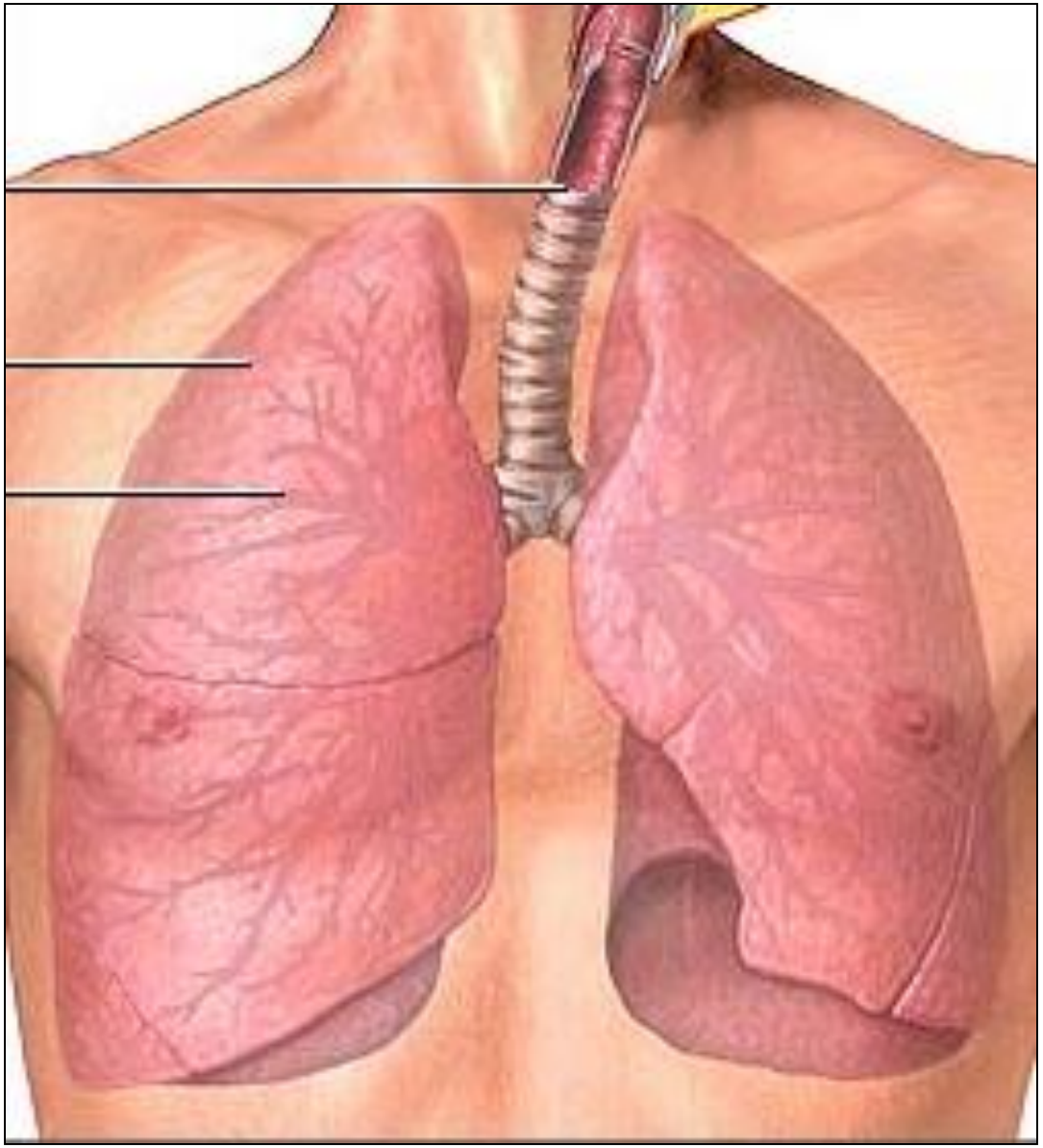
PLEURA & LUNG



Prof. Saeed Abuel Makarem

Objectives

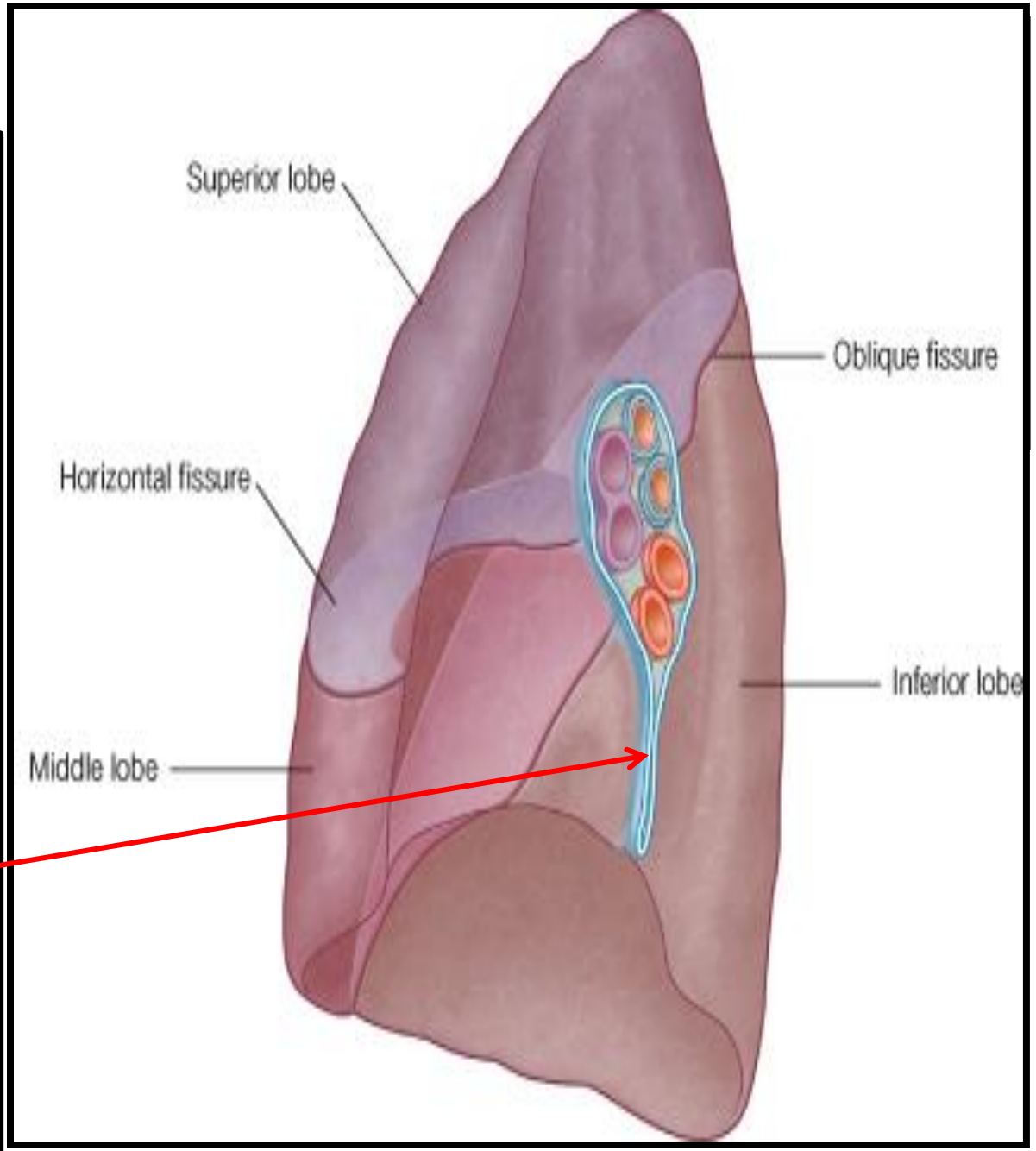
By the end of the lecture, you should be able to:

- **Describe the anatomy of the pleura:**

  Subdivisions: parietal & visceral pleurae, nerve supply of each part.
- **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 these segment in the lung.**

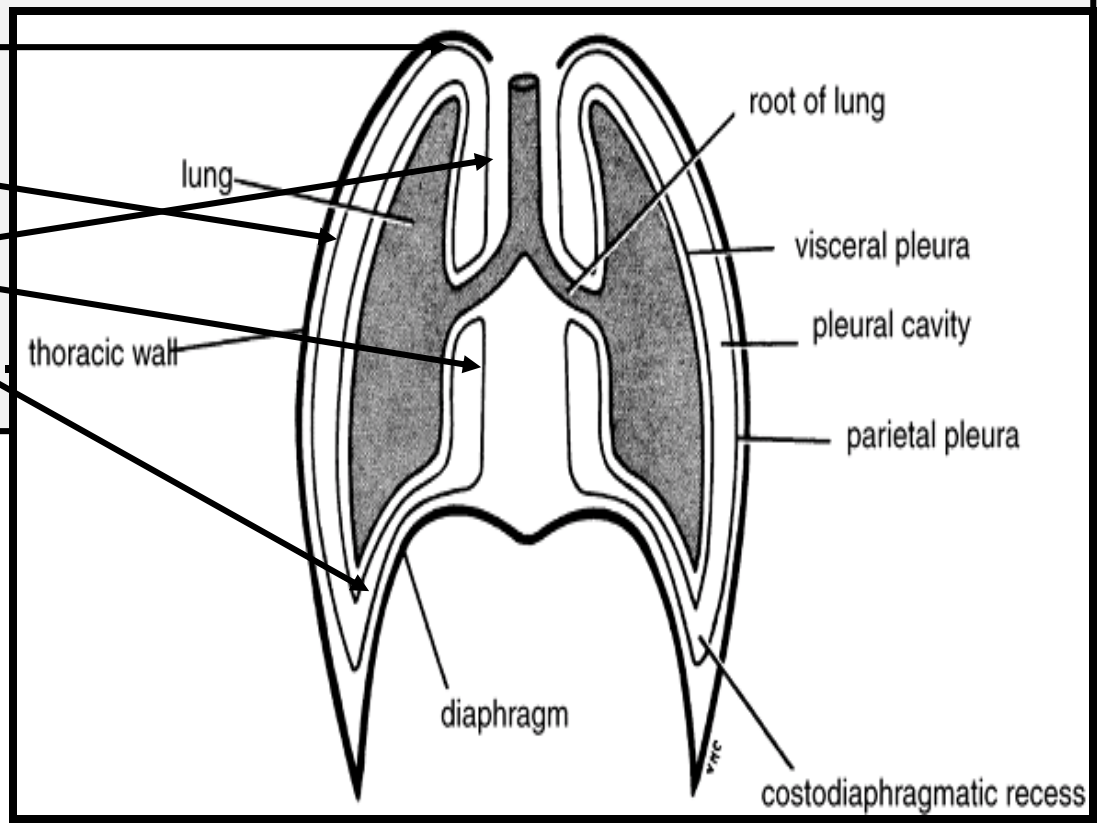
What is Pleura?

- Double-layered serous membranous sac 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 **2** layers, is the pleural cavity,
- It contains a very thin film of pleural fluid (5-10 ml.).



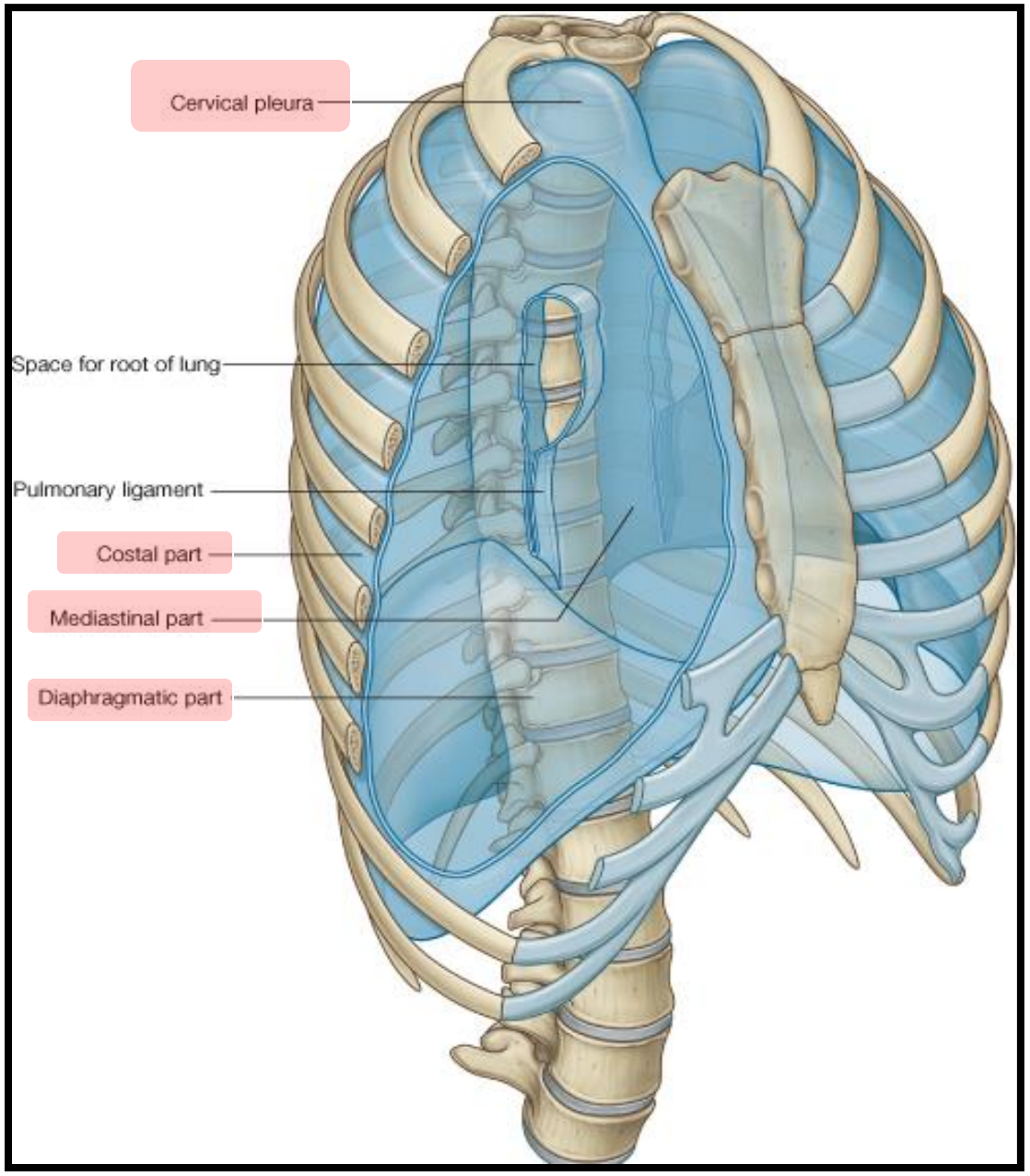
Parietal Pleura

- **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.**



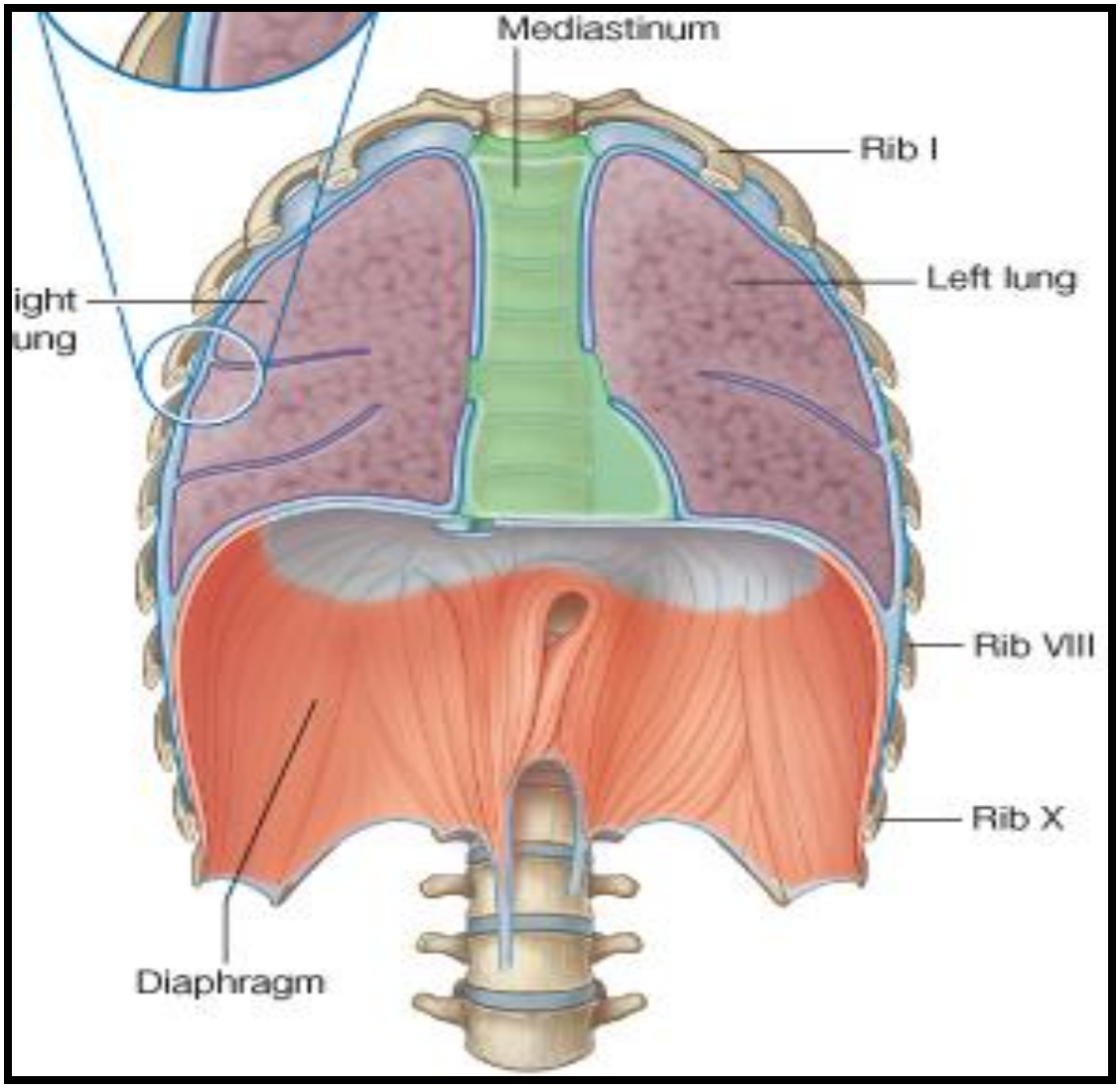
Parietal Pleura

- **Cervical Pleura**:
- Projects upward into the root of 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

- **<u>Mediastinal pleura</u>**: Covers the mediastinum.
- At the hilum, it is reflected on to the vessels and bronchi, that enter the hilum of the lung.
- It is continuous with the visceral pleura.
- **<u>Diaphragmatic pleura</u>:**
- Covers the upper (thoracic) surface of the diaphragm.



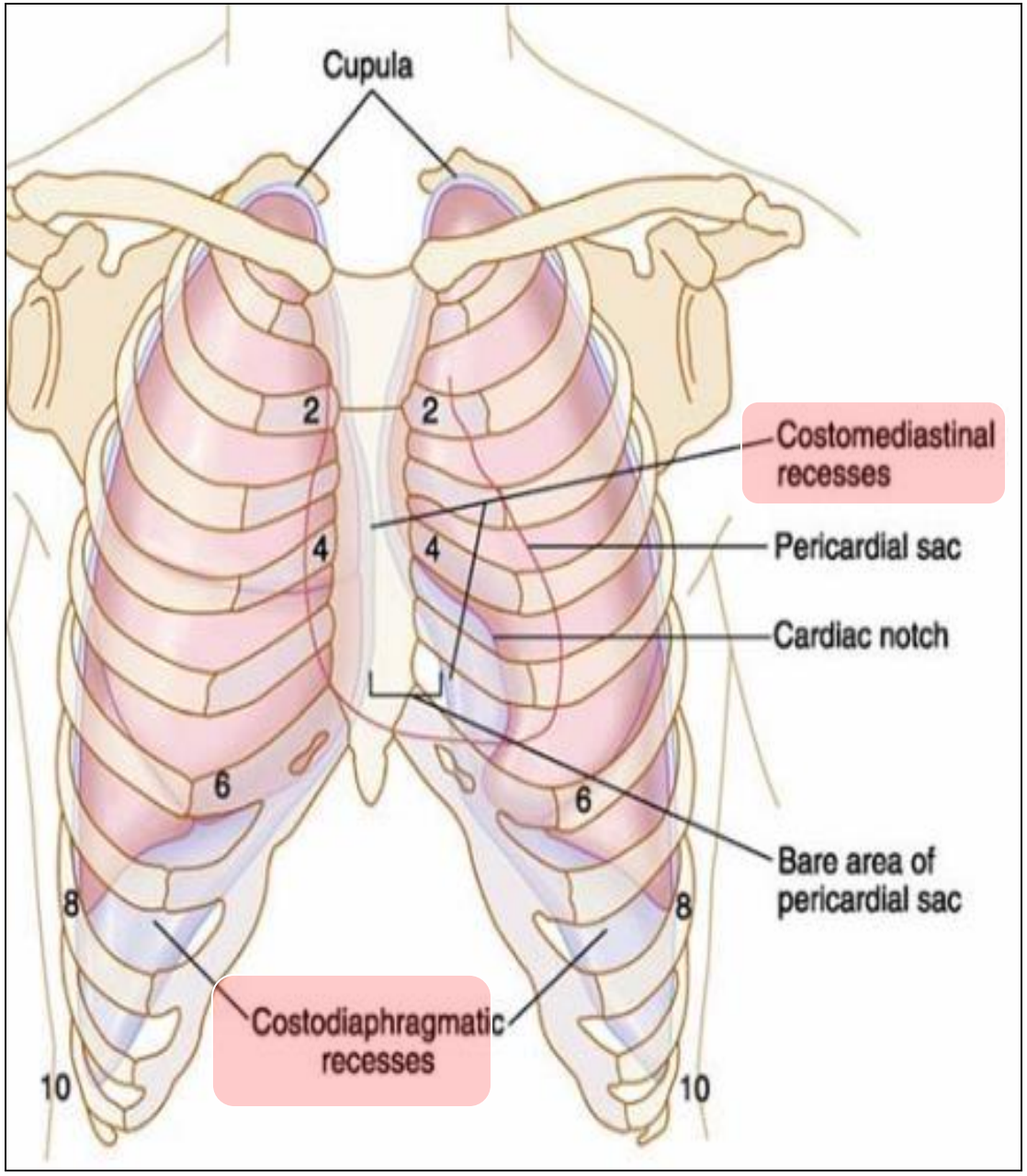
Pleural Recesses

Costodiaphragmatic:

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

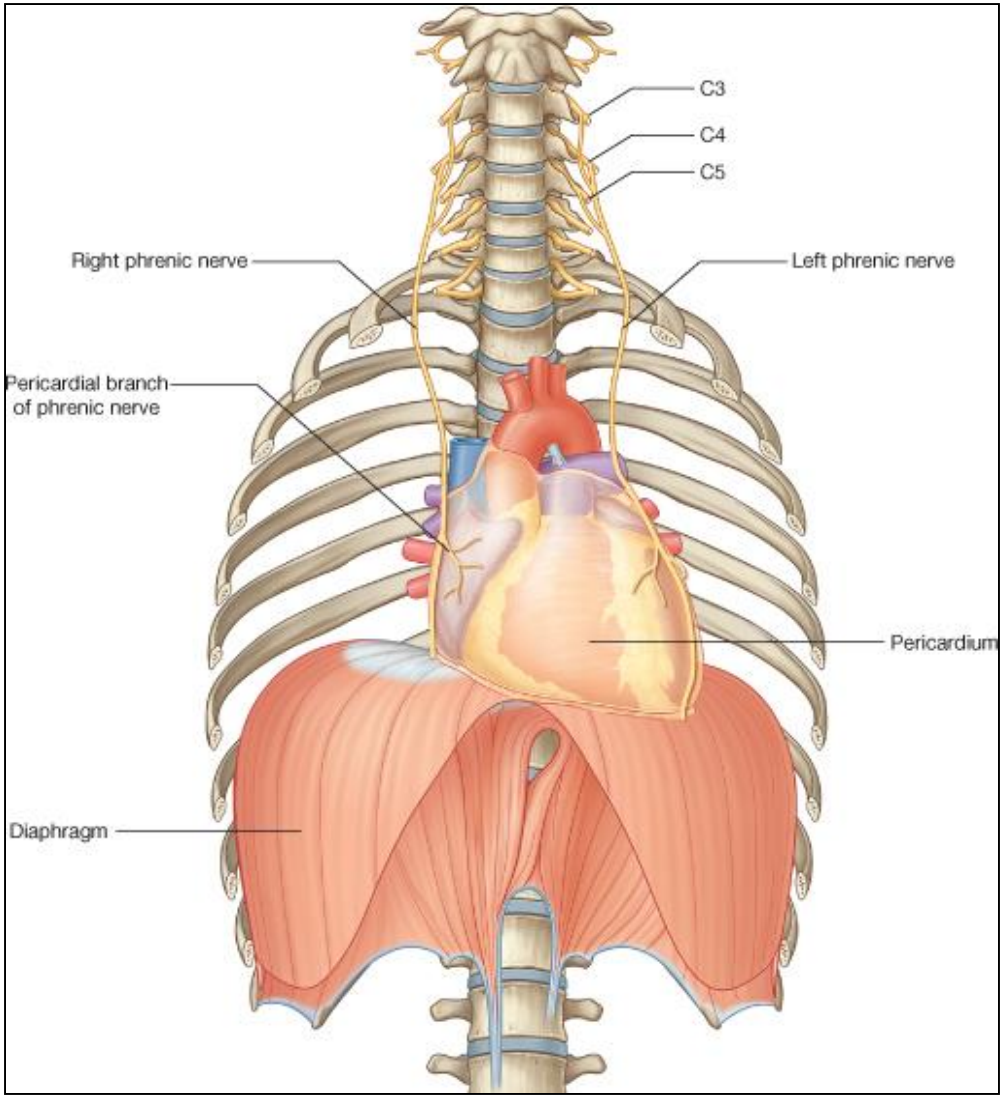
Costomediastinal:

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

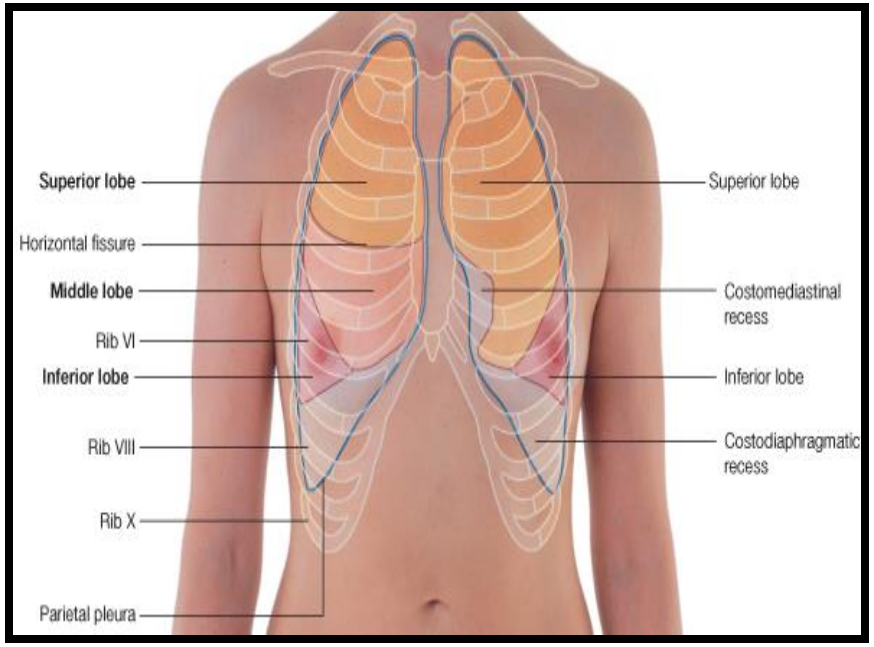


Pleura: Nerve Supply

- **Parietal pleura: (PPTT).**
- 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 **as follow:**
  - central part (over diaphragmatic domes) by phrenic nerves.
  - Around the periphery by lower 6 intercostal nerves.
- **Visceral pleura** sensitive only to ***stretch*** and is supplied by the **autonomic fibers** from the pulmonary plexus.

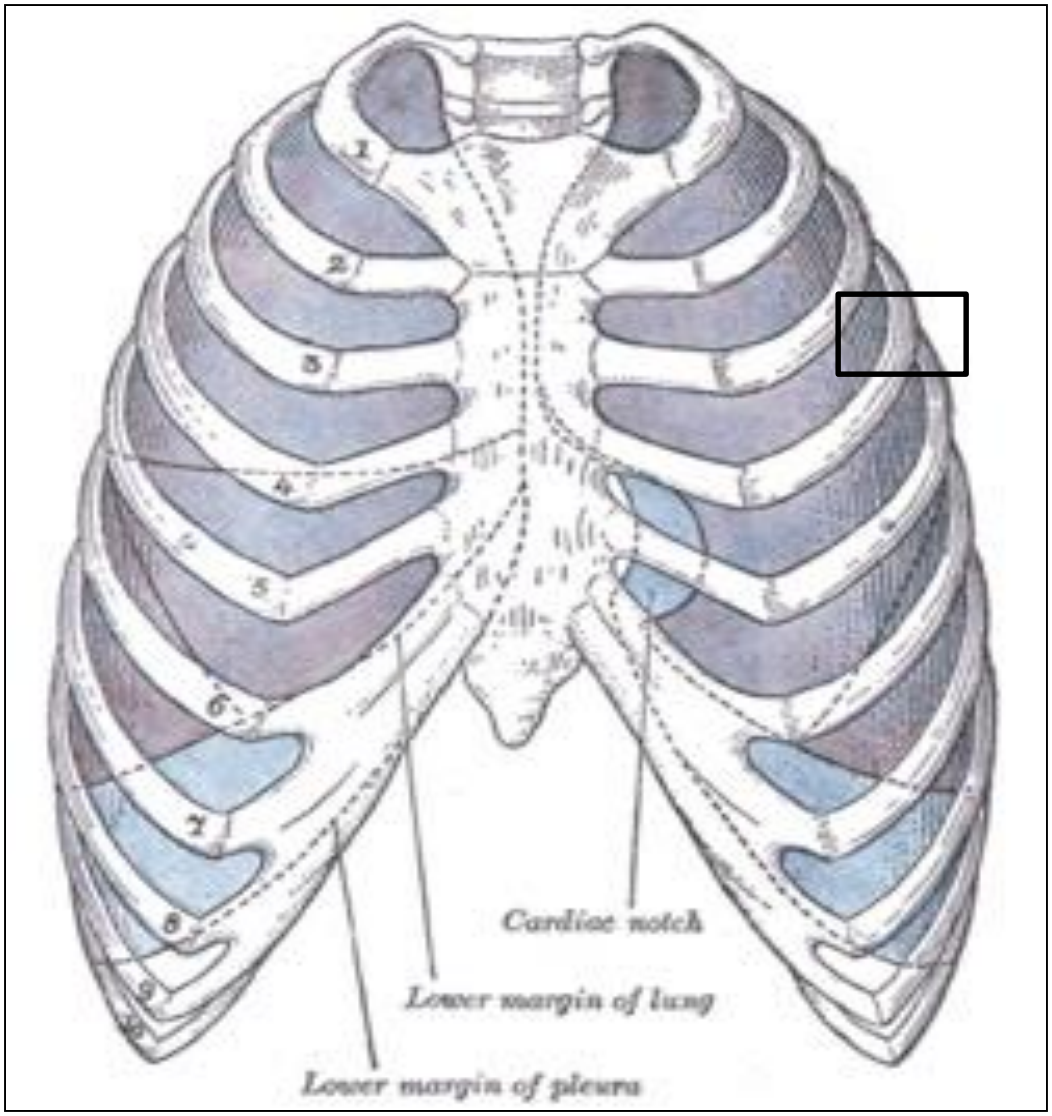


SUFACE ANATOMY OF PLEURA



- **Apex:**
- Lies one inch above medial 1/3 of clavicle.
- **Right pleura:**
- **The anterior margin** extends vertically from sternoclavicular 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 the **cardiac notch.**
- **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.
- **Posterior margin:** along the vertebral column from apex to the inferior margin.

SURFACE ANATOMY OF LUNG

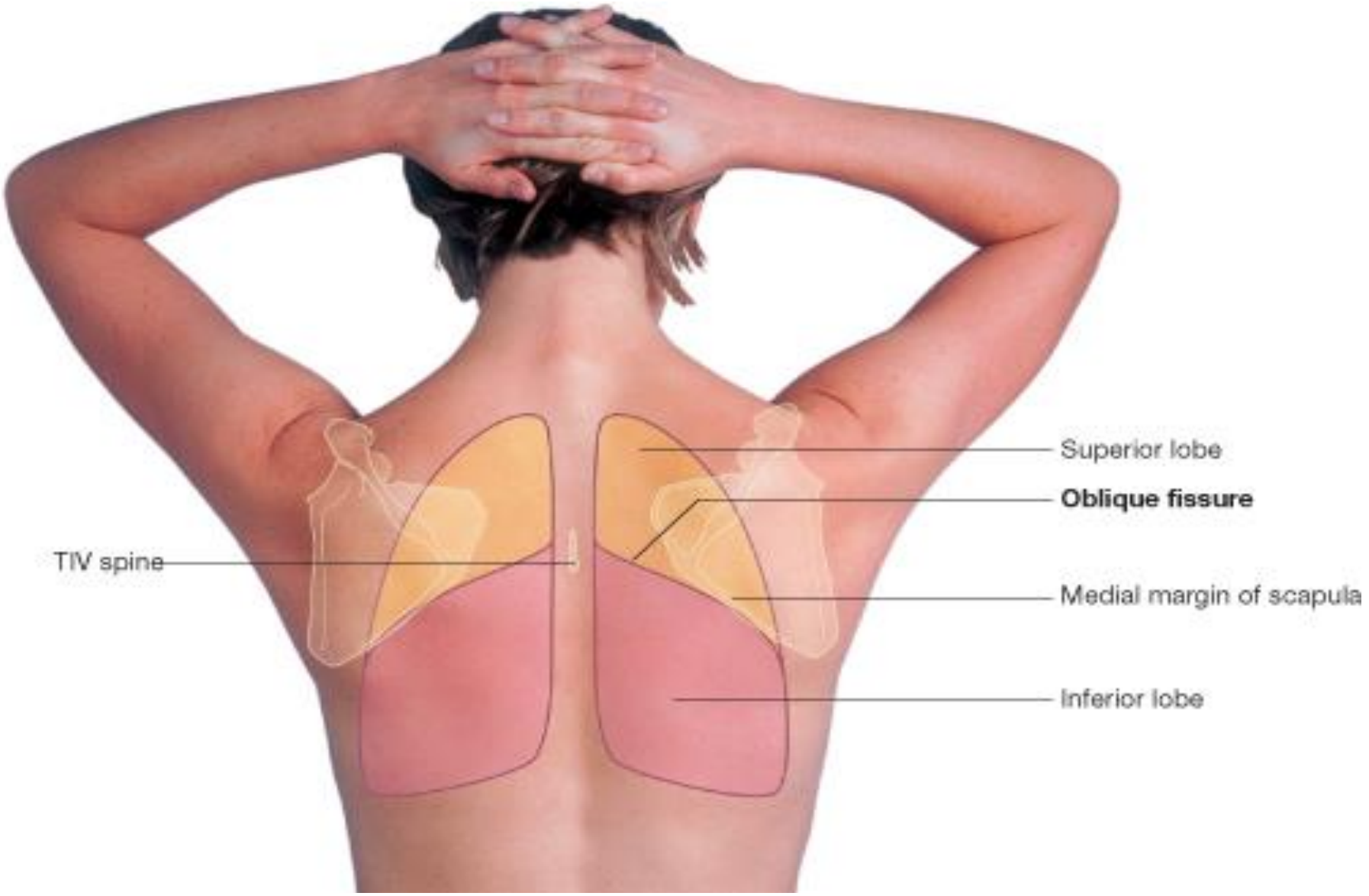


- **Apex, anterior border and posterior border** correspond nearly to the lines of pleura but are slightly away from the median plane.
- **Inferior margin:** as the pleura but more horizontally and finally reaching to the 10th thoracic spine.

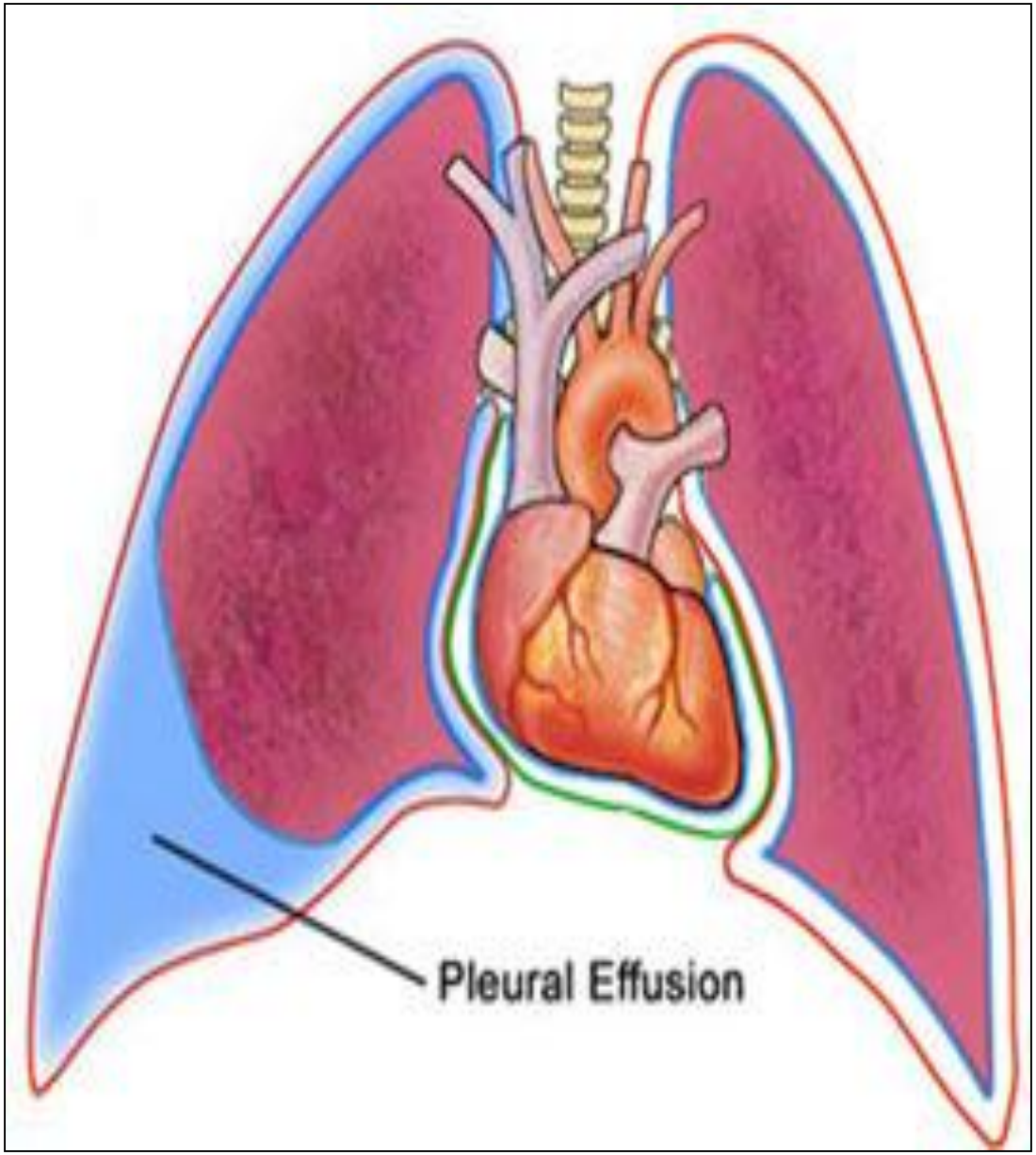
Oblique fissure:

- Represented by a line extending from 3rd 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.


Superior lobe
Oblique fissure
TIV spine
Medial margin of scapula
Inferior lobe

Pleural Effusion



- It is an abnormal accumulation of pleural fluid about 300 ml, in the *Costodiaphragmatic pleural recess*, (normally 5-10 ml fluid).
- Causes:

1. Inflammation,
2. TB,
3. Congestive heart disease.
4. Malignancy, (mesothelioma of the pleural sac).

The lung is compressed & the bronchi are narrowed.

- Auscultation would reveal faint & decreased breathing sounds over compressed or collapsed lung lobe.
- Dullness on percussion over the effusion.

Lungs

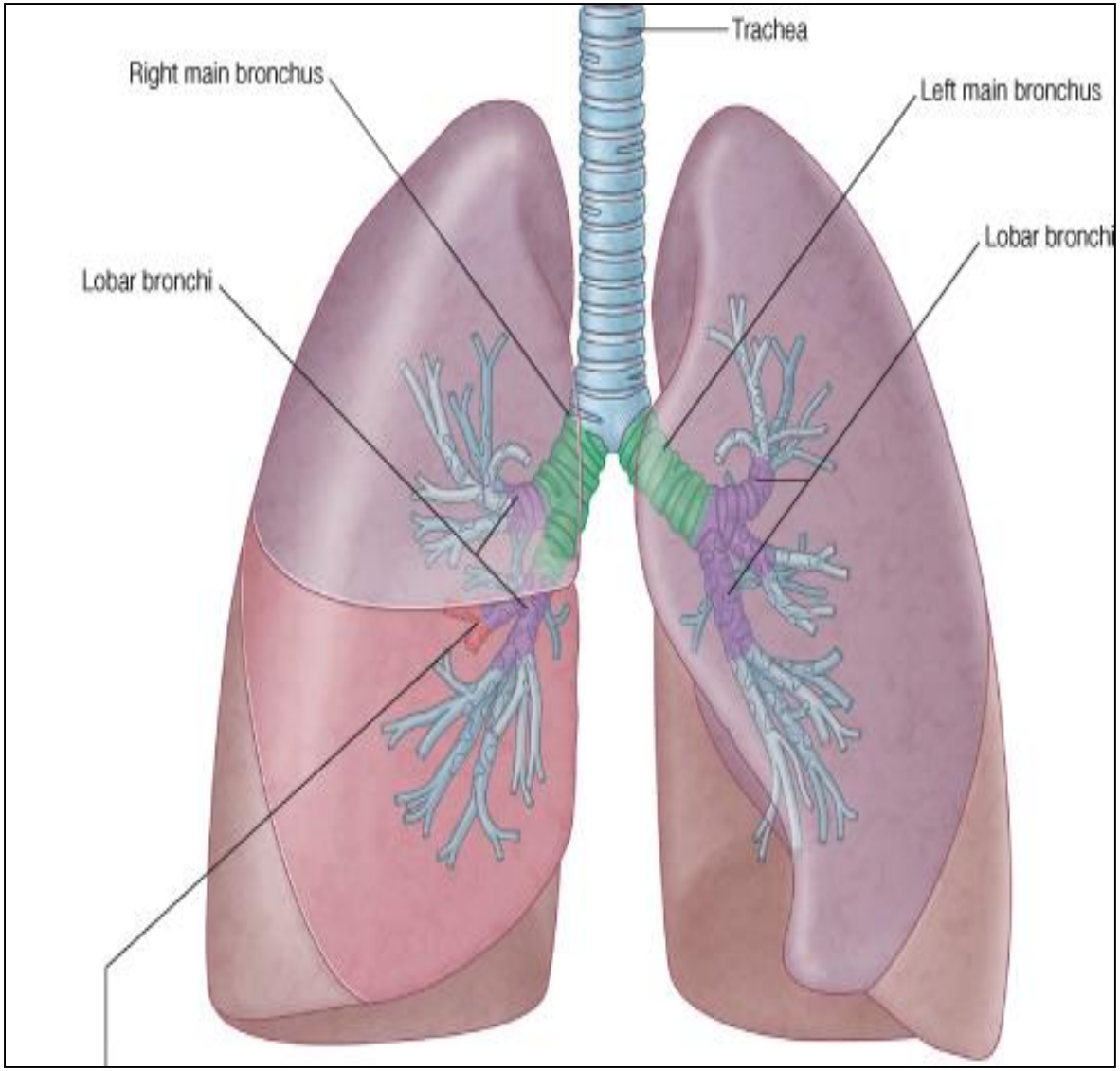
- Located in the thoracic cavity, one on each side of the mediastinum
- **<u>Each lung is</u>**:

Conical in shape.

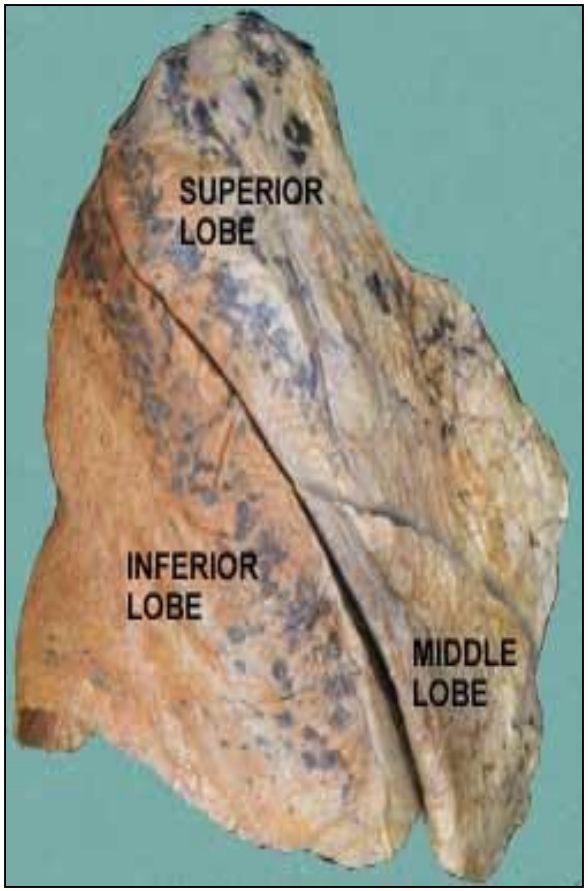
Covered by visceral pleura.

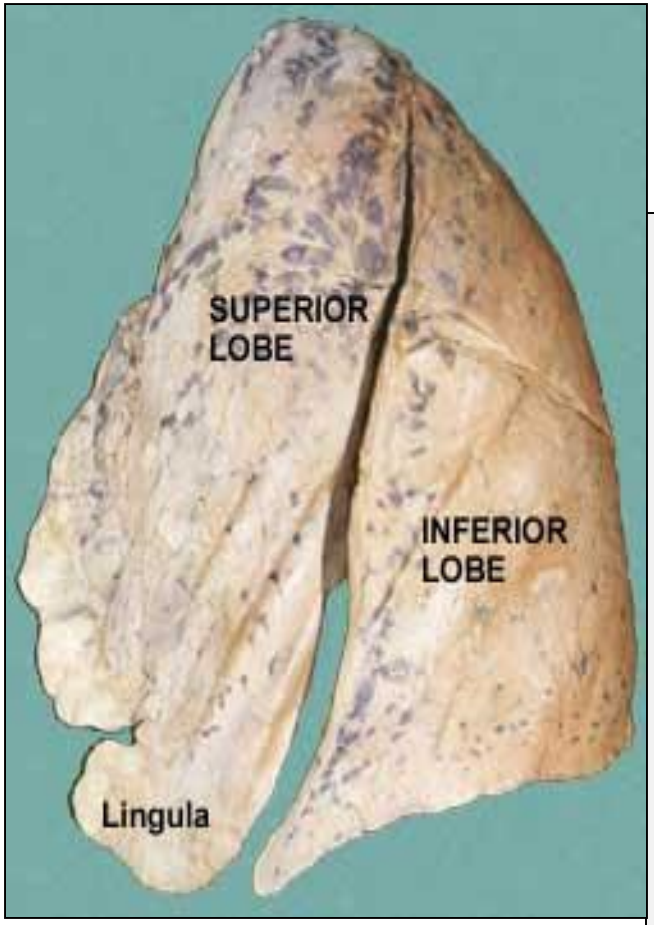
Suspended free in its own pleural cavity.

Attached to the mediastinum only by its root.



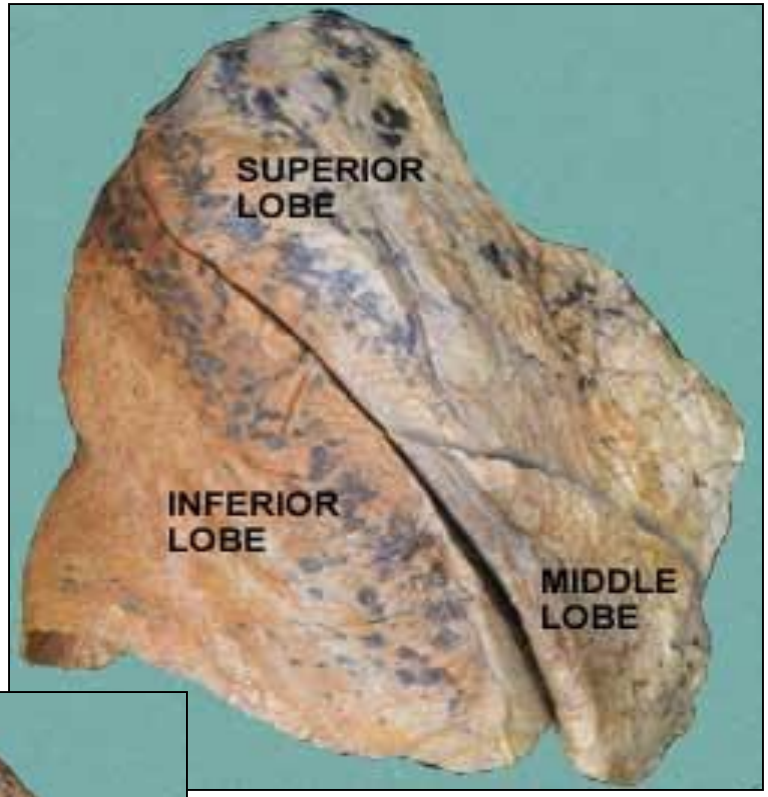
LUNGS

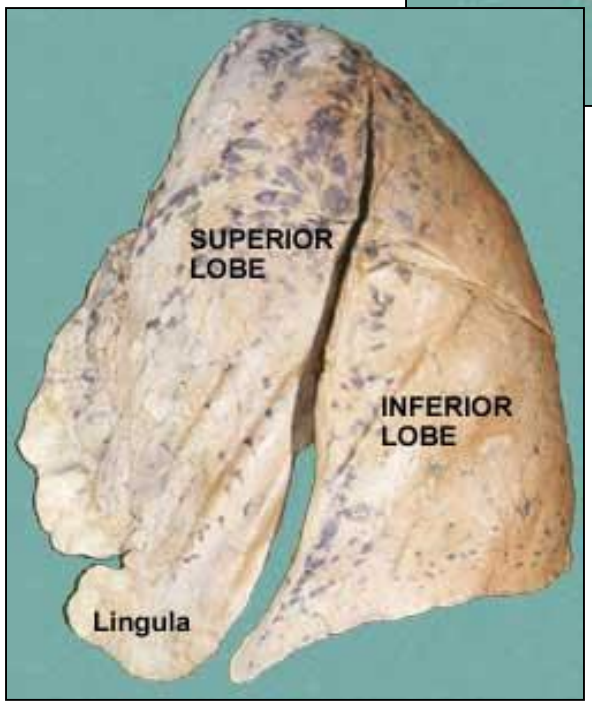




- **Each lung has:**
- **Apex and base:** identify the top and bottom of the lung, respectively.
- **Costal surface:** surrounded by the ribs and intercostal spaces from front, side & back).
- **Medial surface:**
- Where the bronchi, blood vessels, and lymphatic vessels enter or leave the lung at the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

LUNGS

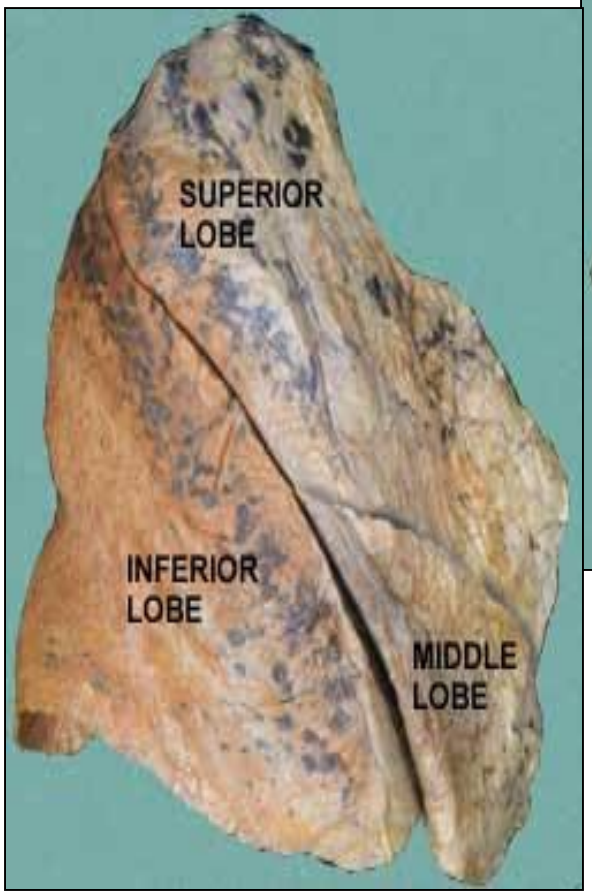


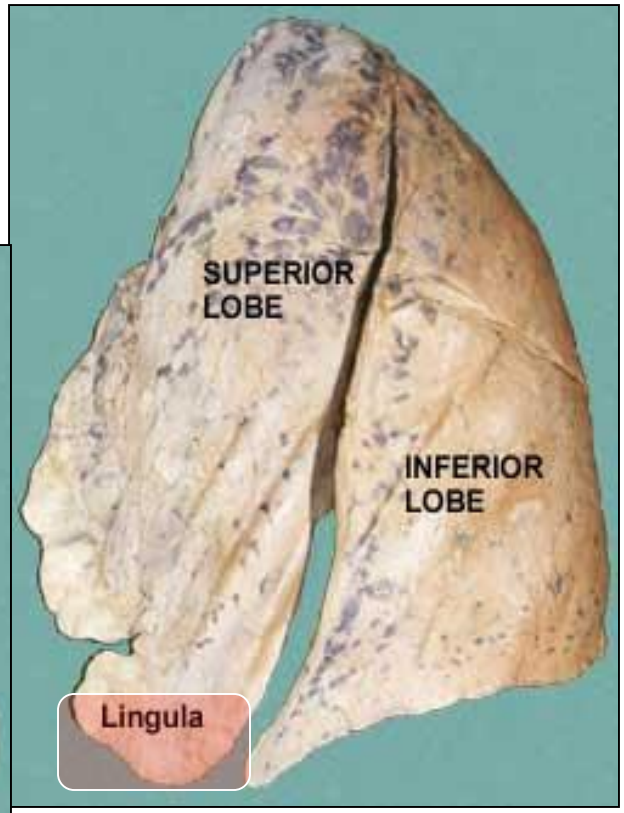


- **Apex:**
- Projects into the root of the neck.
- (1/2 an inch above medial 1/3 of the clavicle).
  It is covered by cervical pleura.

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

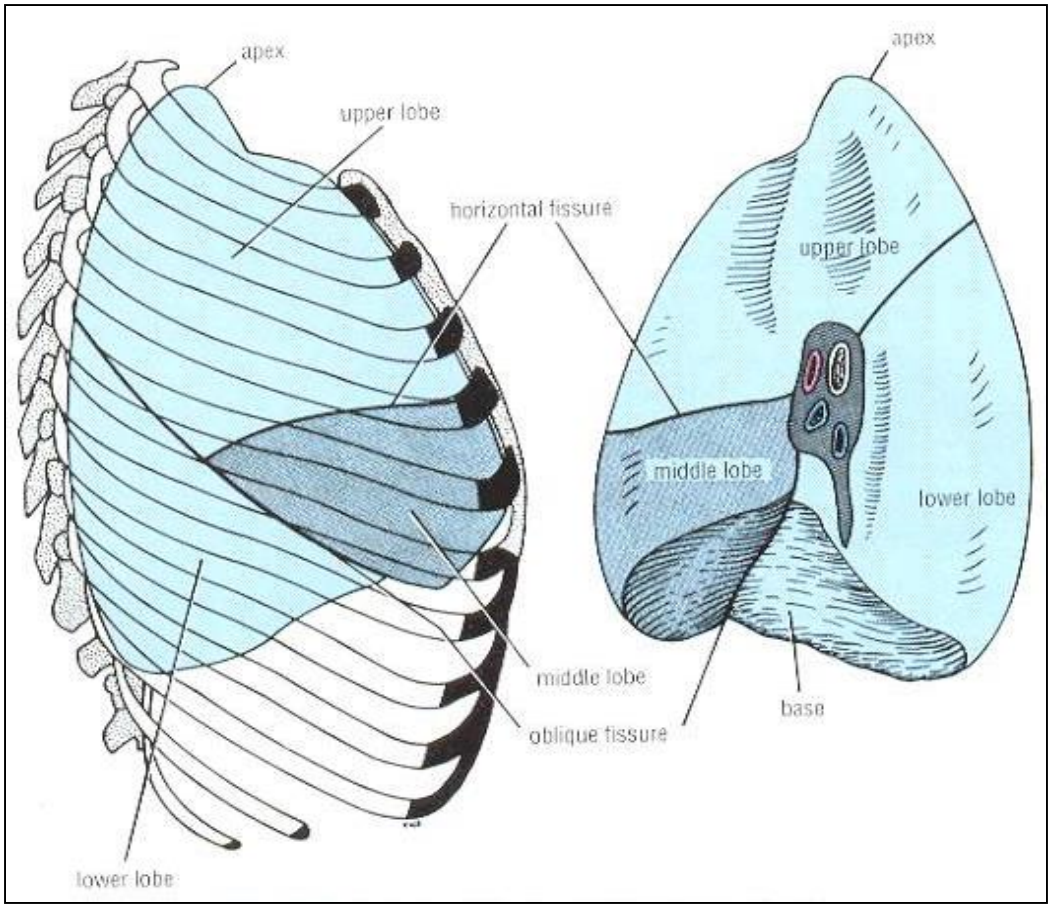
Borders: Anterior & Posterior





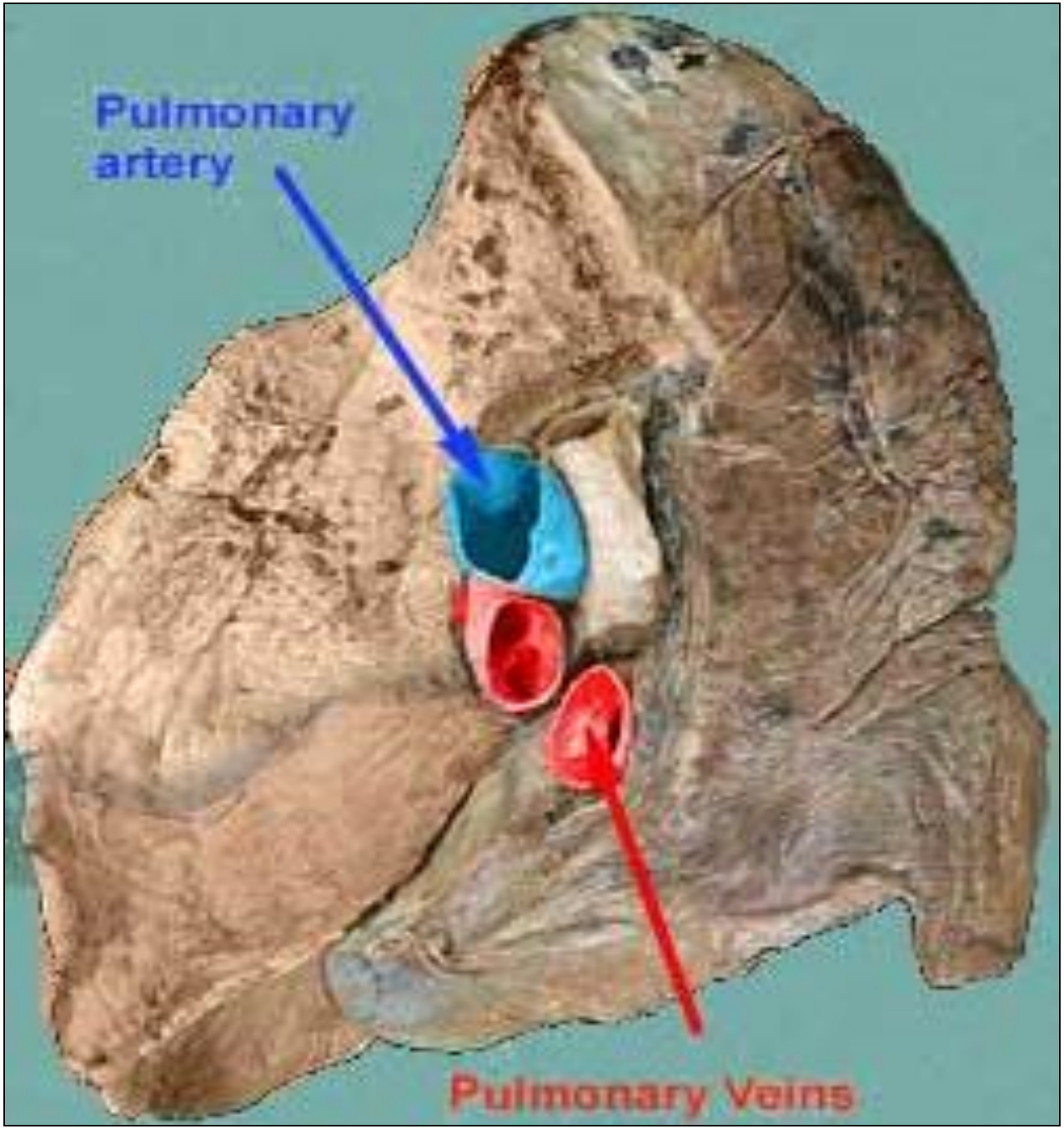
- **Anterior border:**
- It is sharp, thin and overlaps the heart.
- Anterior border of left lung presents a cardiac notch at its lower end.
- It has a thin projection called the lingula below the cardiac notch.
- **Posterior border:**
- **It** is thick and rounded, and lies along the vertebral column.

Surfaces: Costal & Mediastinal



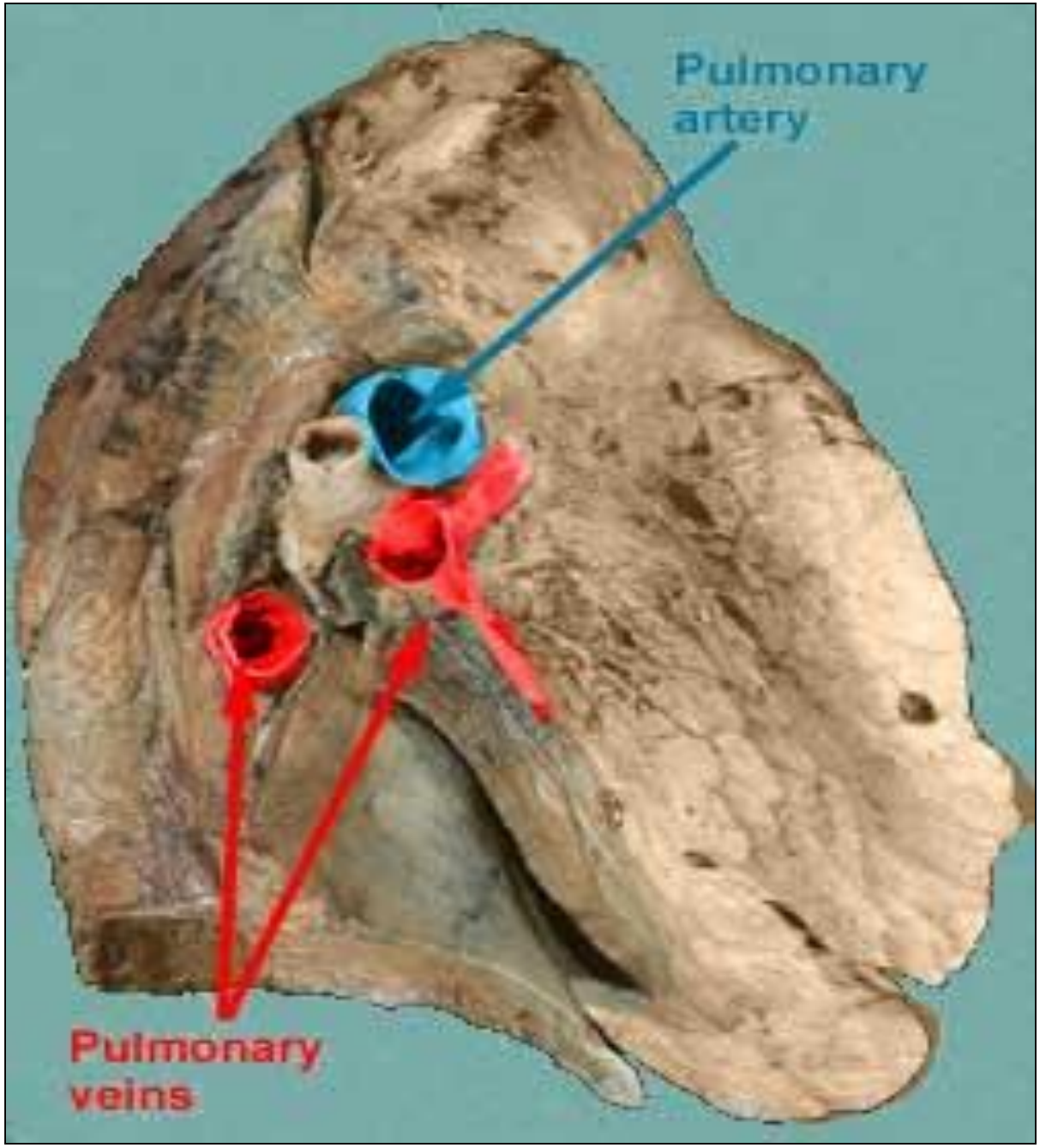
Lateral & medial surfaces of right lung

- **Costal surface:**
- Convex.
- Covered by costal pleura which separates the 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.



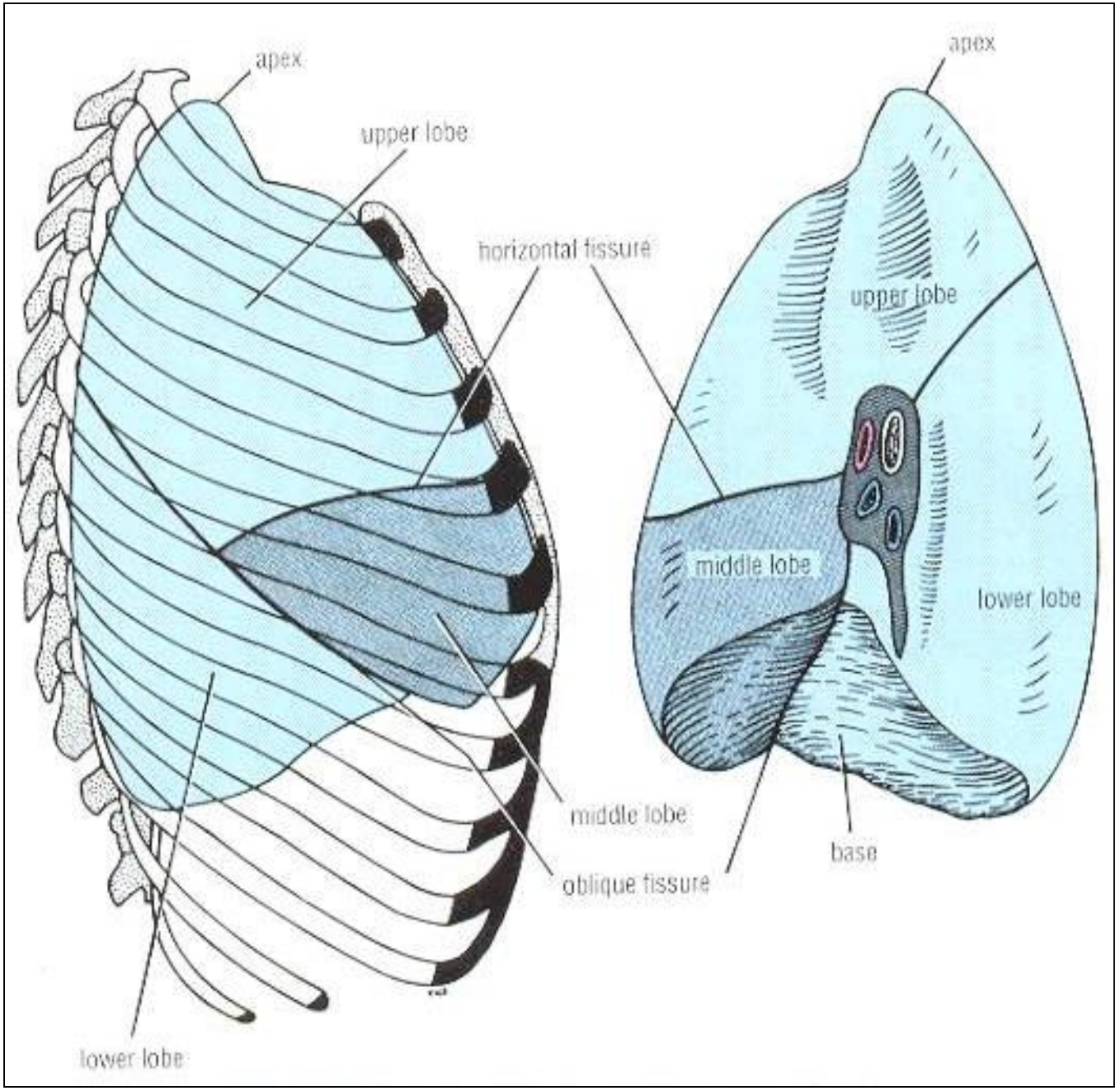
RIGHT LUNG ROOT

- **2 bronchi:** Most posterior.
- Pulmonary artery**:** Most superior.
- 2 Pulmonary veins:
- Are most anterior and most inferior.



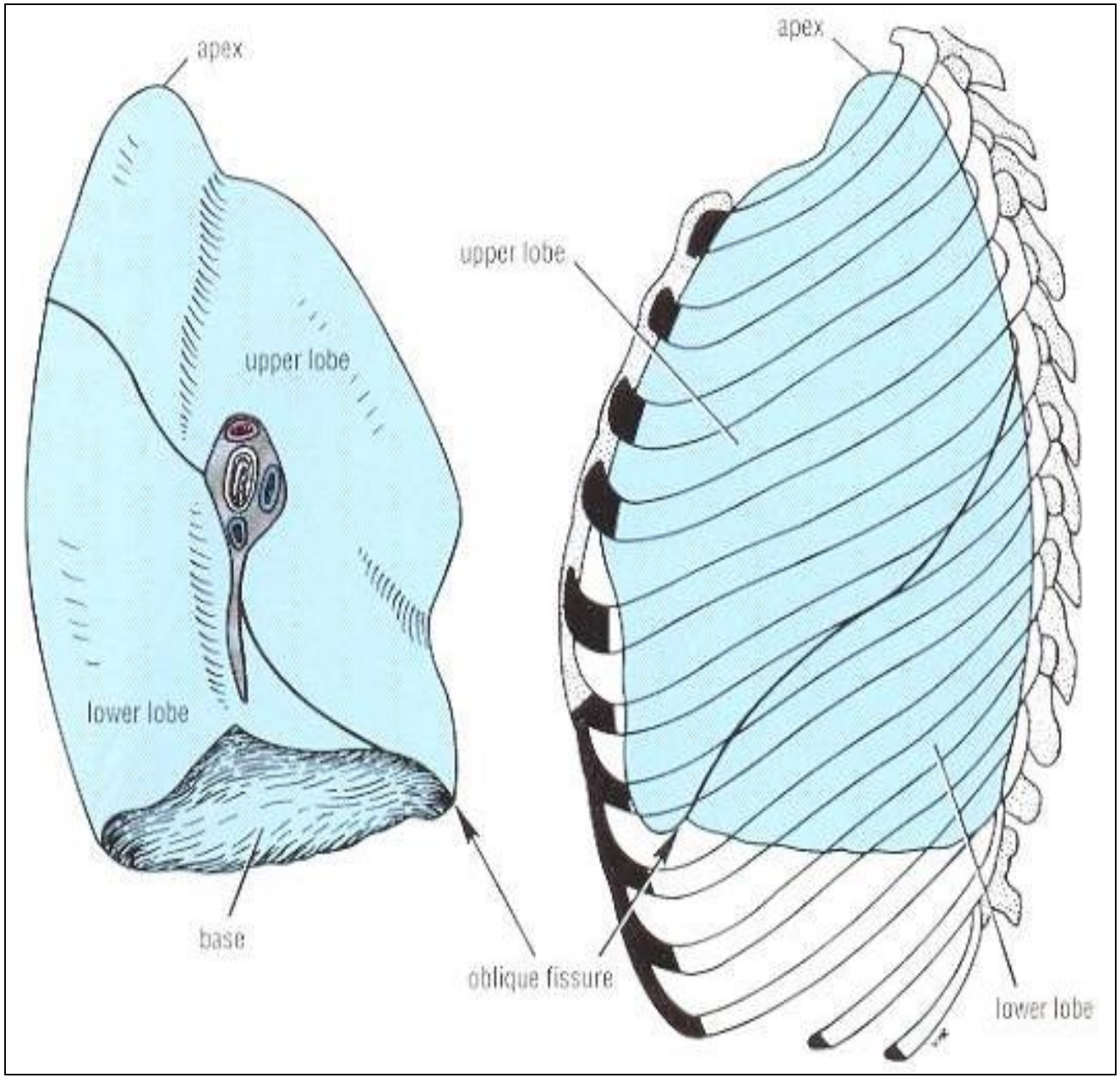
LEFT LUNG ROOT

- **One bronchus:**
  Most posterior.
- Pulmonary artery:
  Most superior.
- 2 Pulmonary veins:
- Are most anterior and most inferior.



Right lung

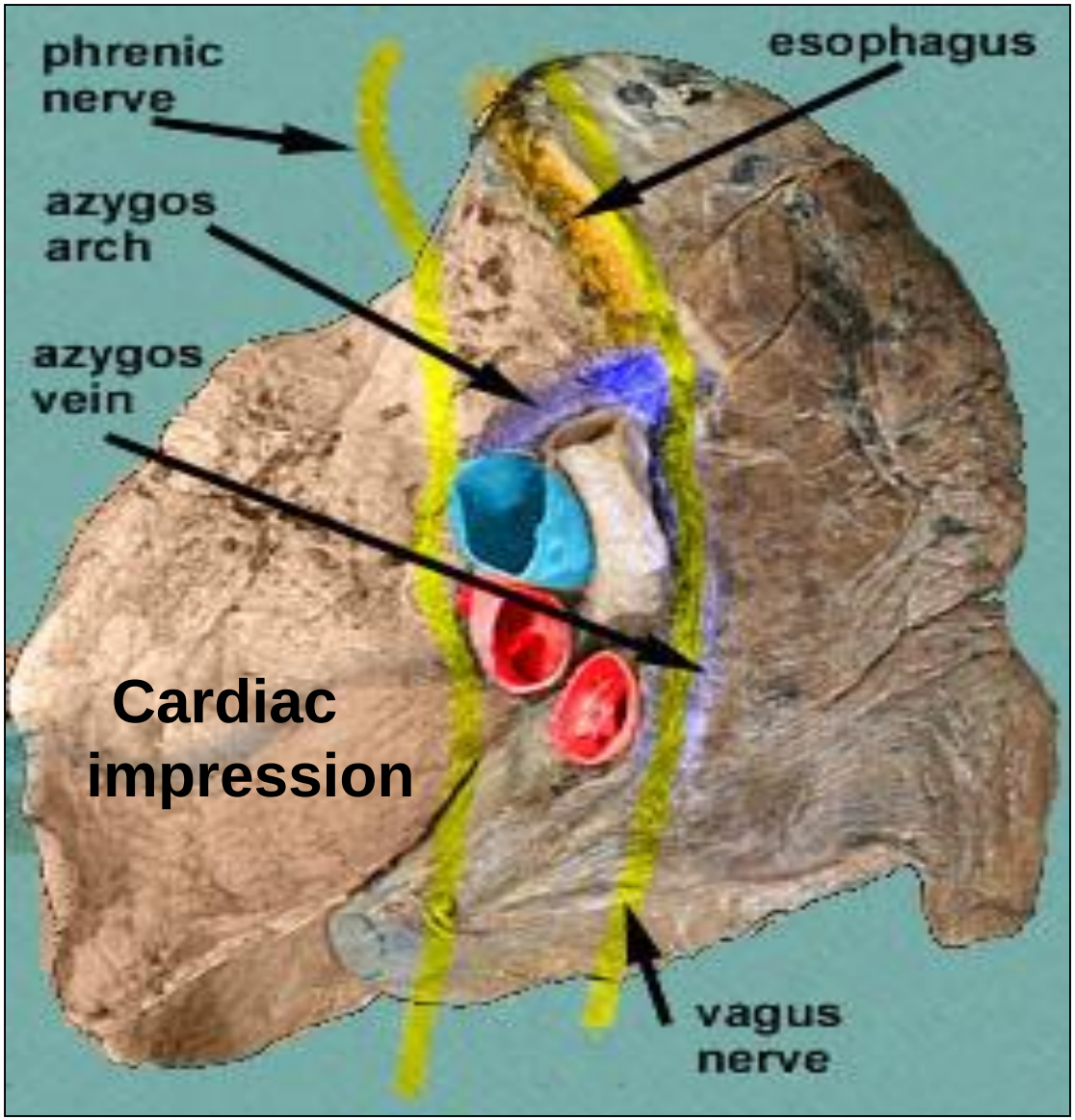
- Larger & shorter than left lung.
- Divided by 2 fissures (oblique & horizontal) into 3 lobes:
- Upper,
- Middle,
- Lower.



Left Lung

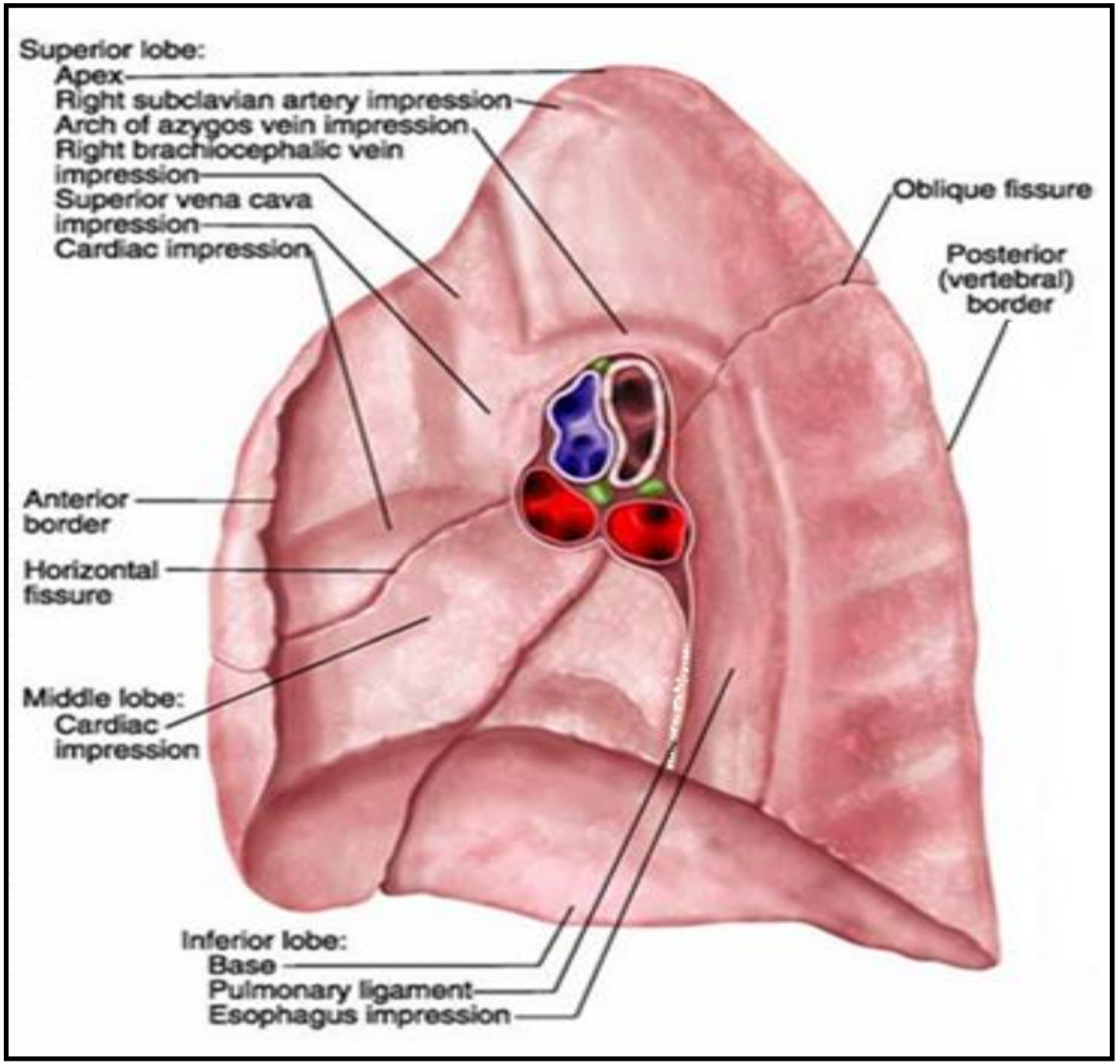
- Divided by only one oblique fissure into 2 lobes:
- Upper
- Lower.
- It has a cardiac notch at the lower part of its anterior border.
- **NB.** There is **No** horizontal fissure.

Mediastinal surface of right lung

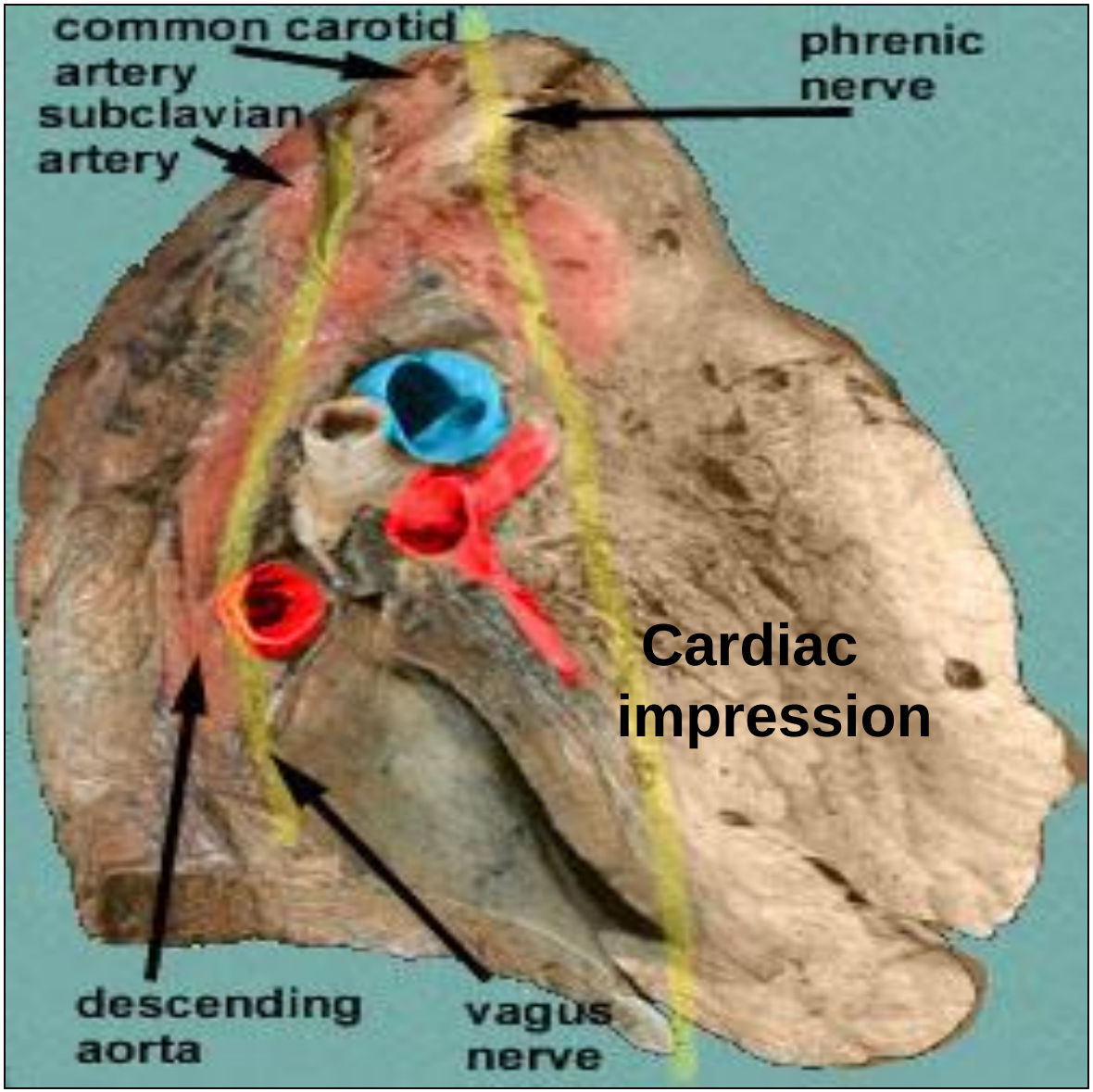


- **On the mediastinal surface of the lung,** you find these structures:
- Azygos vein and its arch (just posterior and over the root of the lung).
- Vagus nerve posterior to the root of the lung.
- Esophagus posterior to the root.
- Phrenic nerve anterior to the root of the lung.
- **Cardiac impression:** related to right atrium of the heart.
- **Below hilum and in front of pulmonary ligament: groove for I.V.C.**

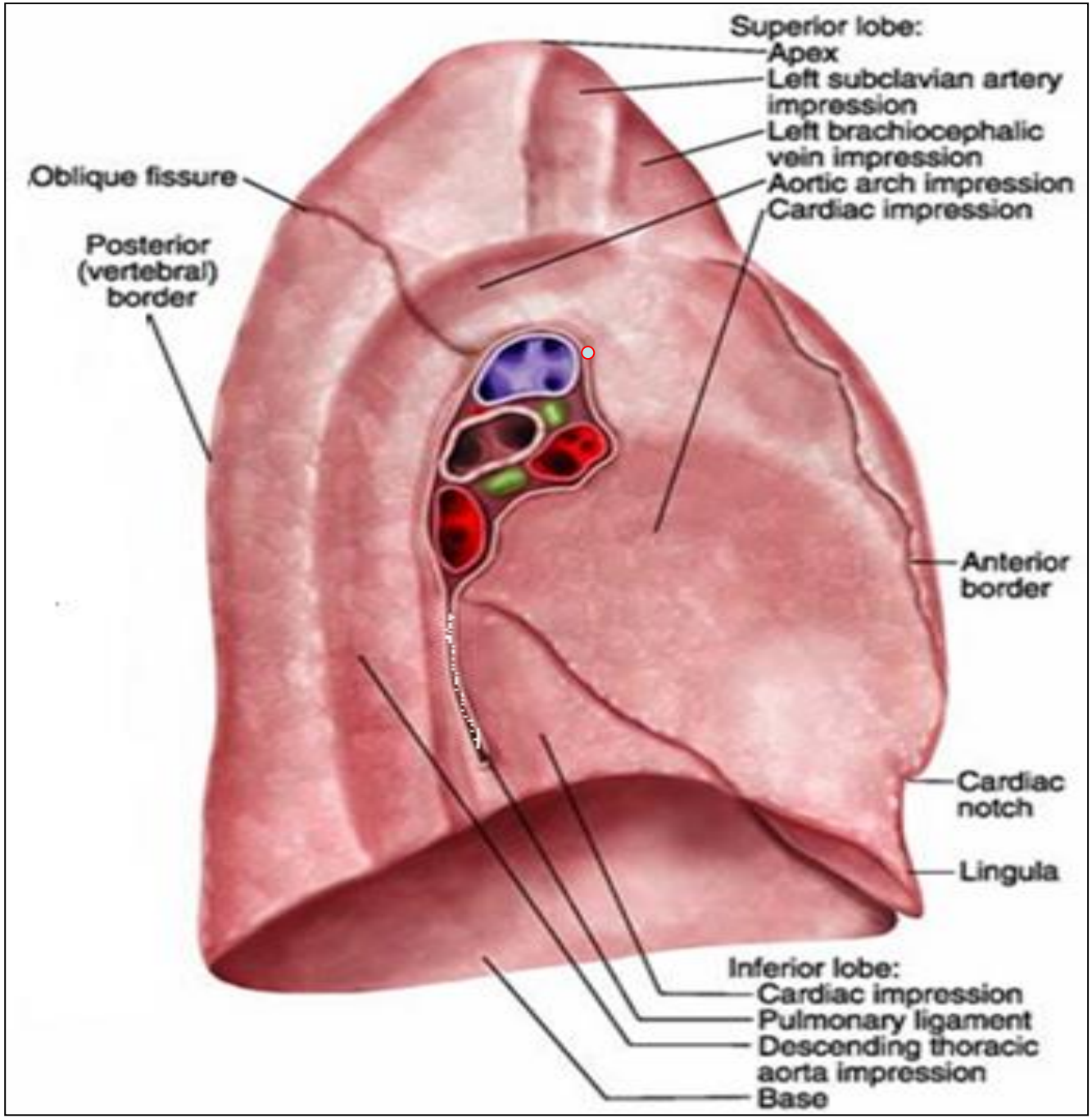
Mediastinal surface of the right lung



Mediastinal surface of left lung



- On the mediastinal surface of the lung, you will find these structures:
- Descending aorta Just posterior to the root.
- Vagus nerve posterior to the root of the lung.
- Arch of the aorta just over the root of lung.
- **Groove for**:
- Left common carotid a.
- Left subclavian artery.
- Phrenic nerve anterior to the root of the lung.
- **Cardiac impression:** related to left ventricle.



Mediastinal surface of the left lung

Blood supply of lung

- **Bronchial arteries (From descending thoracic aorta). It supply 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 nervous system. (sympathetic & parasympathetic fibers).

1- Sympathetic Fibers:

From … Sympathetic trunk.

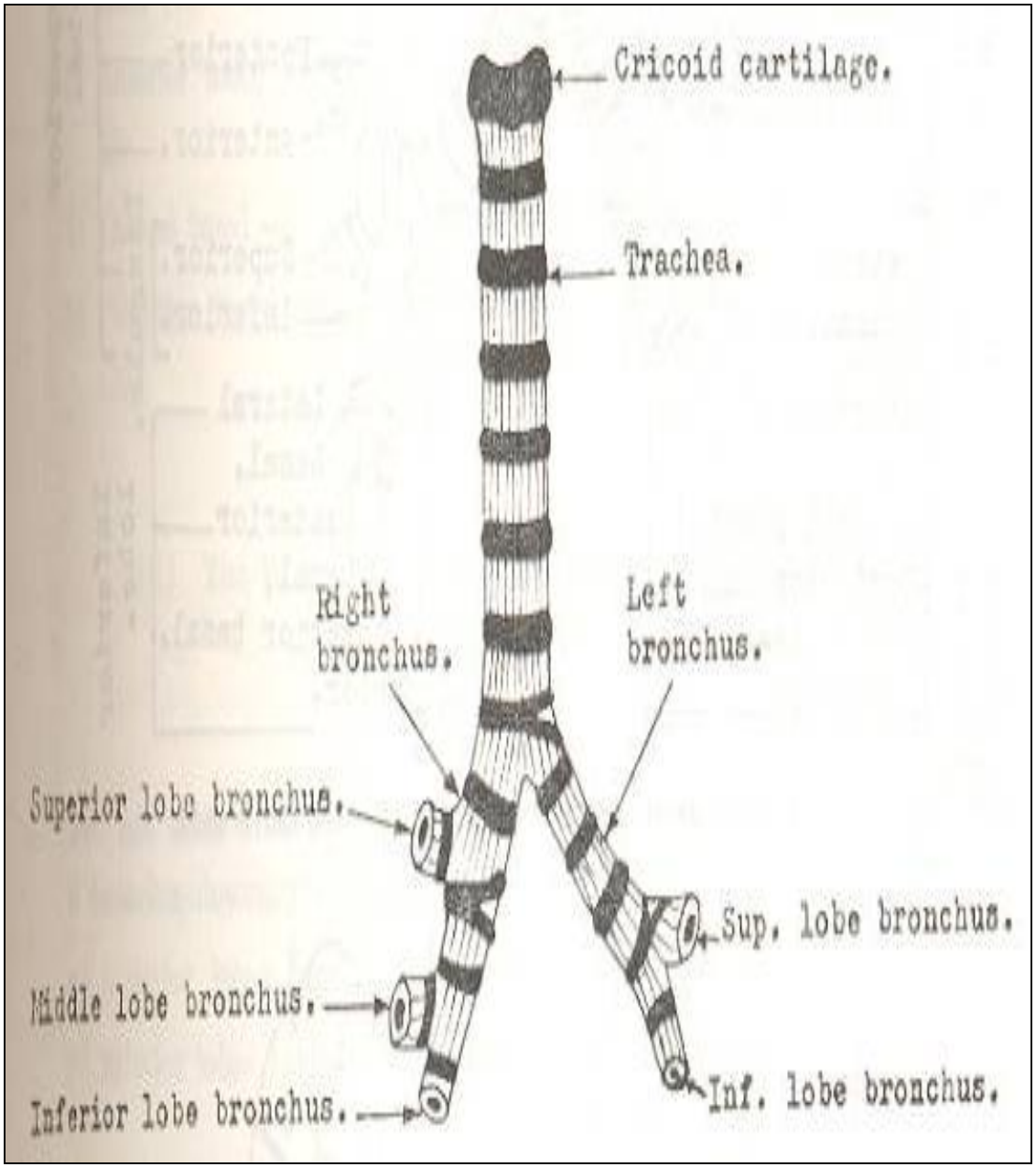
Action: broncho-dilatation and vasoconstriction.

2- Parasympathetic Fibers:

From…..**Vagus** nerve.

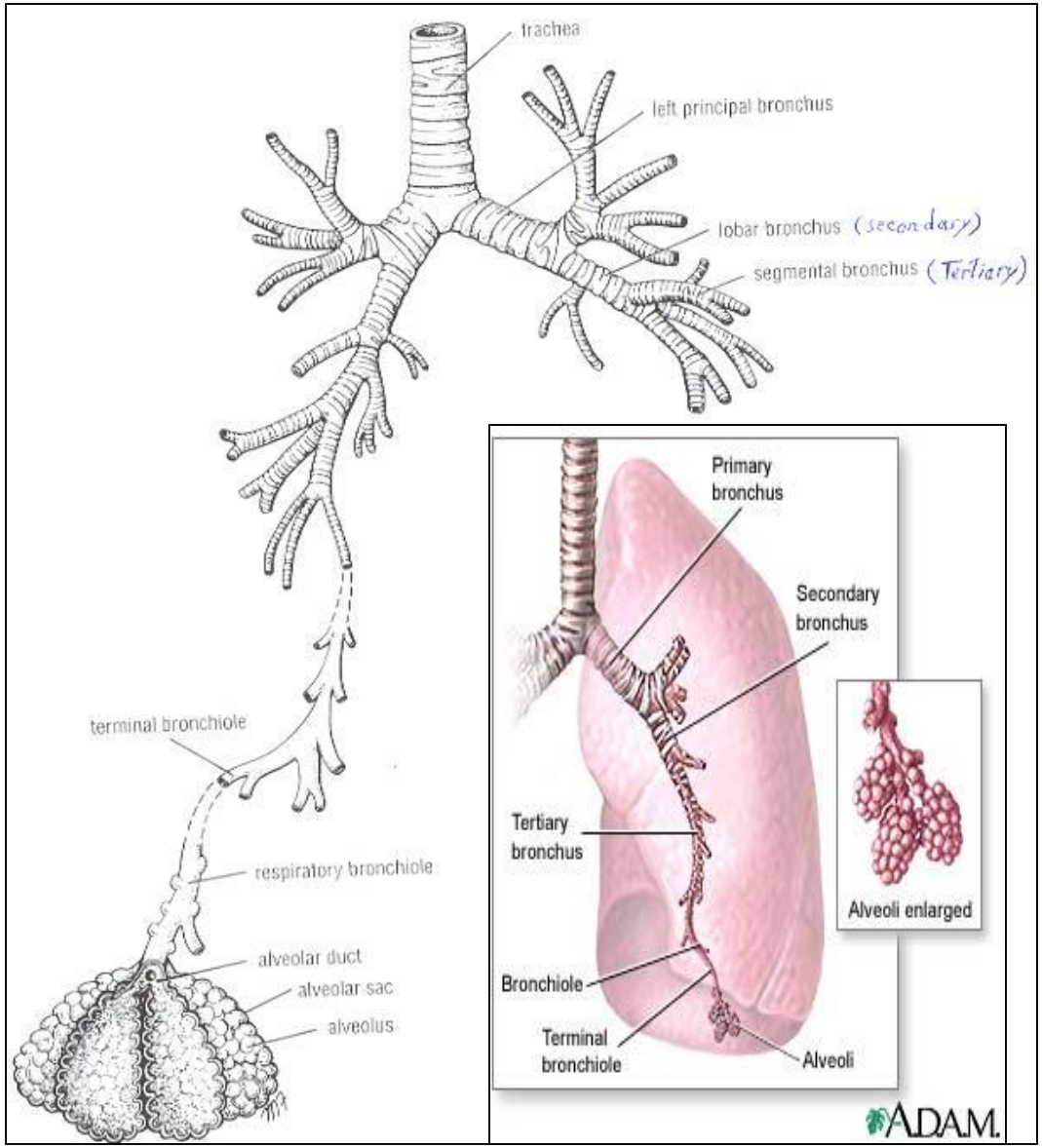
Action: Broncho-constriction and secretomotor to bronchial glands and vasodilatation.

Bronchi



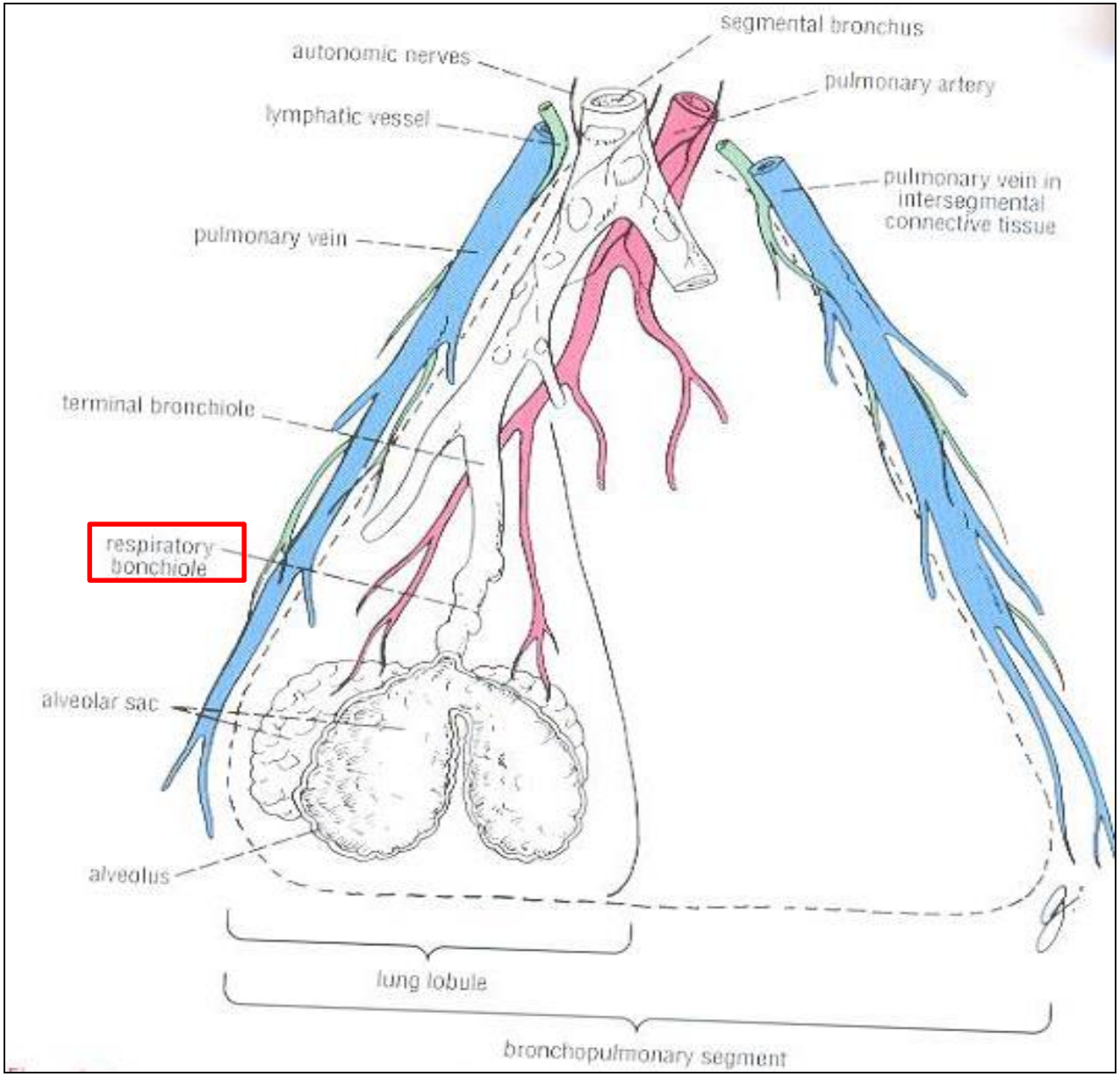
- The trachea divides into 2 main bronchi:
- Right main bronchus: which divides before entering the hilum, it gives: superior lobar (secondary) bronchus.
  On entering hilum, it divides into middle & inferior lobar bronchi.
- Left main bronchus: On entering hilum, it divides into superior & inferior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

Bronchopulmonary segments



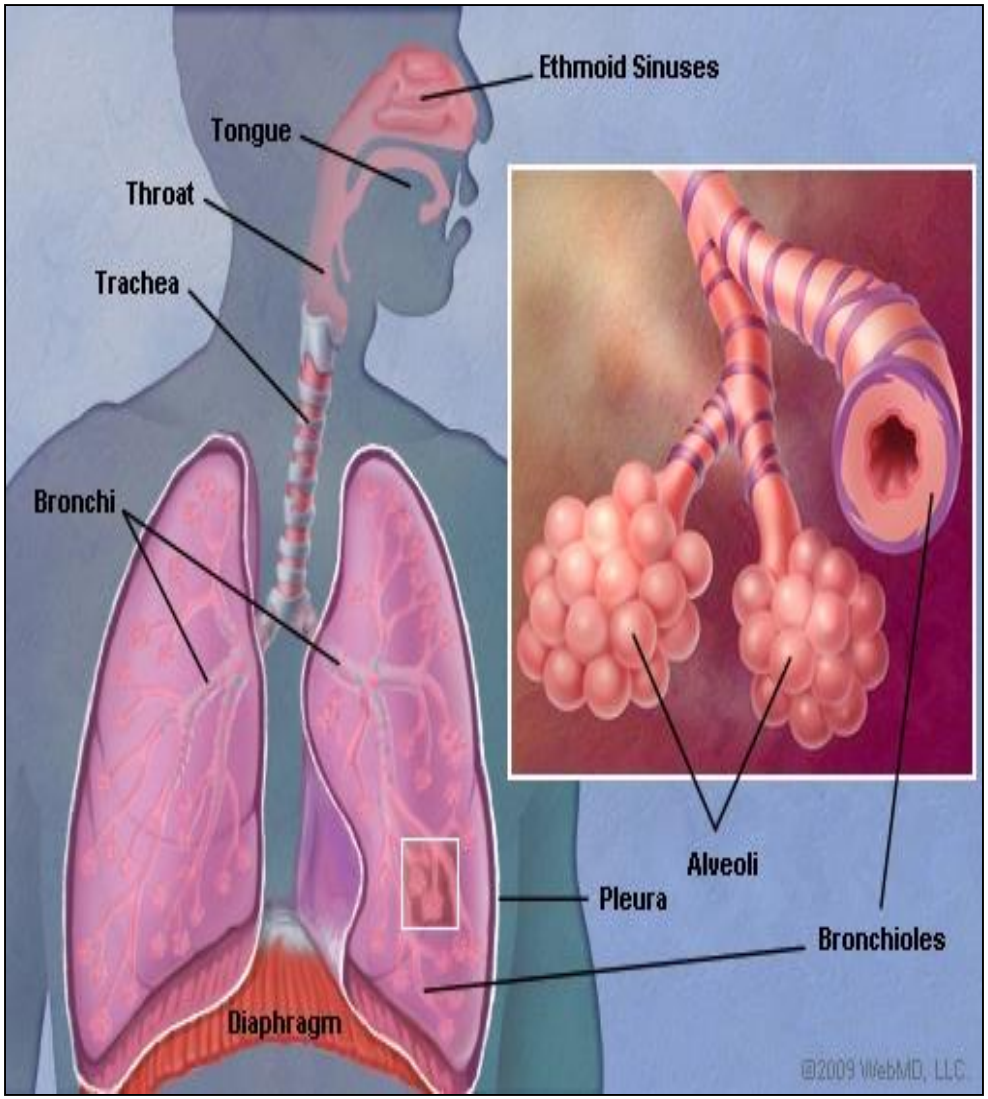
- These are the anatomical, functional, and surgical units of the lungs.
- Each lobar (secondary) bronchus gives segmental (tertiary) bronchi.
- Each segmental bronchus divides repeatedly into bronchioles.
- Bronchioles divide into terminal bronchioles, which show delicate outpouchings ‘the respiratory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

Bronchopulmonary segments



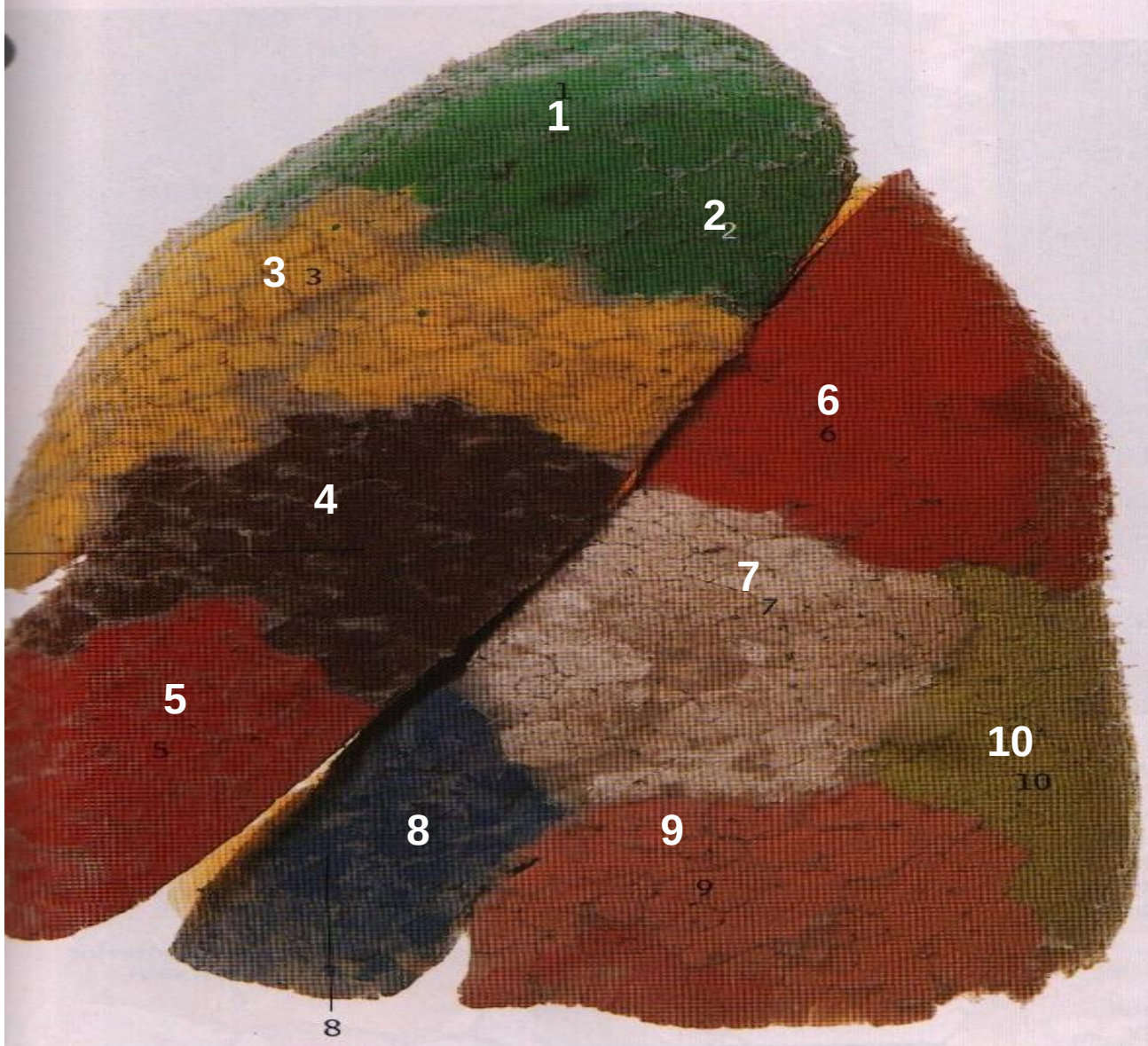
- The respiratory bronchioles end by branching into alveolar ducts, which lead into alveolar sacs.
- The alveolar sacs consist of several alveoli.
- Each alveolus is surrounded by a network of blood capillaries for gas exchange.

Bronchopulmonary segments

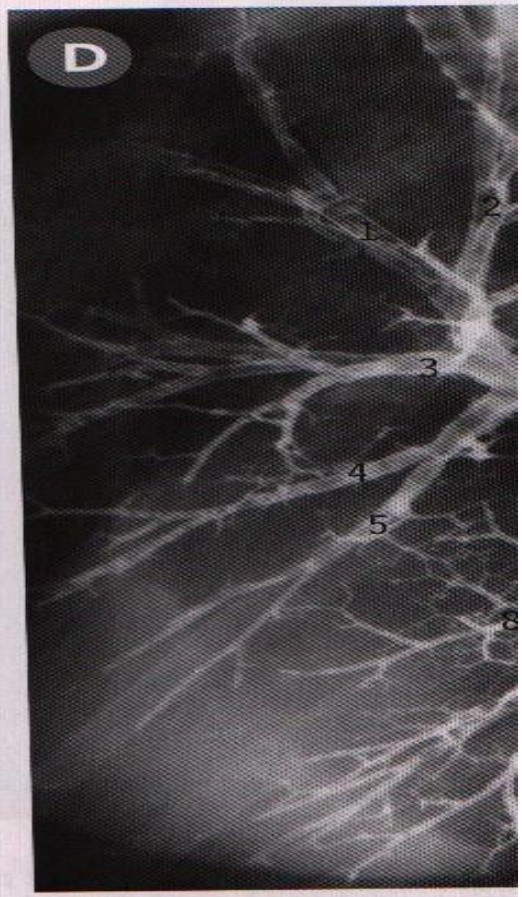


- **The main characteristics of a bronchopulmonary segment:**
- It is a subdivision of a lung lobe.
- It is pyramidal shaped, its apex toward the lung root.
- It is surrounded by connective tissue septa.
- It has a segmental bronchus, a segmental artery, lymph vessels, and autonomic nerves.
- **The segmental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

nchopulmonary segments
the left lung *from the lateral side*



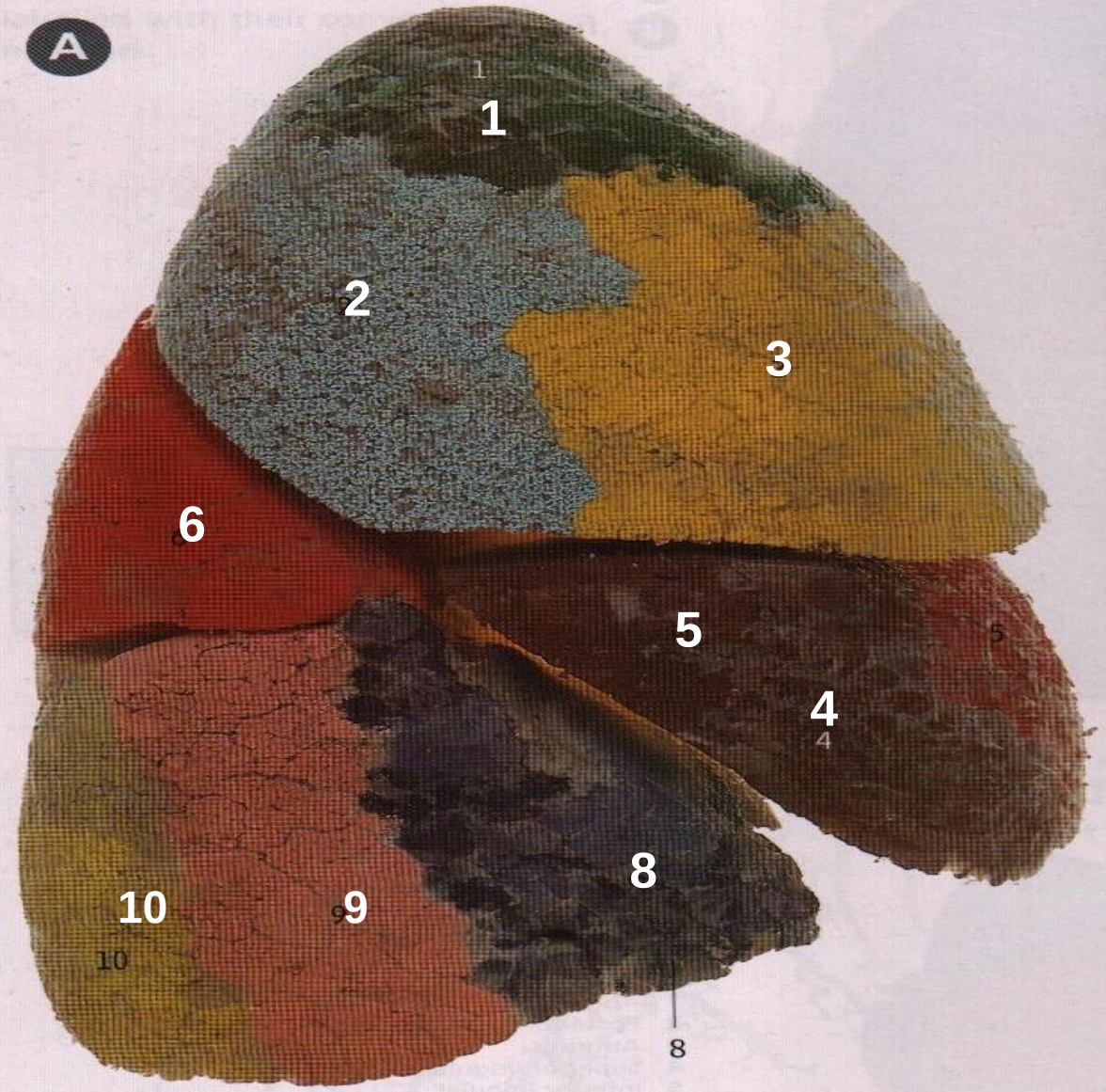
Left bronchog



Superior lobe
- **1** Apical
- **2** Posterior
- **3** Anterior
- **4** Superior lingular
- **5** Inferior lingular

Inferior lobe
- **6** Apical (superior)
- **7** Medial basal (cardiac)
- **8** Anterior basal
- **9** Lateral basal
- **10** Posterior basal

Bronchopulmonary segments of the right lung *from the lateral side*



Right bronc

Superior lobe
- **1** Apical
- **2** Posterior
- **3** Anterior

Middle lobe
- **4** Lateral
- **5** Medial

Inferior lobe
- **6** Apical (superior)
- **7** Medial basal
- **8** Anterior basal
- **9** Lateral basal
- **10** Posterior basal


THANK YOU