

LUNG ANATOMY

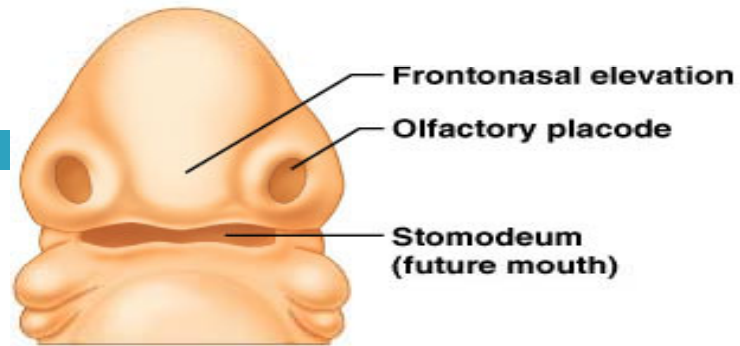
PART 2

D.HAMMOUDI.MD

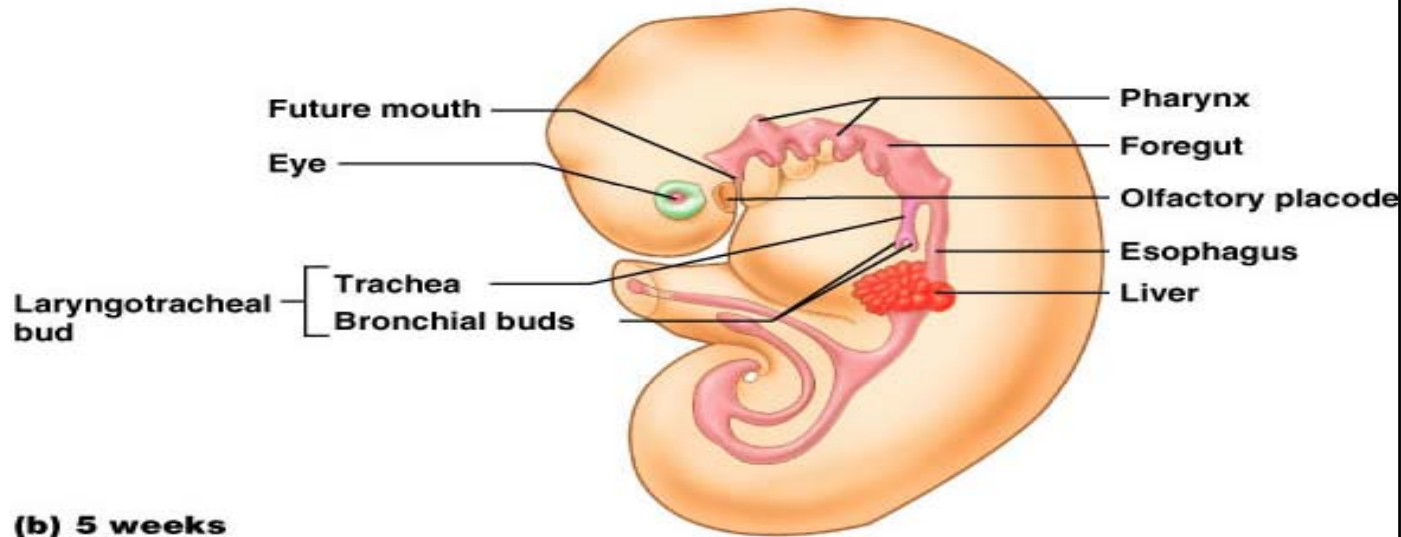
Developmental Aspects

- ❑ Olfactory placodes invaginate into olfactory pits by the 4th week
- ❑ Laryngotracheal buds are present by the 5th week
- ❑ Mucosae of the bronchi and lung alveoli are present by the 8th week
- ❑ By the 28th week, a baby born prematurely can breathe on its own
- ❑ During fetal life, the lungs are filled with fluid and blood bypasses the lungs
- ❑ Gas exchange takes place via the placenta

Respiratory System Development



(a) 4 weeks



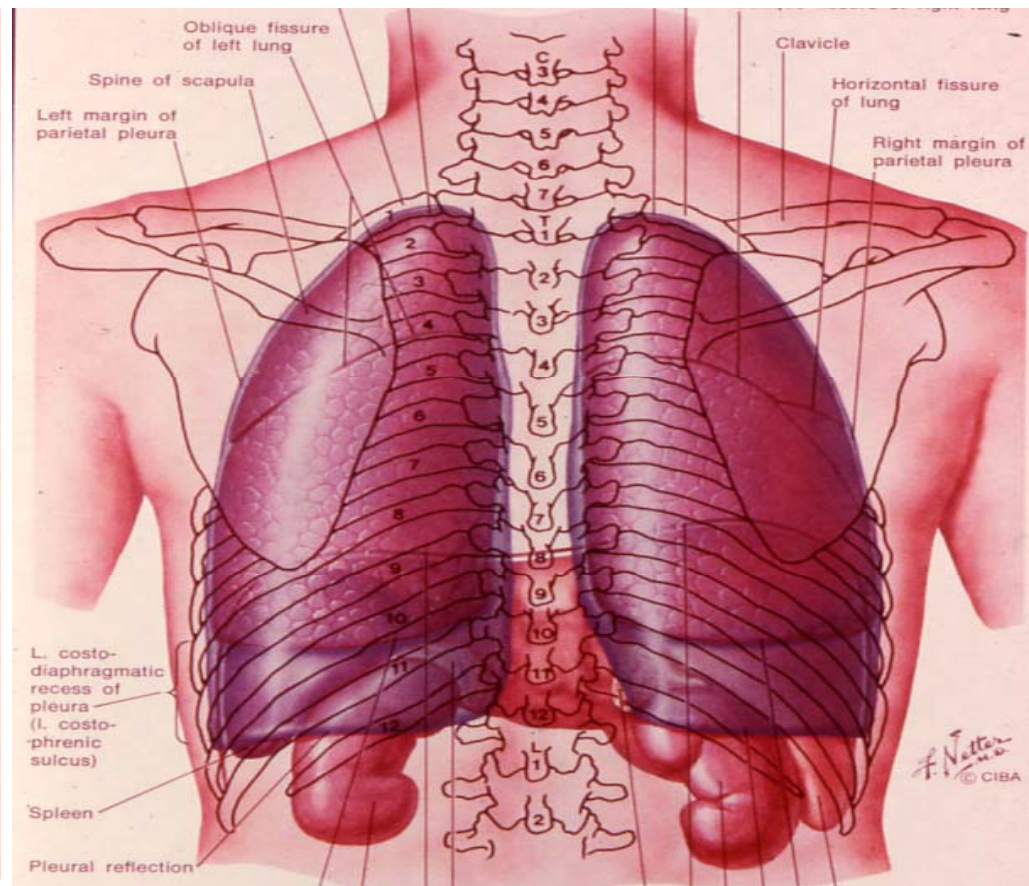
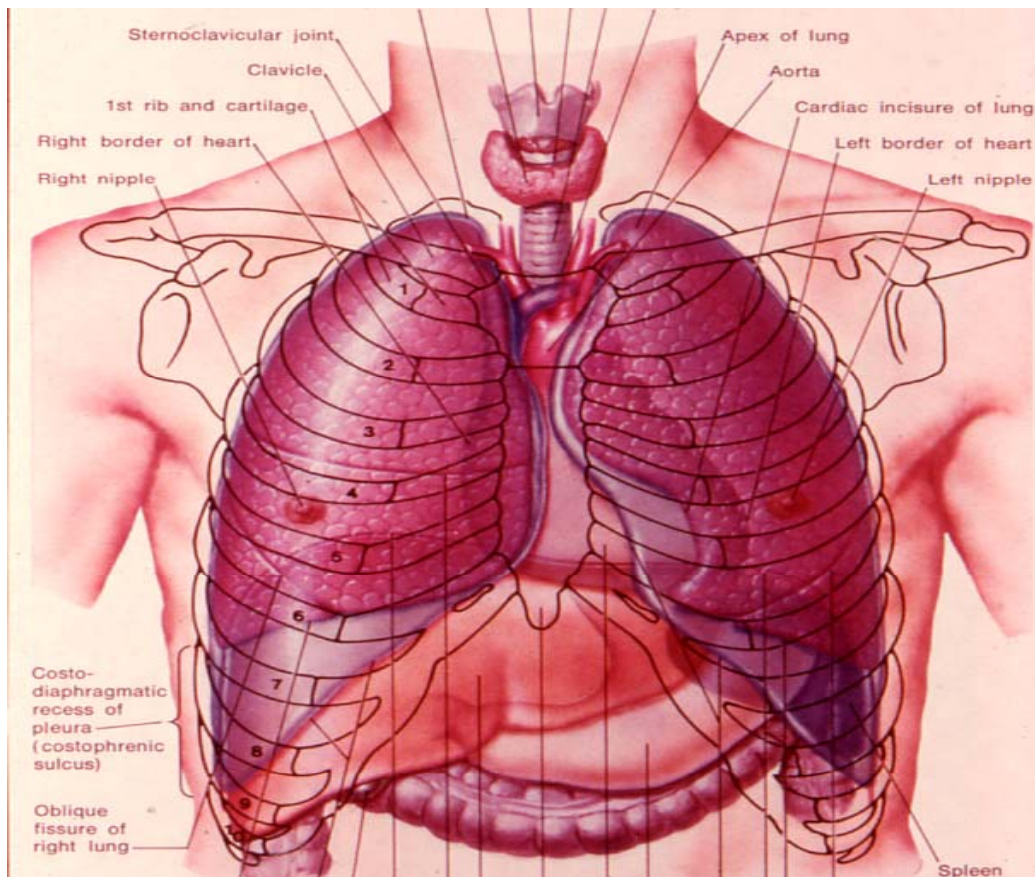
(b) 5 weeks

Figure 22.29

Developmental Aspects

- ❑ At birth, respiratory centers are activated, alveoli inflate, and lungs begin to function
- ❑ Respiratory rate is highest in newborns and slows until adulthood
- ❑ Lungs continue to mature and more alveoli are formed until young adulthood
- ❑ Respiratory efficiency decreases in old age

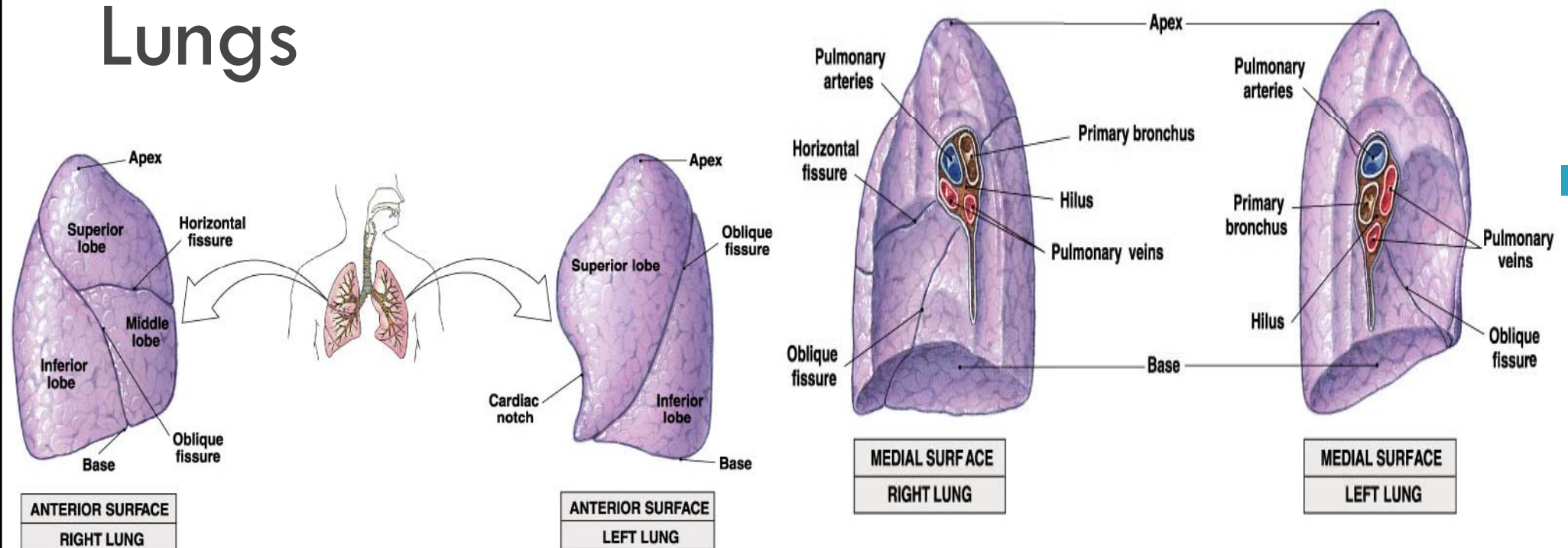
The lungs lie within the pleural space: parietal pleura lines the thorax; visceral pleura surrounds the lungs.







Lungs



- **Two lungs:** Principal organs of respiration
 - ▣ **Right lung:** Three lobes
 - ▣ **Left lung:** Two lobes
- **Divisions**
 - ▣ Lobes, bronchopulmonary segments, lobules



**1. groove for azygos vein;
vein arches over root of
right lung to enter superior
vena cava**

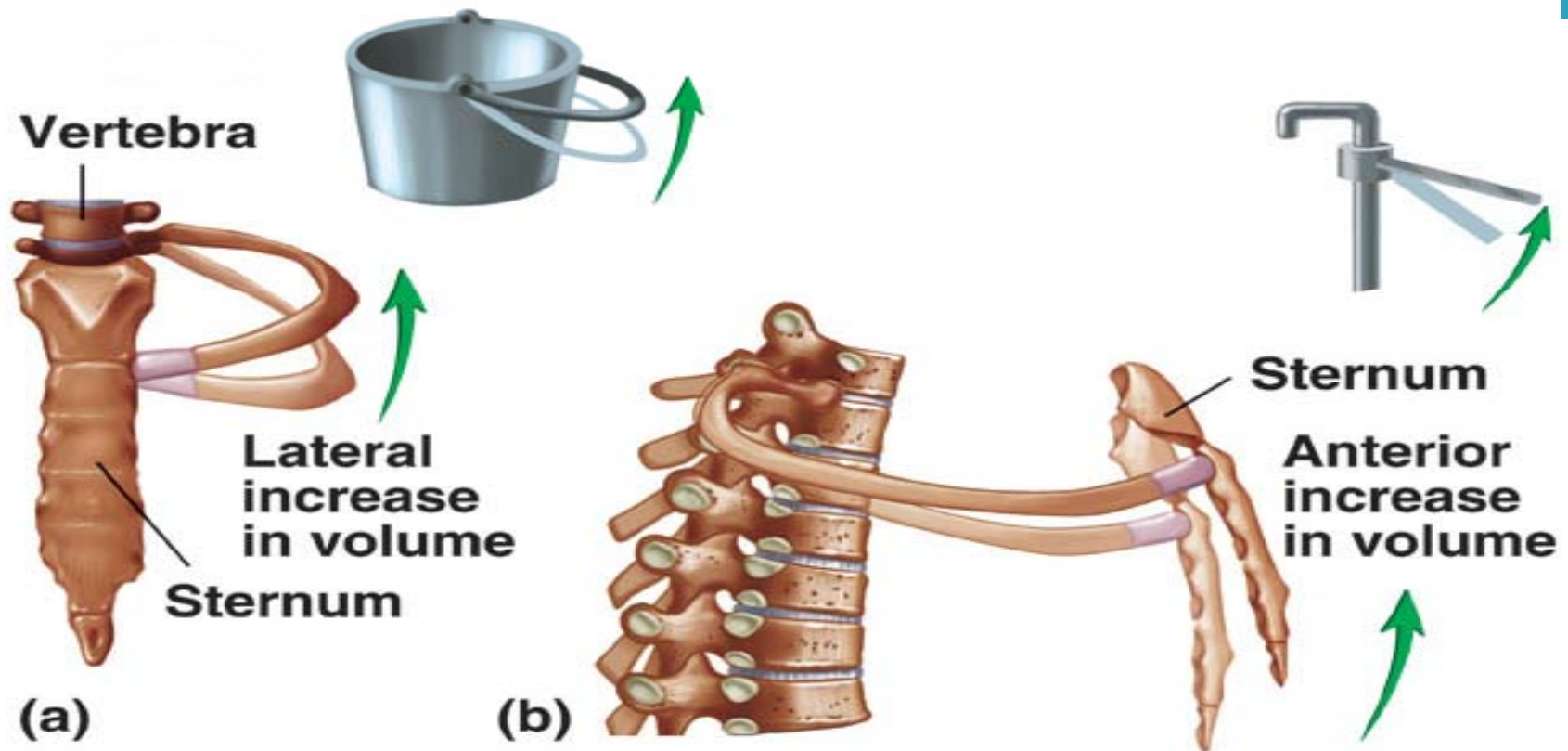
**2. horizontal fissure of
right lung; right lung has
two fissures, left has one**

**3. groove for thoracic
aorta**

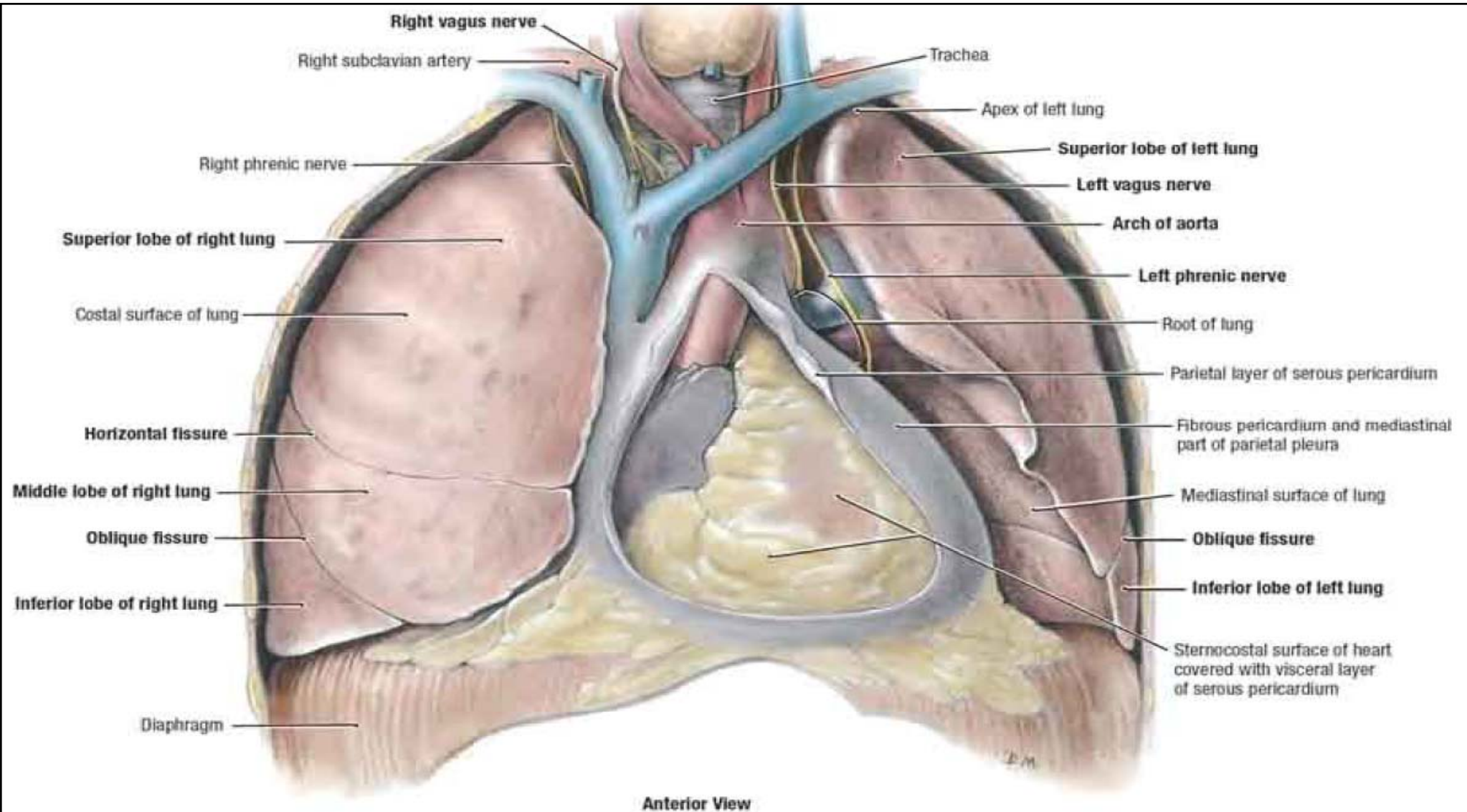
**4. oblique fissure of left
lung**

Thoracic Volume

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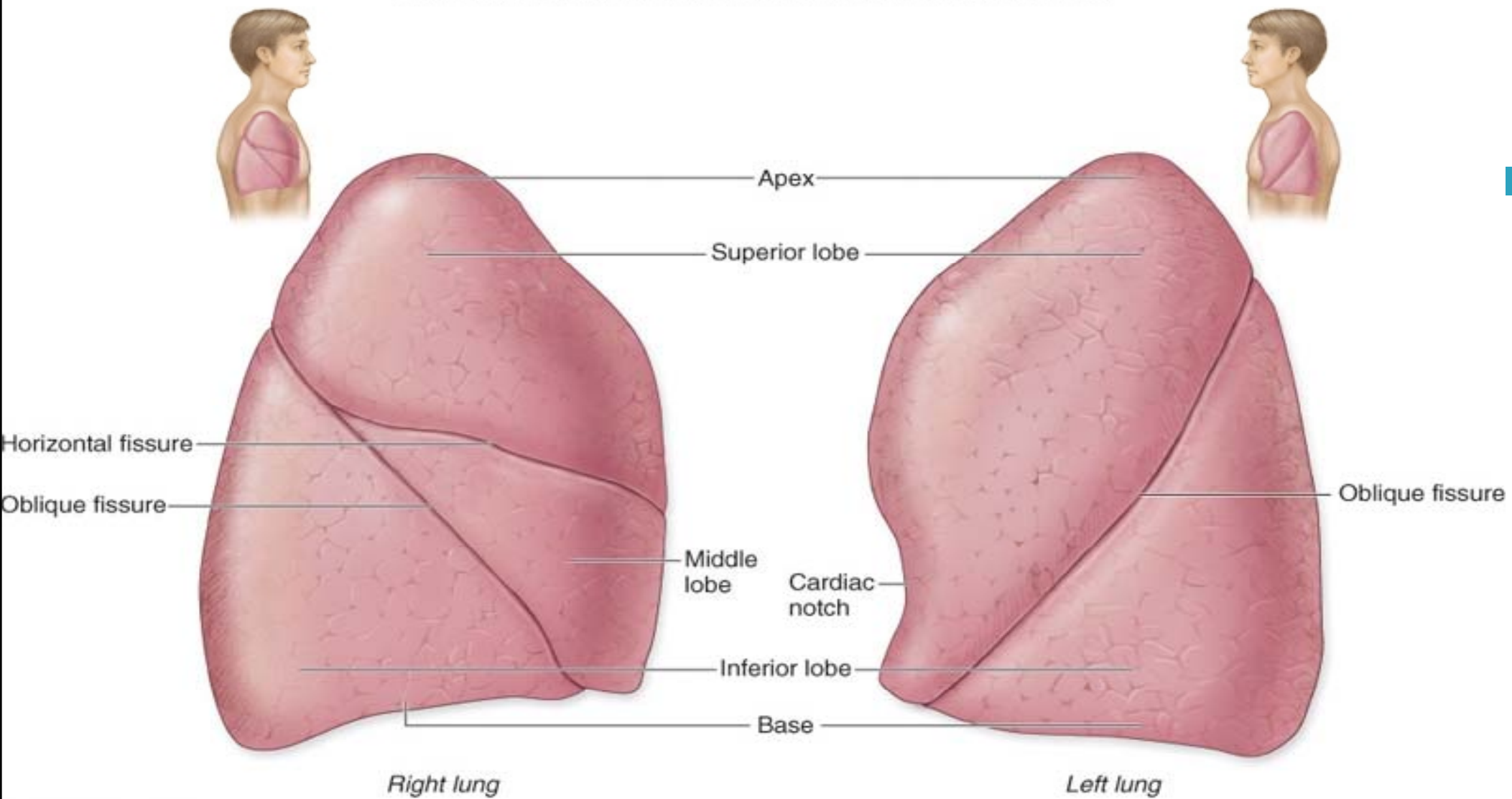
- The lungs invaginate a continuous membranous pleural sac; the visceral (pulmonary) pleura covers the lungs, and the parietal pleura lines the thoracic cavity;
- the visceral and parietal pleurae are continuous around the root of the lung.



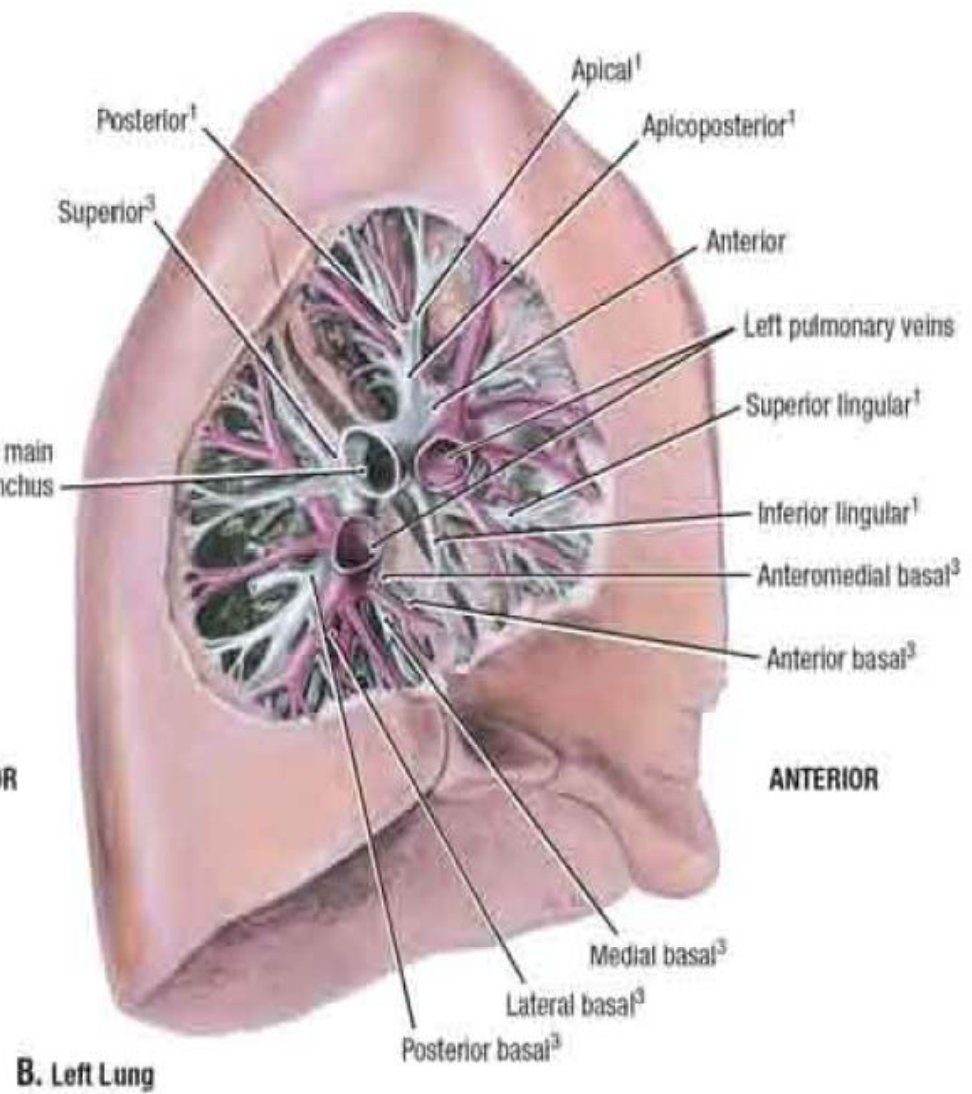
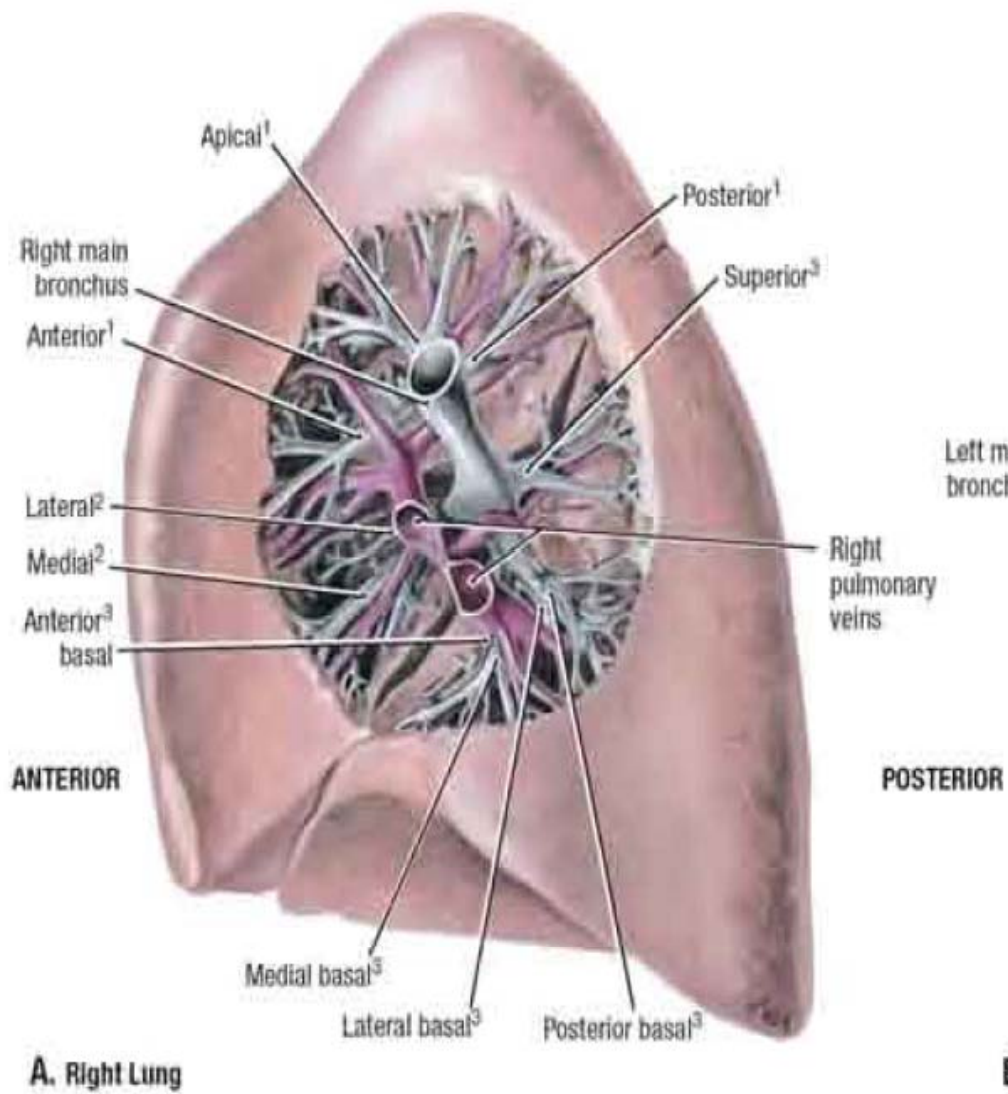
- **Lungs occupy all of the thoracic cavity except the mediastinum**

- **Root** – site of vascular and bronchial attachments
- **Costal surface** – anterior, lateral, and posterior surfaces in contact with the ribs
- **Apex** – narrow superior tip
- **Base** – inferior surface that rests on the diaphragm
- **Hilus** – indentation that contains pulmonary and systemic blood vessels

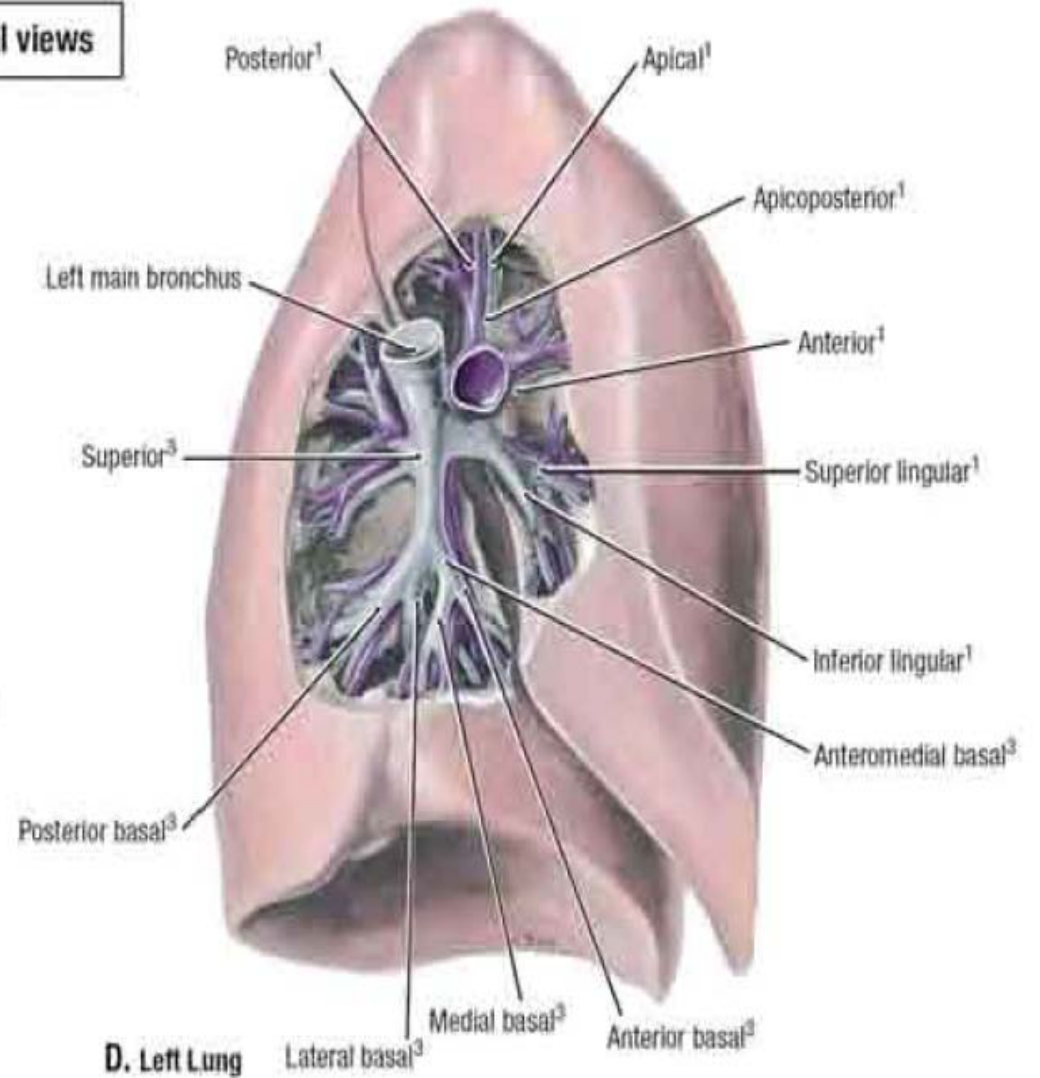
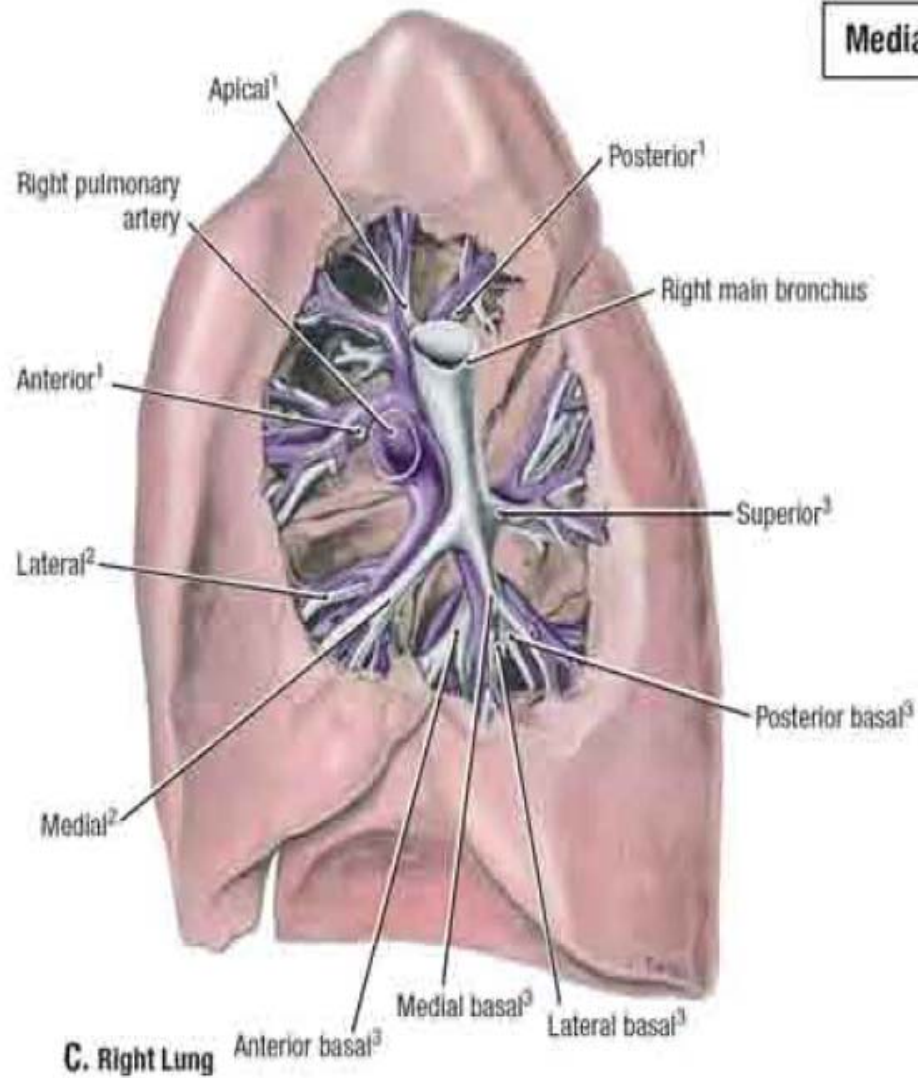
Gross Anatomy of the Lungs

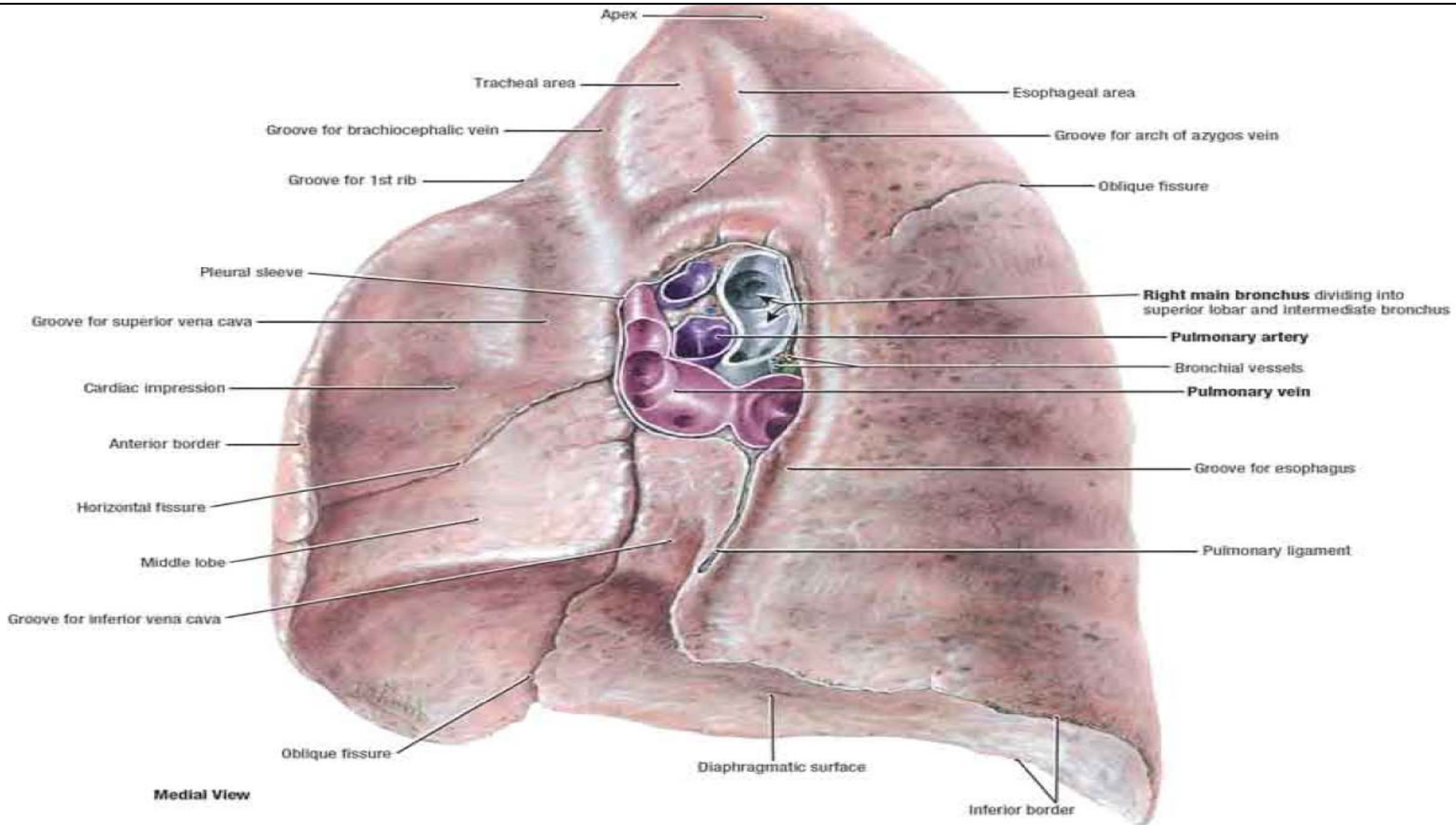


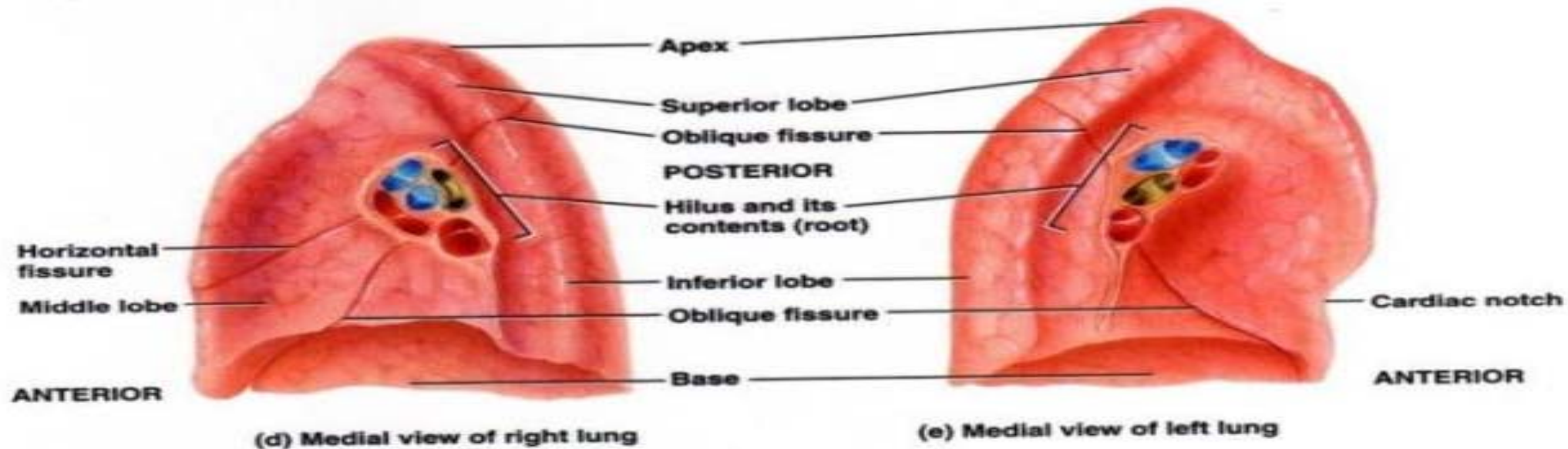
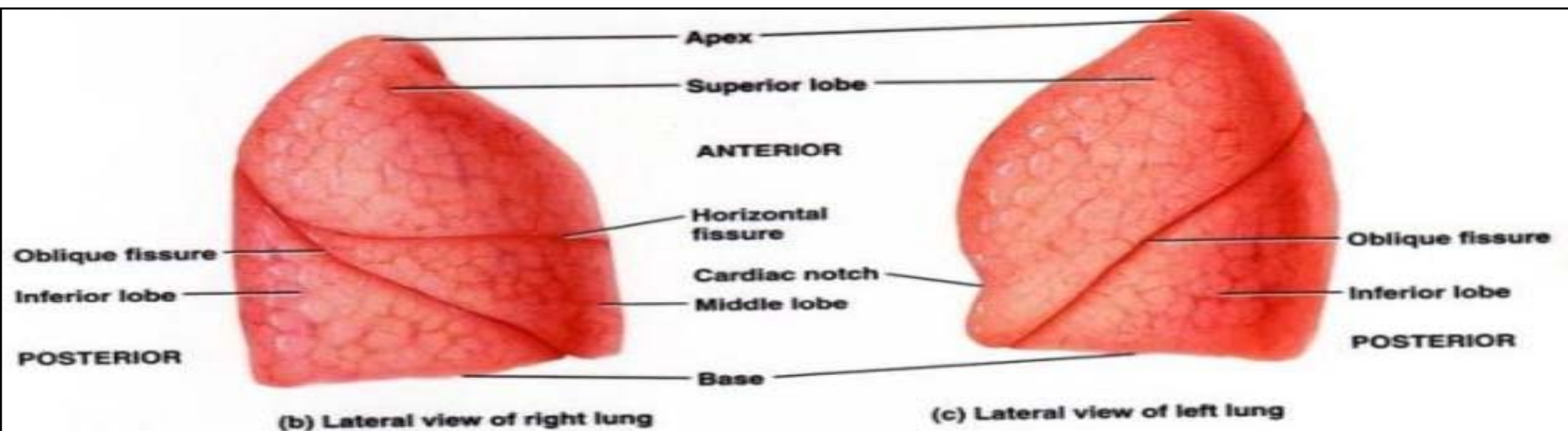
(a) Lateral views



Medial views





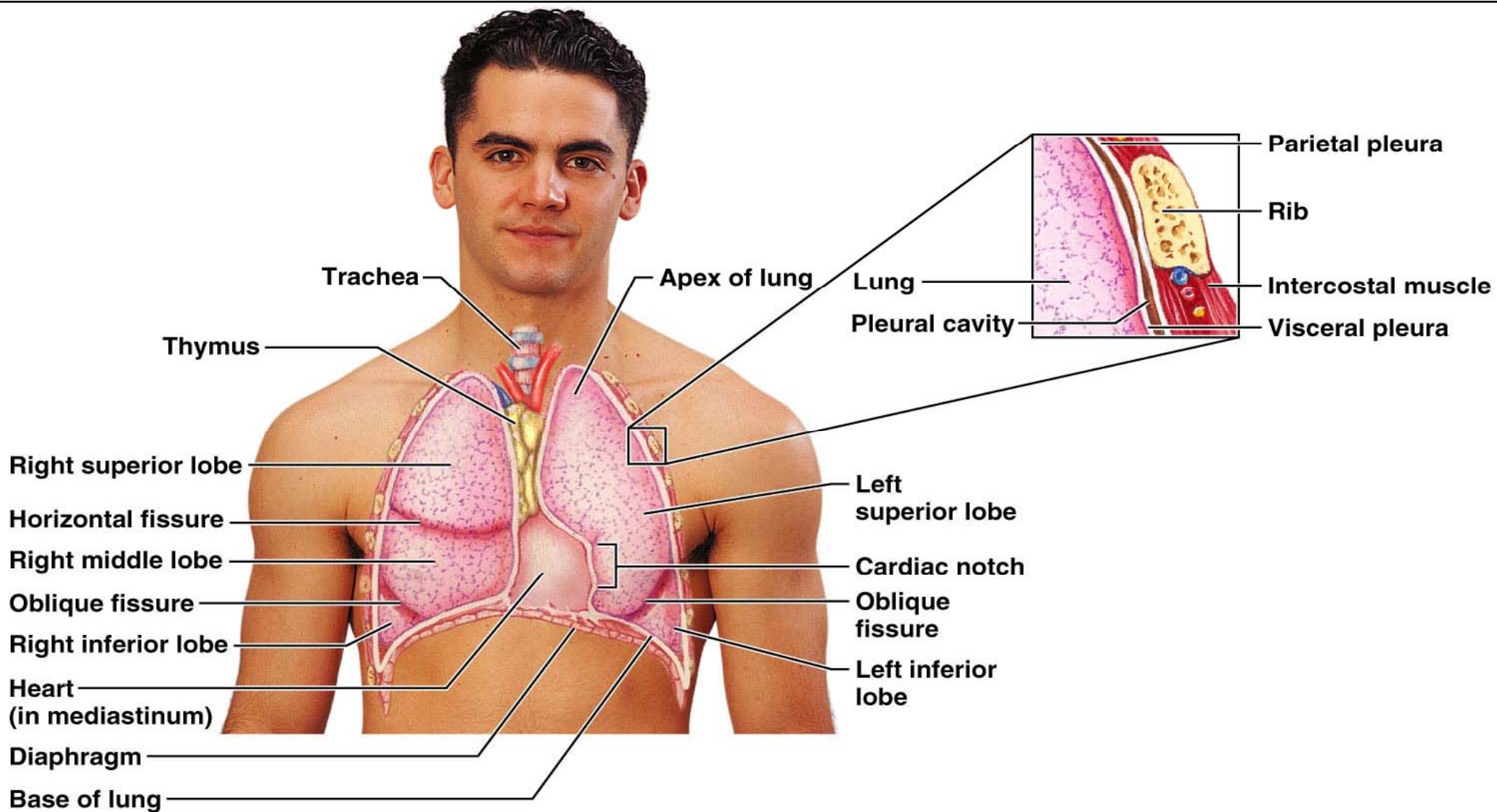


Knowledge of the anatomy of the bronchopulmonary segments is essential for precise interpretations of diagnostic images of the lungs and for surgical resection (removal) of diseased segments.

During the treatment of lung cancer, the surgeon may remove a

- whole lung (*pneumonectomy*) ,**
- a lobe (*lobectomy*) ,**
- or one or more bronchopulmonary segments (*segmentectomy*) .**

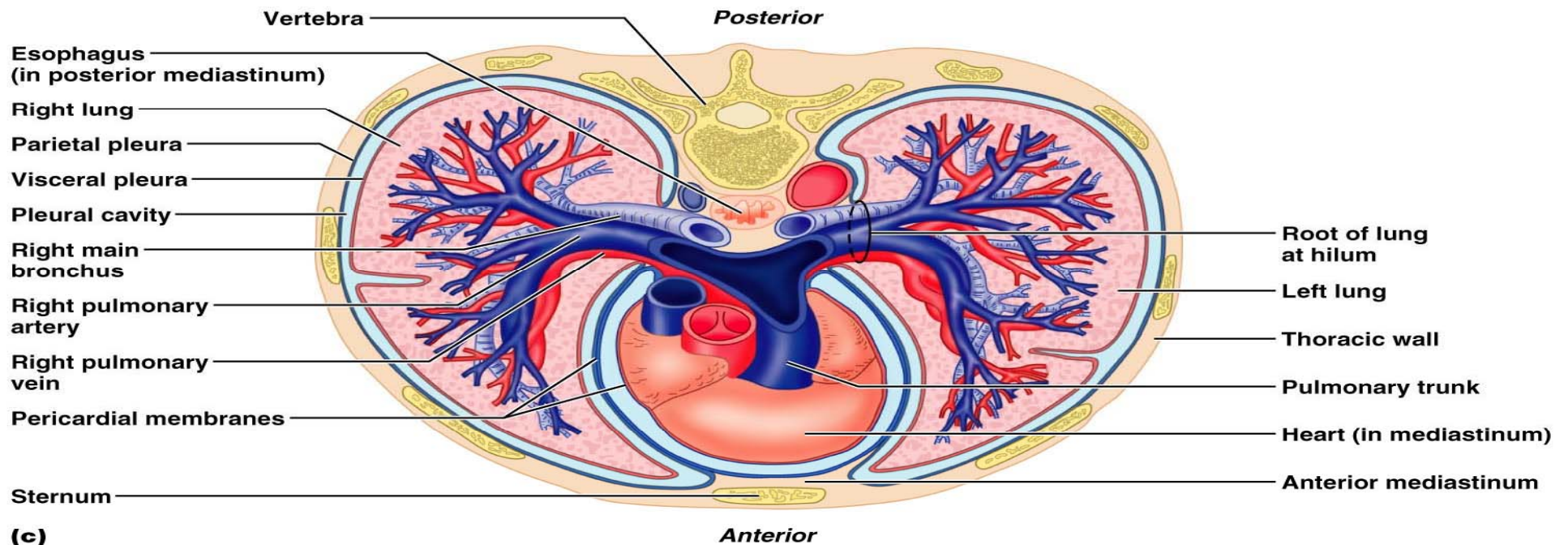
Knowledge and understanding of the bronchopulmonary segments and their relationship to the bronchial tree are also essential for planning drainage and clearance techniques used in physical therapy for enhancing drainage from specific areas (e.g., in patients with pneumonia or cystic fibrosis).



(a)

Lungs

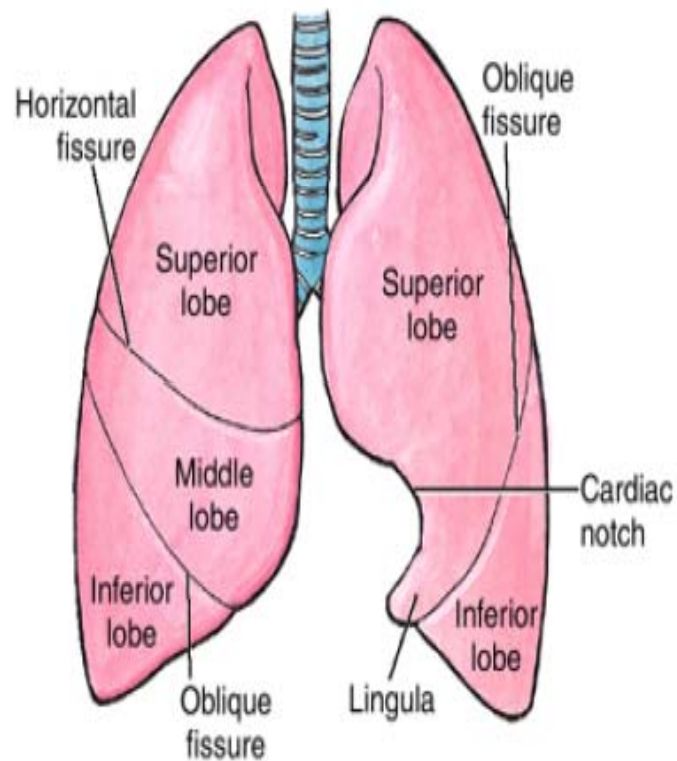
- ❑ **Cardiac notch (impression)** – cavity that accommodates the heart
- ❑ **Left lung** – separated into upper and lower lobes by the oblique fissure
- ❑ **Right lung** – separated into three lobes by the oblique and horizontal fissures



(c)

Transverse Thoracic Section

Figure 22.10c

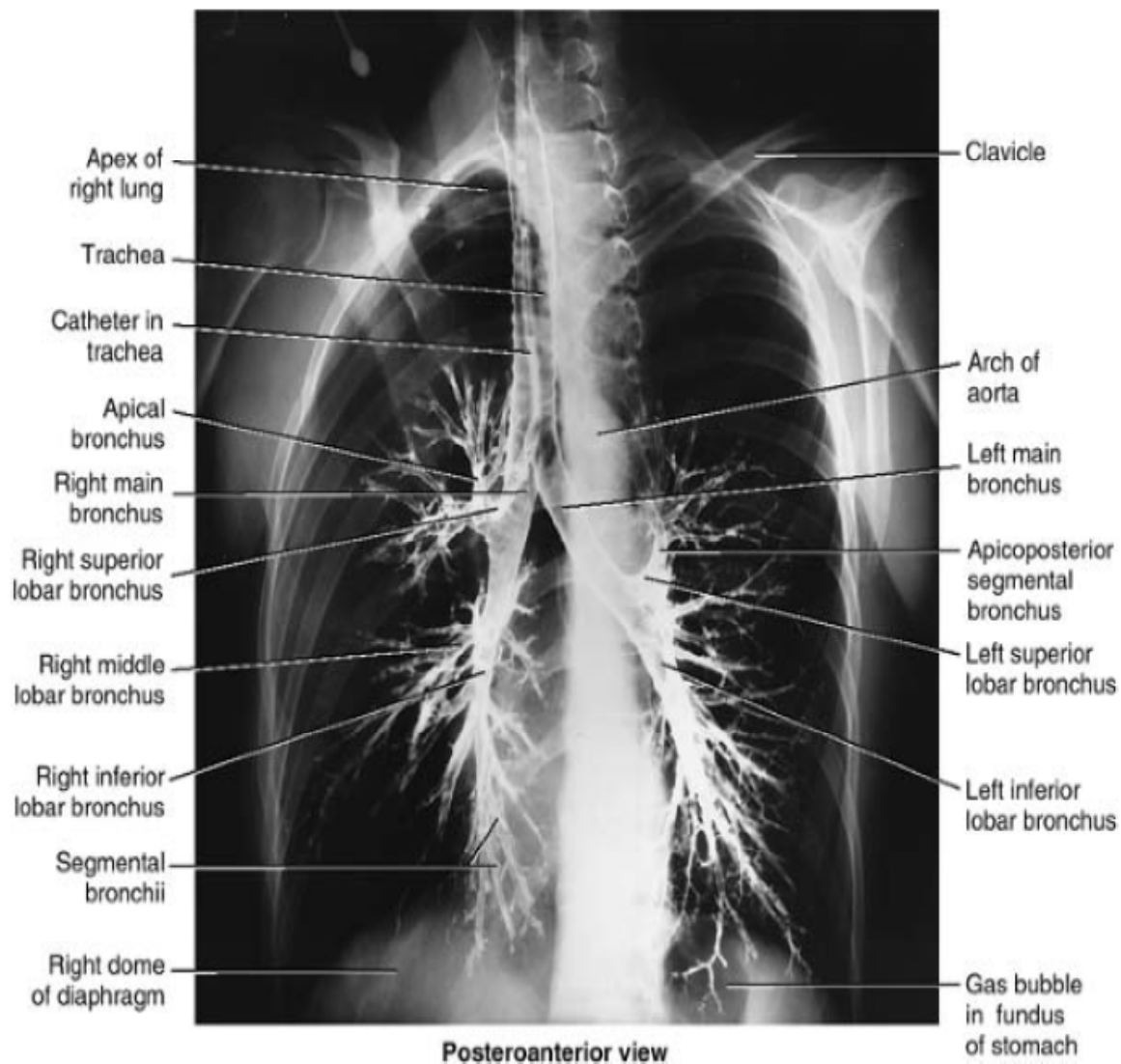


Right lung (three lobes)

Superior (upper) lobe is separated by horizontal fissure from middle lobe, which is separated by oblique fissure from inferior (lower) lobe

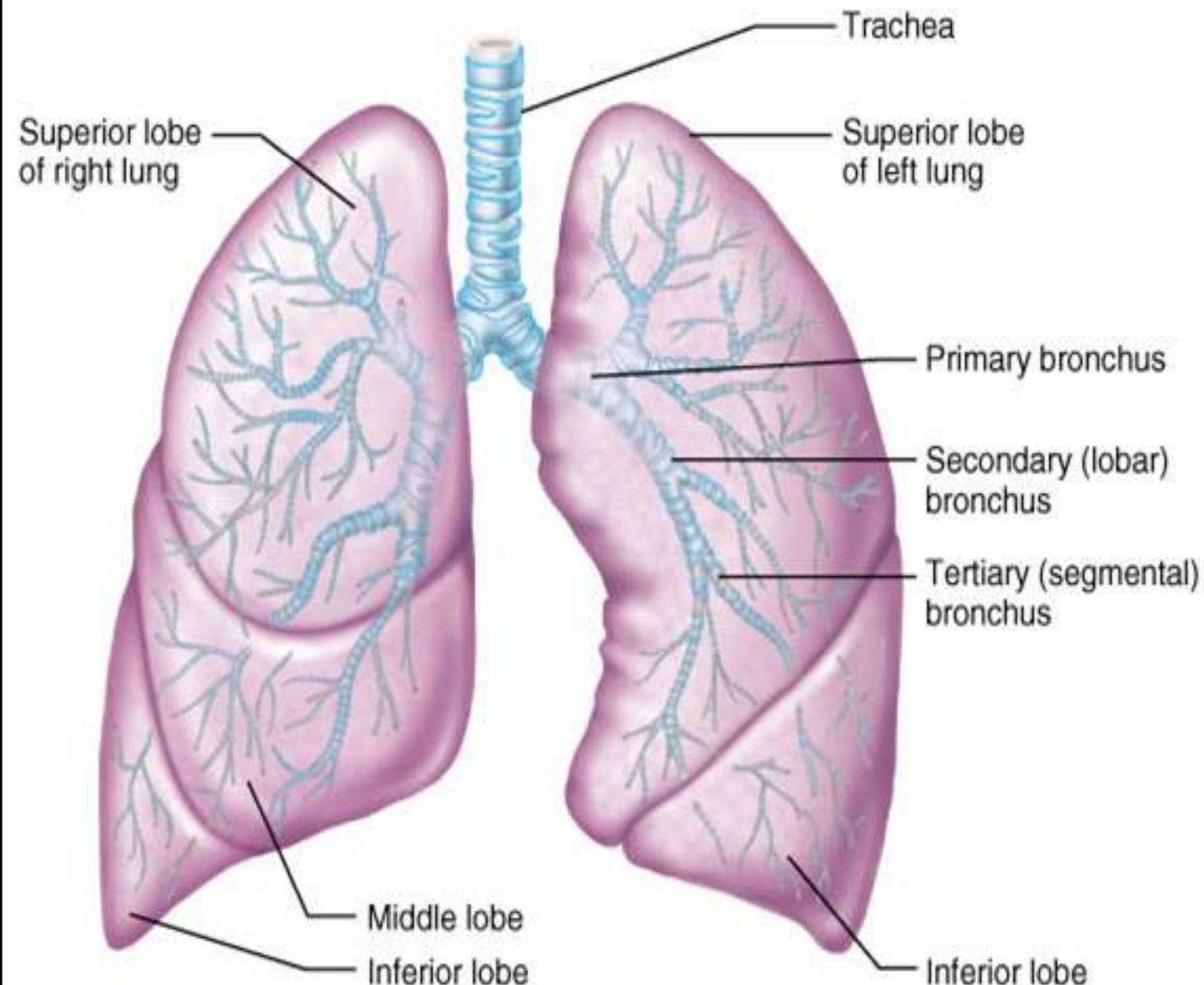
Left lung (two lobes)

Superior (upper) lobe is separated by oblique fissure from inferior (lower) lobe

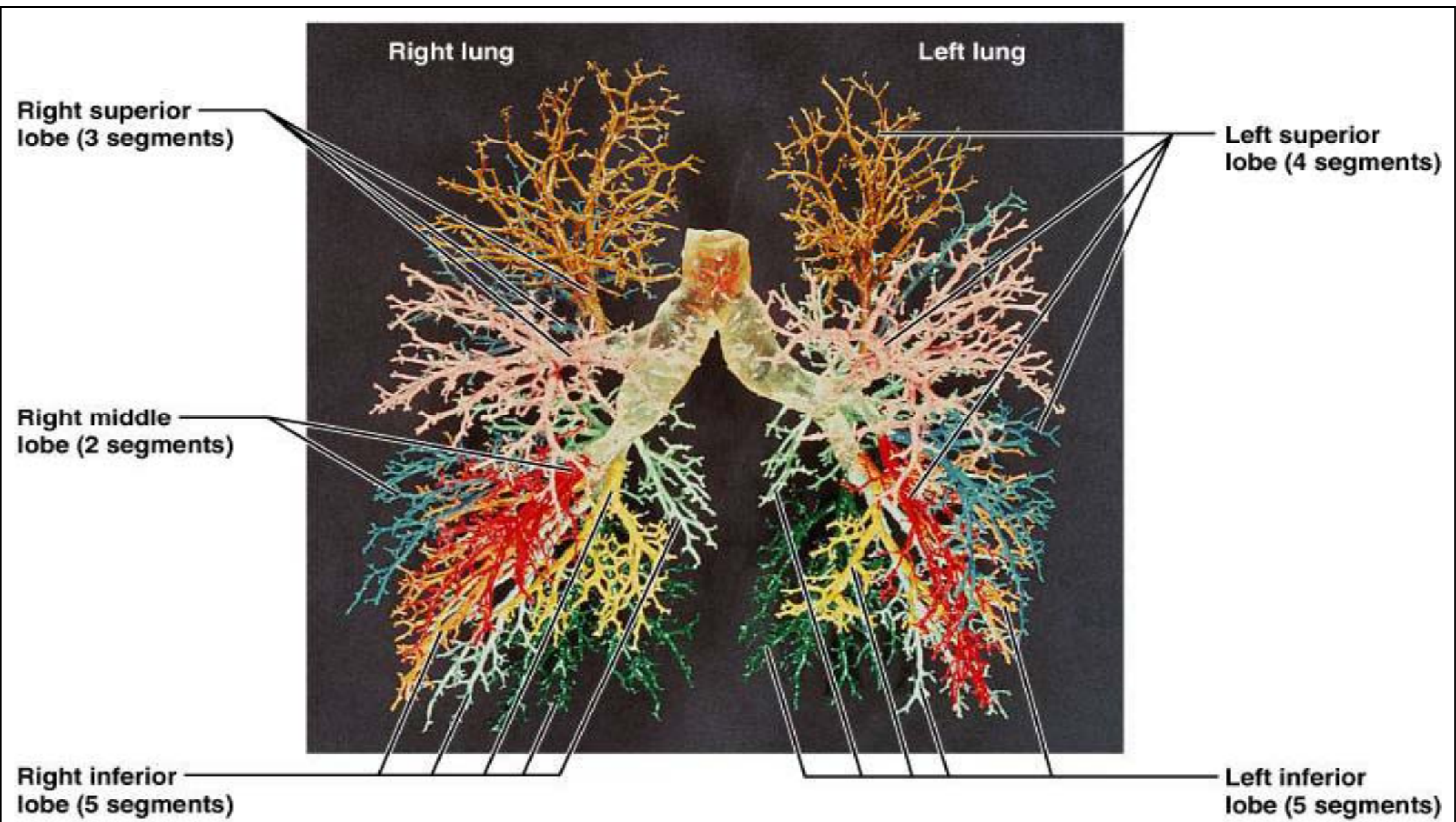


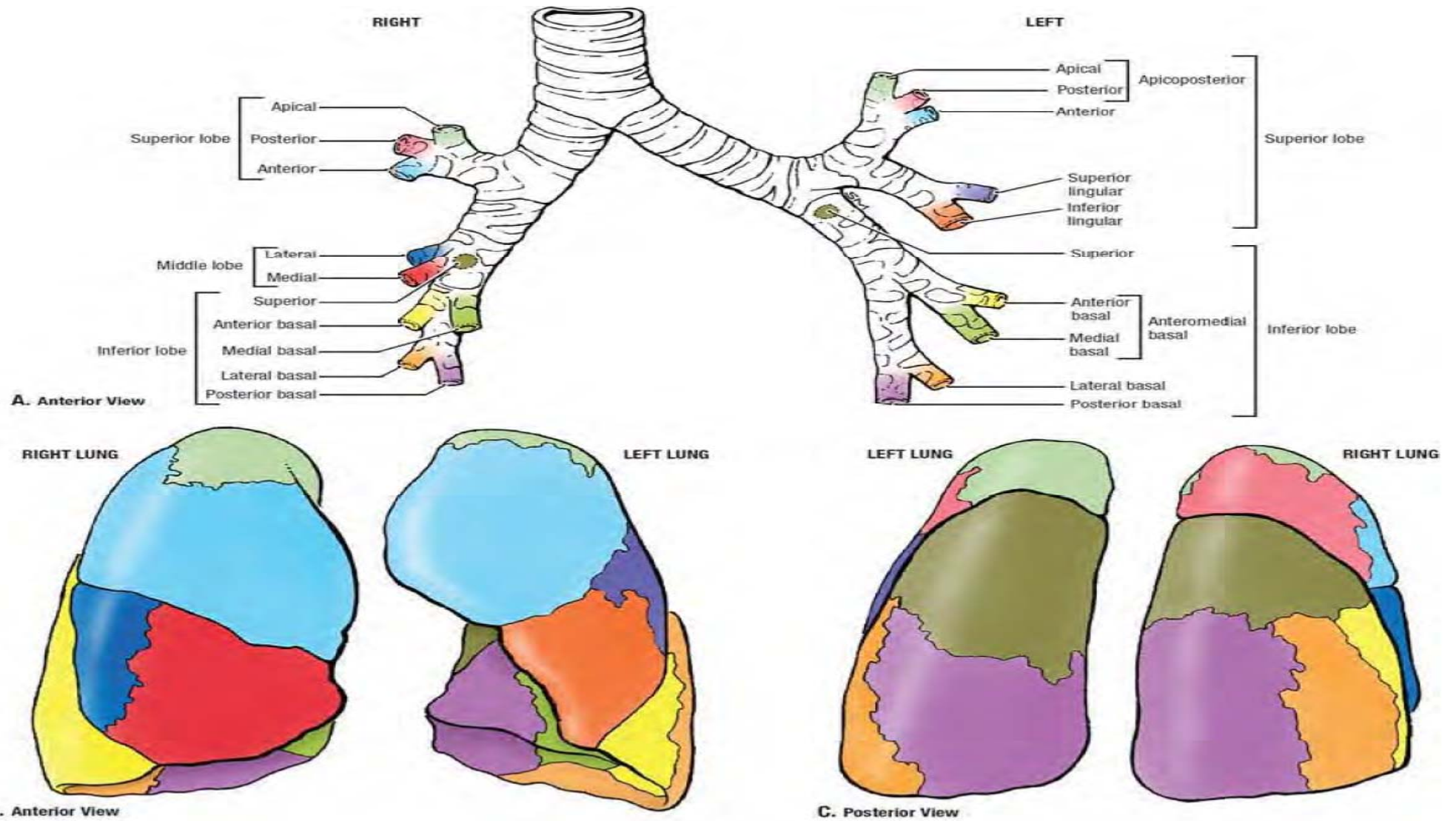
Posteroanterior view



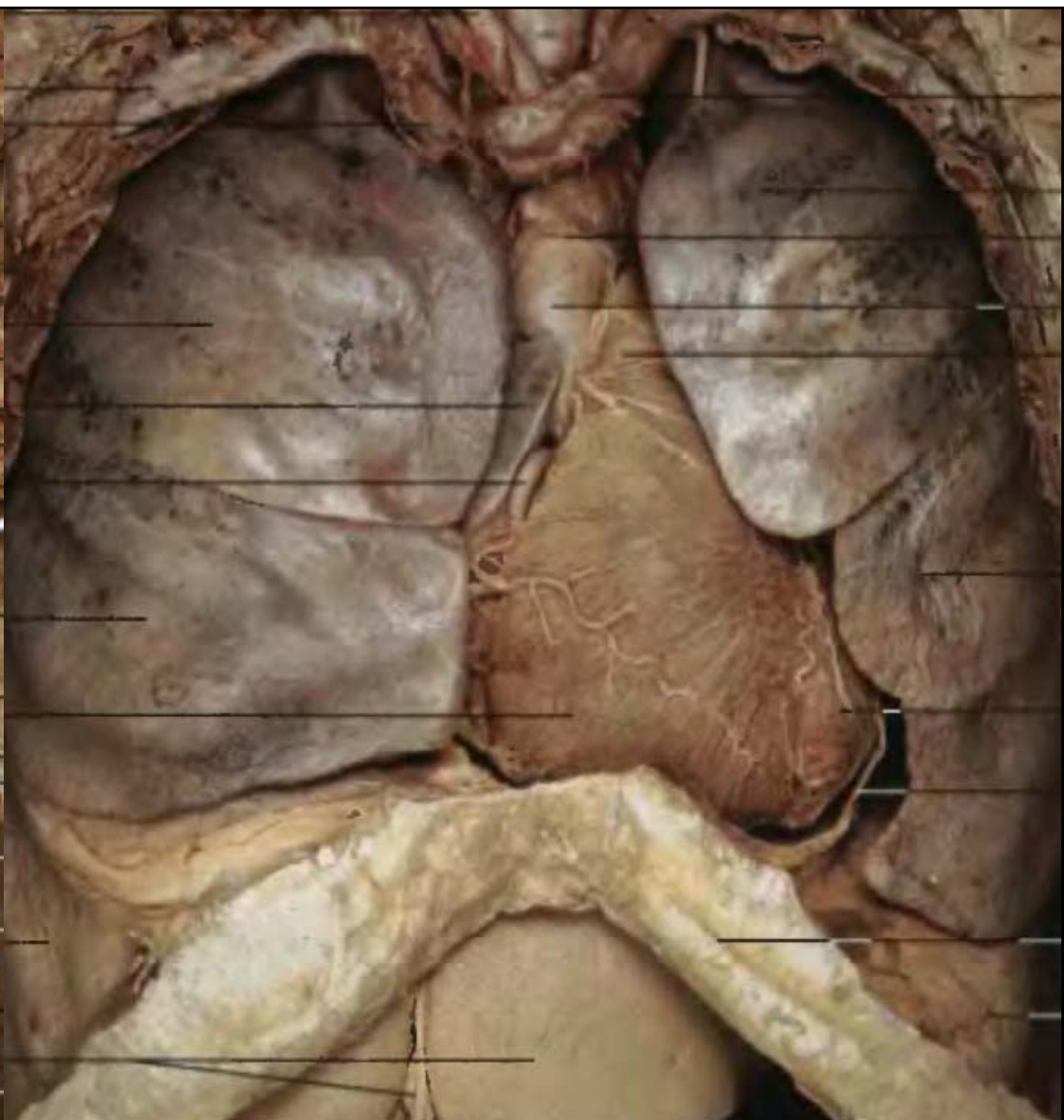


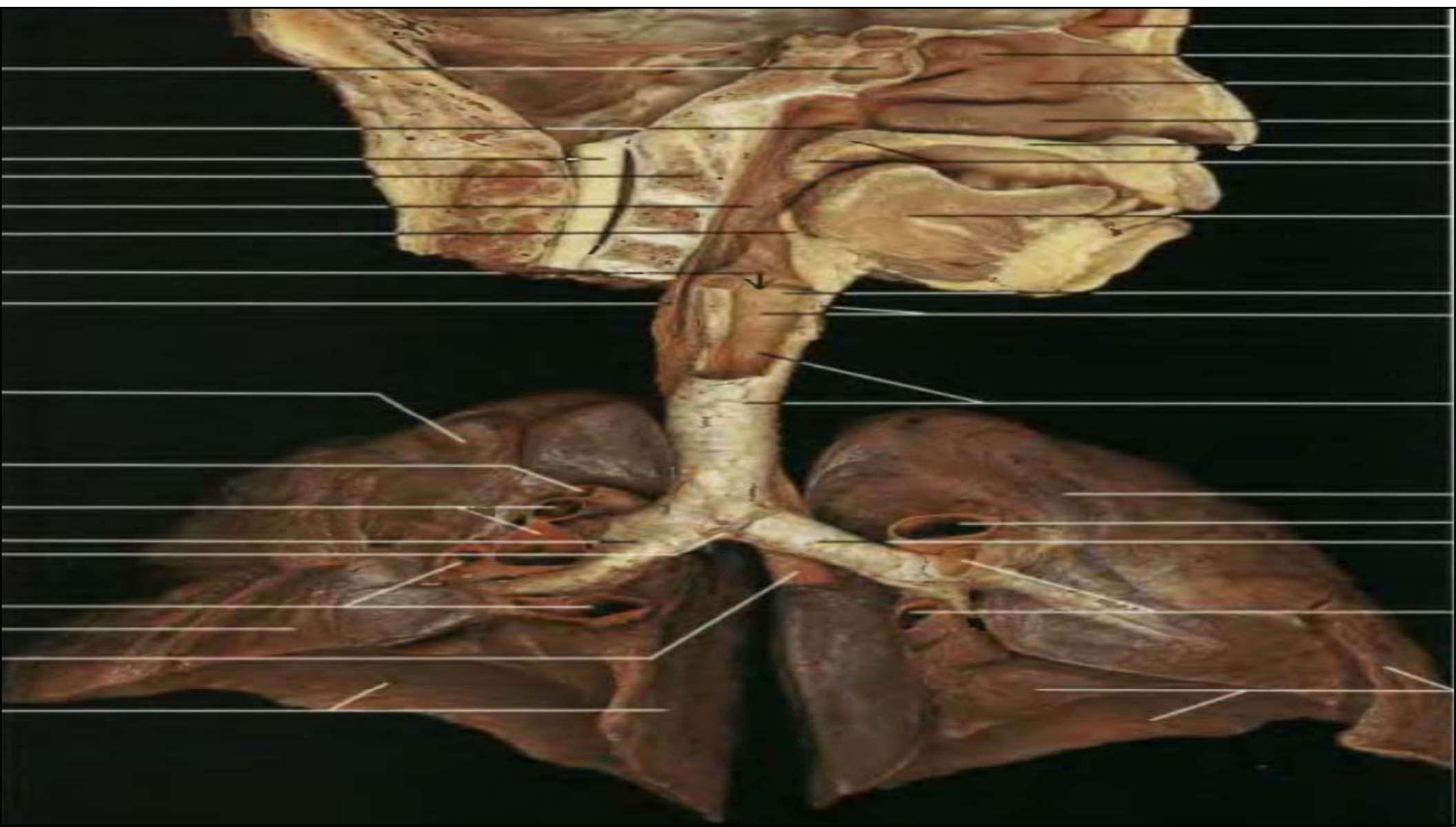
- There are 10 tertiary or segmental bronchi on the right, and 8 on the left.

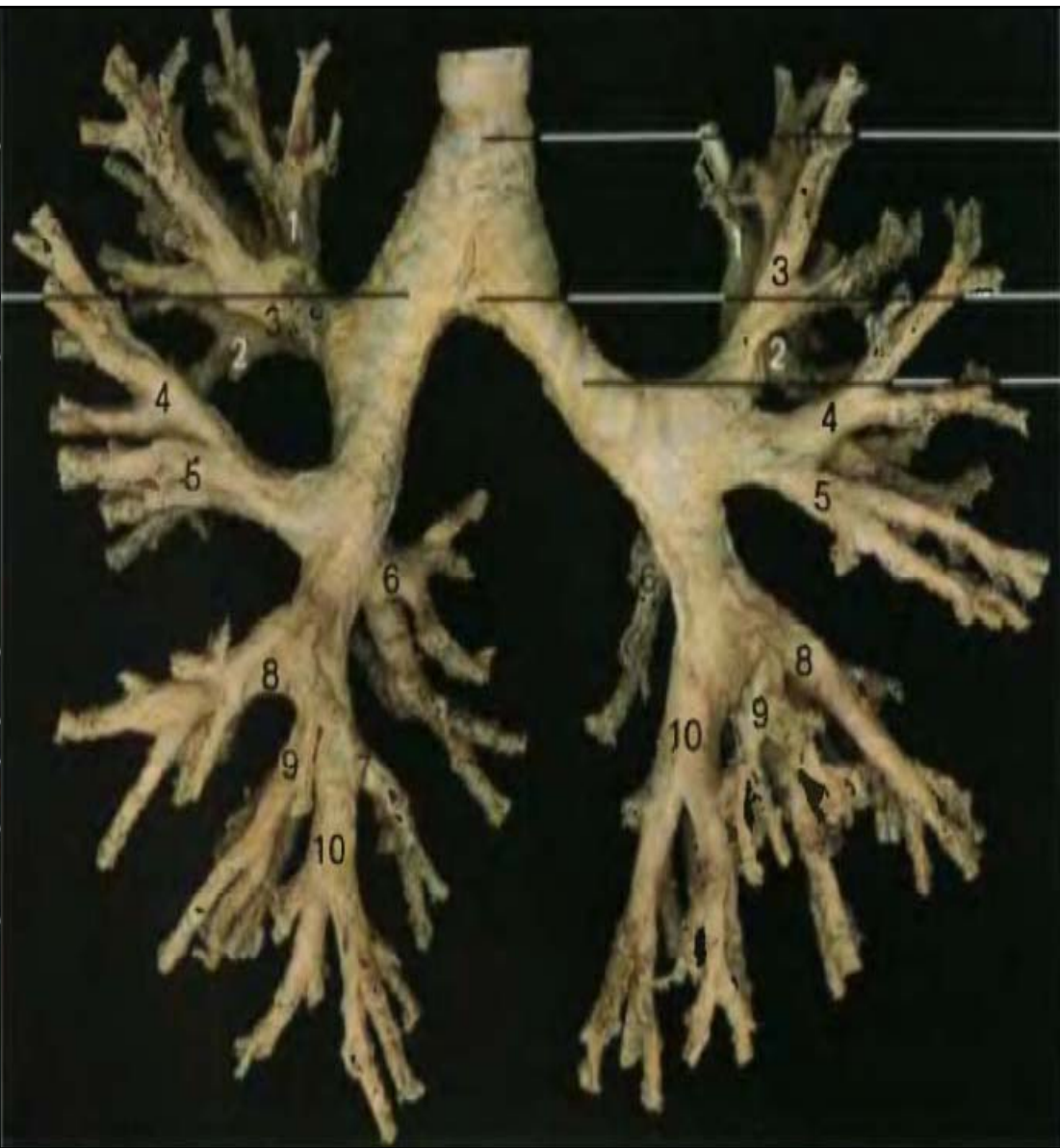










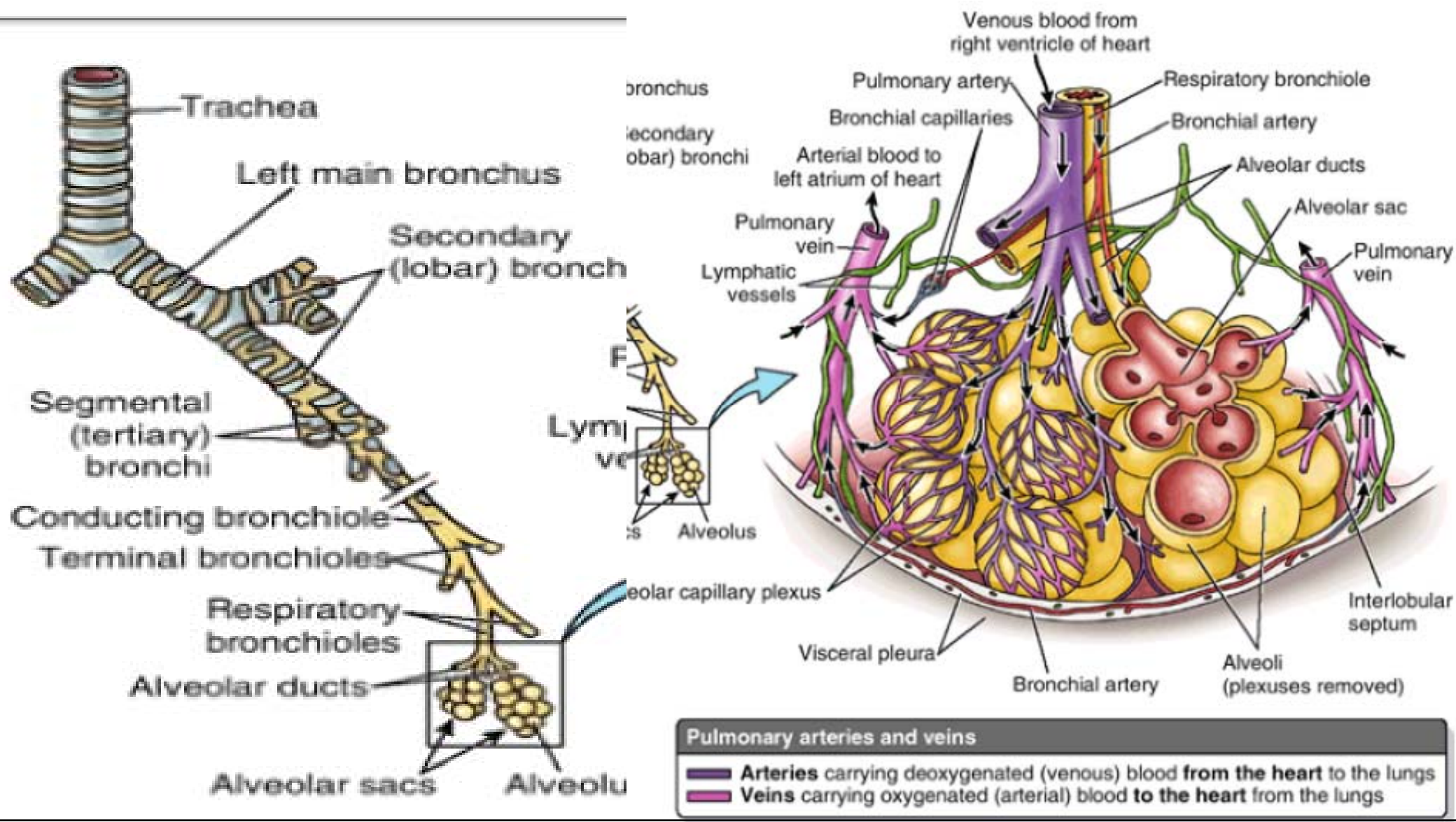


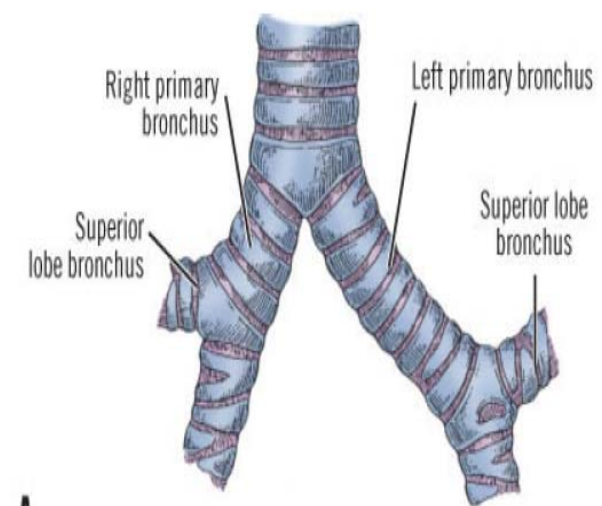
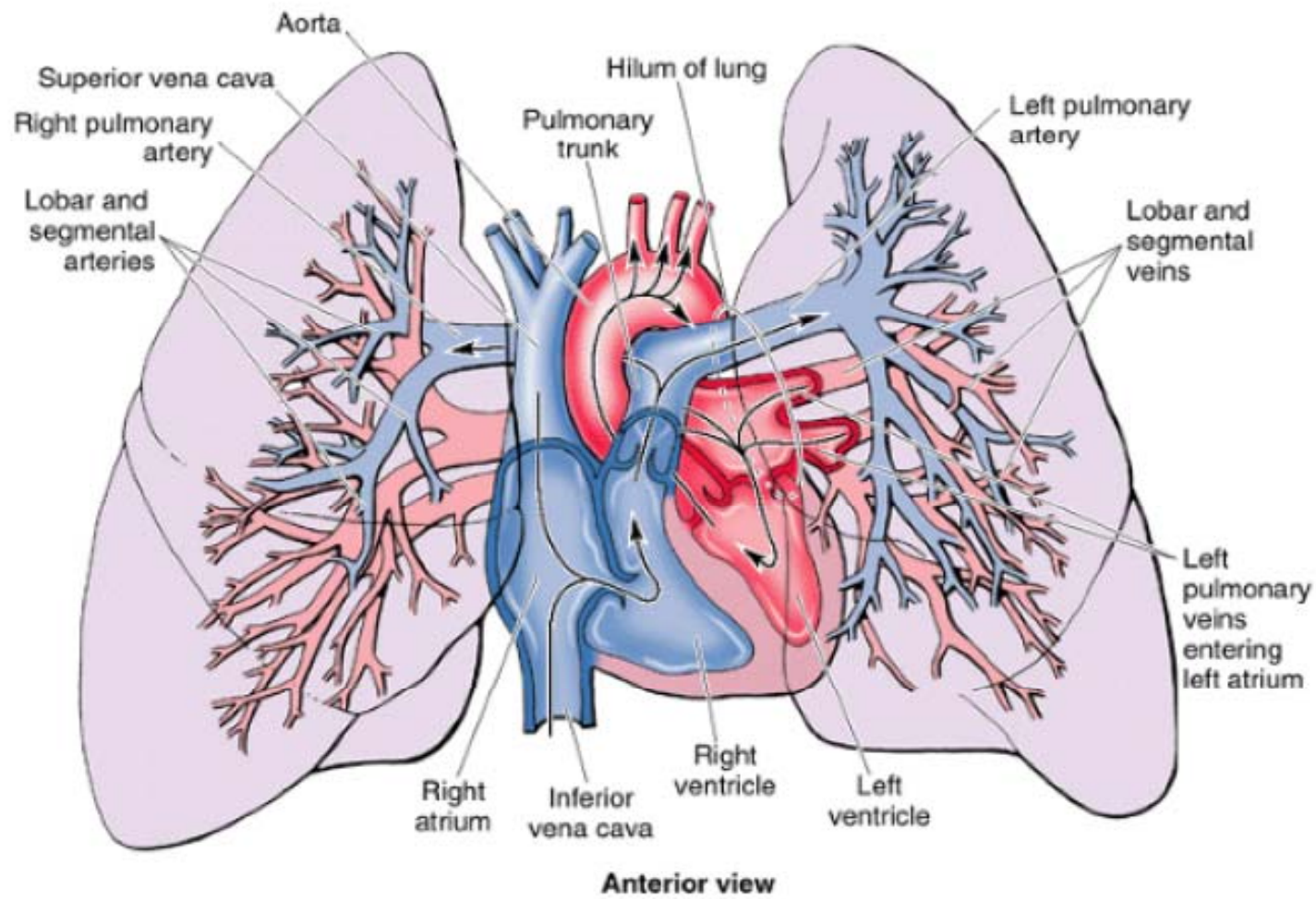
Blood Supply to Lungs

- Lungs are perfused by two circulations: **pulmonary and bronchial**
- **Pulmonary arteries** – supply **systemic venous** blood to be oxygenated
 - ▣ Branch profusely, along with bronchi
 - ▣ Ultimately feed into the pulmonary capillary network surrounding the alveoli
- **Pulmonary veins** – carry oxygenated blood from respiratory zones to the heart

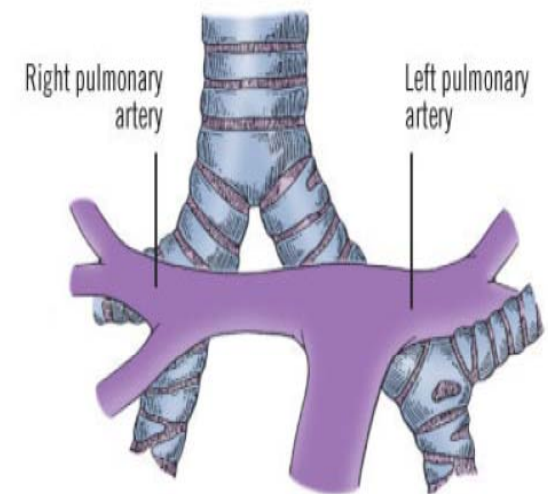
Blood Supply to Lungs

- **Bronchial arteries** – provide systemic blood to the lung tissue
 - ▣ Arise from aorta and enter the lungs at the hilus
 - ▣ Supply all lung tissue except the alveoli
- **Bronchial veins anastomose with pulmonary veins**
- Pulmonary veins carry most venous blood back to the heart



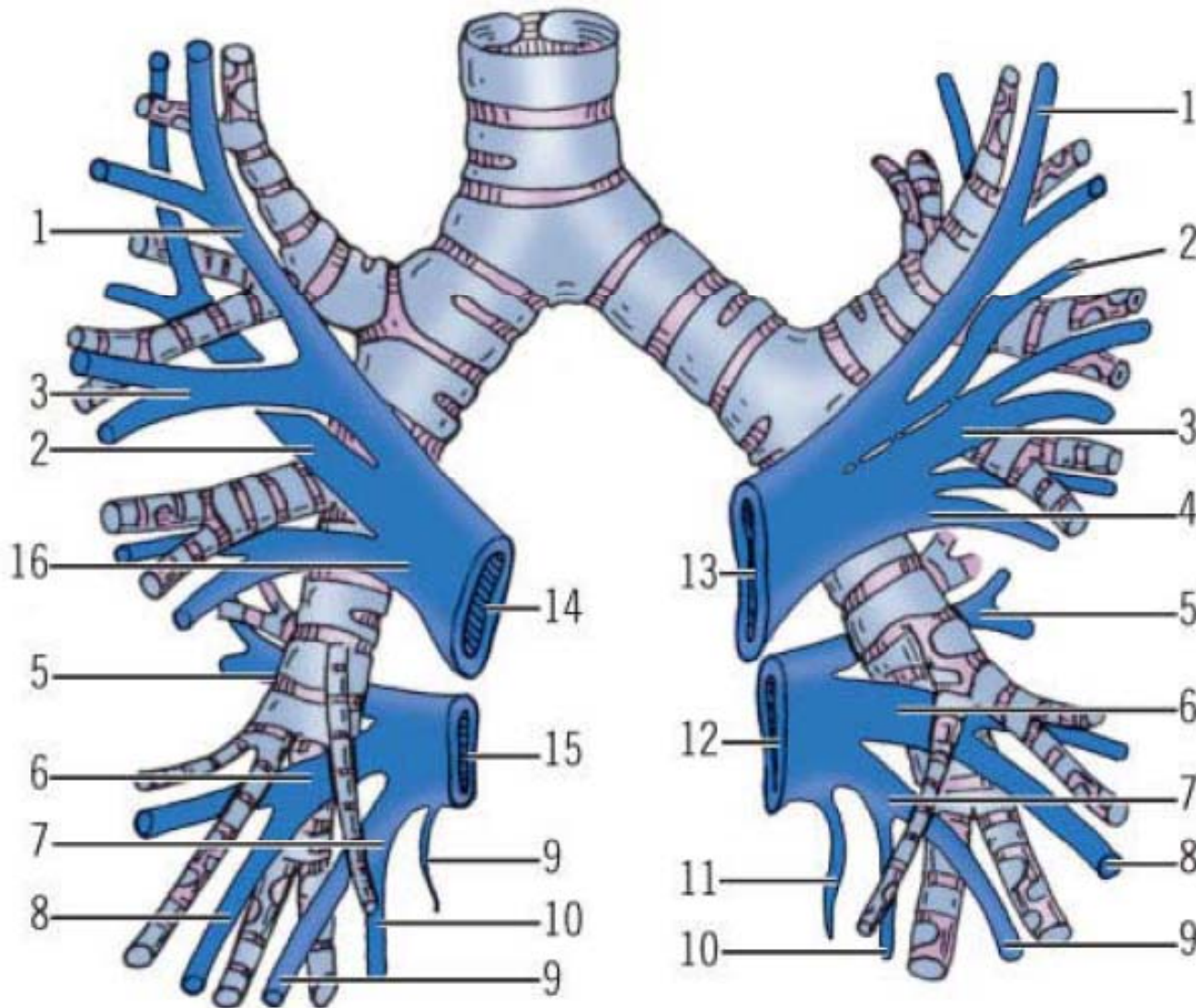


A



B

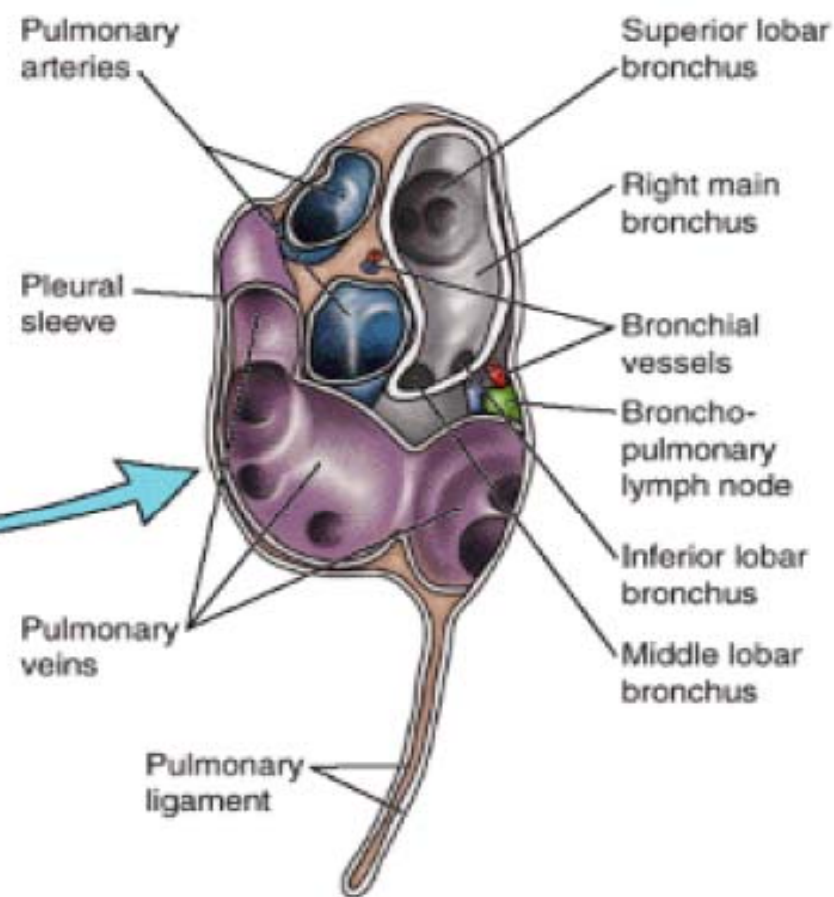
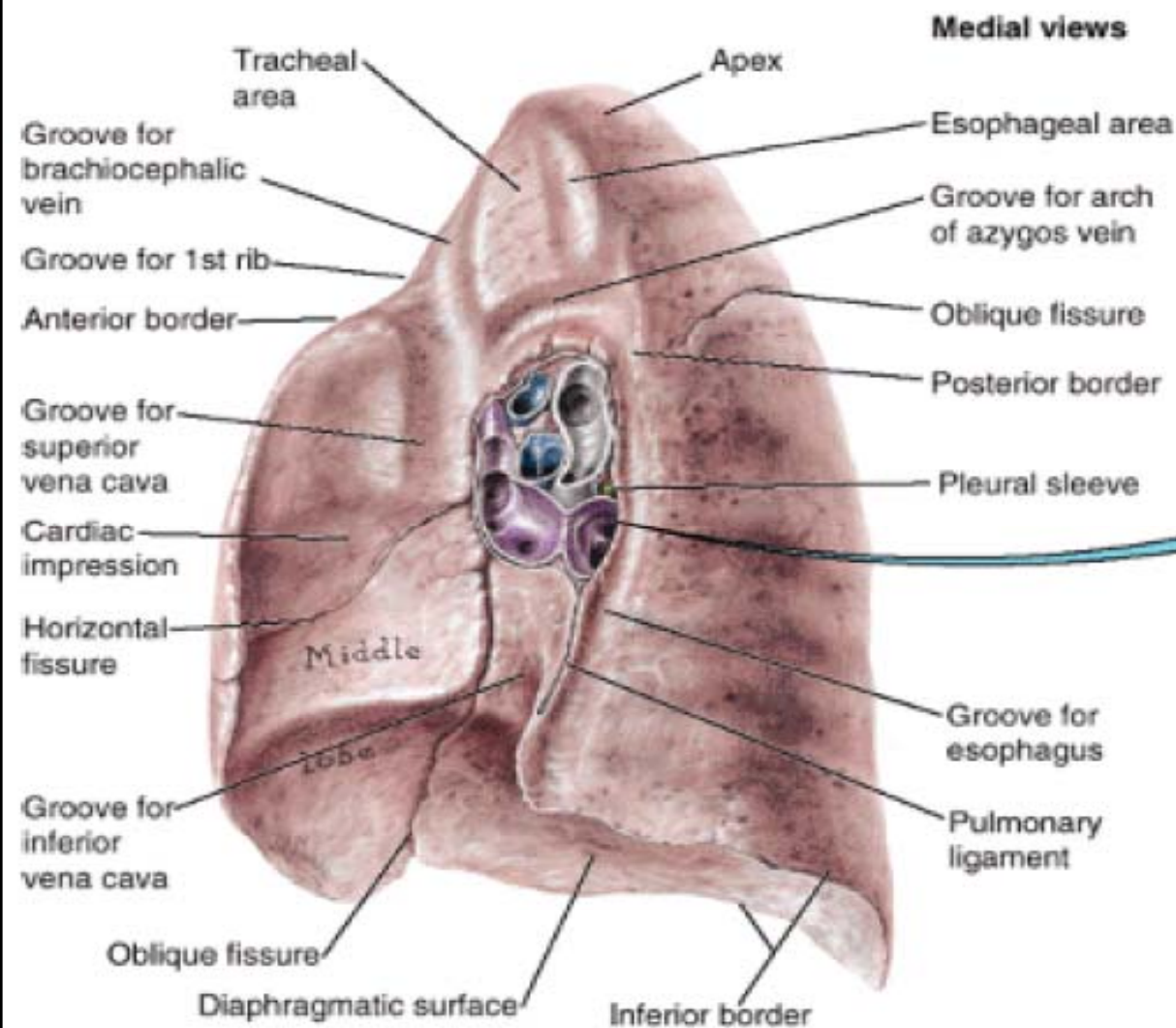
Figure 1.19. Pulmonary circulation.



Pulmonary veins, segmental veins.

1, Apical vein. 2, Posterior vein. 3, Anterior vein. 4, Lingular vein. 5, Apical basal vein. 6, Superior basal vein. 7, Inferior basal vein. 8, Anterior basal vein. 9, Lateral basal vein. 10, Posterior basal vein.

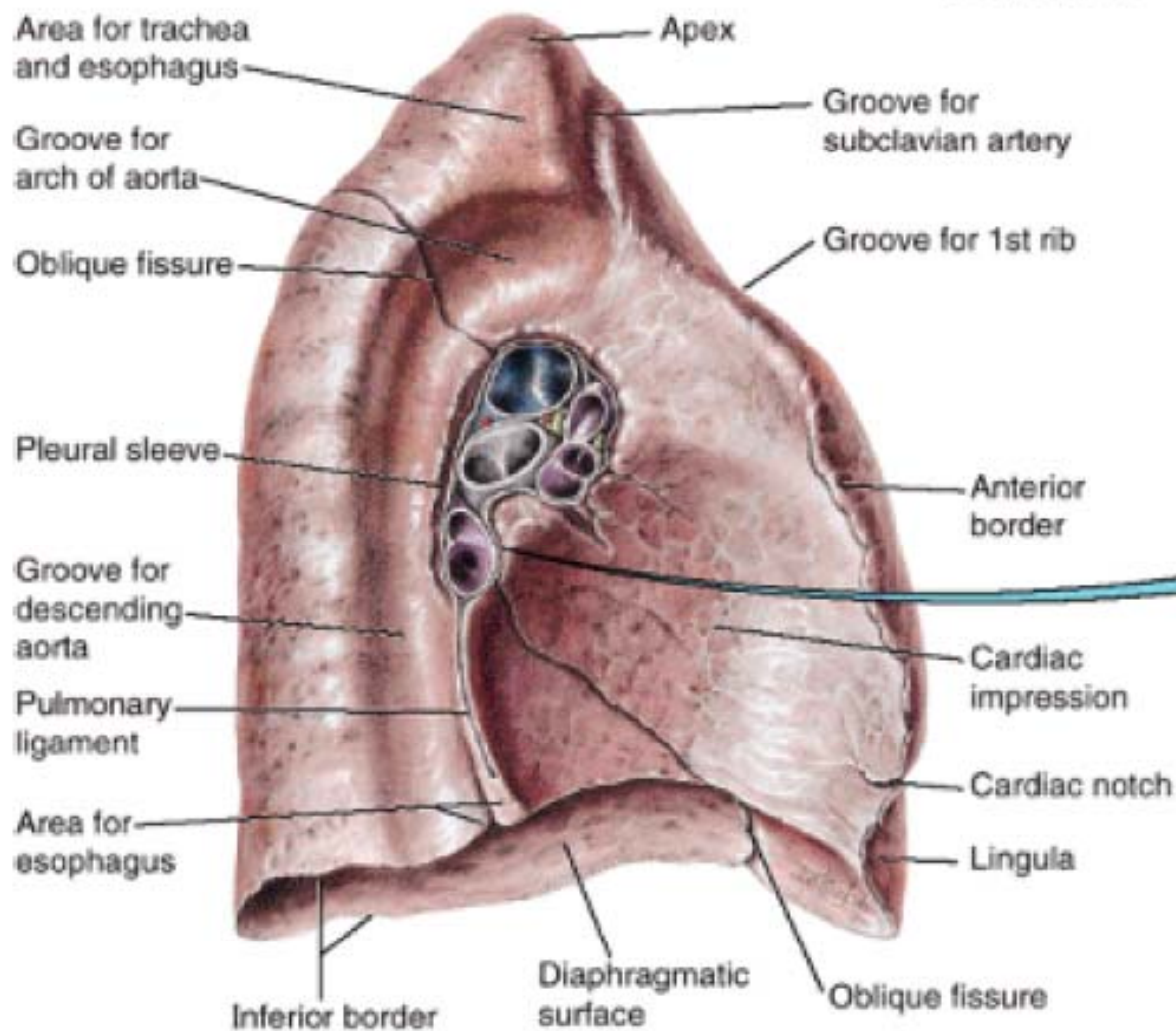
11, Superficial intersegmental vein between segment 7 and segment 10. 12, Left inferior pulmonary vein. 13, Left superior pulmonary vein. 14, Right superior pulmonary vein. 15, Right inferior pulmonary vein. 16, Middle lobe vein.



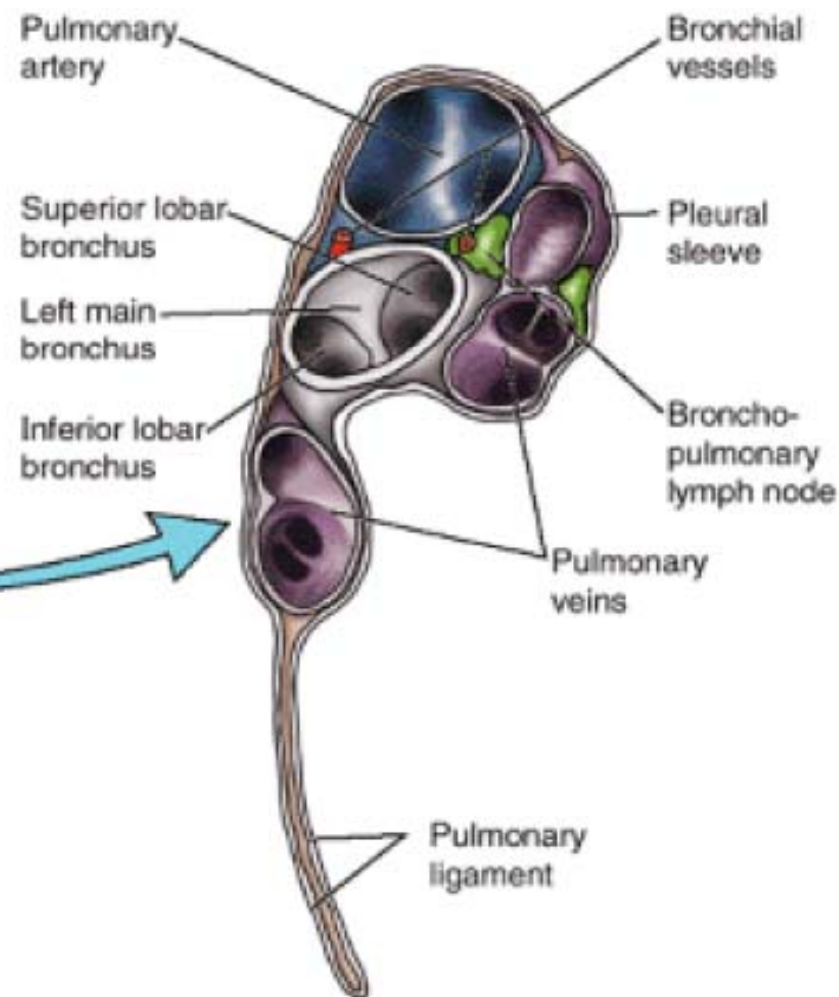
(A) Right Lung

(B)

Medial views



(C) Left Lung



(D)

Pleurae

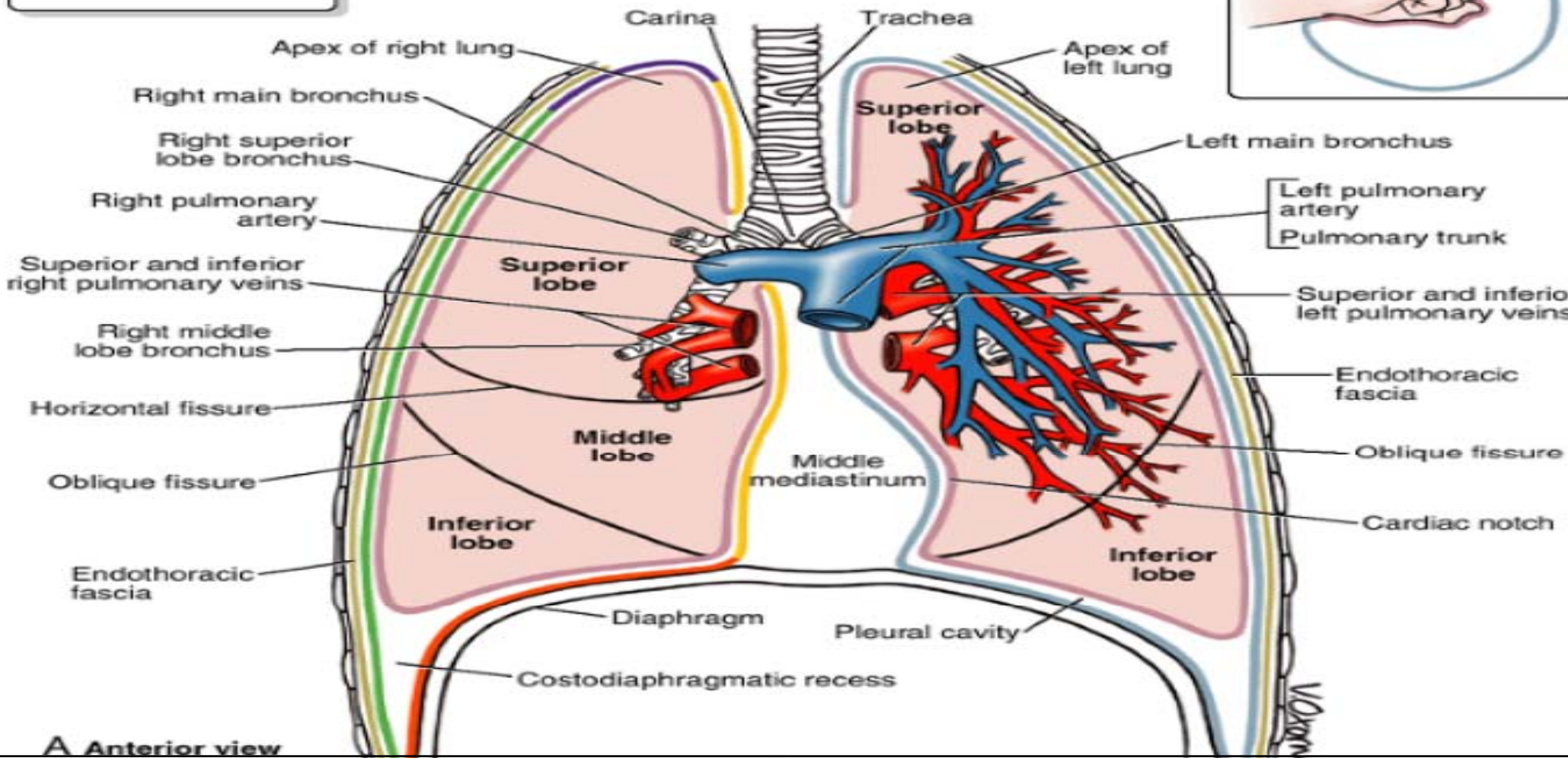
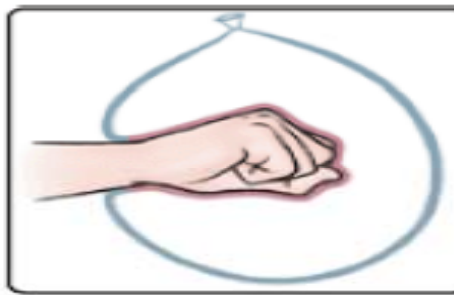
- Thin, double-layered serosa
- Parietal pleura
 - ▣ Covers the thoracic wall and superior face of the diaphragm
 - ▣ Continues around heart and between lungs

Parietal pleura parts

- Cervical
- Costal
- Diaphragmatic
- Mediastinal

Pleurae

- Visceral
- Parietal



A Anterior view

The pleural cavity is a potential space between the visceral and parietal pleurae that contains a thin layer of fluid.

If a sufficient amount of air enters the pleural cavity, the surface tension adhering visceral to parietal pleura (lung to thoracic wall) is broken, and the lung collapses because of its inherent elasticity (elastic recoil).

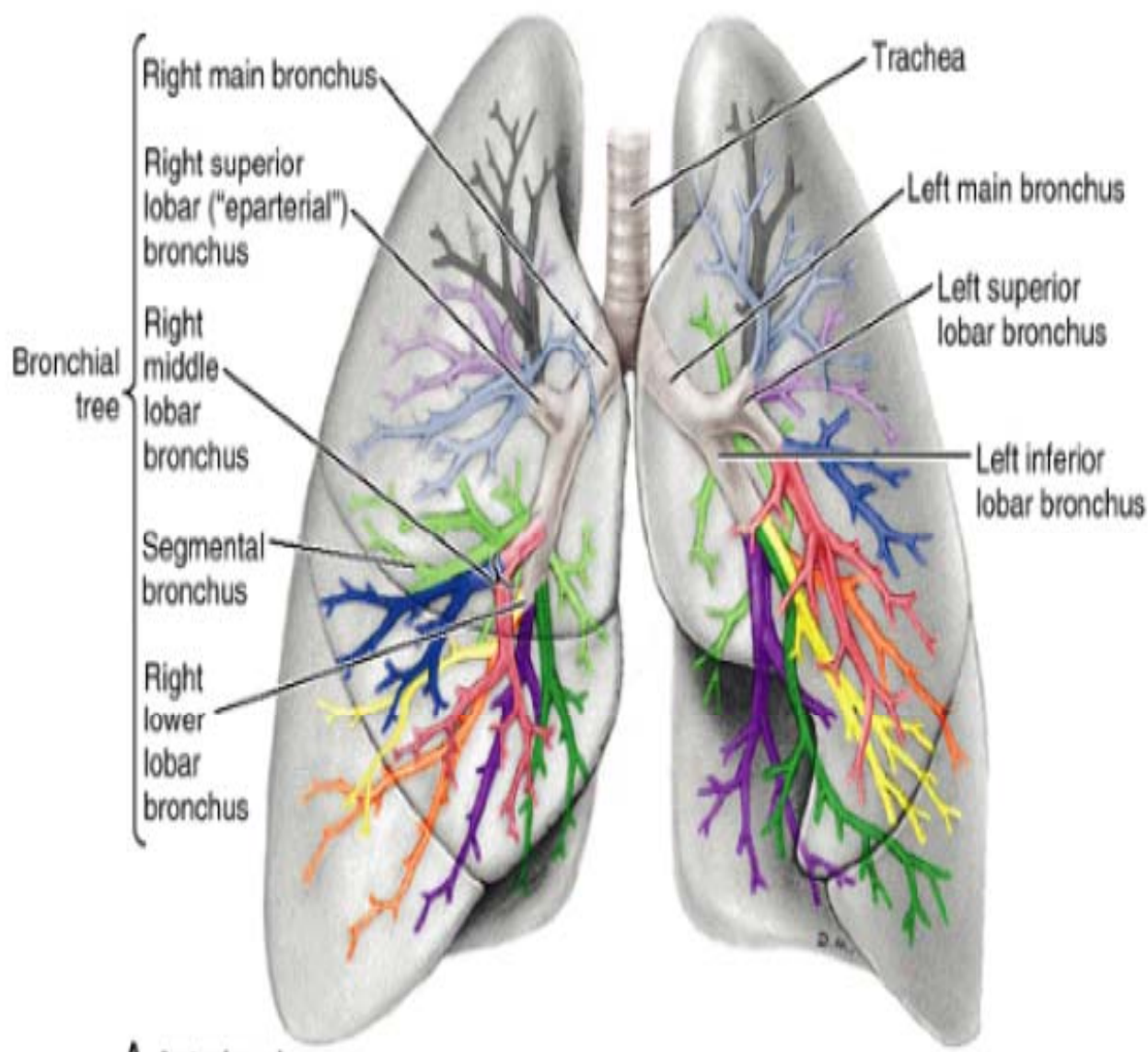
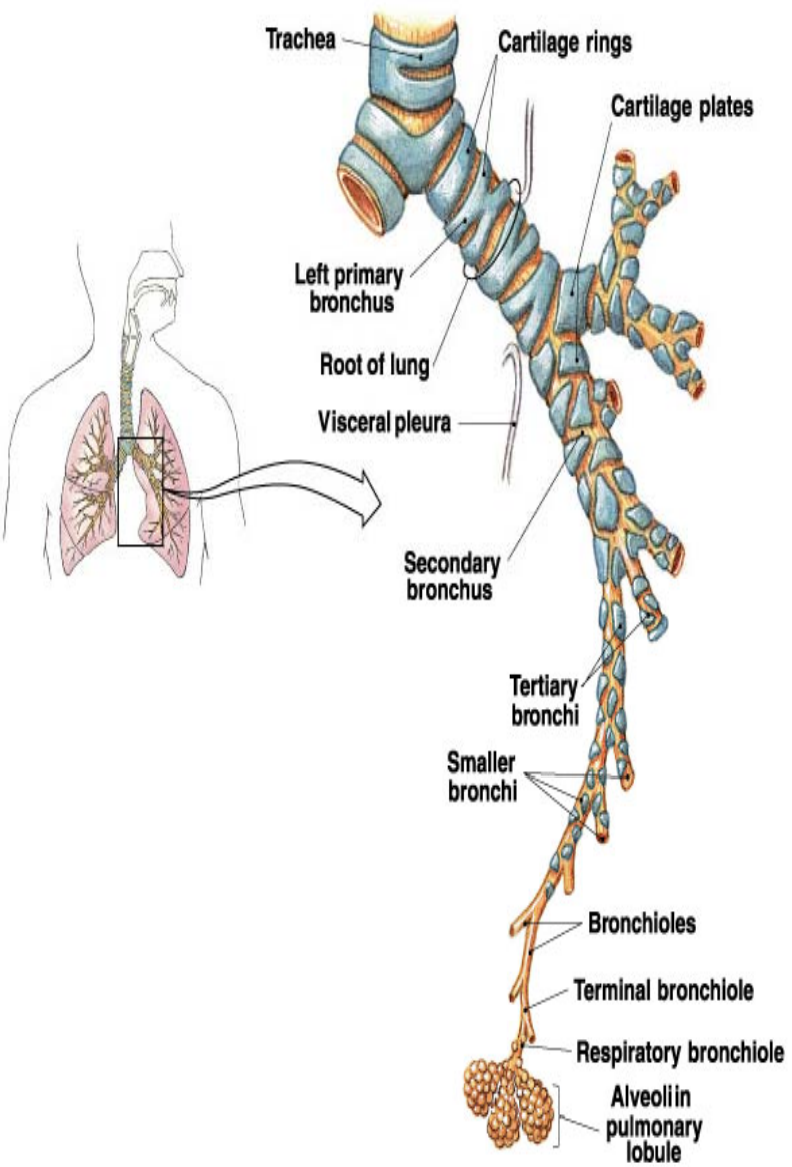
When a lung collapses, the pleural cavity “normally a potential Space “becomes a real space **and may contain air** (pneumothorax), blood (hemothorax),

The parietal pleura can be divided regionally into

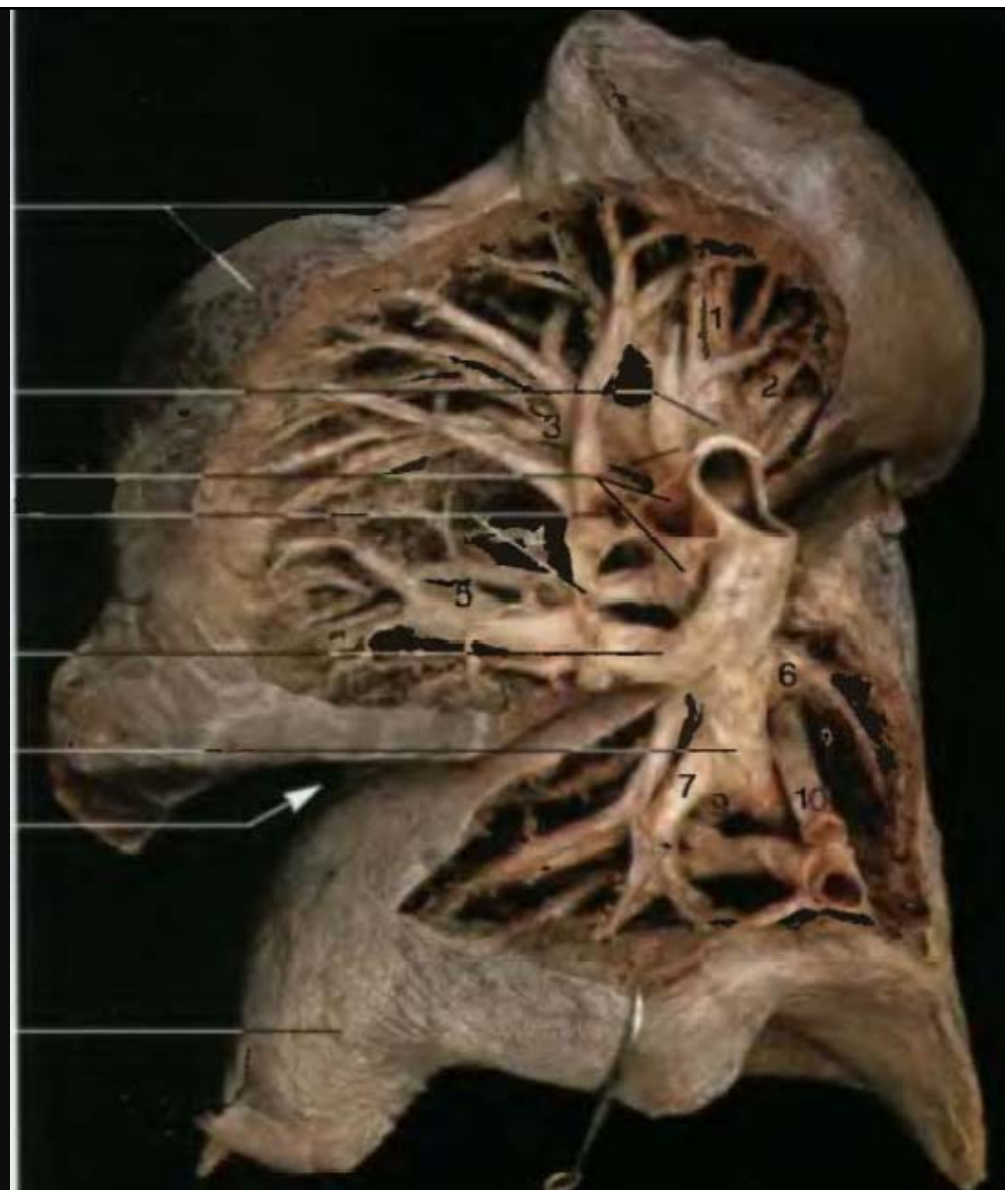
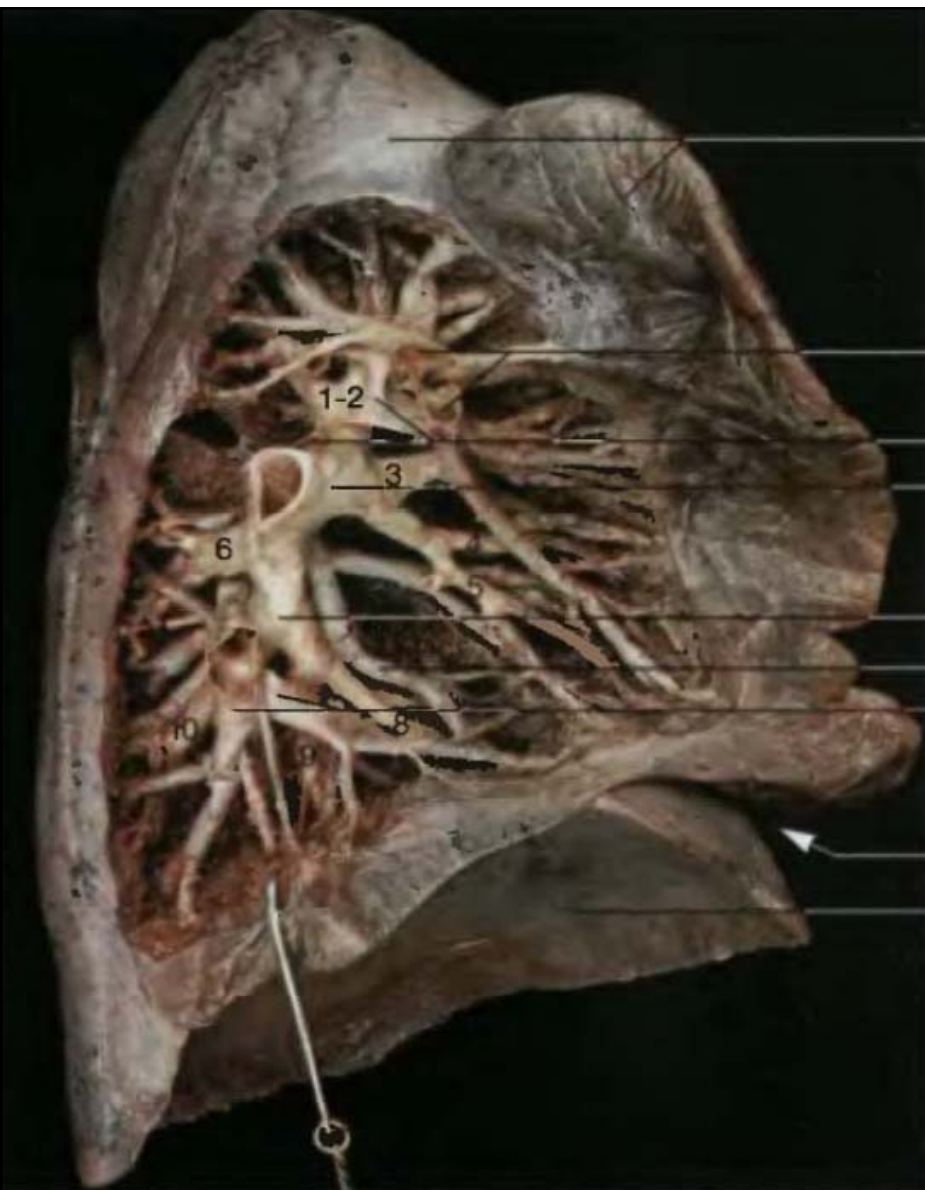
- the costal,**
 - diaphragmatic,**
 - mediastinal,**
 - and cervical parts;**
-
- note the costodiaphragmatic recess.**

Pleura

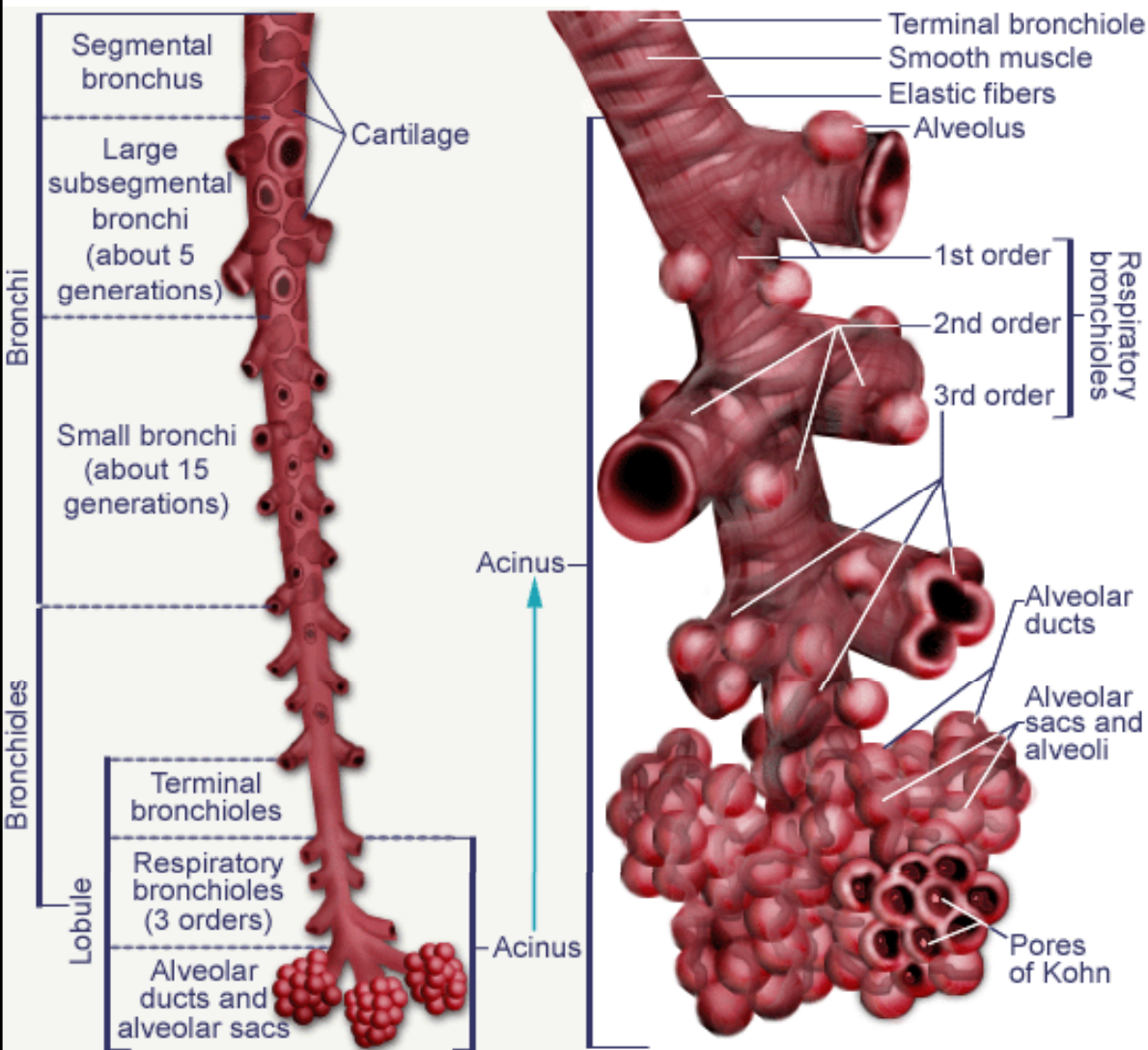
- Visceral, or pulmonary, pleura
 - ▣ Covers the external lung surface
 - ▣ Divides the thoracic cavity into three chambers
 - The central mediastinum
 - Two lateral compartments, each containing a lung



A Anterior view

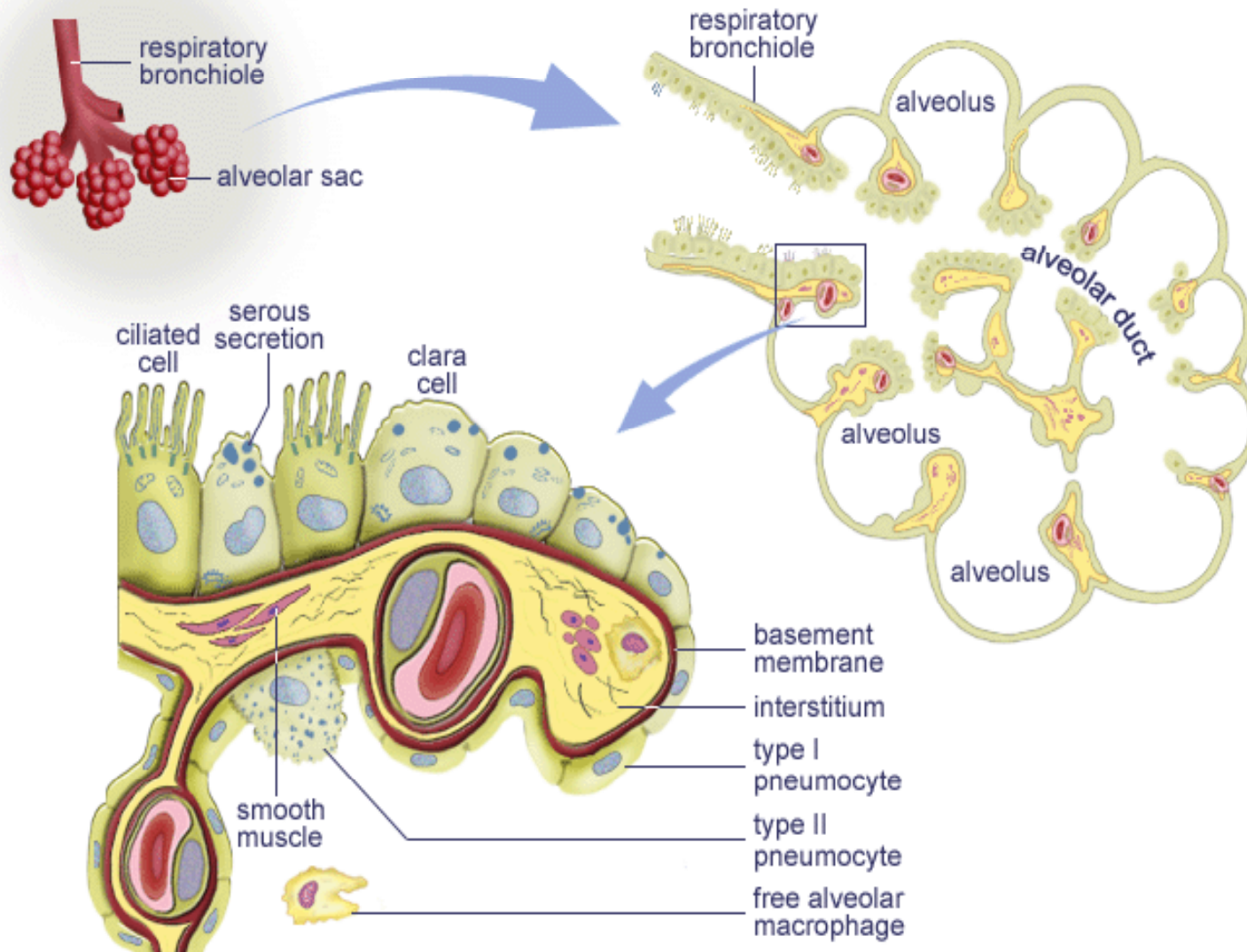


The Pulmonary Airway Tree



- The pulmonary airway tree begins with the trachea which consists of a series of cartilage horseshoes connected together by soft tissue.
- The trachea bifurcates at the carina, behind the sternum, to produce the two mainstem bronchi.
- These in turn divide into the lobar bronchi (2 on the left, 3 on the right).
- The lobar bronchi again bifurcate, and so on for about 23 generations.
- The first 16 or so of these generations act merely as conduits for passage of gas, and together constitute the conducting zone.
- Beyond the 16th generation, alveoli start to appear in the airway walls, becoming more numerous until the process terminates in an acinus consisting of a large collection of alveoli.

Respiratory Bronchiole



Respiratory Bronchiole

Alveolar ducts are small ducts leading from the respiratory bronchioles to the alveolar sacs.

The respiratory bronchiole epithelium consists of ciliated cuboidal cells and clara cells.

Clara cells are non-mucous and non-ciliated secretory cells found in the primary bronchioles of the lungs.

One of the main functions of Clara cells is to protect the bronchiolar epithelium.

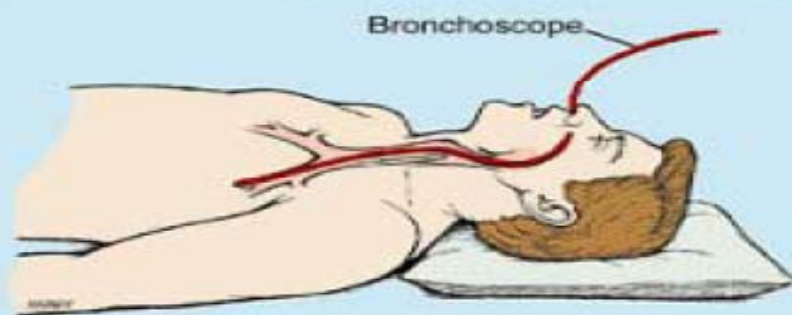
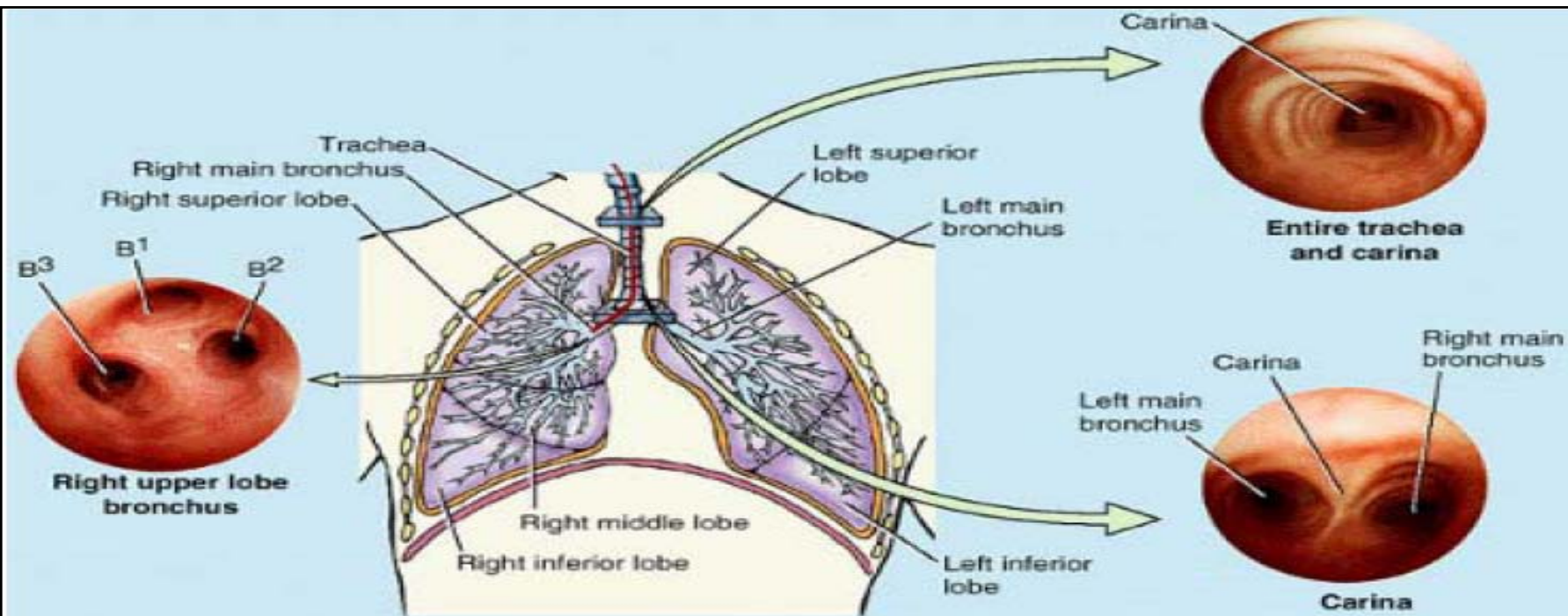
They do this by secreting a small variety of products, including Clara cell secretory protein (CCSP) and a component of the lung surfactant.

They are also responsible for detoxifying harmful substances inhaled into the lungs.

Clara cells accomplish this with cytochrome P450 enzymes found in their smooth endoplasmic reticulum.

Clara cells also multiply and differentiate into ciliated cells to regenerate the bronchiolar epithelium.

Clara cells contain Tryptase Clara, which is responsible for cleaving the hemagglutinin surface protein of influenza A virus, thereby activating it and causing the symptoms of flu.



❑ **Aspiration of Foreign Bodies**

- ❑ Because the right bronchus is wider and shorter and runs more vertically than the left bronchus, aspirated foreign
- ❑ bodies are more likely to enter and lodge in it or one of its branches. A potential hazard encountered by dentists is an
- ❑ aspirated foreign body, such as a piece of tooth, filling material, or a small instrument. Such objects are also most
- ❑ likely to enter the right main bronchus.

Pleura

- Pleural fluid produced by pleural membranes
 - ▣ Acts as lubricant
 - ▣ Helps hold parietal and visceral pleural membranes together

