The module:

Respiratory System

Session 2 : **Lecture : 1**

Title: ***Anatomy and histology of the respiratory system***

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Clinically oriented anatomy by Moore and Dalley
Greys anatomy for students by Drake
Color atlas of histology by Leslie

The module:

Respiratory System

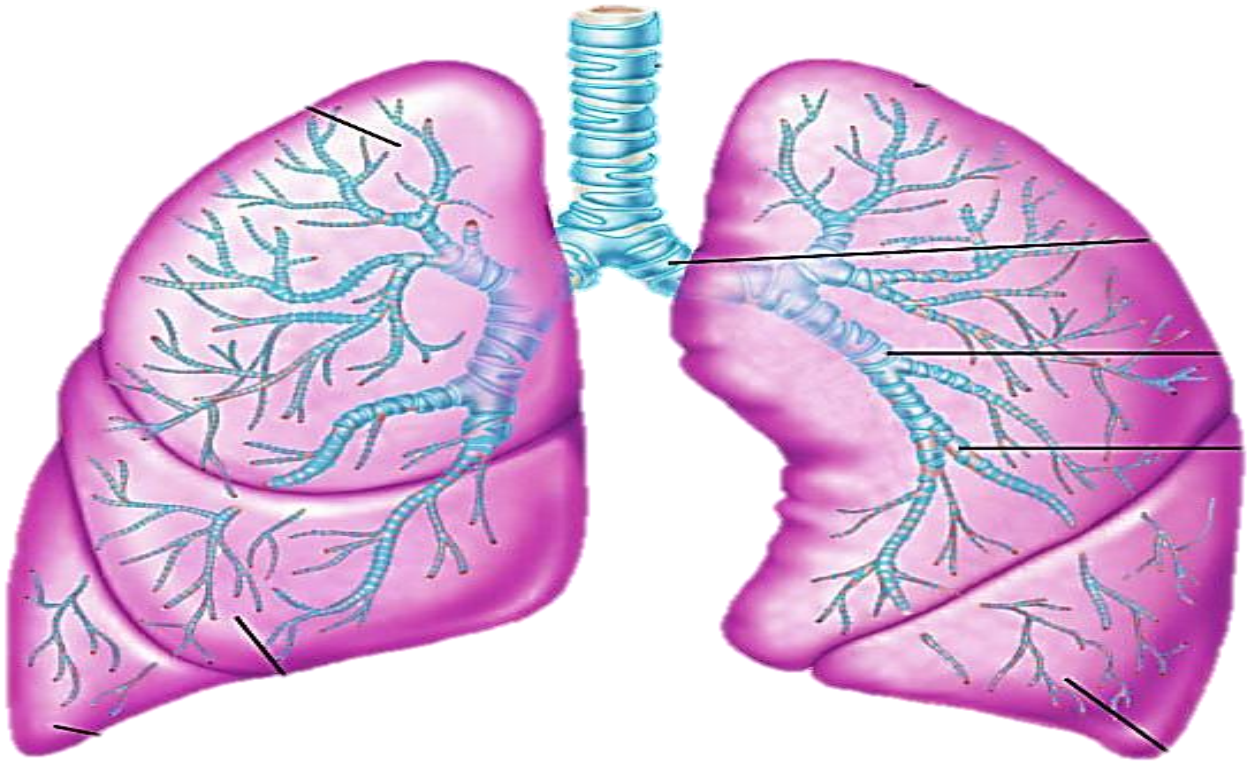
Learning objectives:

Describe the anatomy and functional histology of each part of lower respiratory tract

Clinically oriented anatomy by Moore and Dalley
Grays anatomy for students by Drake
Color atlas of histology by Leslie

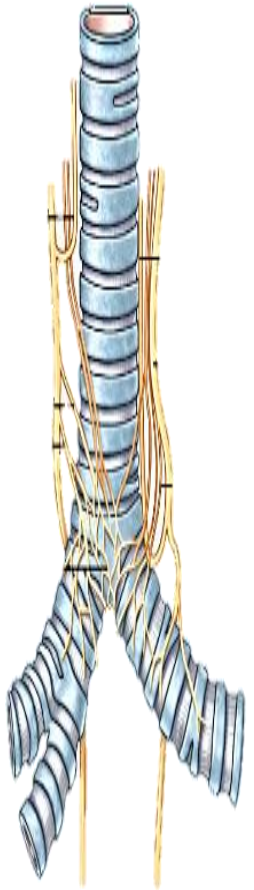
LO3

Conducting zone
lower respiratory tract



Trachea

LO3



- A flexible tube also called **windpipe.**
- Extends through the mediastinum and lies **anterior** to the esophagus and **inferior** to the larynx.
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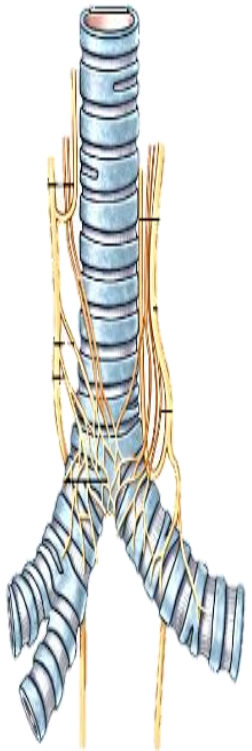
- Anterior and lateral walls of the trachea supported by **15 to 20 C-shaped tracheal cartilages.**
- Posterior part of tube lined by **trachealis** muscle
- Lined by **ciliated pseudostratified columnar epithelium**

- Cartilage rings reinforce and provide rigidity to the tracheal wall to ensure that the trachea remains open at all times

Trachea

LO3

- At the level of the sternal angle, the trachea bifurcates into two smaller tubes, called the **right and left primary bronchi.**
- Each primary bronchus projects laterally toward each lung.
- The most inferior tracheal cartilage separates the primary bronchi at their origin and forms an internal ridge called the **carina.**



LO3

Bronchial tree

- A highly branched system of air-conducting passages that originate from the left and right primary bronchi.
- Progressively branch into narrower tubes as they diverge throughout the lungs before terminating in **terminal bronchioles.**
- **Incomplete rings of hyaline cartilage** support the walls of the primary bronchi to ensure that they remain open.
- Right primary bronchus is **shorter, wider, and more vertically oriented** than the left primary bronchus.
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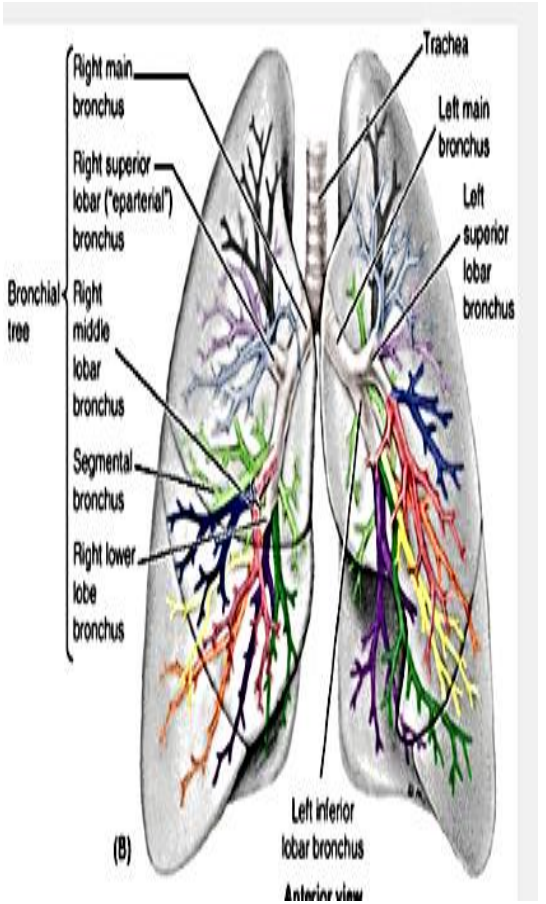
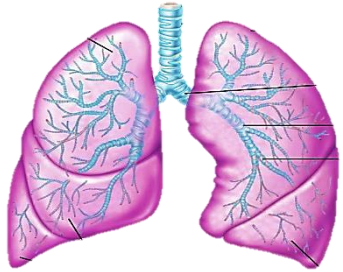
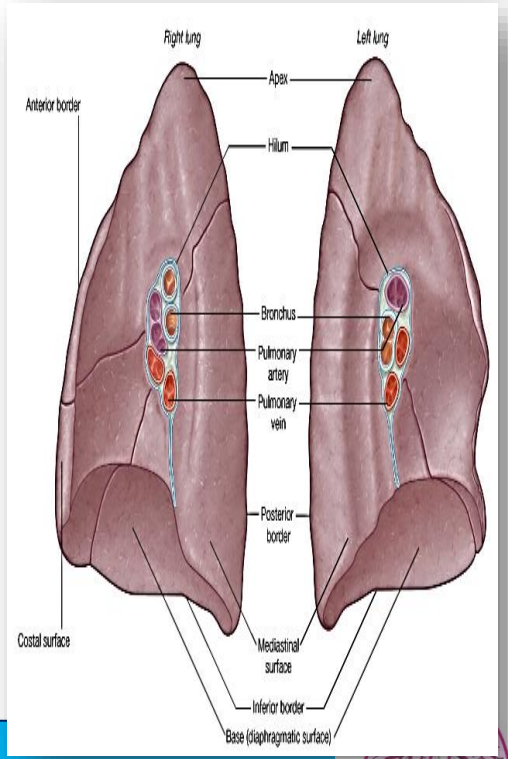


Foreign particles are more likely to lodge in the right primary bronchus

LO3

- The primary bronchi enter the **hilum** of each lung together with the pulmonary vessels, lymphatic vessels, and nerves.
- Each primary bronchus branches into several **secondary bronchi** (or lobar bronchi).
- The left lung has two secondary bronchi.The right lung has three secondary bronchi.
- They further divide into **tertiary bronchi**.
- Each tertiary bronchus is called a **segmental** bronchus because it supplies a part of the lung called a **bronchopulmonary segment**





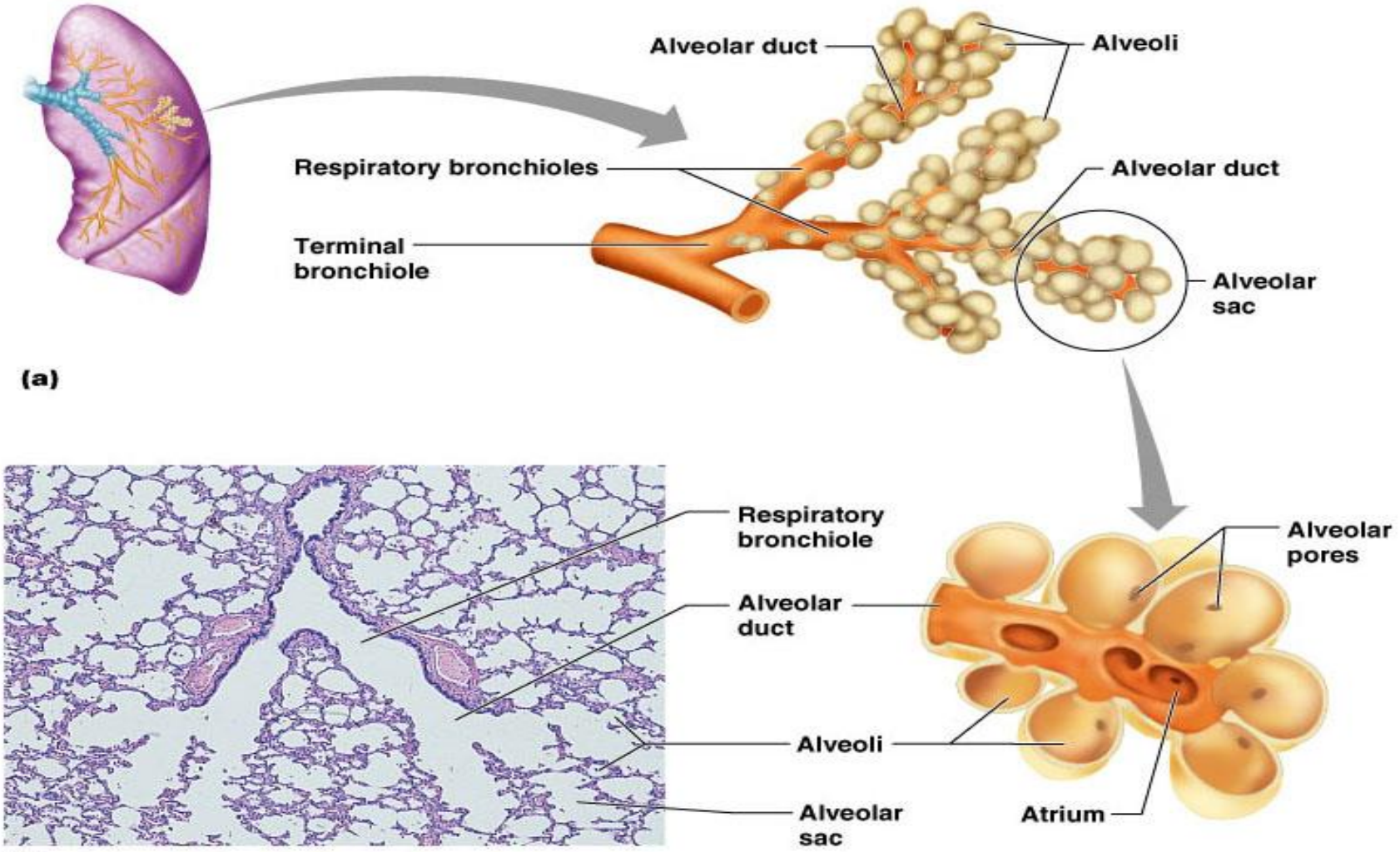
Bronchial Tree

LO3

- **Secondary bronchi→ Tertiary bronchi→ Bronchioles→ Terminal bronchioles.**
- With successive branching amount of **cartilage** decreases and amount of **smooth muscle** increases, this allows **for variation** in airway diameter.
- During sympathetic activity → **bronchodilation.**
- Mediators of allergic reactions like histamine → **bronchoconstriction.**
- Epithelium gradually changes from **ciliated pseudostratified columnar epithelium to simple cuboidal epithelium** in terminal bronchioles.

Respiratory Zone

LO3



Conduction vs. Respiratory zones

LO3

- Most of the tubing in the lungs makes up **conduction zone.**

  Consists of nasal cavity to terminal bronchioles

- The **respiratory zone** is where gas is exchanged

  Consists of alveoli, alveolar sacs, alveolar ducts and respiratory bronchioles

LO3

Respiratory Bronchioles, Alveolar Ducts, and Alveoli

- Lungs contain small saccular outpocketings called **alveoli.**
- They have a thin wall specialized to promote diffusion of gases between the alveolus and the blood in the pulmonary capillaries.
-
- Gas exchange can take place in the **respiratory bronchioles and alveolar ducts** as well as in the **alveoli**, each lung contains approximately 300 to 400 million alveoli.
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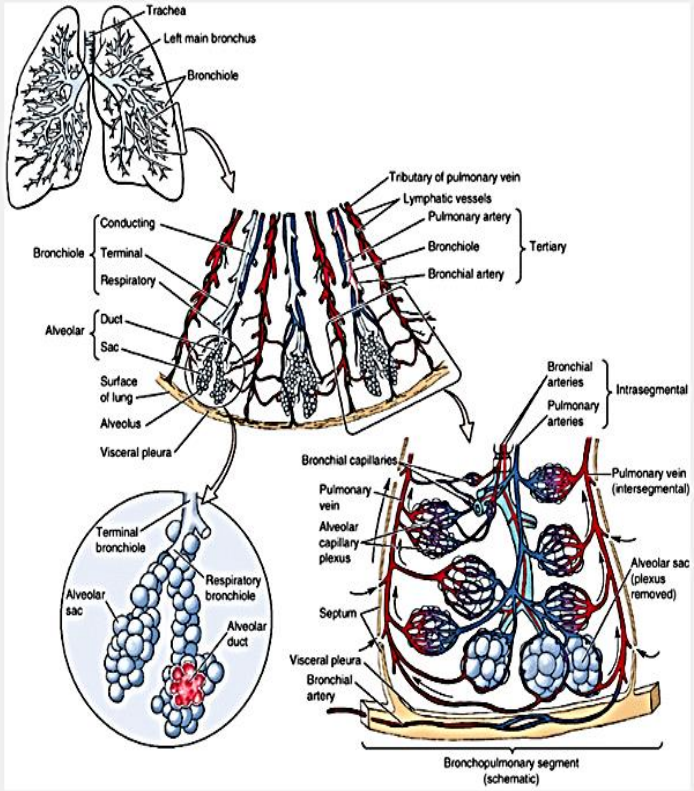
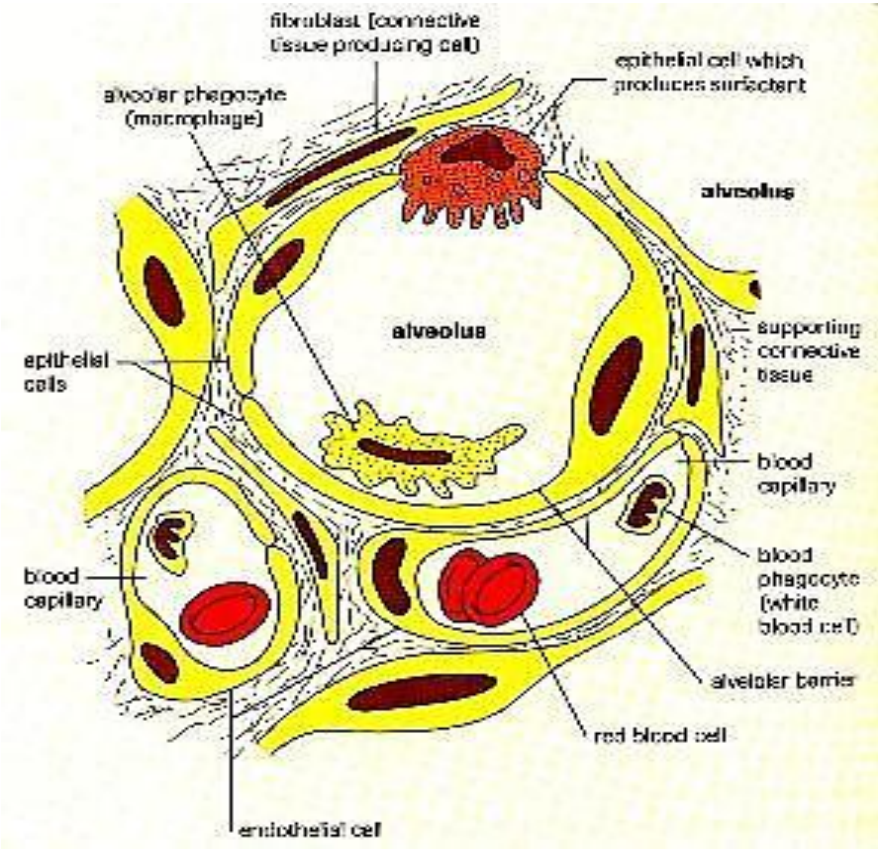
- The spongy nature of the lung is due to the packing of millions of alveoli together.



LO3

Respiratory Membrane

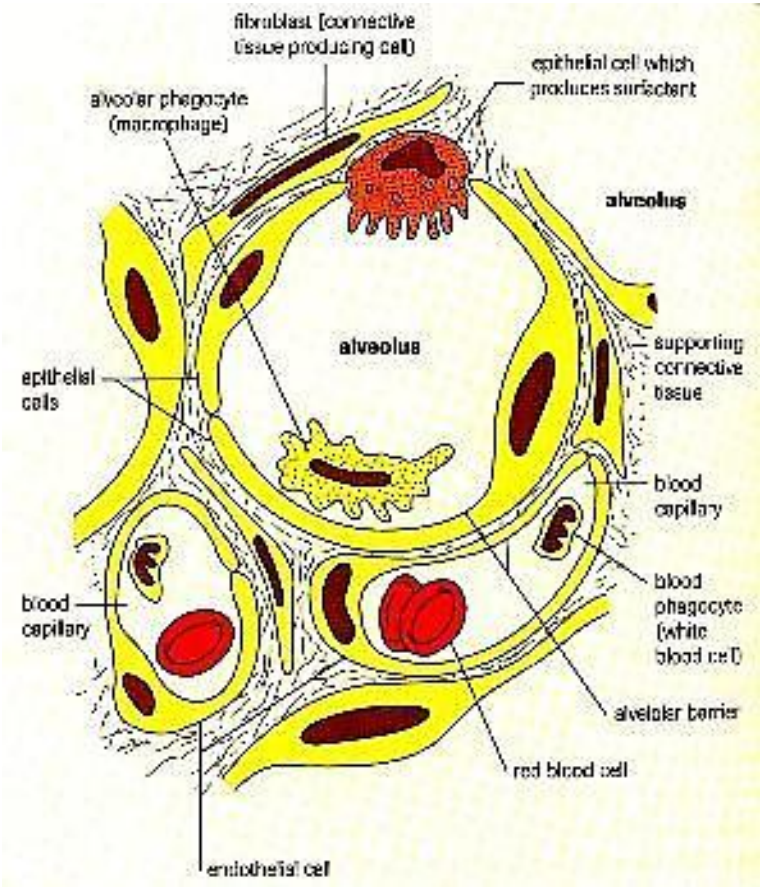
- Squamous cells of alveoli .
- Basement membrane of alveoli.
- Basement membrane of capillaries
- Simple squamous cells of capillaries
- **About .5 µ in thickness**



Cells in the Alveolus

LO3

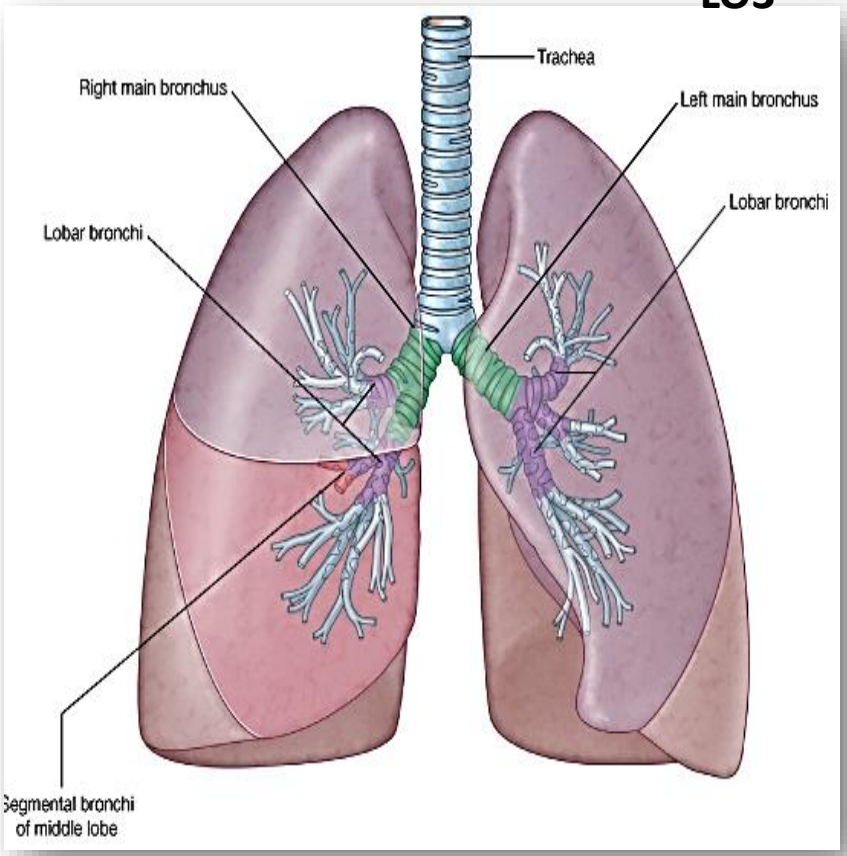
- Type I cells : simple squamous cells forming lining.
- Type II cells : or septal cells secrete **surfactant** (that lowers alveolar surface tension)**.**
- Alveolar macrophages



Gross anatomy of the lung

LO3

- Each lung has a conical shape.
- Its superior region called the **apex** projects superiorly to a point that is slightly superior and posterior to the clavicle.
-
- Both lungs are bordered by the thoracic wall anteriorly, laterally, and posteriorly, and supported by the rib cage.
- Toward the midline, the lungs are separated from each other by the **mediastinum**.
- The relatively broad, rounded surface in contact with the thoracic wall is called the **costal surface** of the lung.



LO3

Lungs

Left lung

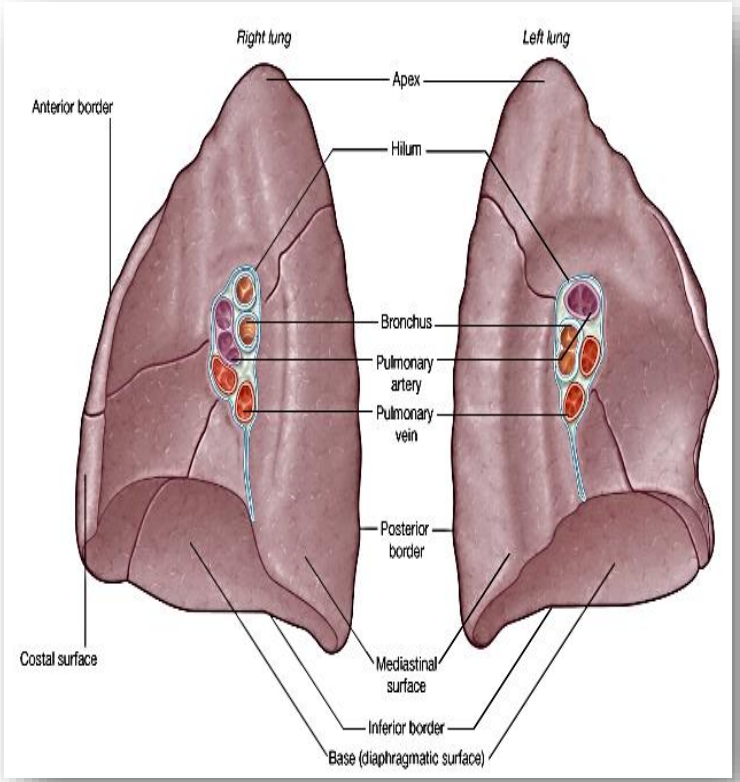
Divided into 2 lobes by **oblique fissure.**

Smaller than the right lung.
Cardiac notch accommodates the heart.

Right lung

Divided into 3 lobes by **oblique and horizontal fissure.**

Located more superiorly in the body due to liver on right side.



Further readings:
1) Clinically Oriented Anatomy (Moore). 5th Edition, 2006. Chapters (1,7,8).