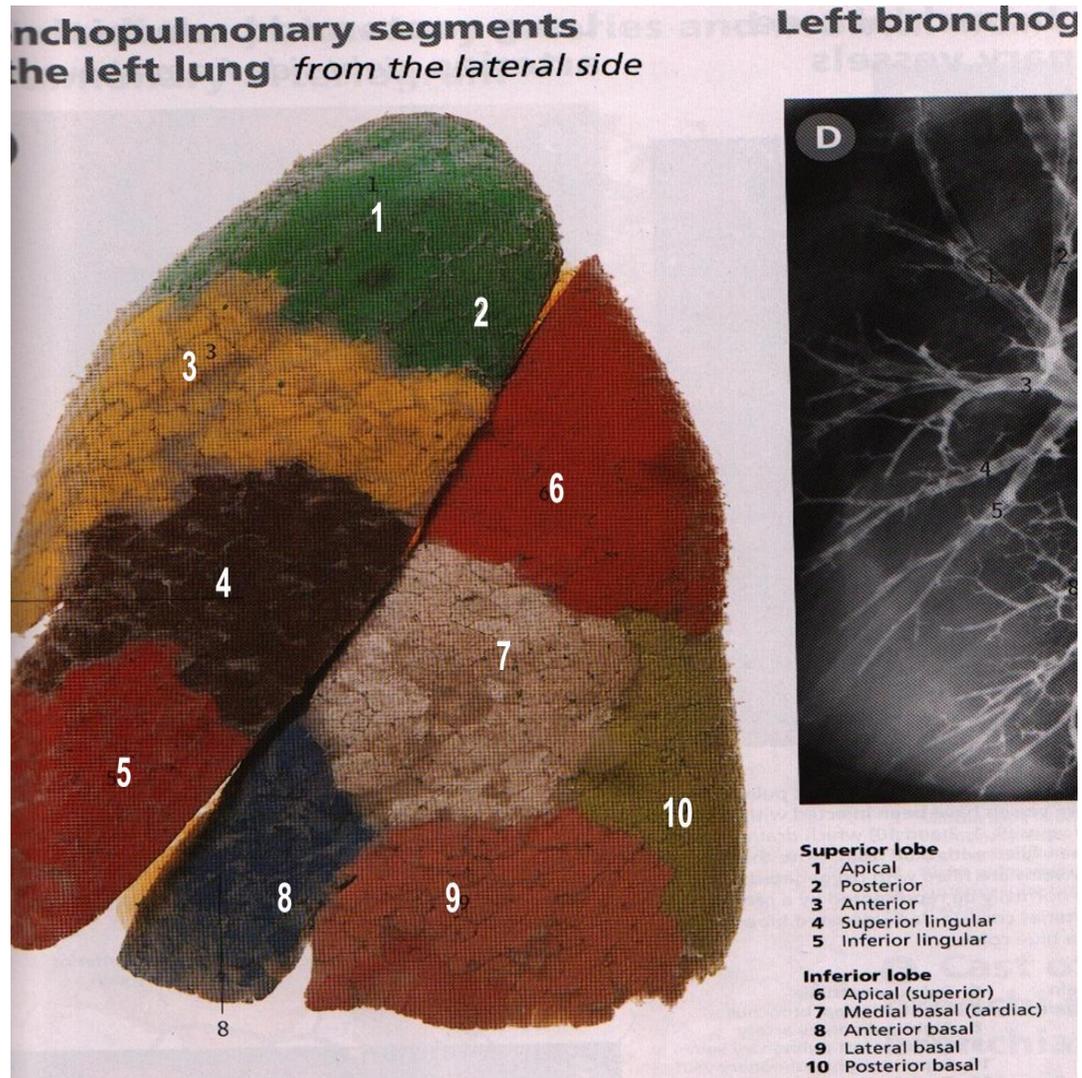
The pulmonary segments are arranged like a pizza. All the tips (apex) are directed toward the lung root

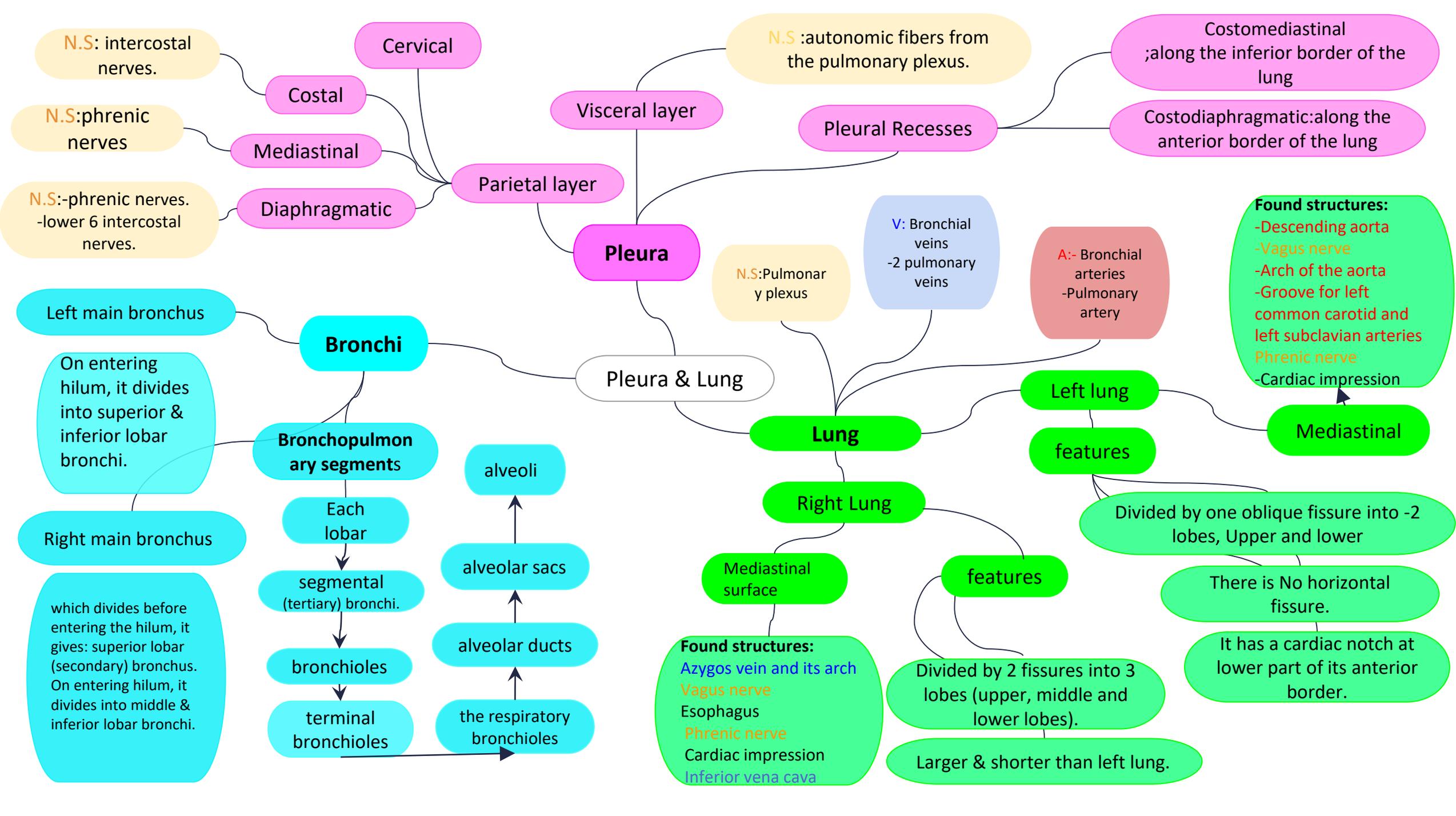


This picture shows one segment and its content

Lungs

Bronchopulmonary segments





Questions

1. The bronchi in the right lung root lie:
 - a. Anteriorly
 - b. Posteriorly
 - c. Superiorly
 - d. Inferiorly
 - e. Both a and d

Answer: B

2. The pulmonary veins of the right lung root lie:
 - a. Anteriorly
 - b. Posteriorly
 - c. Superiorly
 - d. Inferiorly
 - e. Both a and d

Answer: E

3. The cardiac impression in the right lung is related to the:
 - a. Right atrium
 - b. Right ventricle
 - c. Left ventricle
 - d. Inferior vena cava

Answer: A

4. Which of the following statements is incorrect?
 - a. The pulmonary veins in the left lung root lie anteriorly and inferiorly
 - b. The pulmonary artery in the right lung root lies superiorly
 - c. The left lung root has two bronchi
 - d. The right lung root has two bronchi

Answer: C

5. Which feature is found only in the left lung?
 - a. Cardiac notch
 - b. Transverse fissure
 - c. Oblique fissure
 - d. Cardiac impression

Answer: A

6. Which of the following structures carries oxygenated blood from the lung alveoli to the left atrium of the heart?
 - a. Bronchial artery
 - b. Pulmonary artery
 - c. Pulmonary veins
 - d. Azygos vein

Answer: C

7. Which of the following vessels supplies the lungs themselves with oxygen?
 - a. Bronchial artery
 - b. Bronchial vein
 - c. Pulmonary artery
 - d. Pulmonary vein

Answer: A

Questions

8. The lungs and visceral pleura receives parasympathetic innervation from:
- a. Cranial nerve IX
 - b. Vagus nerve
 - c. Phrenic nerve
 - d. Spinal nerve II

Answer: B

9. Which of the following is the first branching of the bronchial tree that has gas exchanging capabilities?
- a. Alveolar sacs
 - b. Alveolar ducts
 - c. Terminal bronchioles
 - d. Respiratory bronchioles

Answer: D

10. The pleural cavity, contains a thin film of pleural serous fluid. what is the normal value:
- A) 5-10ml.
 - B) 10-20ml.
 - C) 50ml.
 - D) 300ml.

Answer: A

11. Which one of the parietal pleura covers the thoracic (upper) surface of the diaphragm:
- A) Cervical Pleura.
 - B) Costal pleura.
 - C) Mediastinal pleura.
 - D) Diaphragmatic pleura

Answer: D

12. Pleural Recesses are :
- A) Costodiaphragmatic.
 - B) Costomediastinal.
 - C) none of them.
 - D) all of them.

Answer: D

13. Mediastinal pleura is supplied by:
- A) laryngeal nerve.
 - B) phrenic nerve.
 - C) intercostal nerves.
 - D) vagus nerve

Answer: B

14. The anterior margin of the left pleura has :
- A) Cardiac notch.
 - B) lingula.
 - C) none of them.
 - D) all of them.

Answer: D

15. Cause of Pleural Effusion is :
- A) TB.
 - B) infections.
 - C) congestive heart disease.
 - D) all of them

Answer: D

16. The apex of the lungs is grooved anteriorly by :
- A) subclavian artery.
 - B) Azygos vein.
 - C) phrenic nerve.
 - D) Cardiac impression

Answer: A

