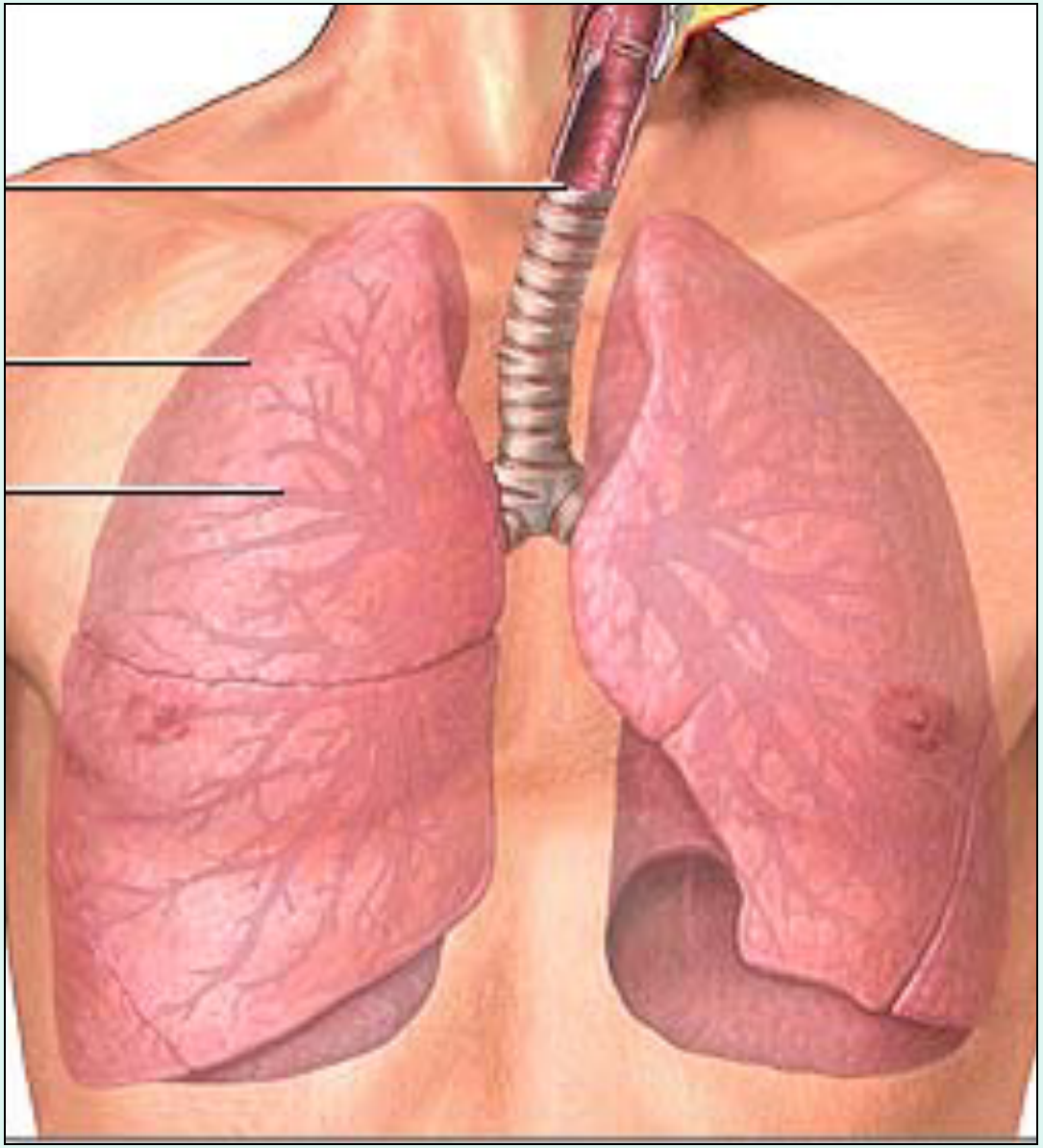
Pleura & Lung



Objectives

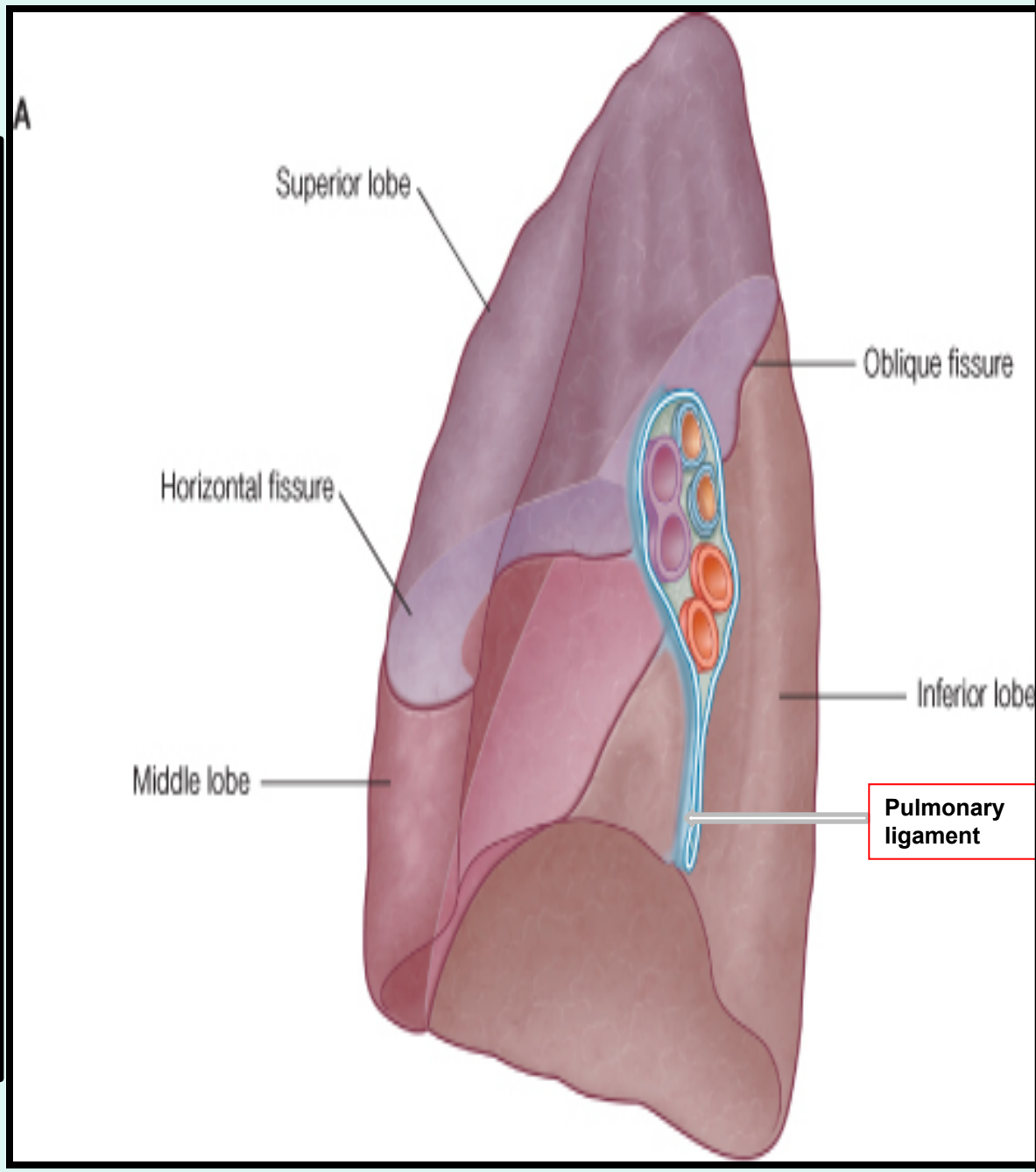
By the end of the lecture, the student should be able to :

- 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.

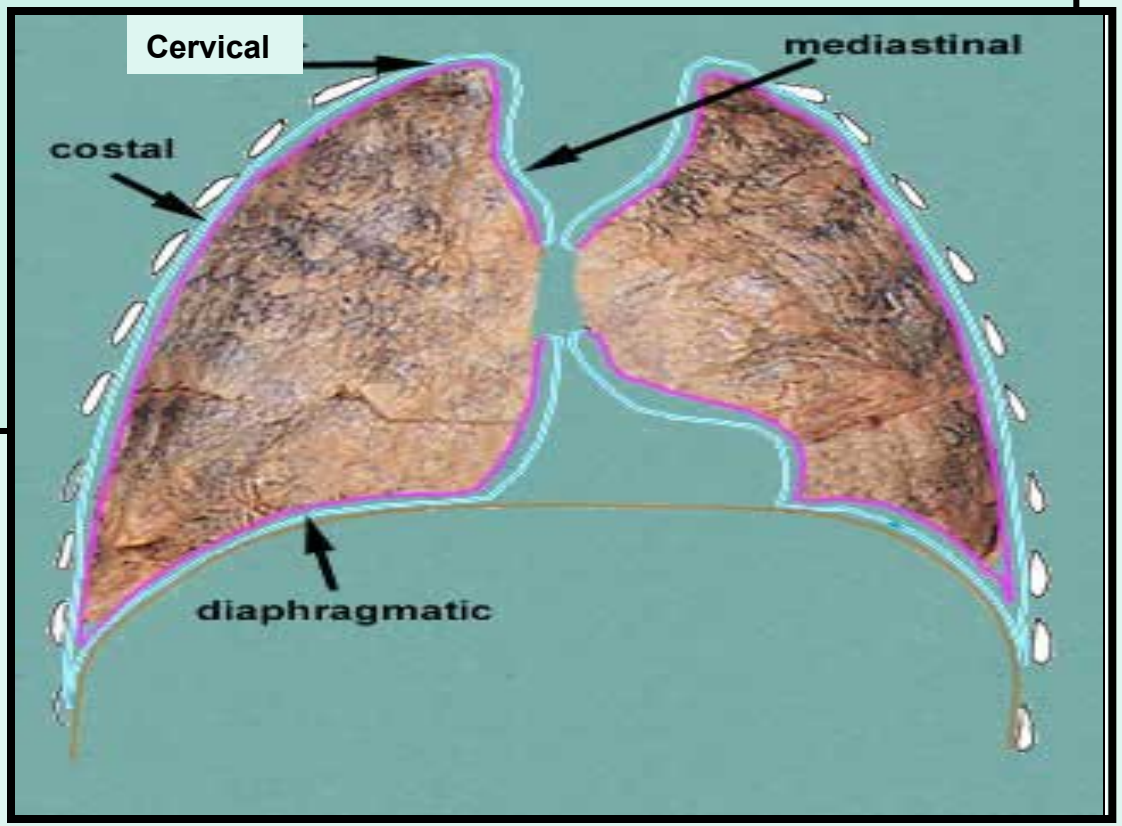
Pleura

- 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.).



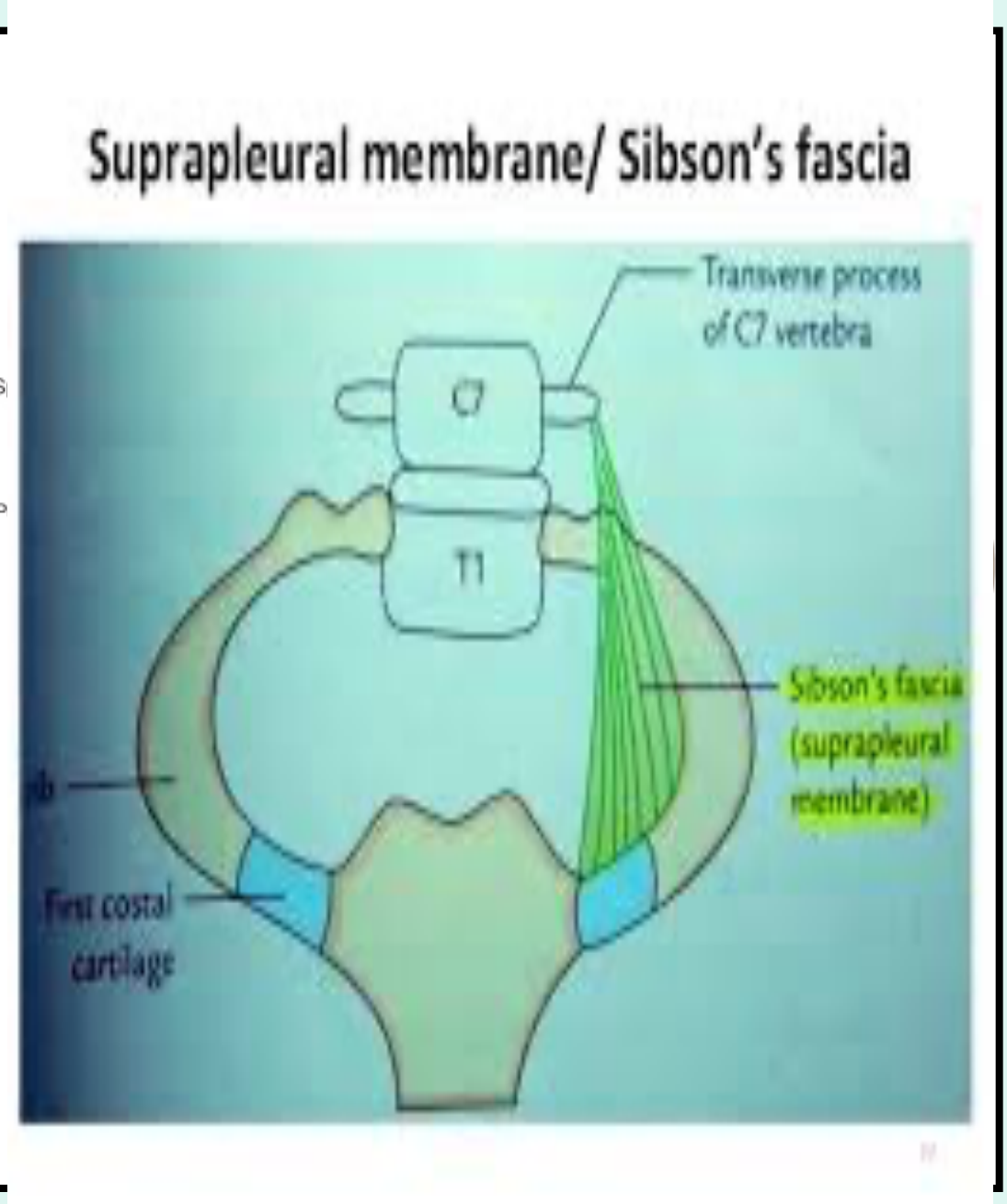
Parietal Pleura

- It is divided according to the region in which it lies and the surfaces it covers, into:
  - 1- Cervical
  - 2- Costal
  - 3- Mediastinal
  - 4- Diaphragmatic



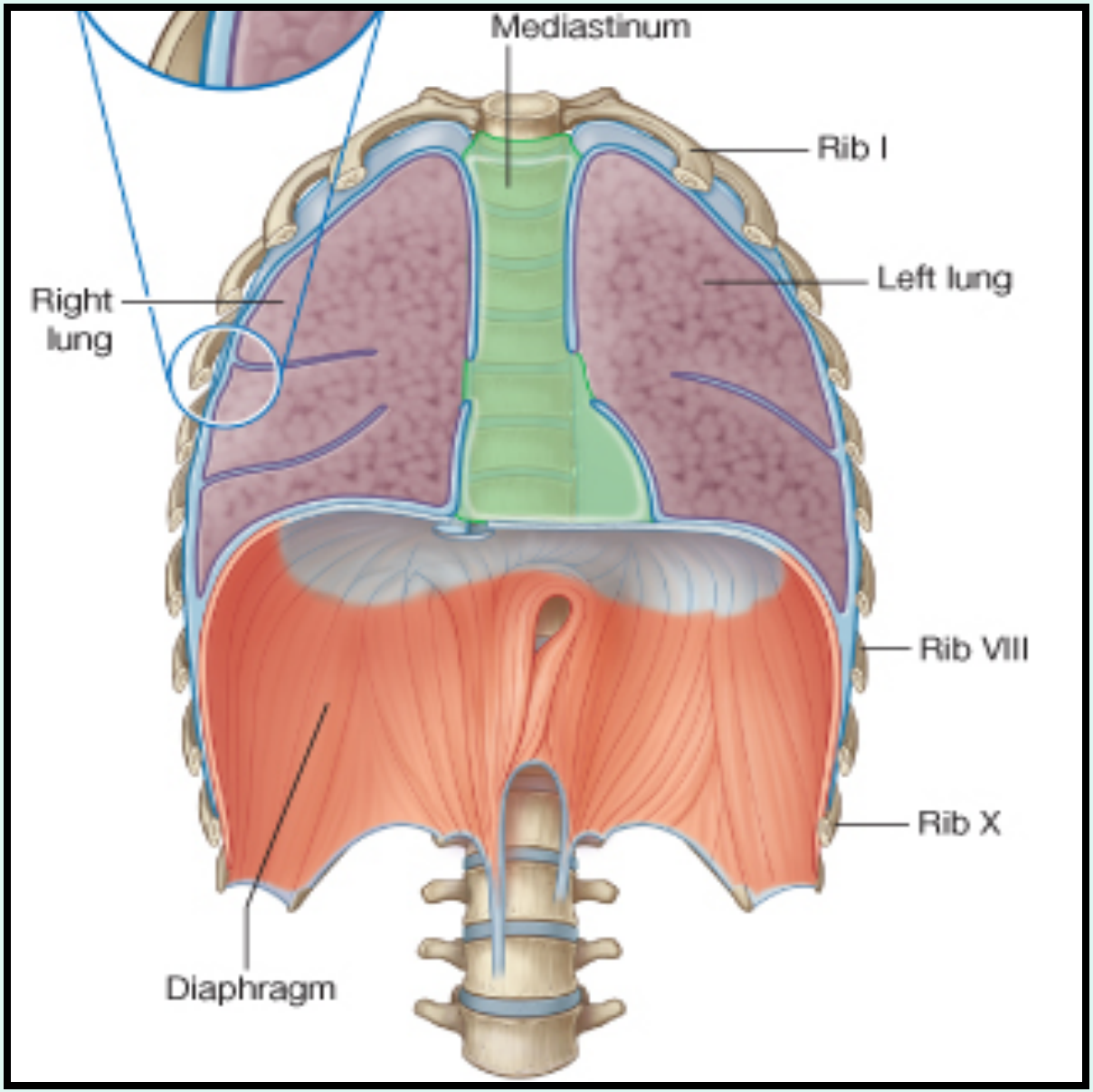
Parietal Pleura

- **Cervical Pleura:**
- Projects up into the neck about one inch above the medial1/3rd of clavicle.
- **It lines** the under surface of the suprapleural membrane.
- **Costal pleura:**
- **lines**, the back of the:
- Sternum,
- Ribs & costal cartilages,
- Intercostal spaces &
- Sides of vertebral bodies



Parietal Pleura

- **Mediastinal pleura**: **covers** the mediastinum.
- **At the hilum**, it is reflected on to the vessels and bronchi, and continuous with the visceral pleura.
- **Diaphragmatic pleura**: **covers** the thoracic (upper) surface of the diaphragm.



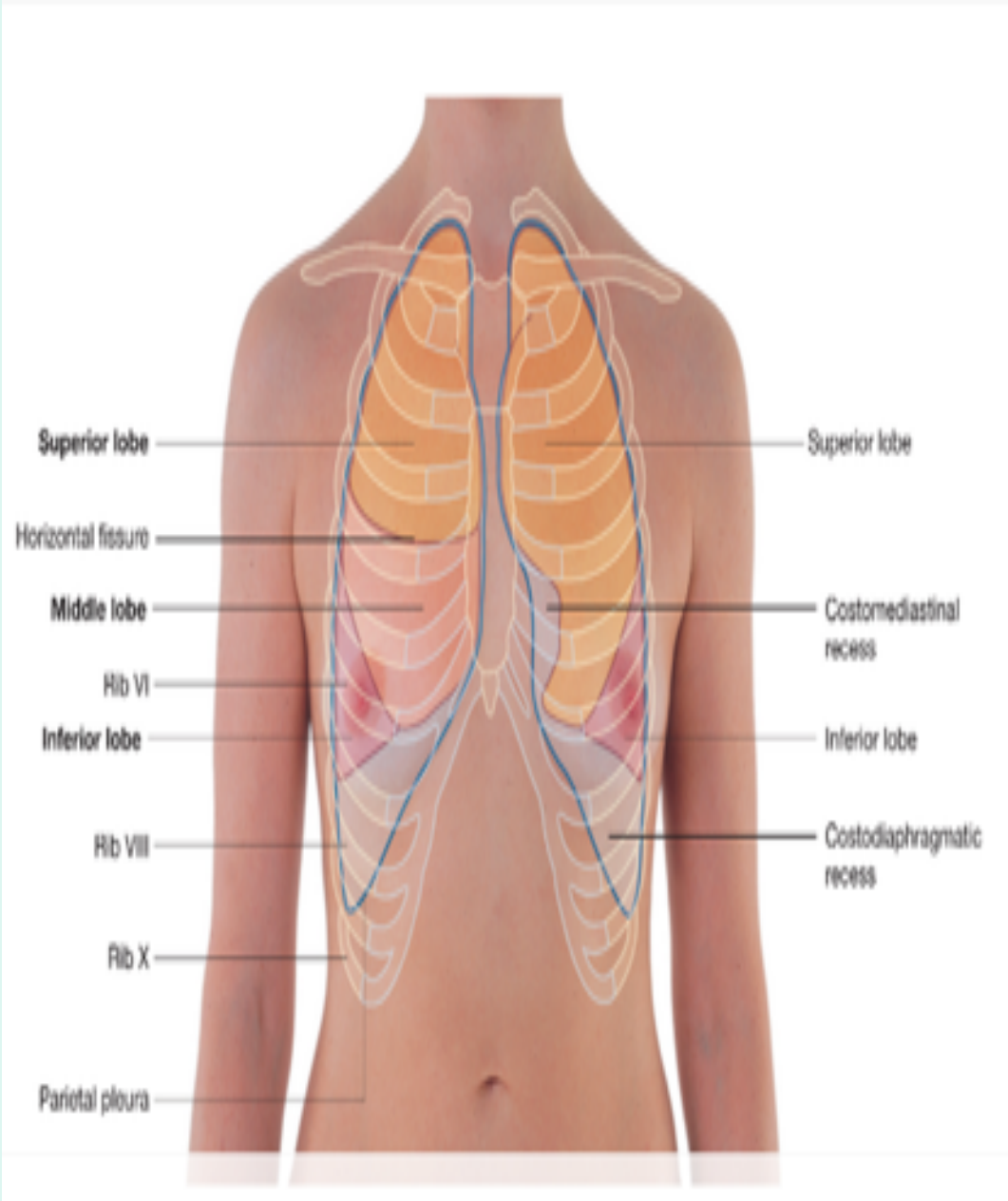
Pleural Recesses

Costodiaphragmatic:

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

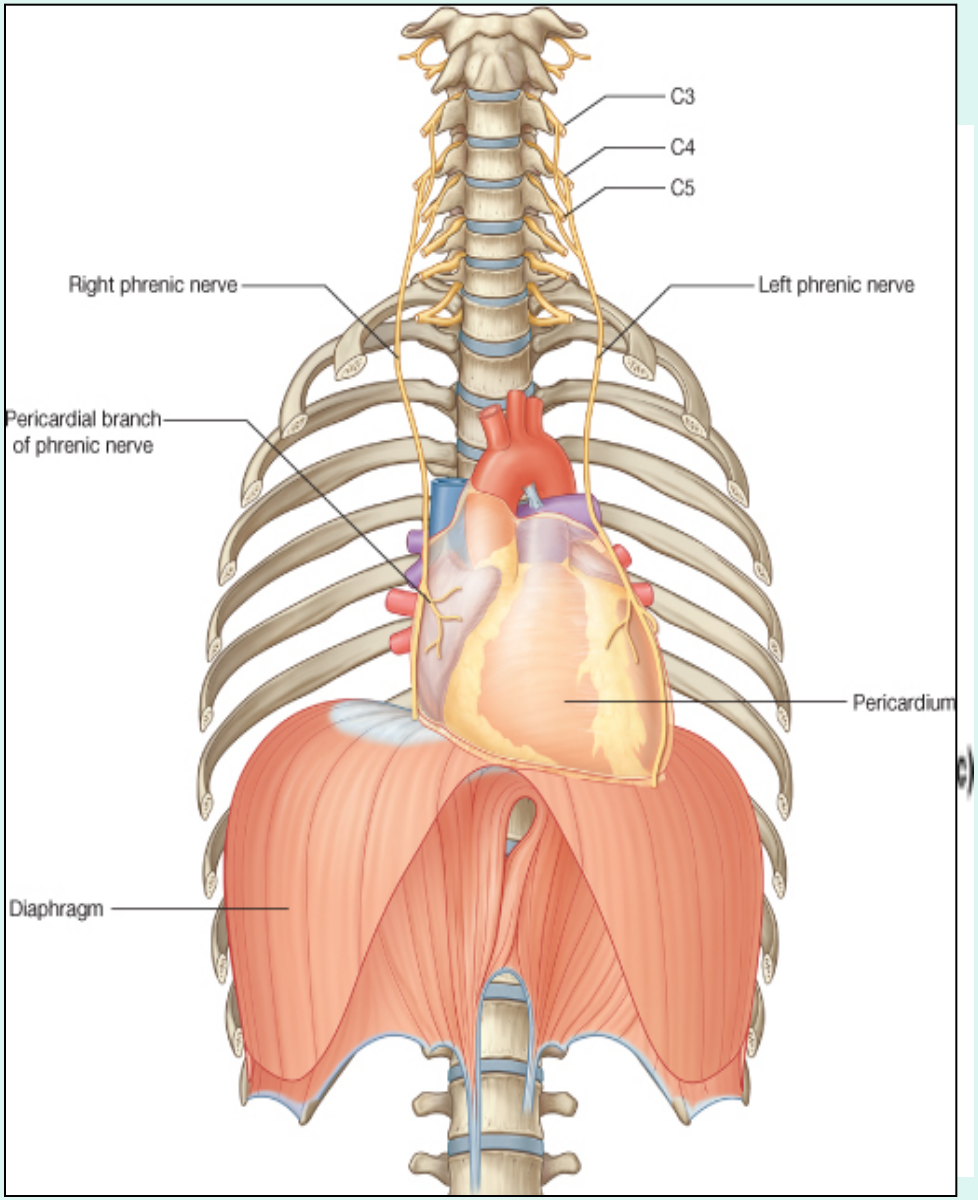
Costomediastinal:

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

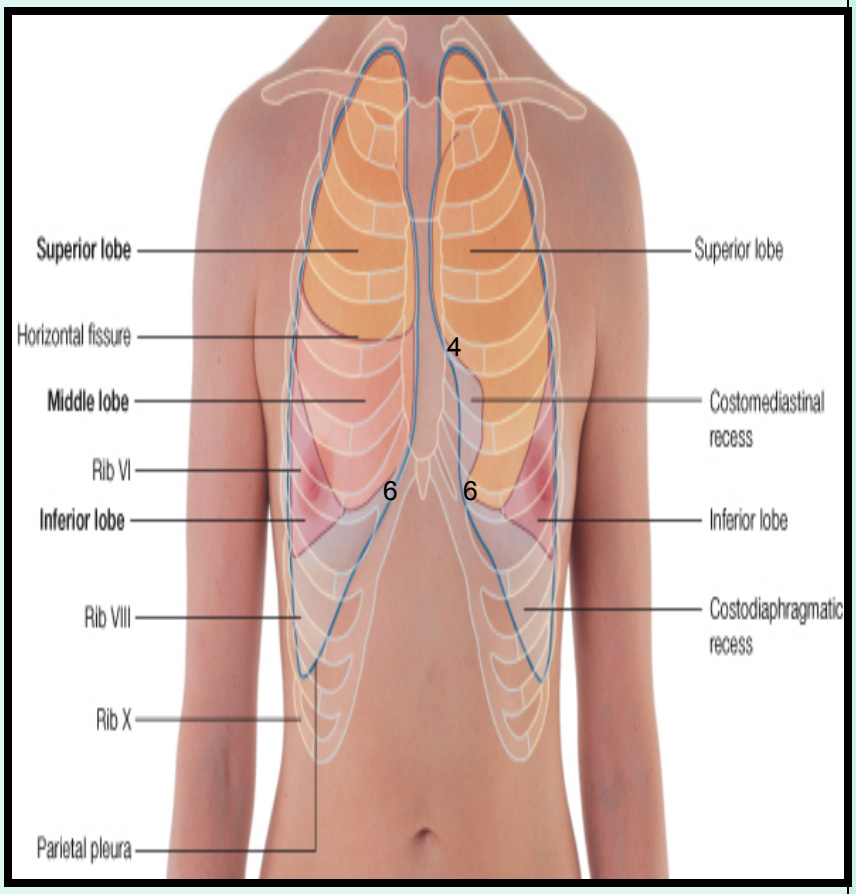


Pleura: Nerve Supply

- **Parietal pleura:**
- **It is sensitive to pain, pressure, temperature, and touch.**
- 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 over the **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.**

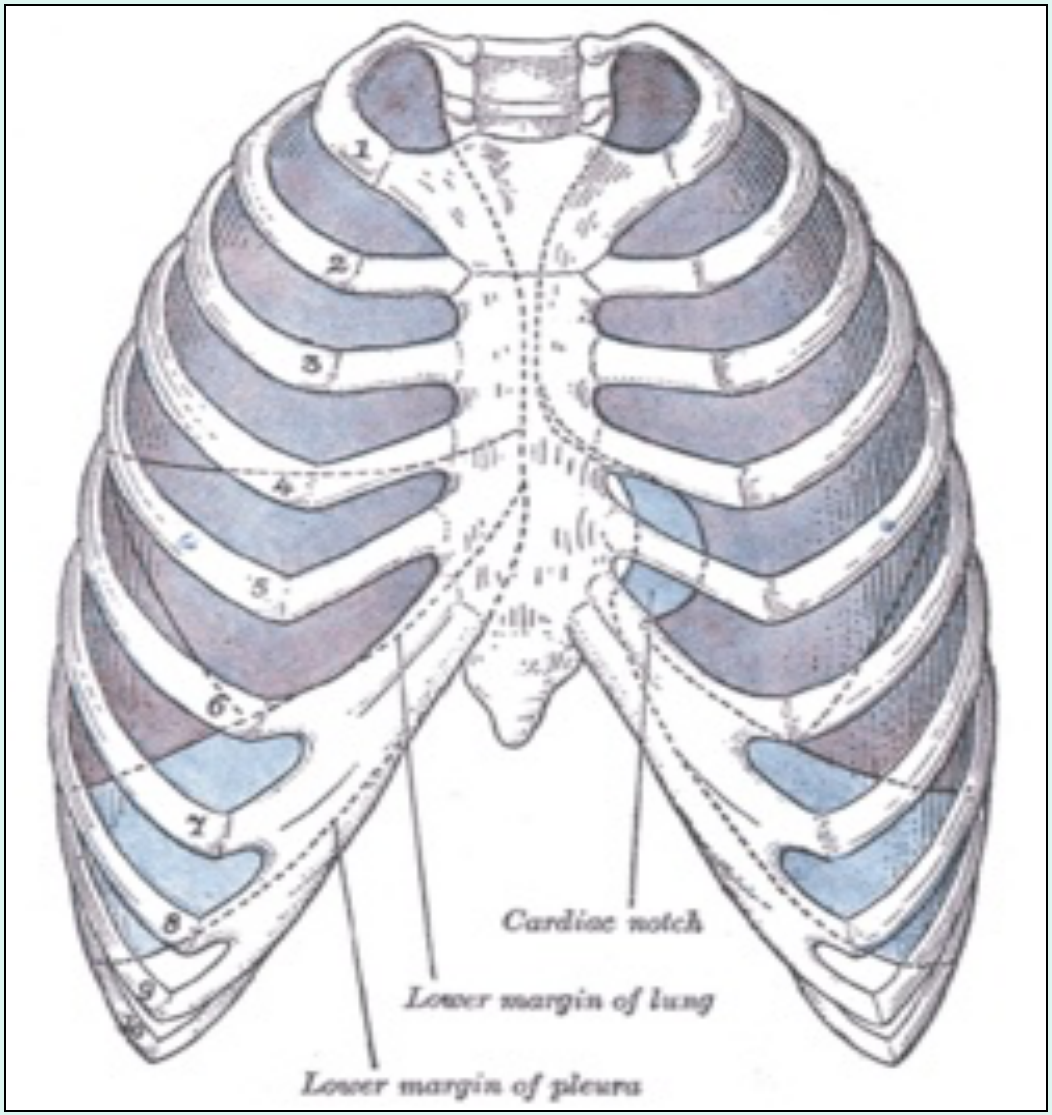


SURFACE ANATOMY OF PLEURA



- **Apex:** lies one inch above the medial 1/3 of the clavicle.
- **The anterior margin**
- **Right pleura:** extends vertically from **sterno-clavicular joint** to **xiphisternal joint (6th costal cartilage).**
- **Left pleura: Simillar course but at the level the 4th costal cartilage** deviates laterally and extends to lateral margin of the sternum to form **cardiac notch then turns sharply downward** to **xiphisternal joint (6th costal cartilage).**
- **Inferior margin :** passes around the chest wall, on the **8th** rib in midclavicular line, **10th** rib in **mid-axillary line** and finally reaching to 12th rib adjacent to vertebral column posteriorly **(T12 spine).**
- **Posterior margin : along the vertebral column** from the **apex (C7)** to the **inferior margin (T12 spine).**

SURFACE ANATOMY OF LUNG



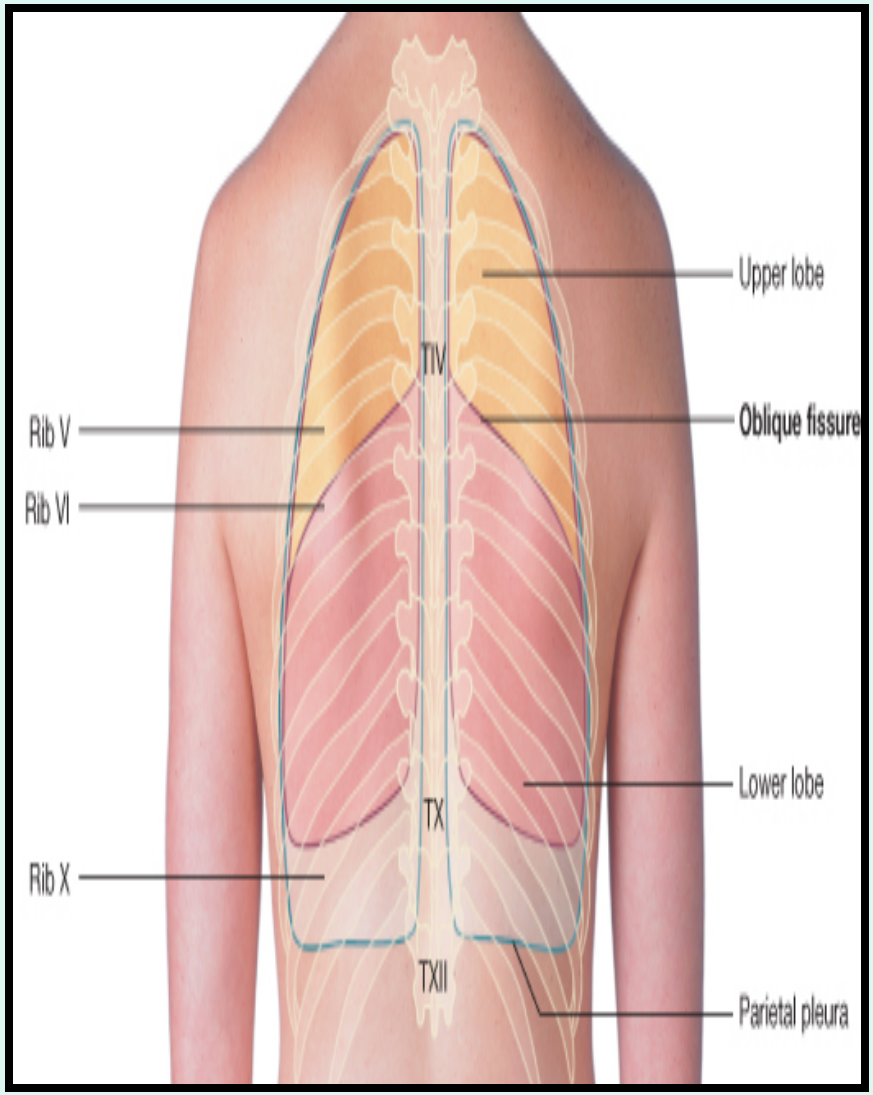
- **Apex, anterior border** correspond nearly to the lines of pleura but are slightly away from the median plane.
- **Inferior margin :** passes around the chest wall, on the **6th** rib in midclavicular line, **8th** rib in **mid-axillary line** and finally reaching to 10th rib adjacent to vertebral column posteriorly.
- as the pleura but more horizontally and finally reaching to **the 10th thoracic spine.**
- **Posterior margin : along the vertebral column** from the **apex (C7)** to the **inferior margin (T10 spine).**

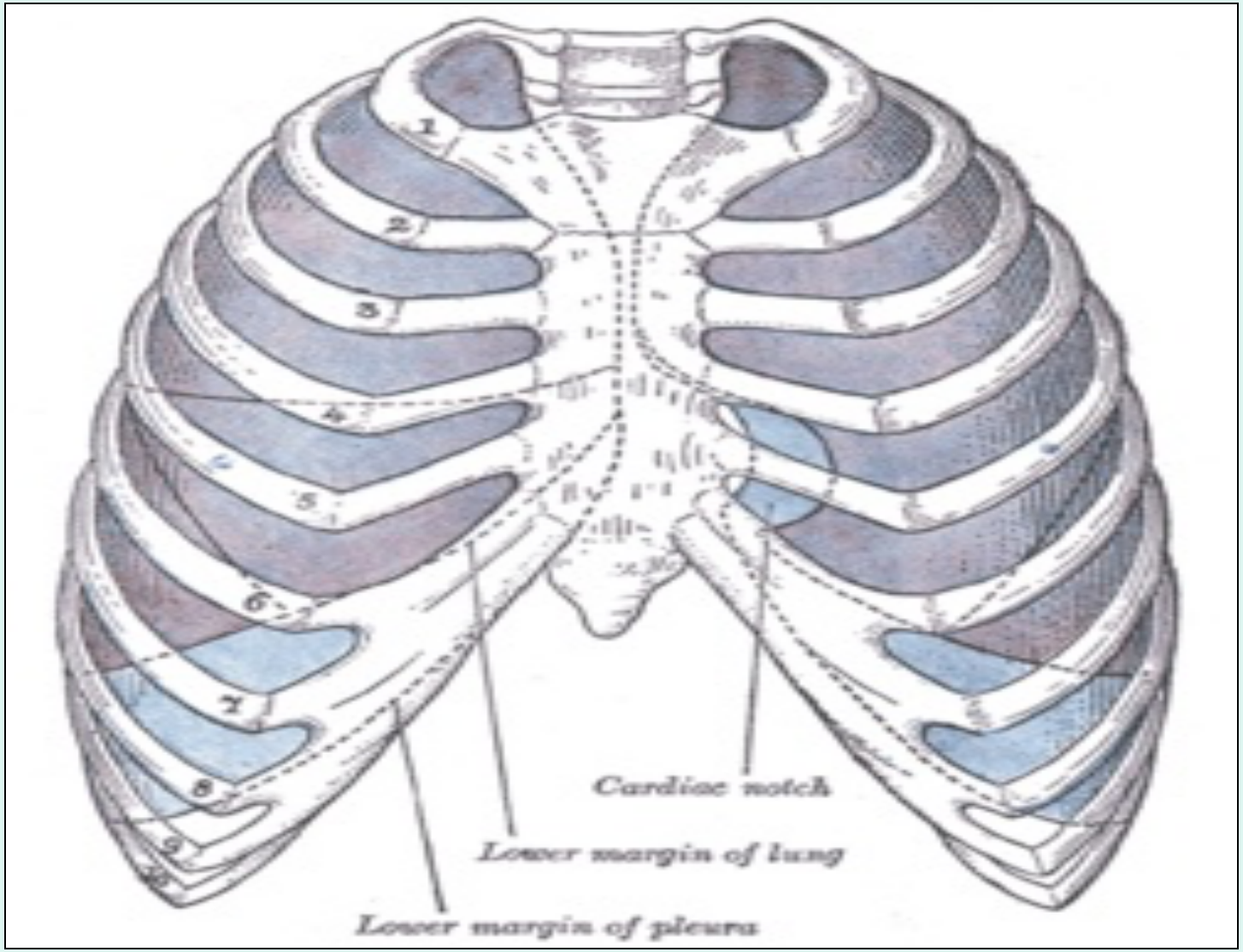
SURFACE ANATOMY OF LUNG

Oblique fissure:

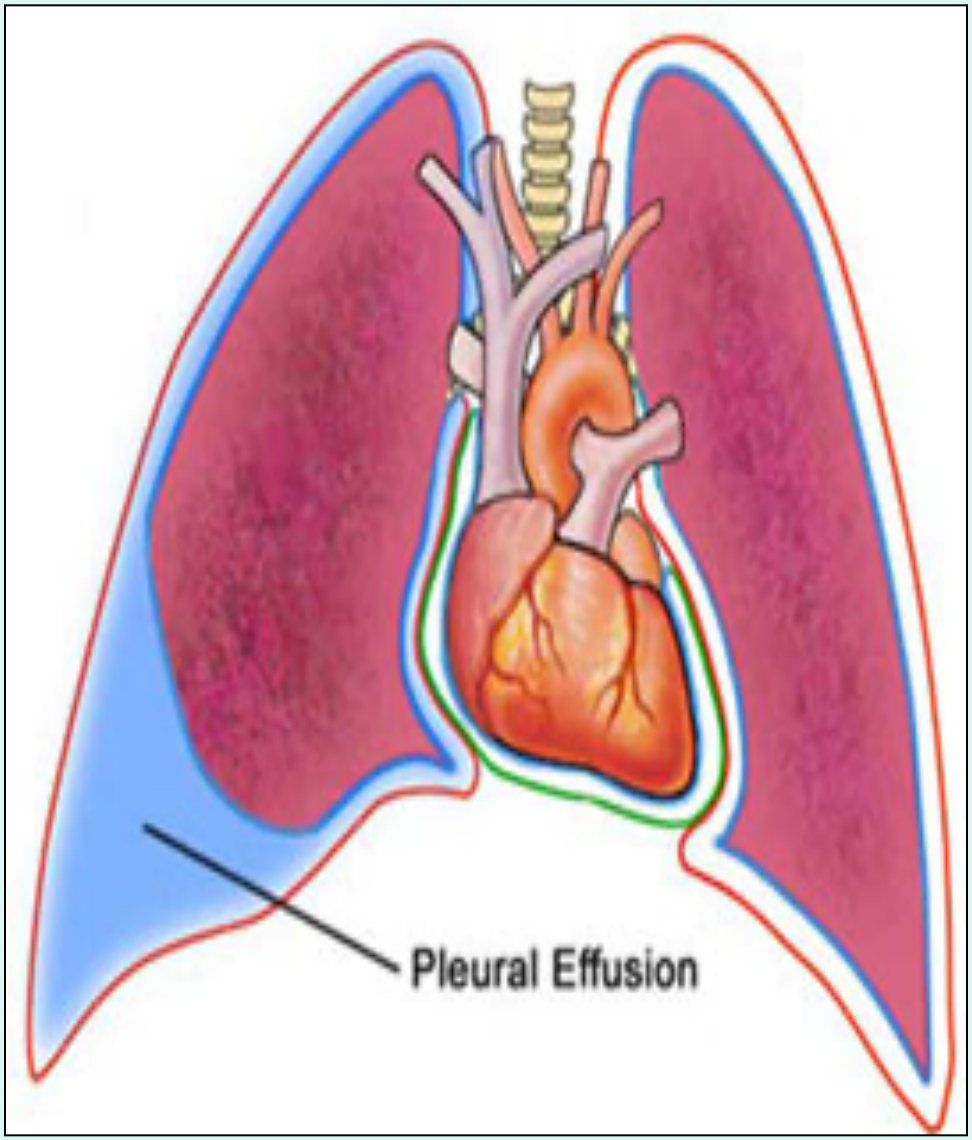
- Represented by a line extending from 4th thoracic spine, obliquely ending at 6th costal cartilage.

Transverse fissure: Only in the right lung: represented by a line extending from 4th right costal cartilage to meet the oblique fissure.




1
2
3
4
5
6
7
8
9
Cardiac notch
Lower margin of lung
Lower margin of pleura

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.

Lungs

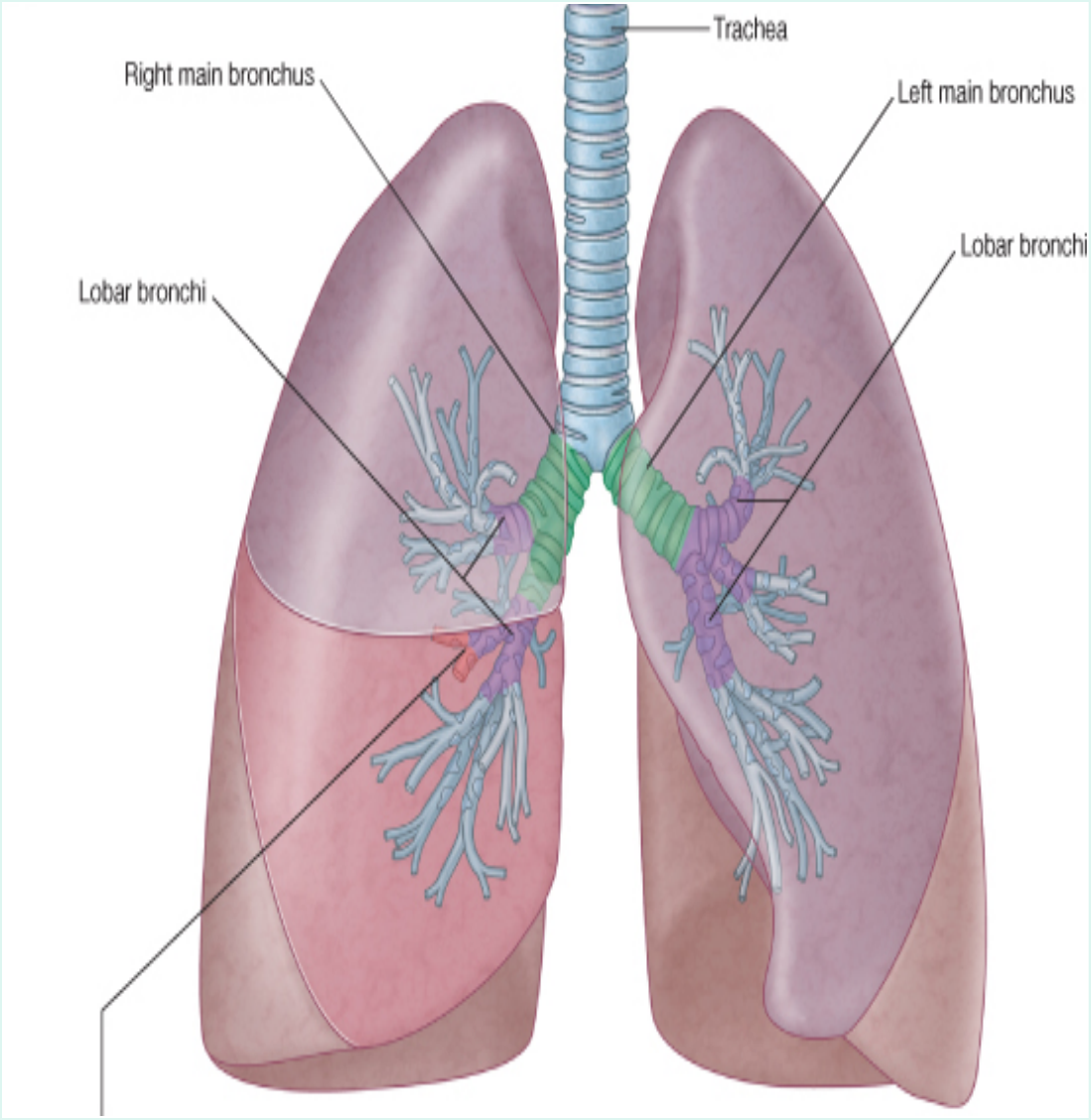
- **Located** in the **thoracic cavity**, one **on each side** of the **mediastinum**
- **Each lung is**:

Conical in shape.

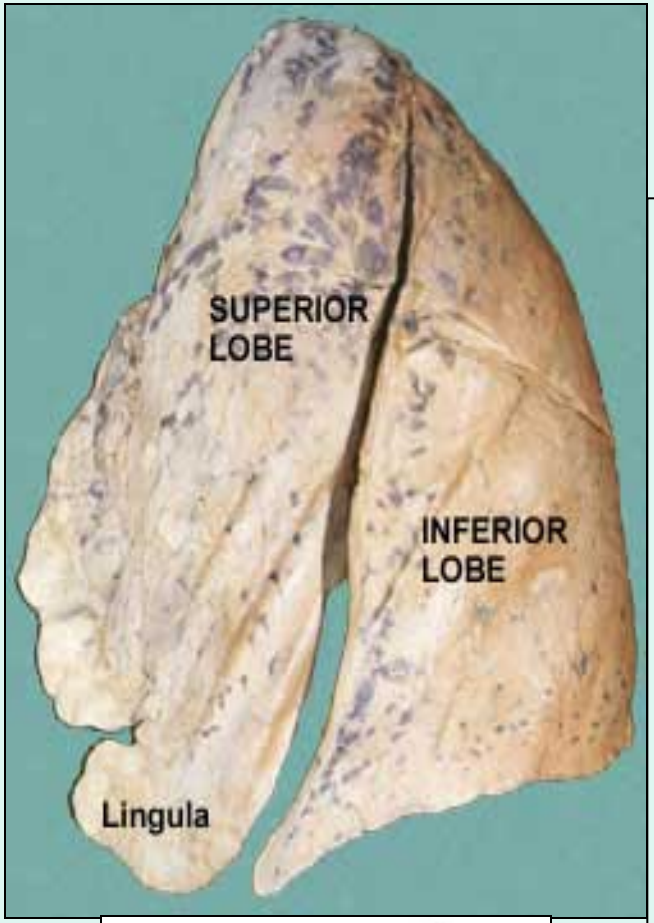
Covered by the visceral pleura.

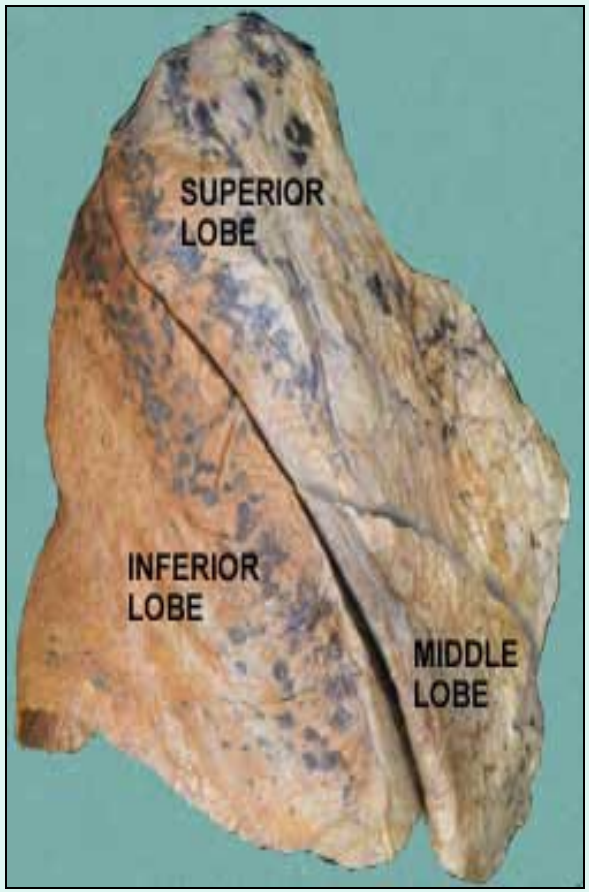
Suspended free in its own pleural cavity.

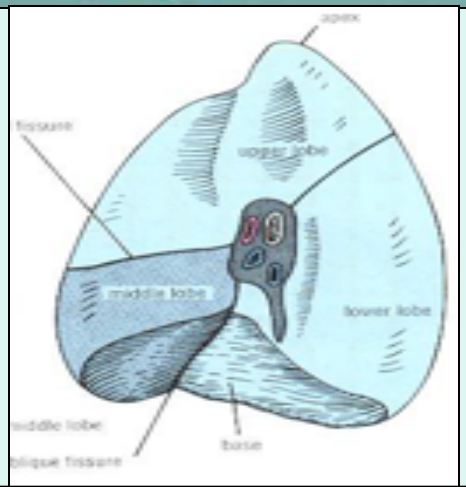
Attached to the mediastinum only by its root.



LUNGS

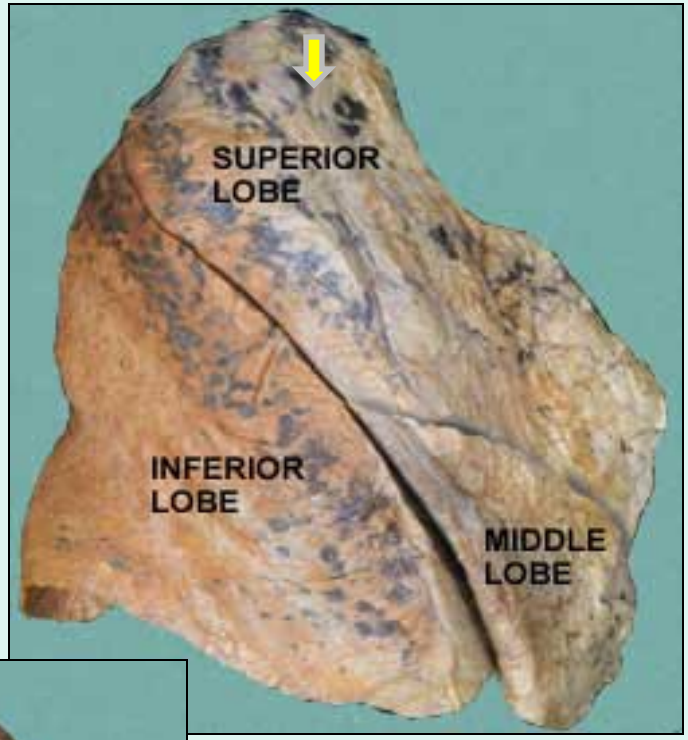


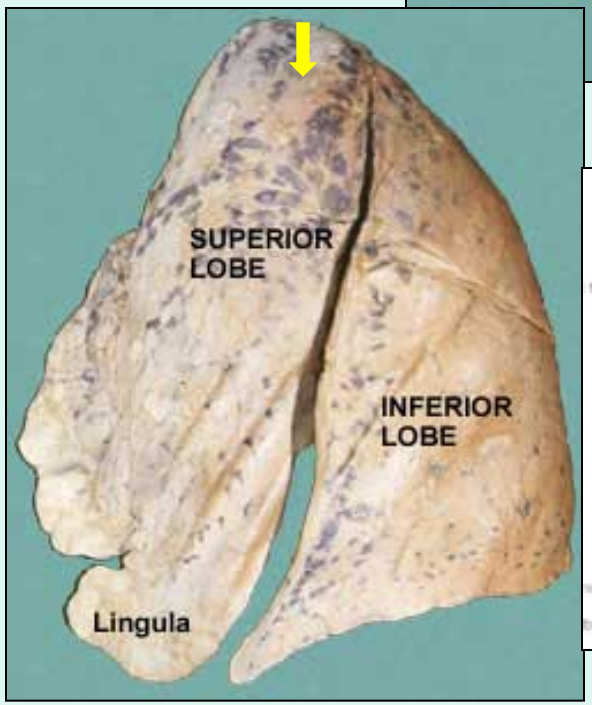


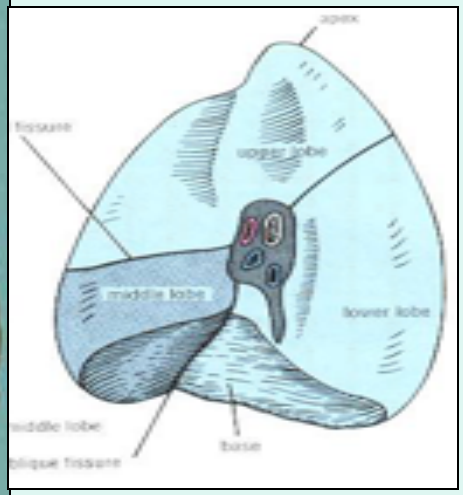


- **Each lung has:**
- **Apex and base:** identify the **top** and **bottom** of the lung, respectively.
- **Costal (lateral)surface:** surrounded by the **ribs** from front & back).
- **Medial (mediastinal) surface:**
- Where the bronchi, blood vessels, and lymphatic vessels **enter the lung** at the **hilum.**
- It is also related to the **structures** forming the **mediastinum.**

LUNGS



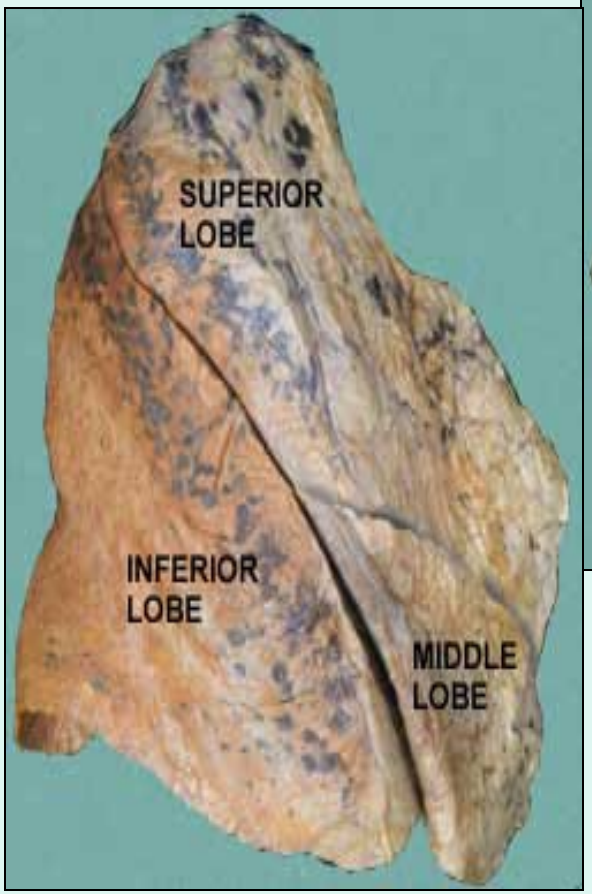


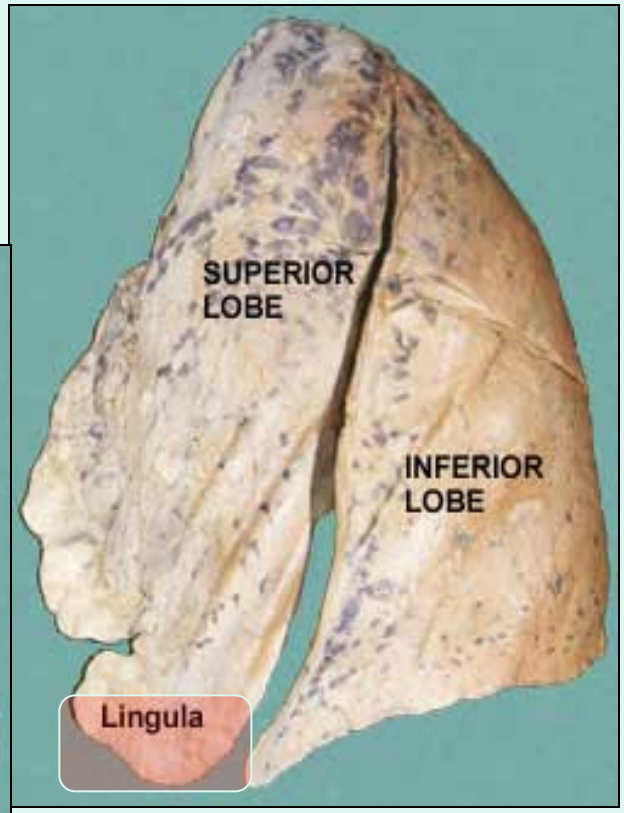


- **Apex:**
- Projects into the root of the neck
- (1 inch above medial 1/3 of clavicle). It is covered by cervical pleura.

  It is grooved anteriorly by subclavian artery.
- **Base:**
- inferior or diaphragmatic surface) is concave and rests on the diaphragm.

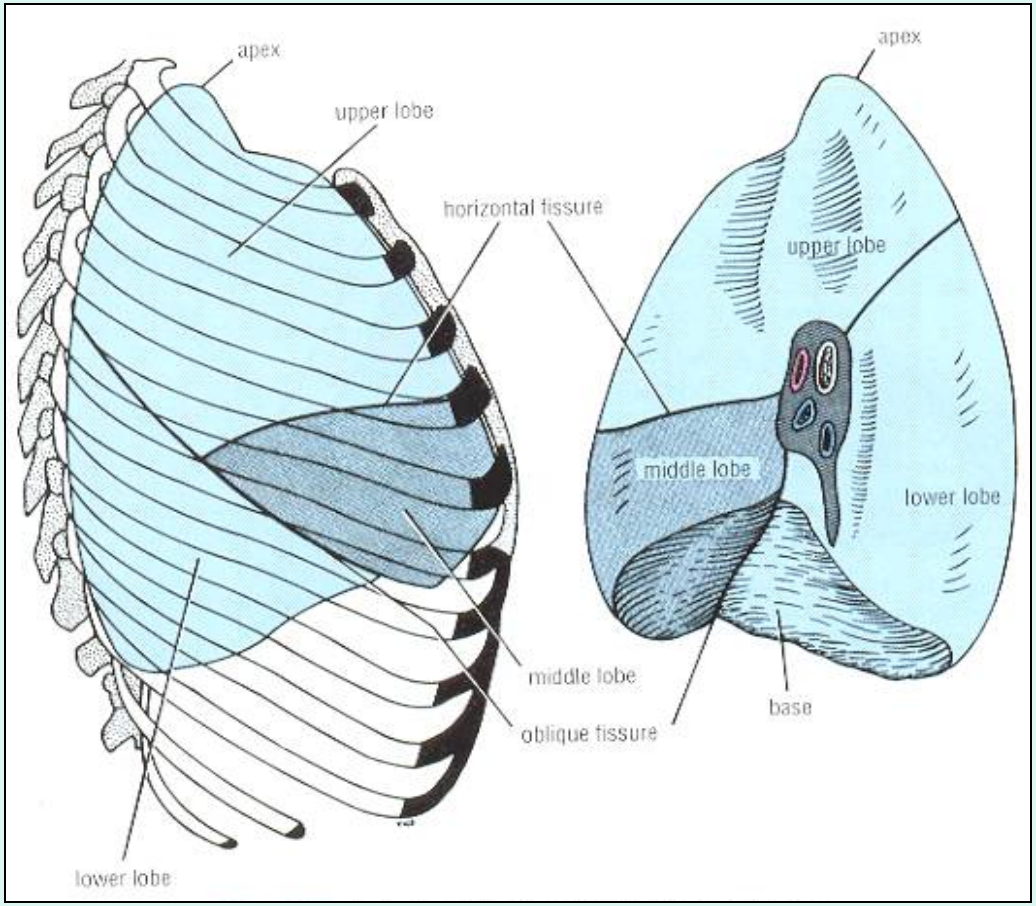
Borders: Anterior & Posterior





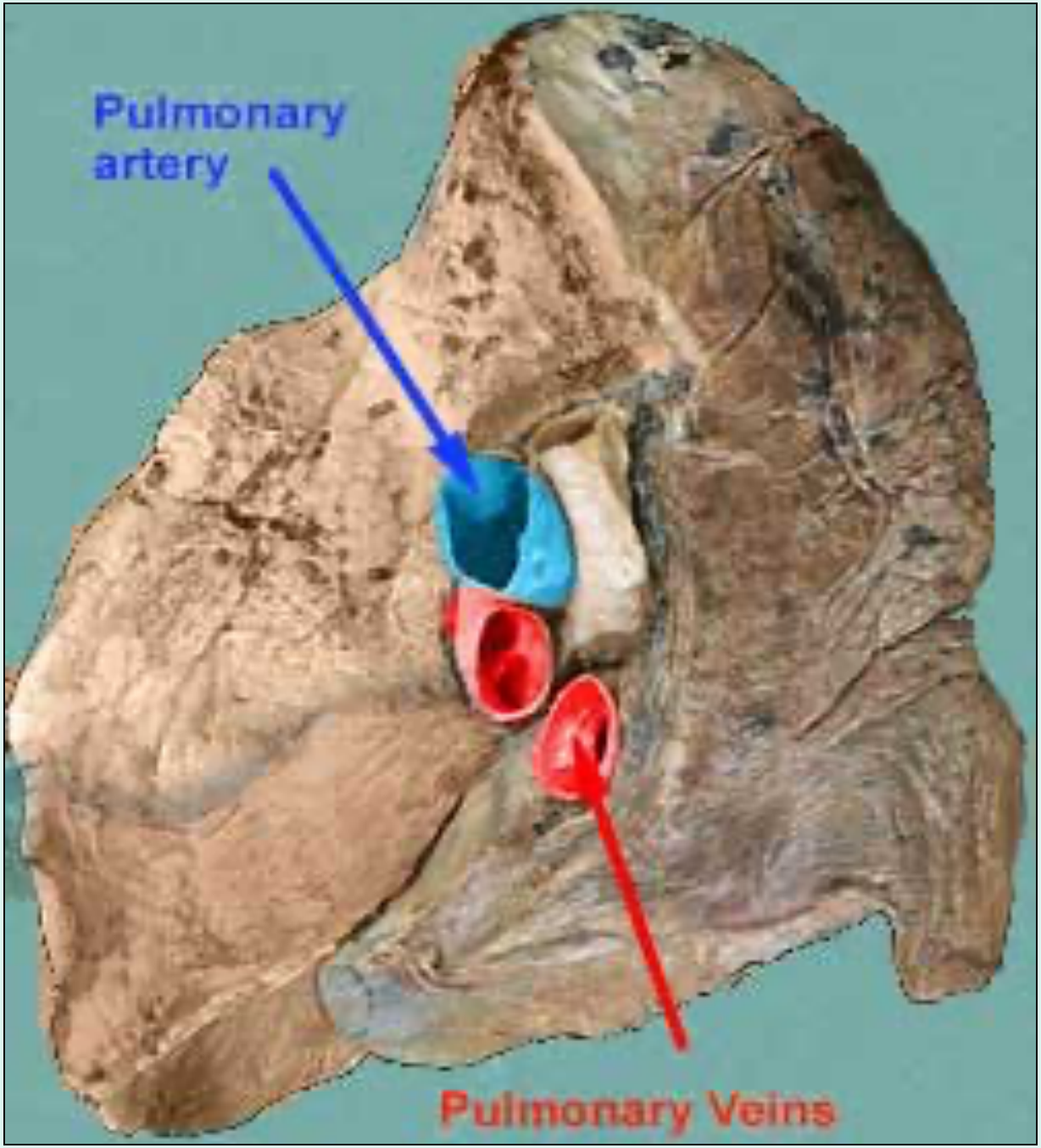
- ***Anterior border :***
- Is **sharp, thin** and overlaps the heart.
- **Anterior border of left lung** presents a **cardiac notch** at its lower end, has a thin **projection** called the **lingula** below the cardiac notch.
- ***Posterior border :*** is **rounded, thick** and lies beside the vertebral column.

Surfaces: Costal & Mediastinal



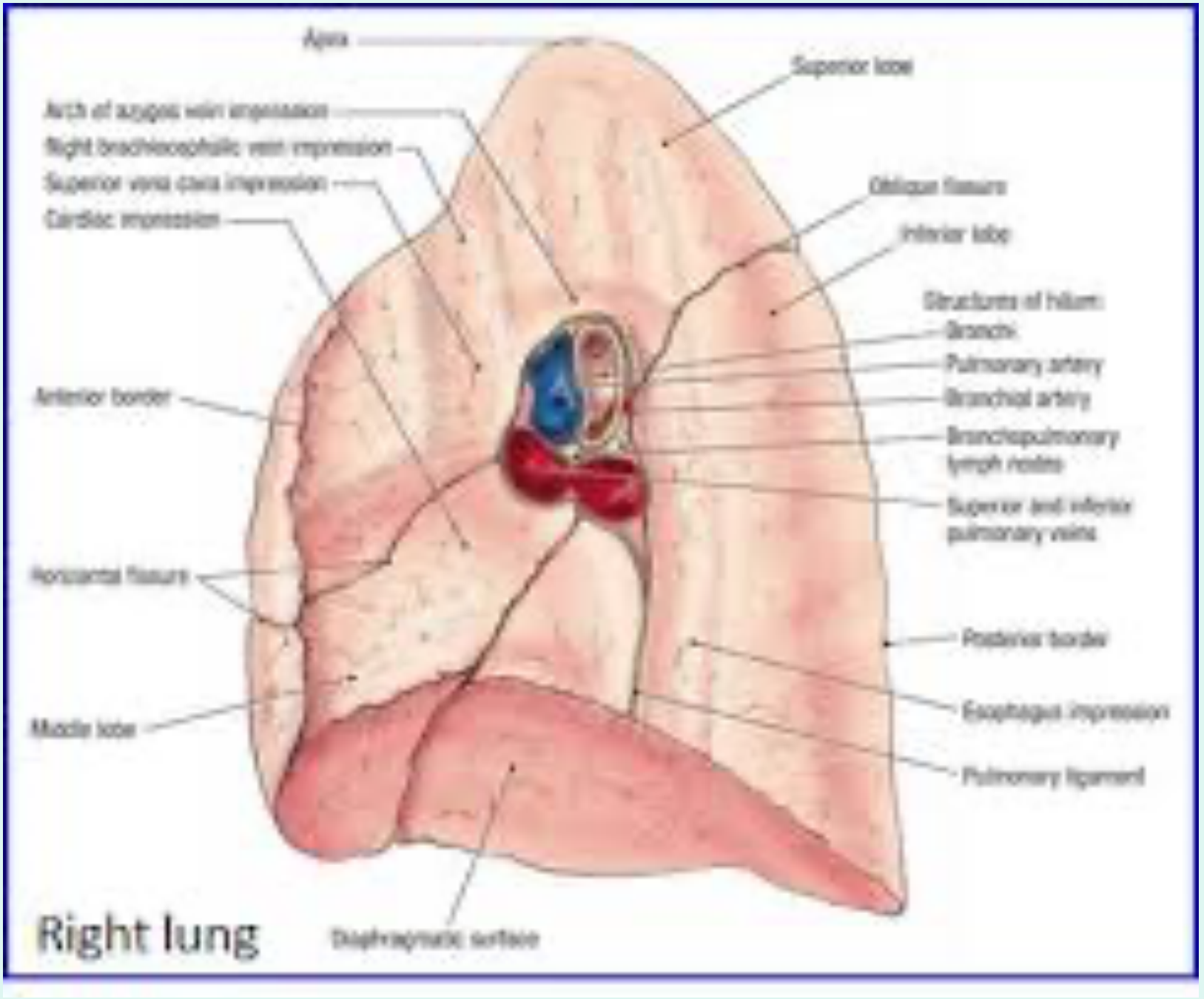
Lateral (costal) & medial surfaces of right lung

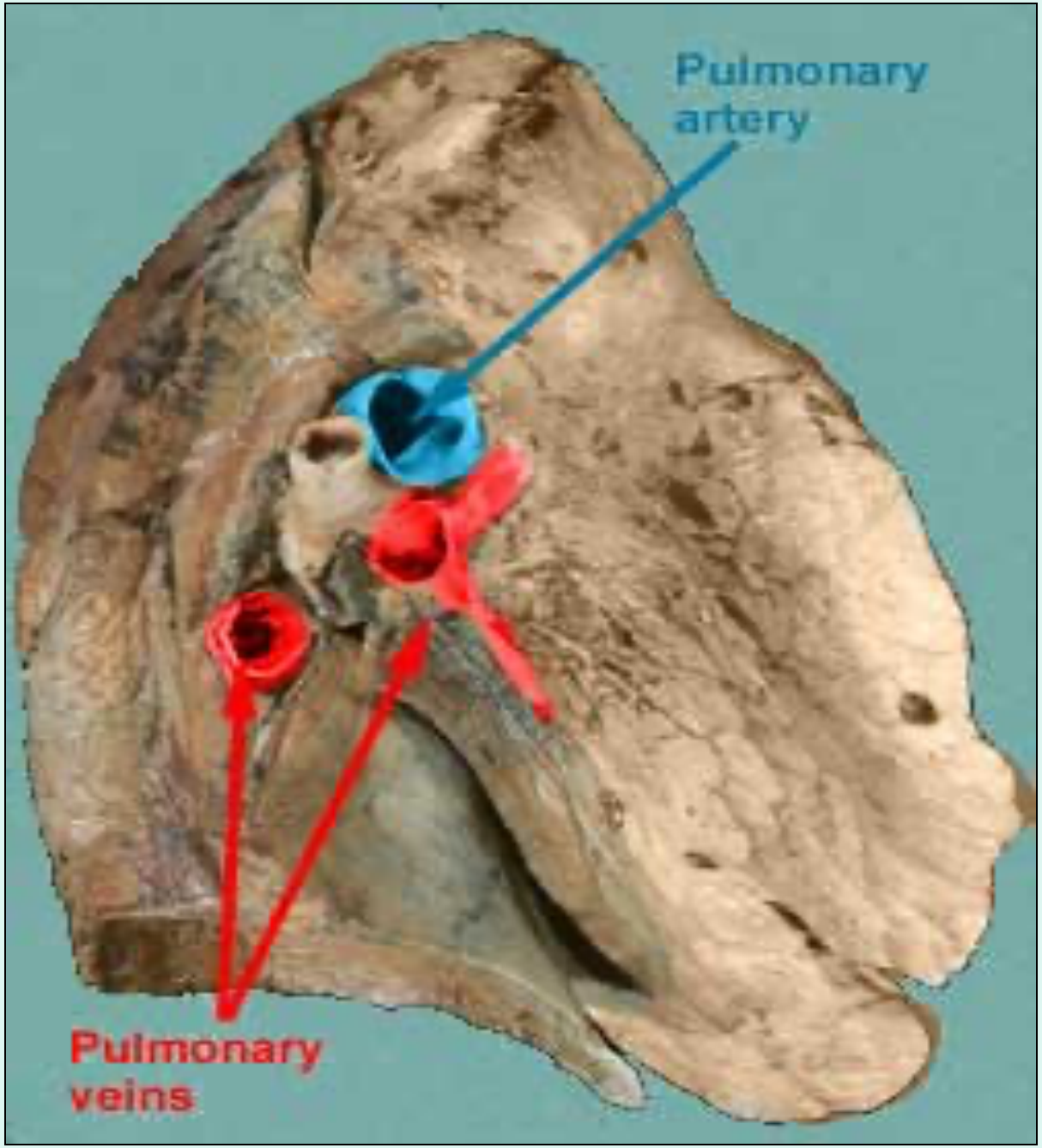
- **Costal surface:**
- Convex.
- Covered by costal pleura which separates lung from: ribs, costal cartilages & intercostal muscles.
- **Medial surface:**
- It is divided into 2 parts:
- **Anterior (mediastinal) part:**
- Contains a hilum in the middle (it is a depression in which bronchi, vessels, & nerves forming the root of lung).
- **Posterior (vertebral) part:**
- **It is related to:**
- Bodies of thoracic vertebrae,
- Intervertebral discs,
- Posterior intercostal vessels
- Sympathetic trunk.



RIGHT LUNG ROOT

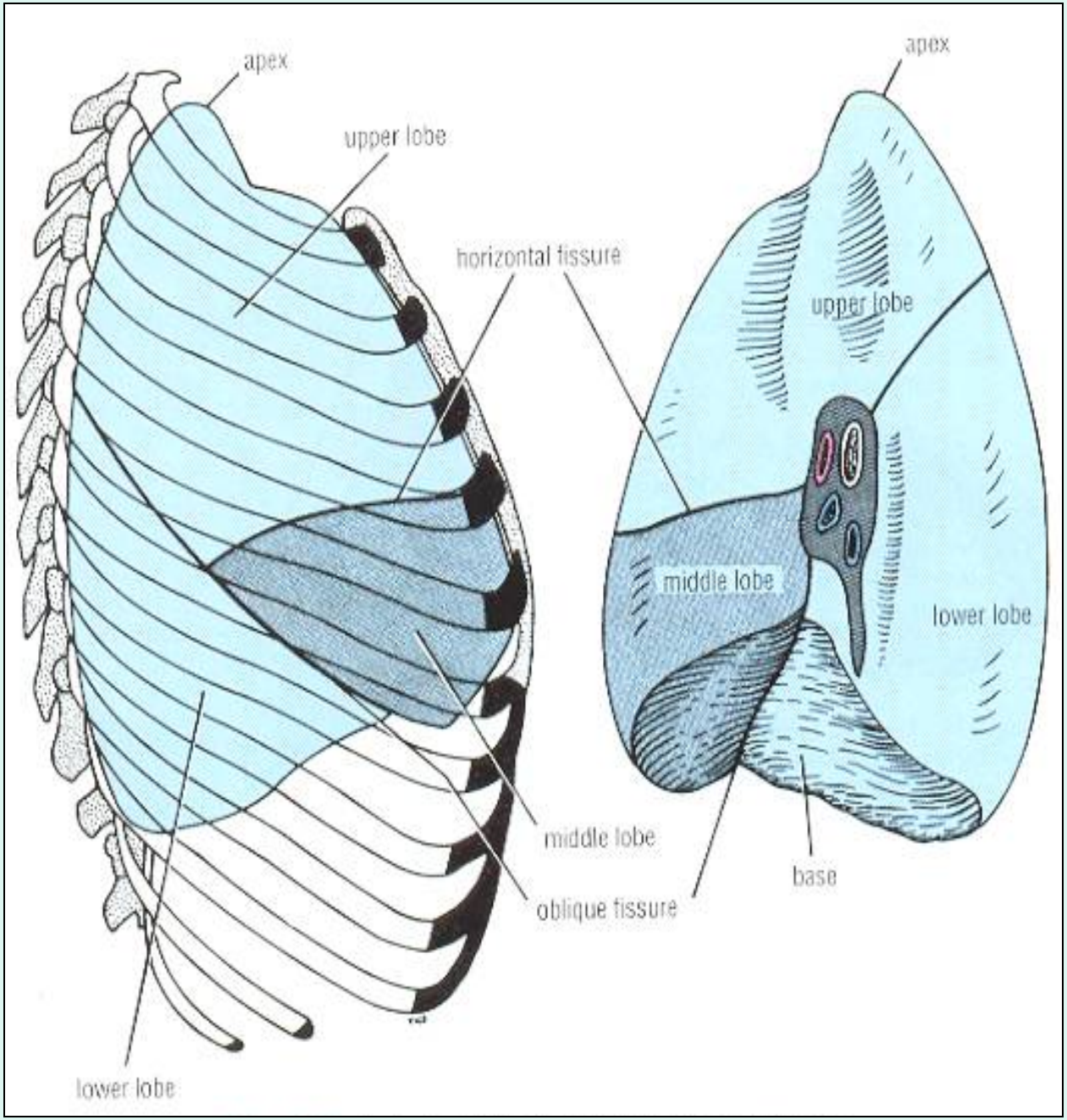
- **2 bronchi:**
- Lie posterior.
- **Pulmonary artery:**
- Is superior
- **Pulmonary veins:**
- Are inferior and anterior.


Apex
Superior lobe
Arch of azygos vein impression
Right brachiocephalic vein impression
Superior vena cava impression
Cardiac impression
Oblique fissure
Inferior lobe
Structures of hilum:
Bronchi
Pulmonary artery
Bronchial artery
Bronchopulmonary lymph nodes
Superior and inferior pulmonary veins
Anterior border
Horizontal fissure
Posterior border
Middle lobe
Esophagus impression
Pulmonary ligament
Diaphragmatic surface
Right lung



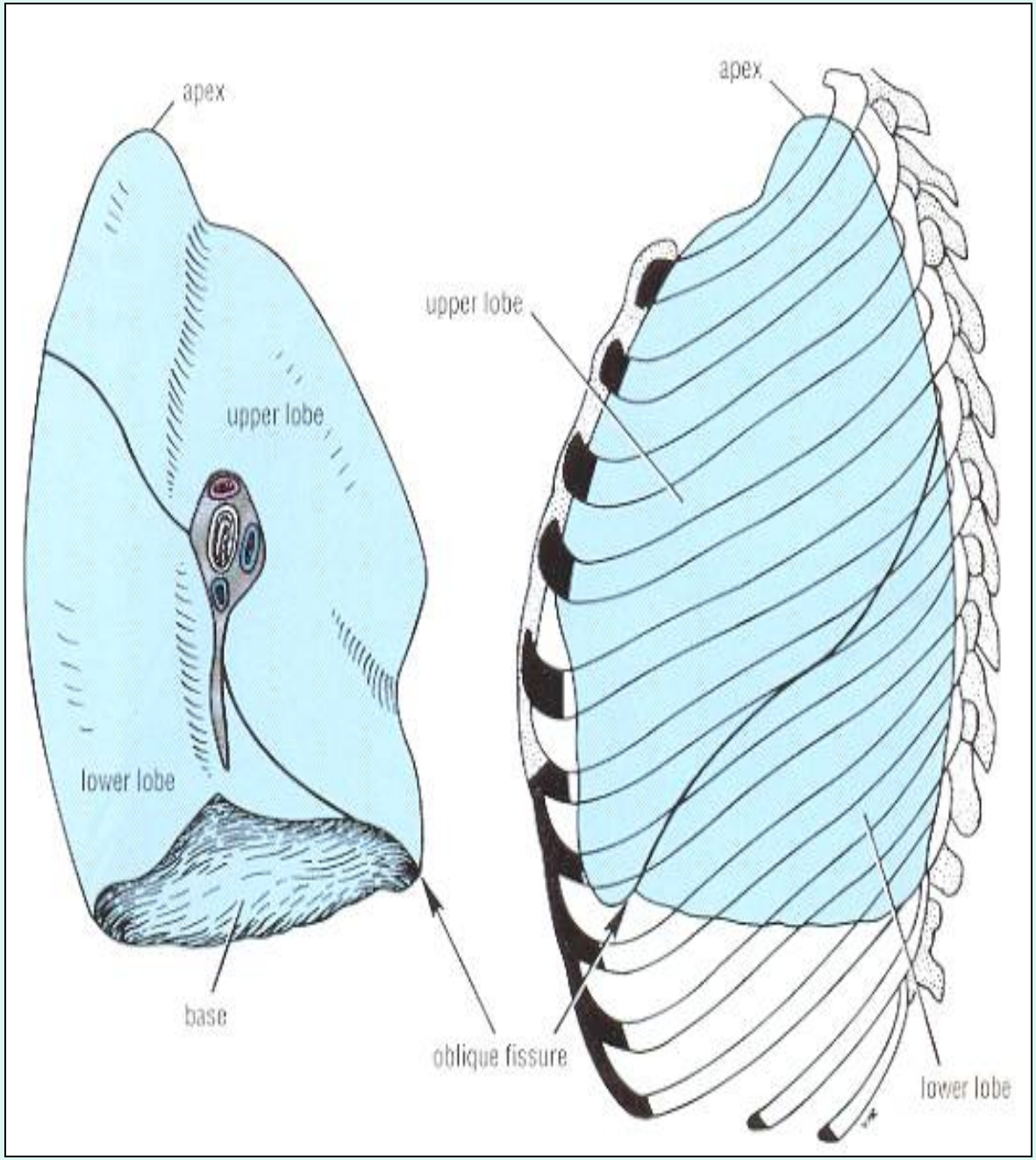
LEFT LUNG ROOT

- **One bronchus:**
- Lies posterior
- **Pulmonary artery:**
- Is superior
- **Pulmonary veins:**
- Is inferior and anterior



Right lung

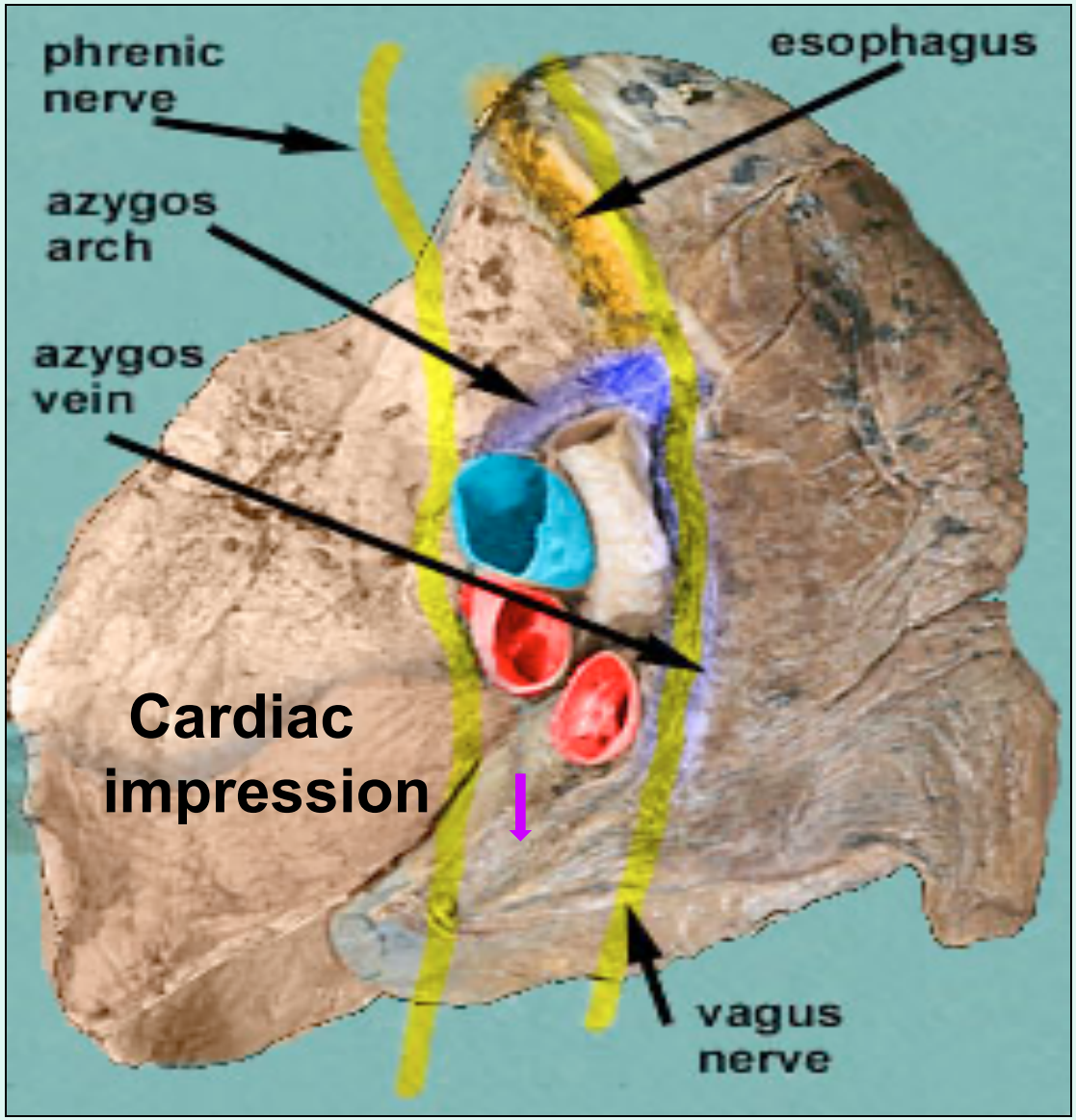
- **Larger & shorter than left lung.**
- **Divided by 2 fissures (oblique & horisontal) into 3 lobes (upper, middle and lower lobes).**



Left Lung

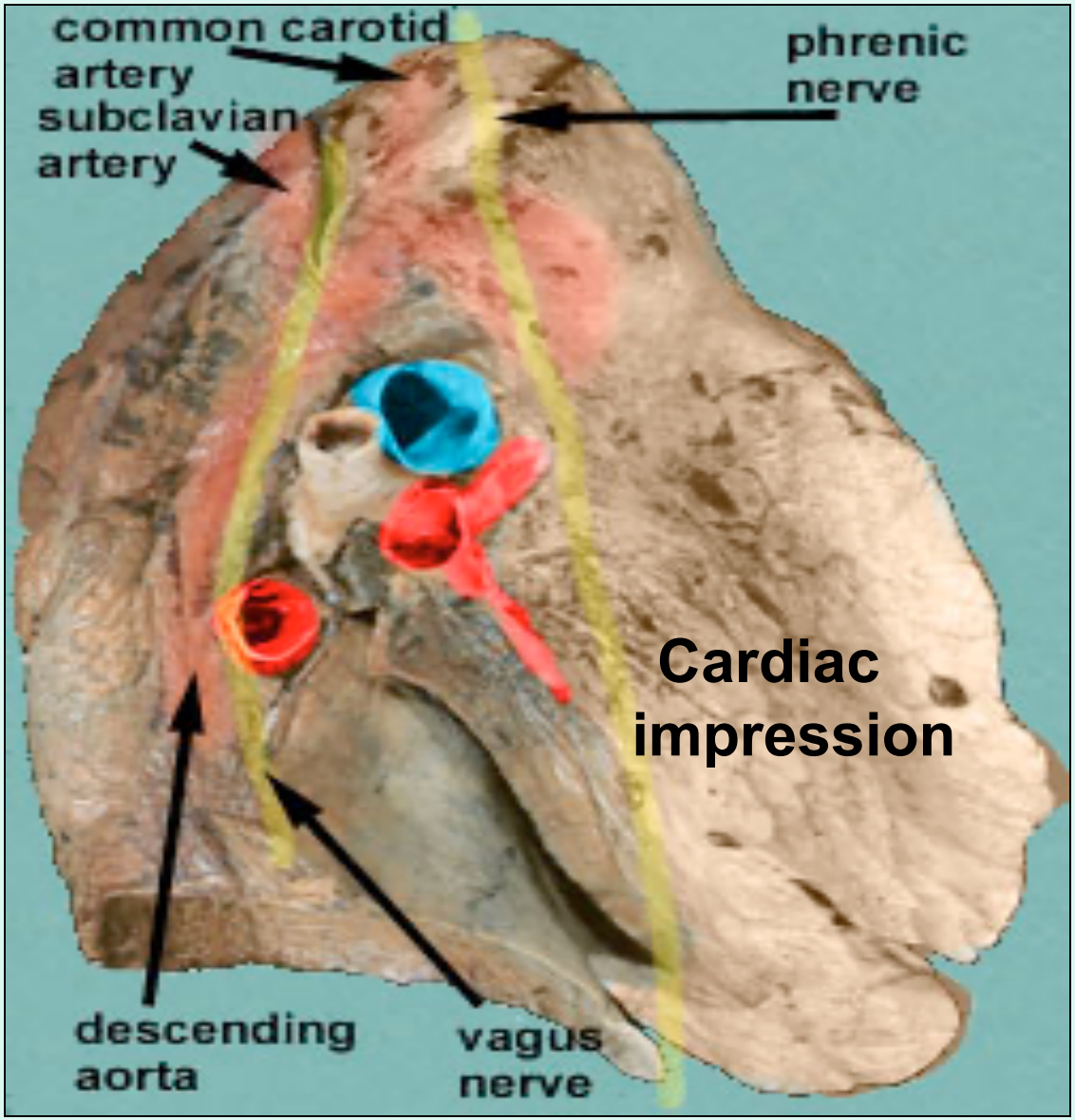
- Divided by one oblique fissure into -2 lobes, Upper and lower.
- There is No horizontal fissure.
- It has a cardiac notch at lower part of its anterior border.

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.
- **Phrenic nerve** **anterior** to the root of the lung.
- **Cardiac impression:** related to **right atrium.**
- **Esophagus** **posterior** to the root.
- **Below hilum and in front of pulmonary ligament : groove for I.V.C.**

Mediastinal surface of left lung



- **On the mediastinal surface of the left lung,** you will find these structures:
- **Descending aorta and its arches** **posterior** and **over** to the root of the lung)..
- **Vagus nerve** posterior to the root of the lung
- **over** the root of the lung
- **Phrenic nerve** **anterior** to the root of the lung.
- **Cardiac impression:** related to **left ventricle.**
- **Groove for left common carotid and left subclavian arteries**

Blood supply of lung

- ***Bronchial arteries*** **(From descending aorta)…. It supplies oxygenated blood to bronchi , lung tissue & visceral pleura.**
- ***Bronchial veins :*** **drain into azygos & hemiazygos veins.**
- ***Pulmonary artery*** **which carries non-oxygenated blood from right ventricle to the lung alveoli.**
- ***2 pulmonary veins :*** **carry oxygenated blood from lung alveoli to the left atrium of the heart.**

Nerve Supply of the lung

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

1- Sympathetic Fibers

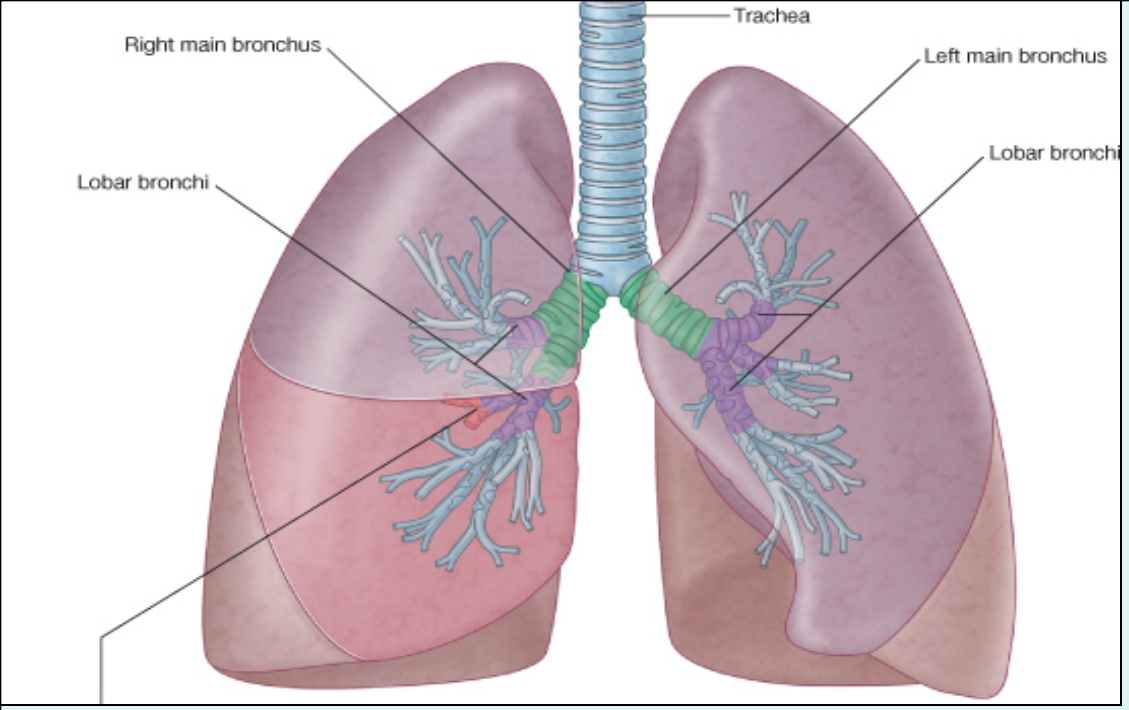
From … *sympathetic trunk*…

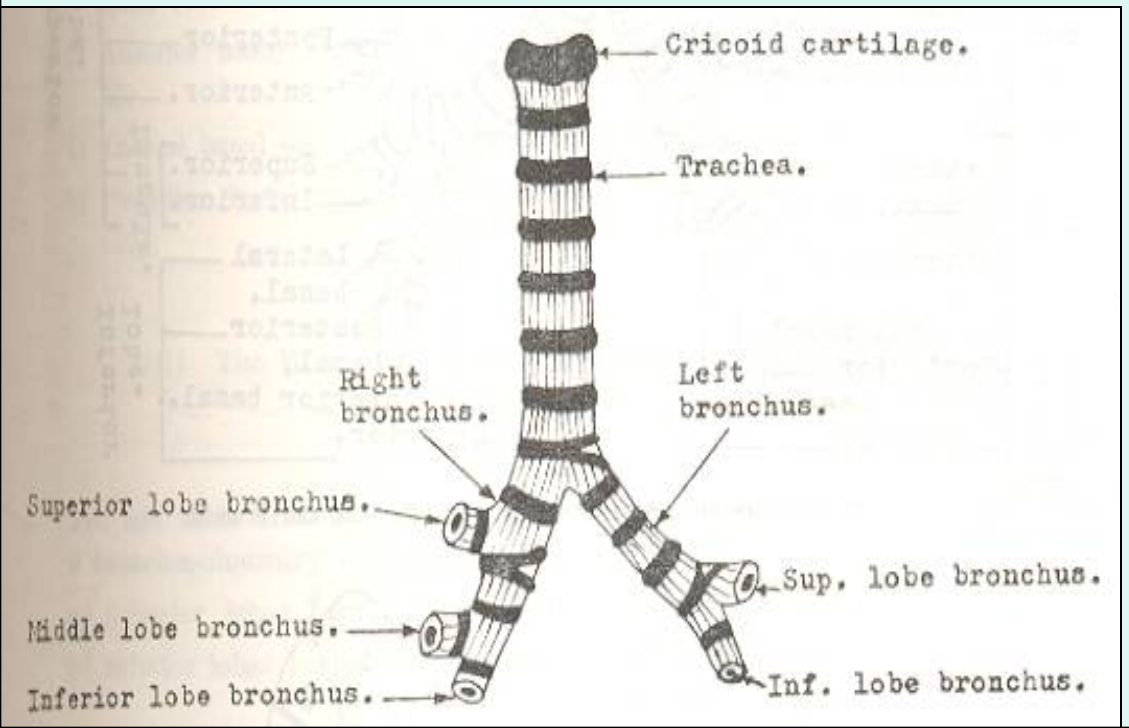
Action: broncho-dilatation/and vasoconstriction.

2- Parasympathetic Fibers

From…..*Vagus nerve* ….

Action: **b**roncho-constriction and vasodilatation and secretomotor to bronchial glands.

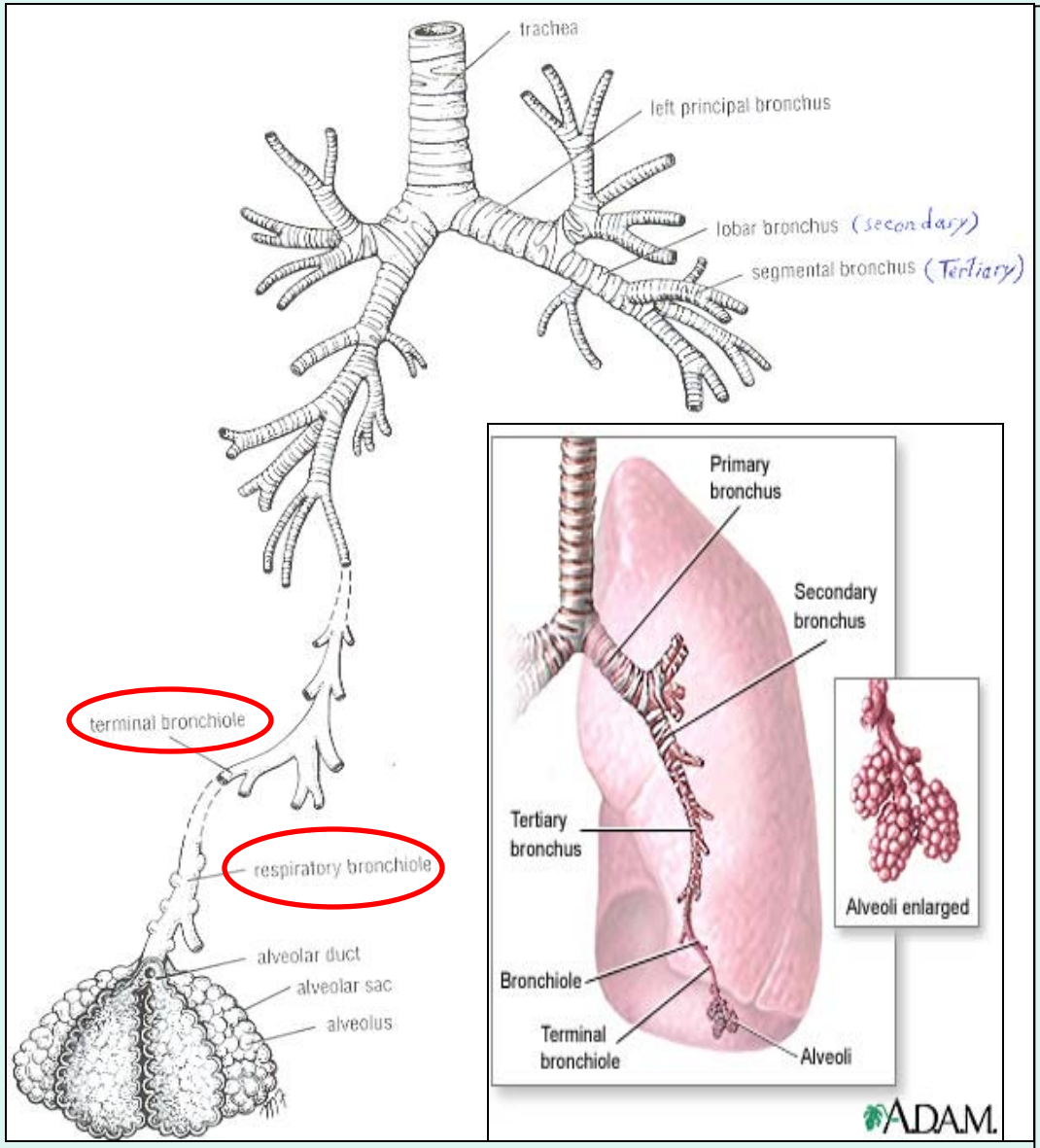




Bronchi

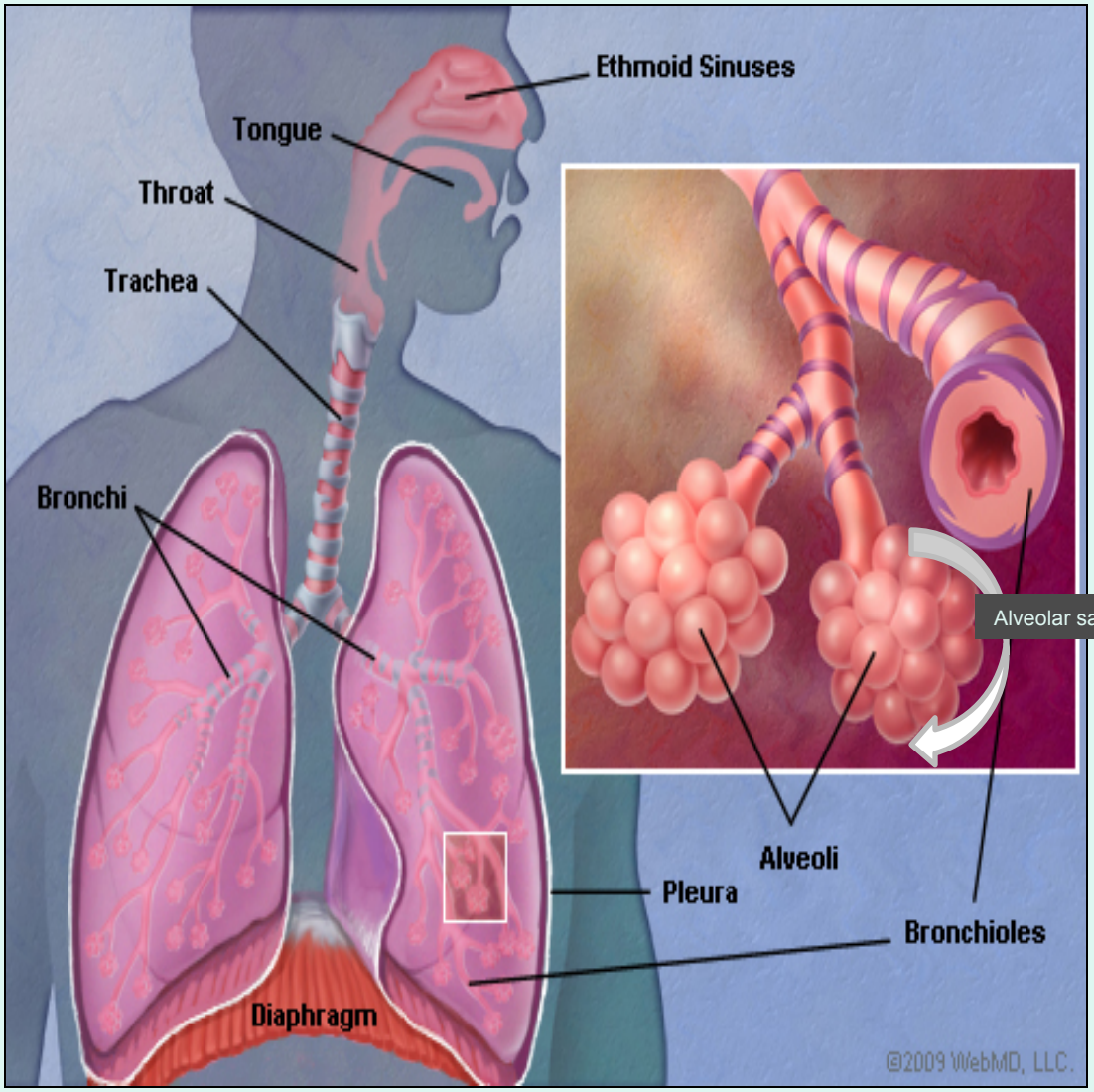
- The trachea divides into 2 main bronchi:
- **Right main bronchus:** which divides before entering the hilum, it gives: superior lobar (secondary) bronchus.
  On entering hilum, it divides into middle & inferior lobar bronchi.
- **Left main bronchus:**
  On entering hilum, it divides into superior & inferior lobar bronchi.

Bronchopulmonary segments



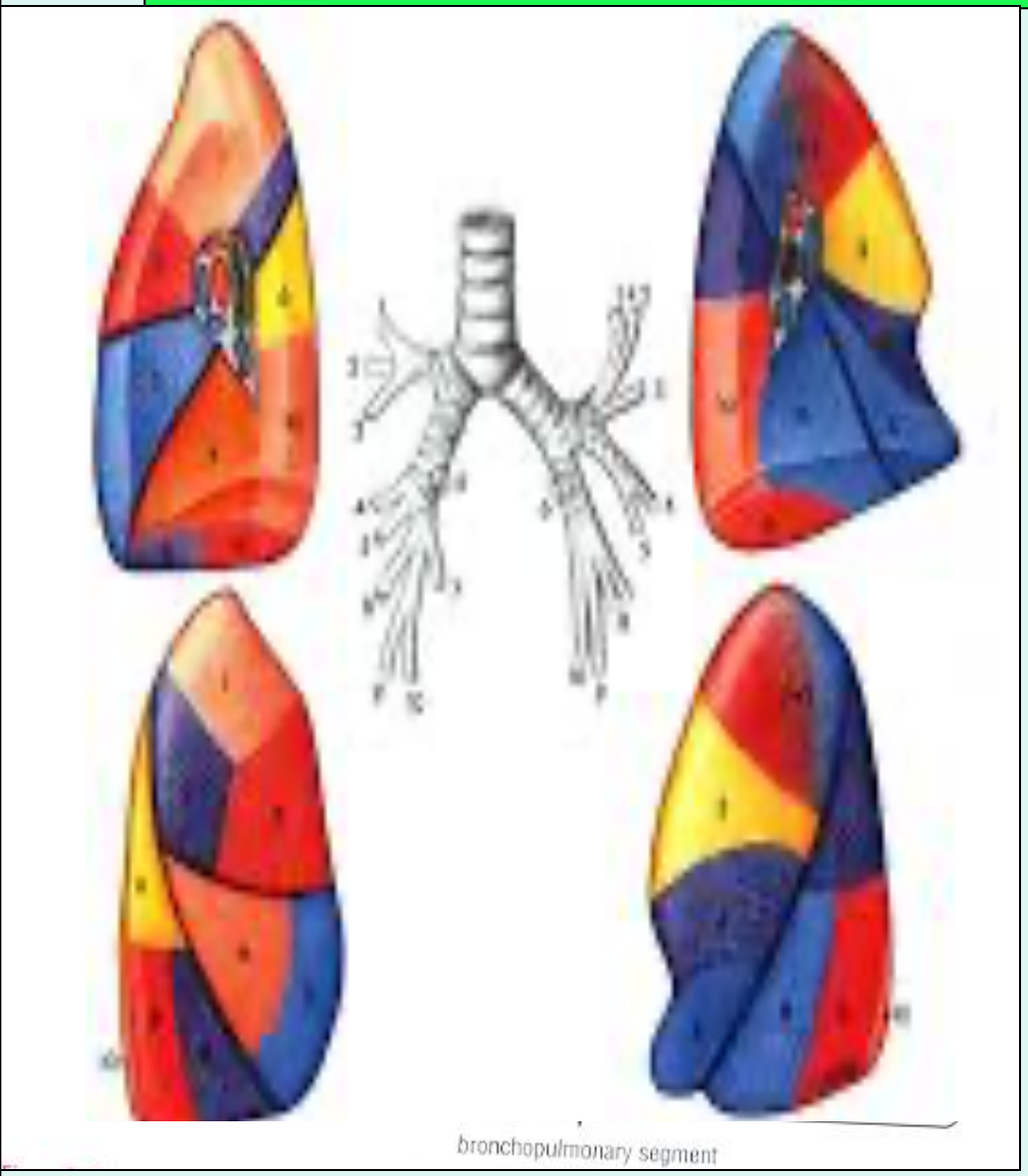
- They are the anatomic, functional, and surgical units of the lungs.
- Each lobar (secondary) bronchus gives segmental (tertiary) bronchi.
- Each segmental bronchus divides repeatedly into bronchioles.
- Bronchioles divide into terminal bronchioles, which show delicate outpouchings 'the respiratory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

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.

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.**