
بسم الله الرحمن الرحيم


رب اشرح لي صدري ويسر لي أمري

RESPIRATORY SYSTEM

PROF DR / AMR SHALABY

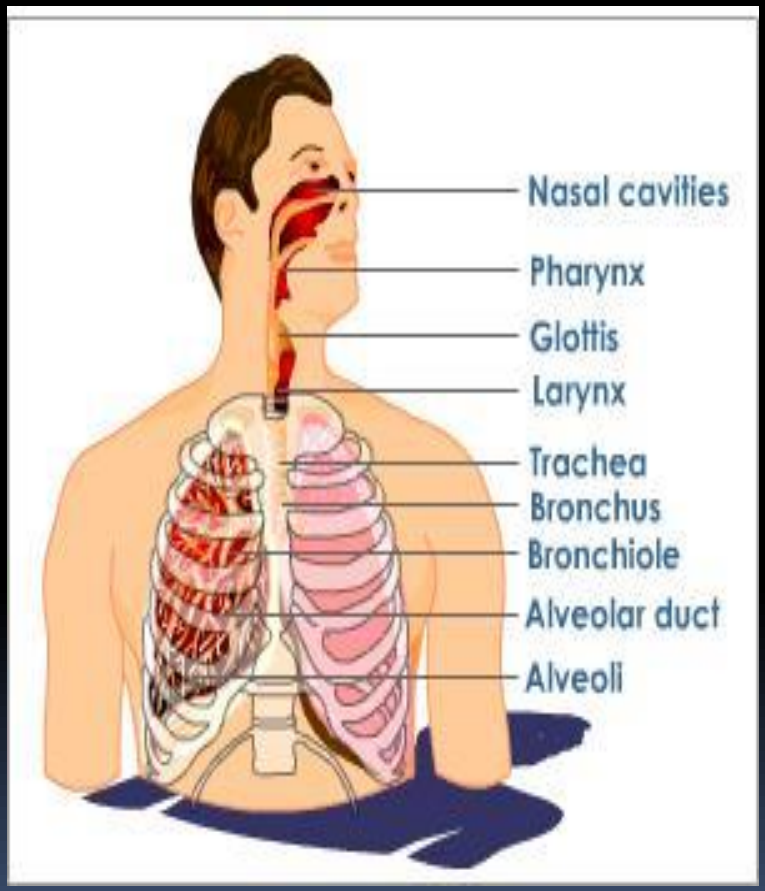
The Respiratory System

- Located in the head, neck and thorax (chest).

  ➔ The **diaphragm** forms the base of the thorax.

- The respiratory system starts with the nose (or mouth) and ends with the lungs (The place of vital exchange).

- The system is protected by the rib cage, sternum bones, and vertebral column.



The main Functions of respiratory system

1. Ventilate the lungs
2. The provision of oxygen
3. Gas exchange between air and circulating blood.
4. Production of sound (olfactory membrane)
5. Defensive system
6. regulate the concentration of pH.(Homeostasis)

Composition of the atmospheric air

- ✓ Nitrogen → 78%
- ✓ **Oxygen** → 21%
- ✓ **Carbon dioxide** → 0.03 - 0.04%
- ✓ Hydrogen → traces
- ✓ Noble gases → traces

- Thus the atmospheric air contains more O_2 than CO_2.

The Pathway of Air

The respiratory system consists of:

1- The upper respiratory tract.

2- The lower respiratory tract.

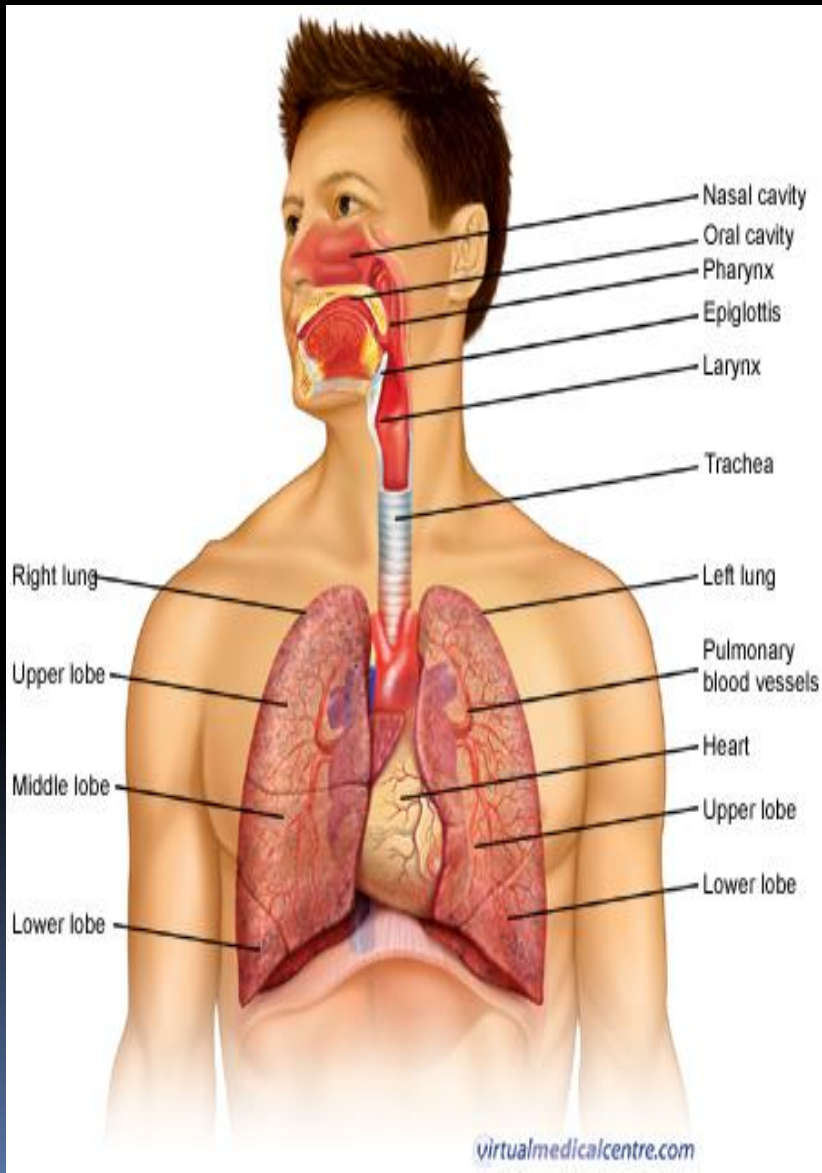
❶ The Upper Respiratory Tract:

- Located in the head and neck.
- No gas exchange occur
- Consists of:

✓ Nose

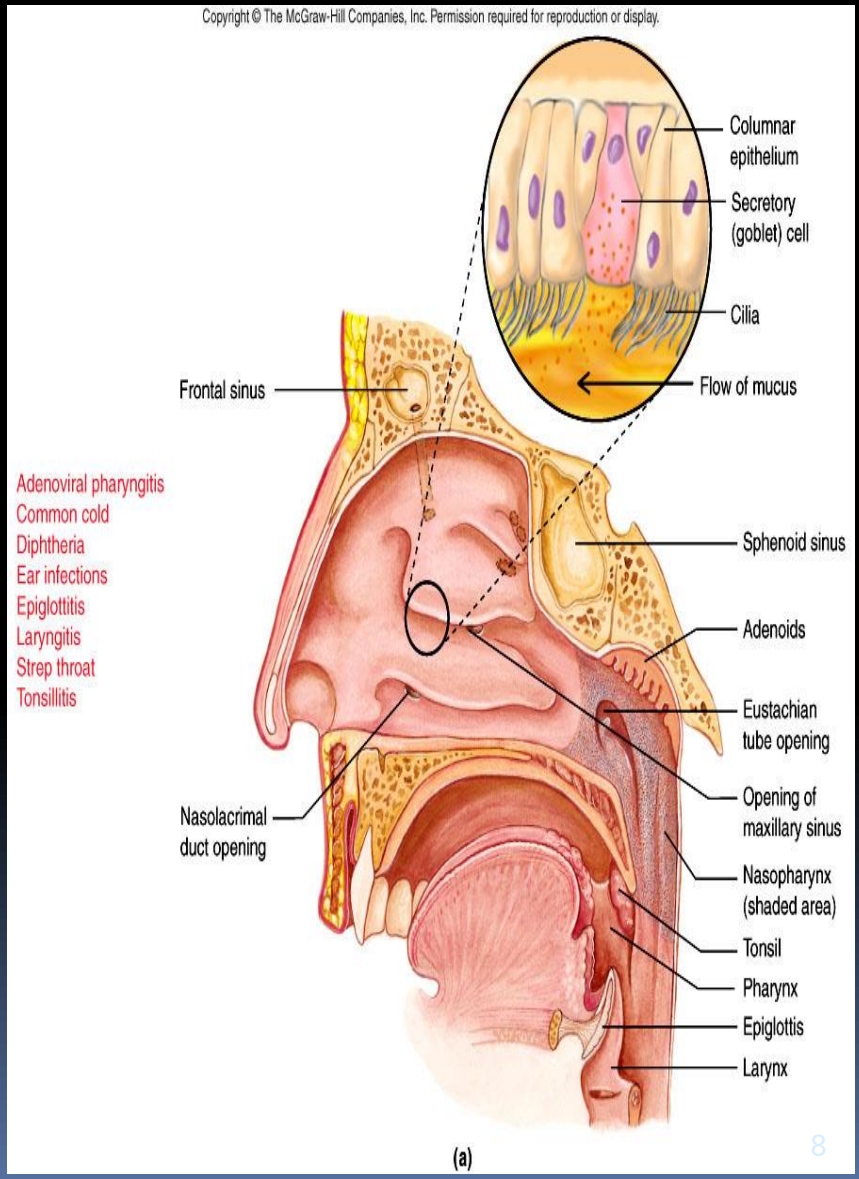
✓ Pharynx

✓ Larynx



❶ The Upper Respiratory Tract:

- **Nose (Nasal Cavity):**
  - Air enters the nasal cavities through the nostrils.
  - The nasal cavities are lined with a ciliated mucous membrane.
  - The function of the nasal cavities is to warm, filter and moisten the incoming air.



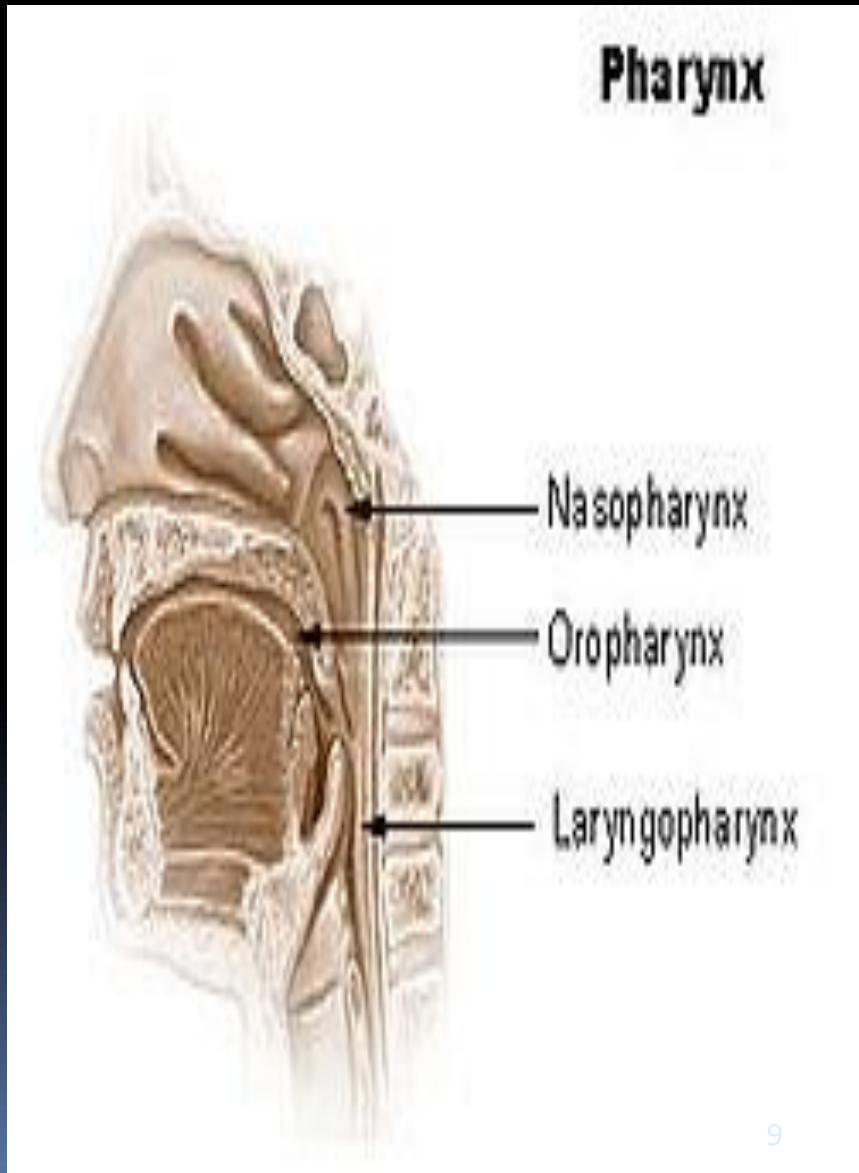
❶ The Upper Respiratory Tract:

❑ **The Pharynx** (the throat):

It is a part of the digestive and respiratory systems, where the oral and the nasal cavities meet.

Consists of 3 parts:

- Nasophaynx
- Oropharynx
- Laryngopharynx



❶ The Upper Respiratory Tract:

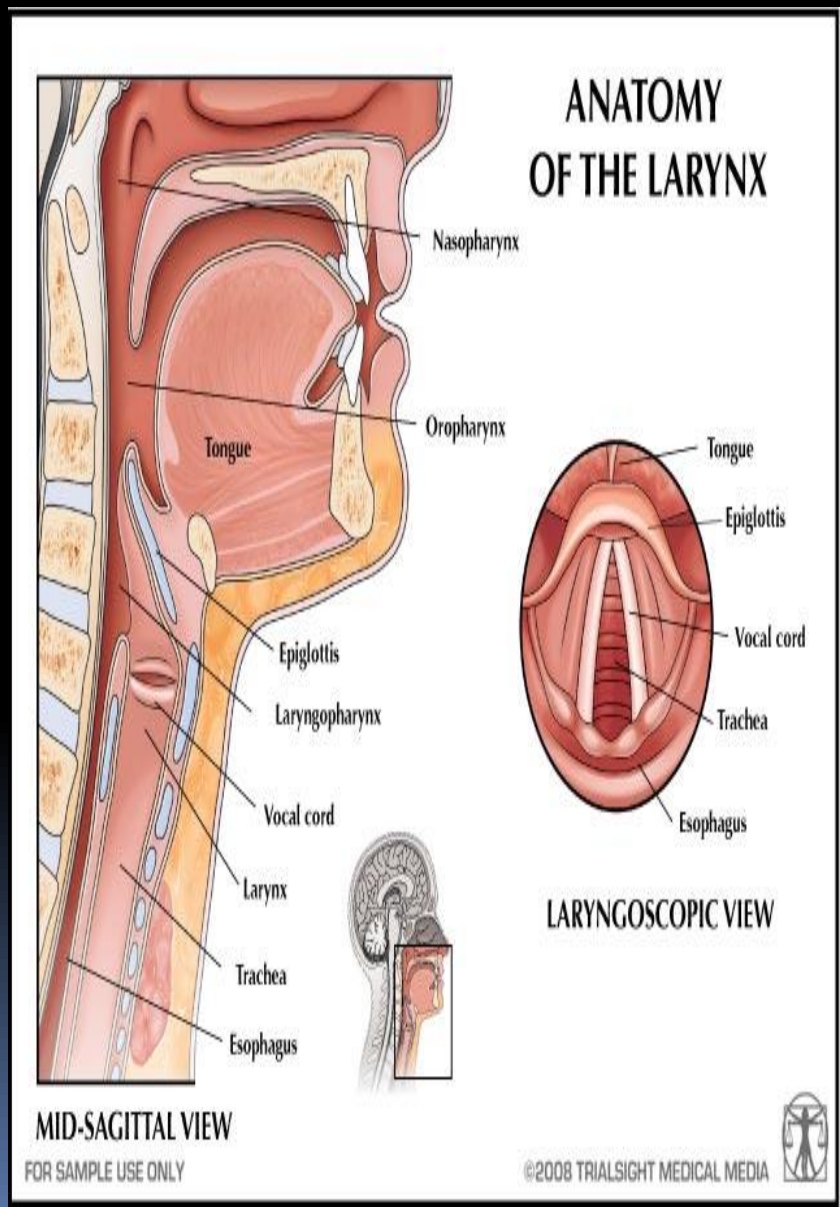
❑ **The larynx** (the voice box):

- Located between the pharynx and the trachea.
- It contains the vocal cords.
- It protect the trachea by producing a strong cough reflex if any solid objects pass the epiglottis.

Functions:

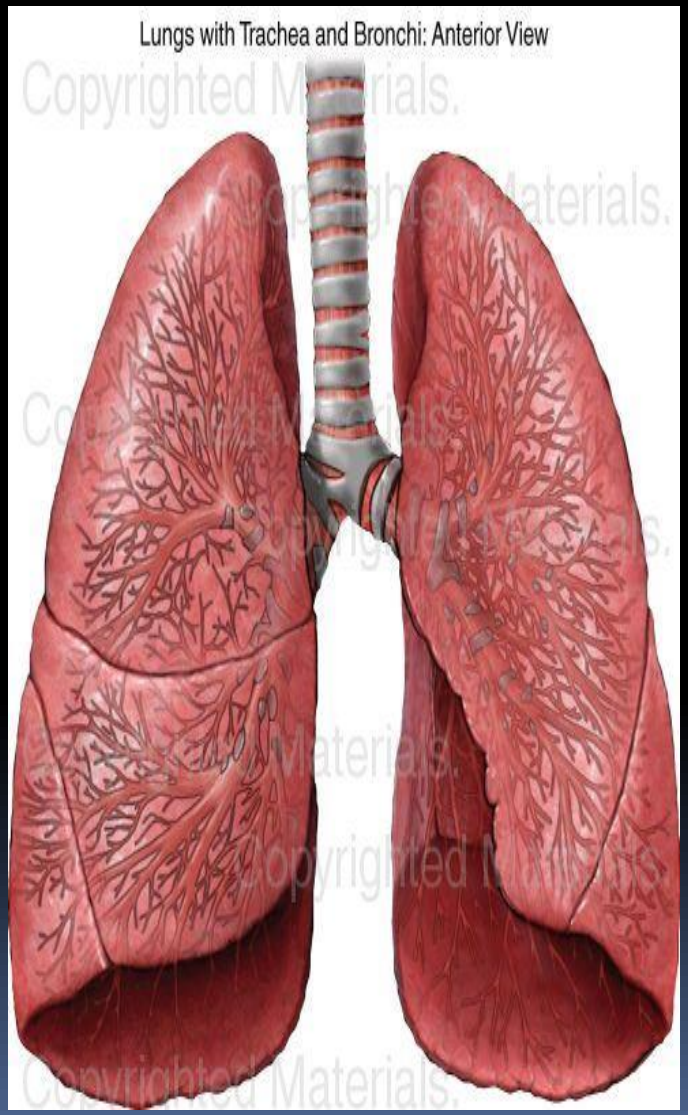
➢ Voice production.

➢ Prevent choking (through the epiglottis).



❷ The Lower Respiratory Tract:

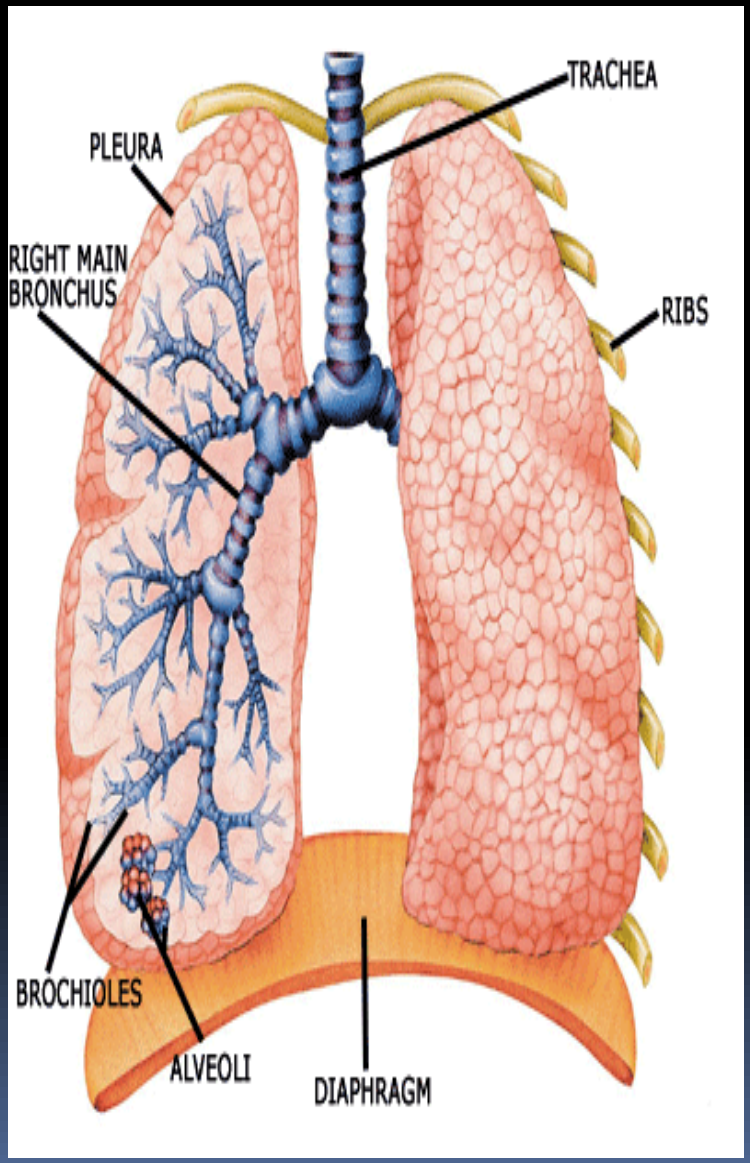
- It is located in the chest and consists of:
  - Trachea
  - Bronchial tree
  - Lungs



❷ The Lower Respiratory Tract:

- **The trachea**:
  - It connects the larynx to the bronchi.
  - **The trachea** is protected by cartilage rings (16-20) in the shape of a "C".

➔ To support the trachea in the open position.



❷ The Lower Respiratory Tract:

- The trachea is lined with ciliated mucous membrane which contain:

1- Mucous-secreting cells (goblet cells).

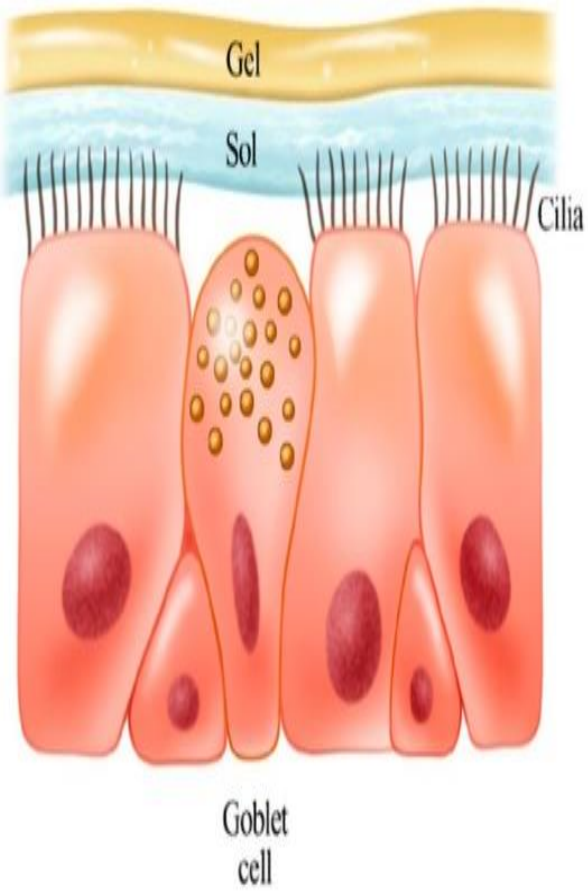
➔ Secrete mucous

➔ The mucous traps dust, bacteria, and viruses.

2- Ciliated epithelial cells:

The surface of each cell has hair-like structures called cilia.

➔



NB:

- The mucociliary transport system extends from the nasopharynx to the respiratory bronchioles.

- The respiratory system produces about 125 mL of mucous each day that is removed by the movement of the cilia.

❷ The Lower Respiratory Tract:

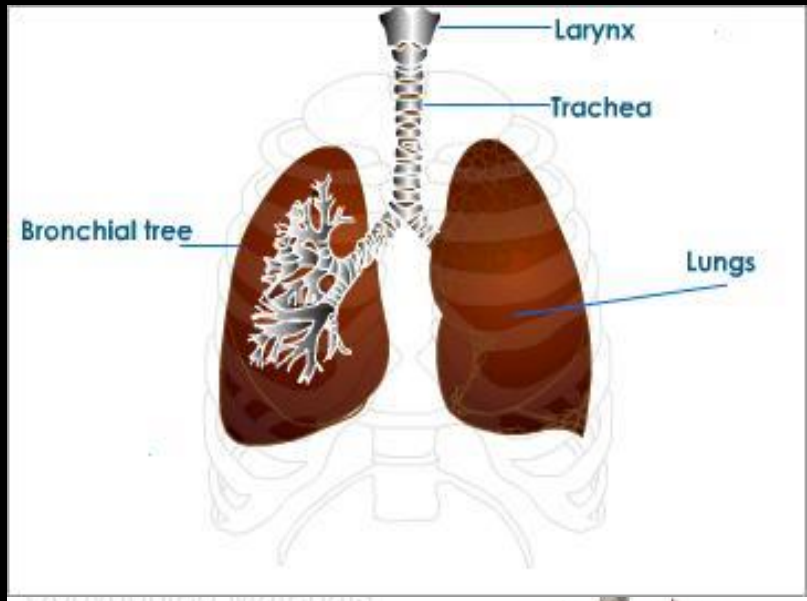
Functions of the trachea:

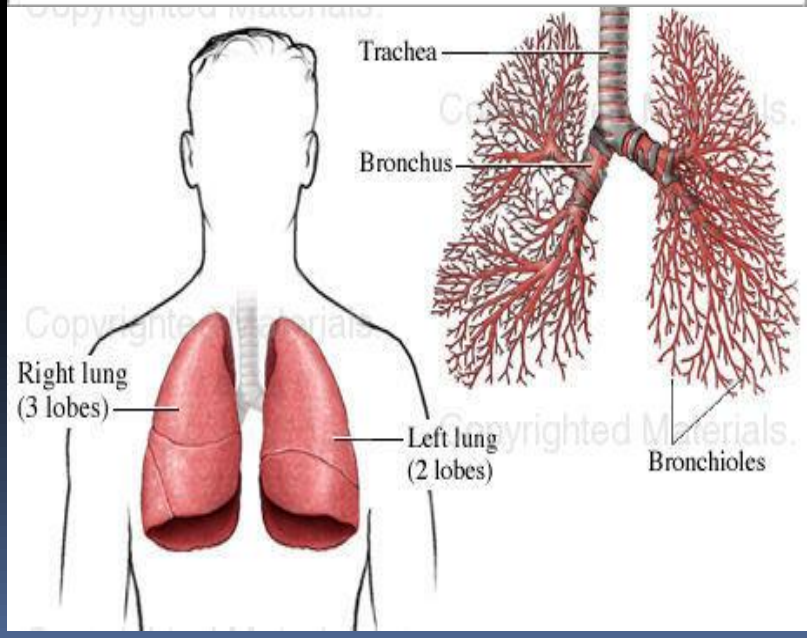
- ✓ Conduct air to and from the lungs.
- ✓ Trap dust, bacteria and viruses in mucous.

❷ The Lower Respiratory Tract:

❑ The bronchial tree:

- The trachea is branched forming the bronchial tree.
- The bronchial tree consists of bronchi, bronchioles, and alveoli.
- These tubes are lined with ciliated mucous membrane.





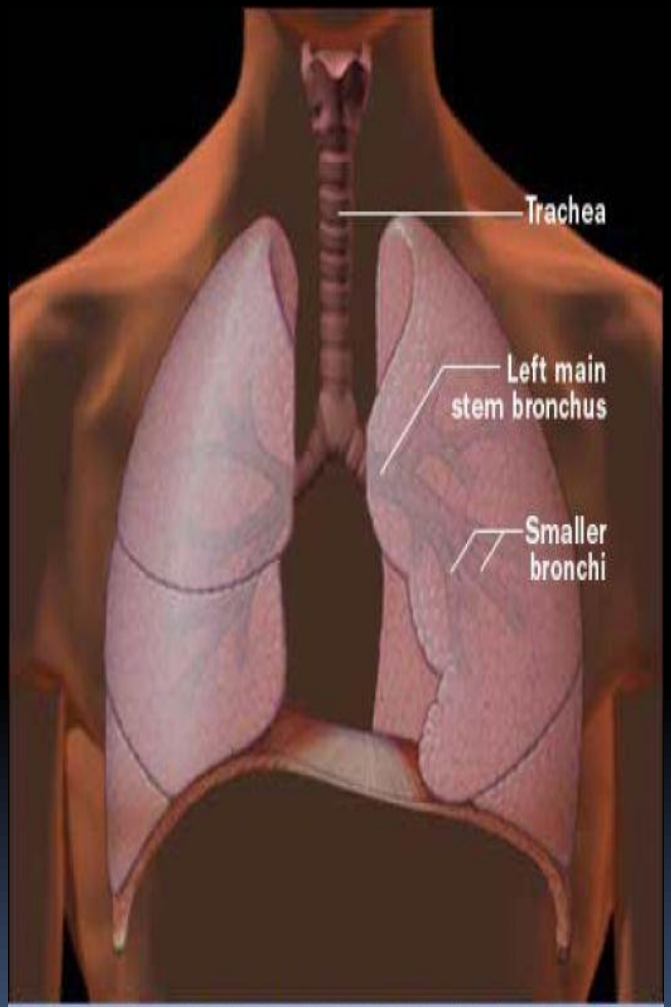
❷ The Lower Respiratory Tract:

- **Bronchi :**

➢ The trachea divides into 2 tubes called the primary bronchi (Right & Left).

➢ The wall of the primary bronchi is constructed like the trachea.

➢ The 2 primary bronchi enter the lungs then further divided into smaller branches called bronchioles.

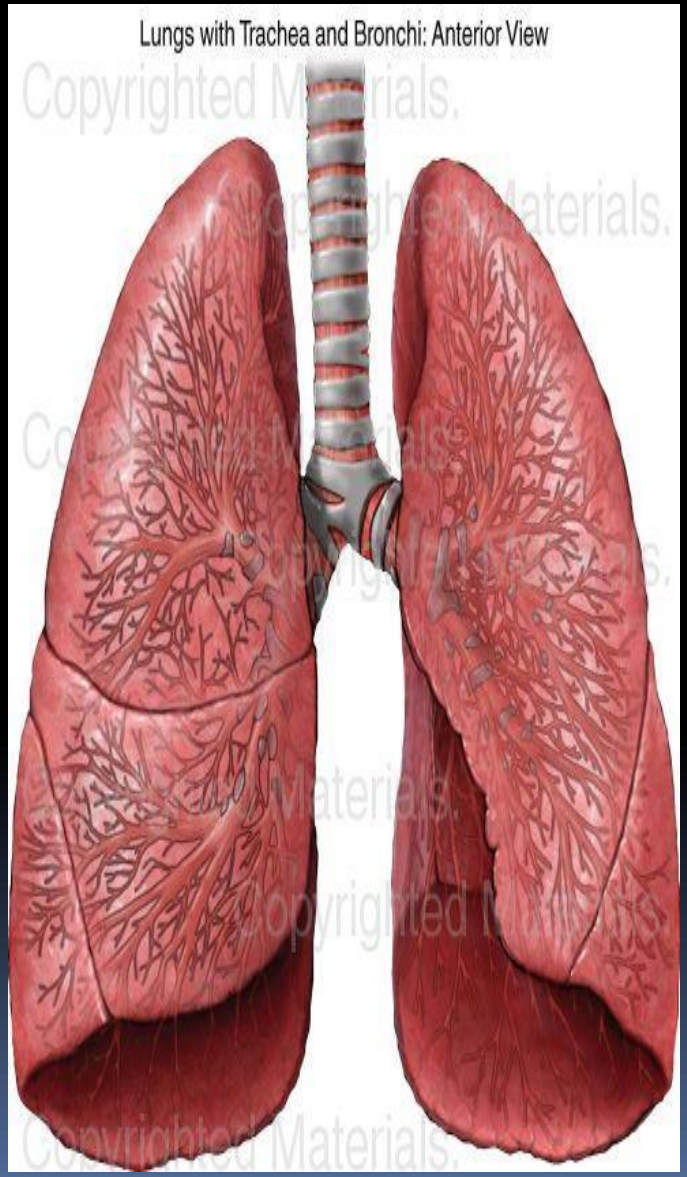


2- Lungs:

- The lungs are a pair of spongy organs located on the chest cavity.
  - They are highly elastic.
  - They respond to the actions of the diaphragm and the rib cage.

- Each lung is covered by a double membrane:

  → **The Pleura**



Respiration

- Respiration is the process that supply all parts of the body with O_2 and expel out the CO_2.
- It is very essential for life.

Characters:

- Respirations should be regular.

➔ Occurring at regular intervals.

- Respirations may be dry, which is normal, or wet.
- Respirations may be deep or shallow.

Respiration

Respiration includes 4 processes:

I- Pulmonary Ventilation (Breathing).

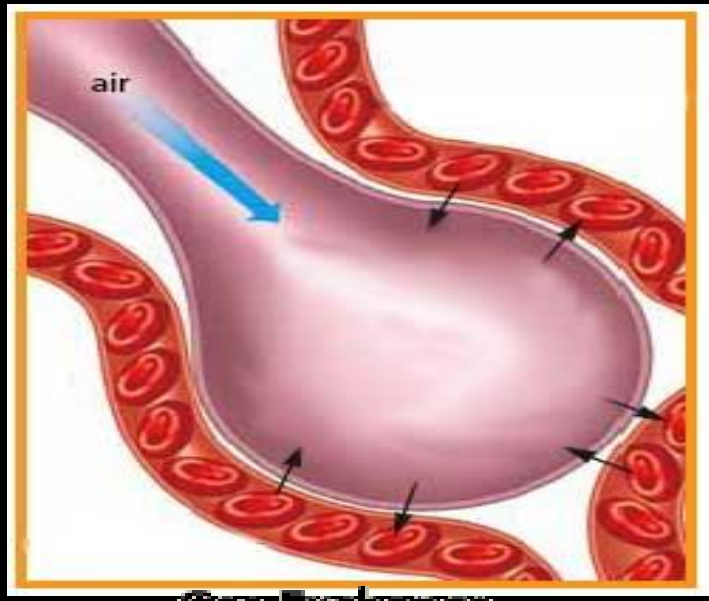
II- External Respiration.

III- Gas Transport.

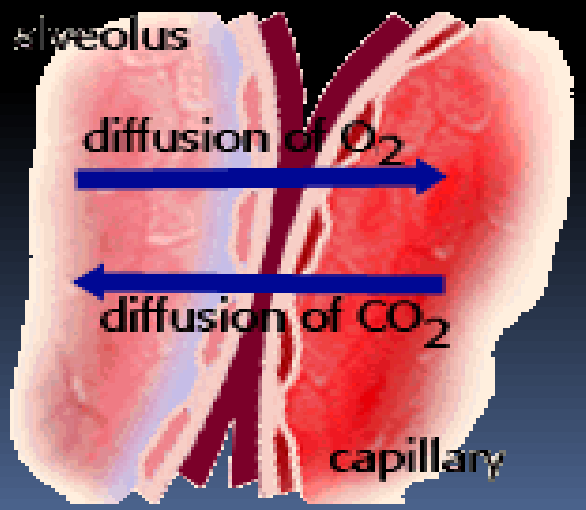
IV- Internal Respiration.

II- External Respiration

- It is the process of gas exchange between the alveoli and the blood.
- Gas exchange occurs as a result of diffusion.
- Diffusion of a gas occurs from the area of higher to the area of lower pressure.



- O_2 moves from the alveoli (higher PO_2) into the blood .
- CO_2 moves from the blood (higher PCO_2) into the alveoli.



III- Gas Transport

- It is the process of distributing the O_2 into the body cells and carrying CO_2 into the lungs.

- The process of gas transport is carried out by the Cardiovascular system.

III- Gas Transport

Oxygen transport

O_2 is carried by blood in 2 forms:

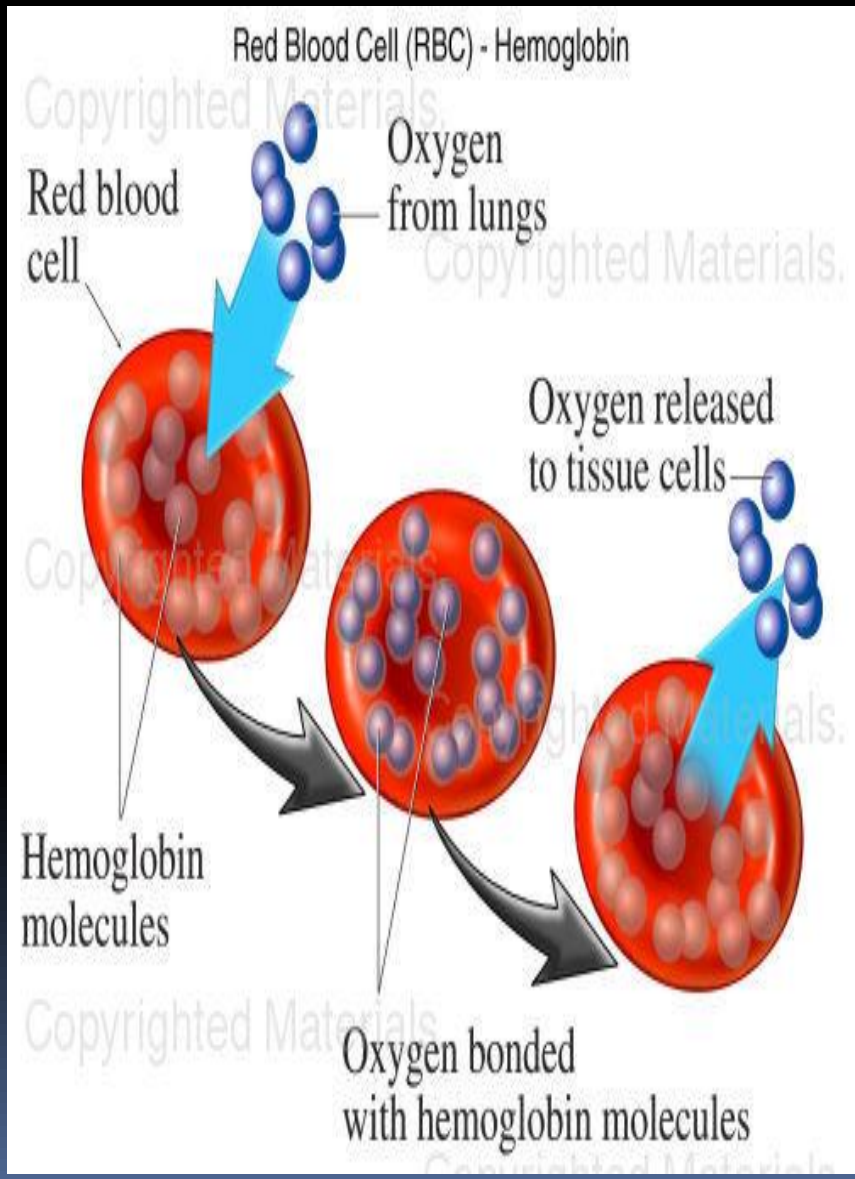
1 - Bound to Hb - 98.5%.

➔ Oxyhemoglobin

2 - Dissolved in the plasma -1.5%

NB:

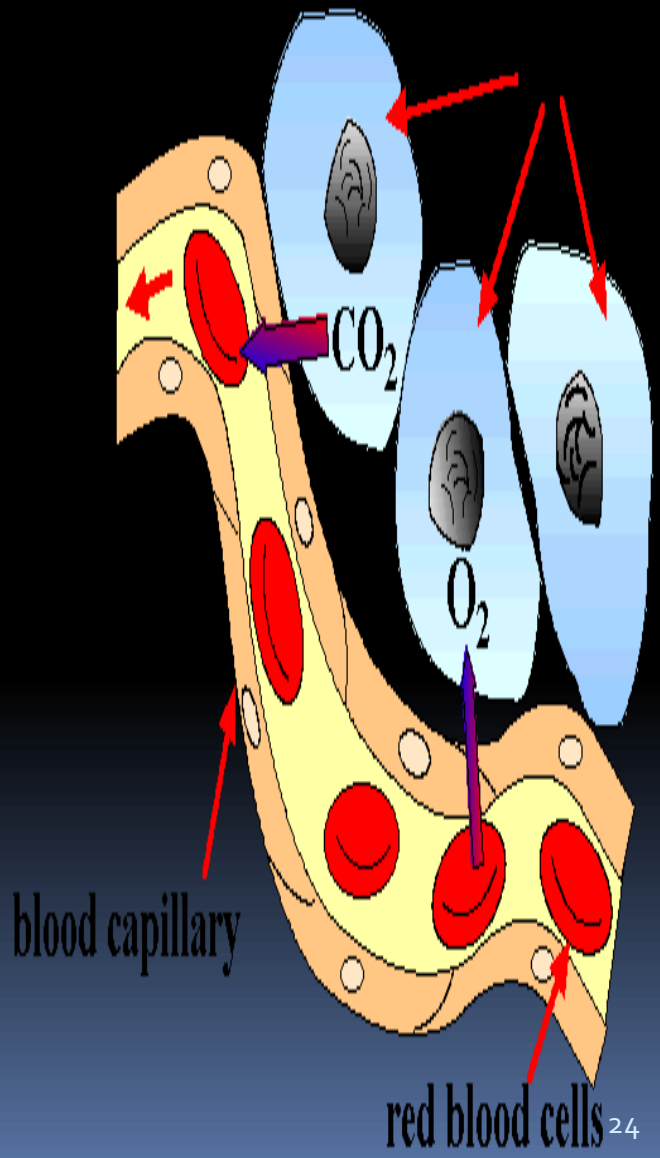
The solubility of O_2 in water is very low, therefore, 98.5% of the O_2 is transported by Hb.



IV. Internal Respiration

- It is the process of gas exchange between the tissues and the blood.
- Gas exchange occurs as a result of diffusion.
- Diffusion of a gas occurs from the area of higher to the area of lower pressure.

- O_2 moves from the blood (higher PO_2) into the tissues.
- CO_2 moves from the tissues (higher PCO_2) into the blood then transported to the lungs.



Respiratory Volumes & Capacities

❑ Volumes

- There are 4 respiratory volumes which:

➔ Do not overlap.

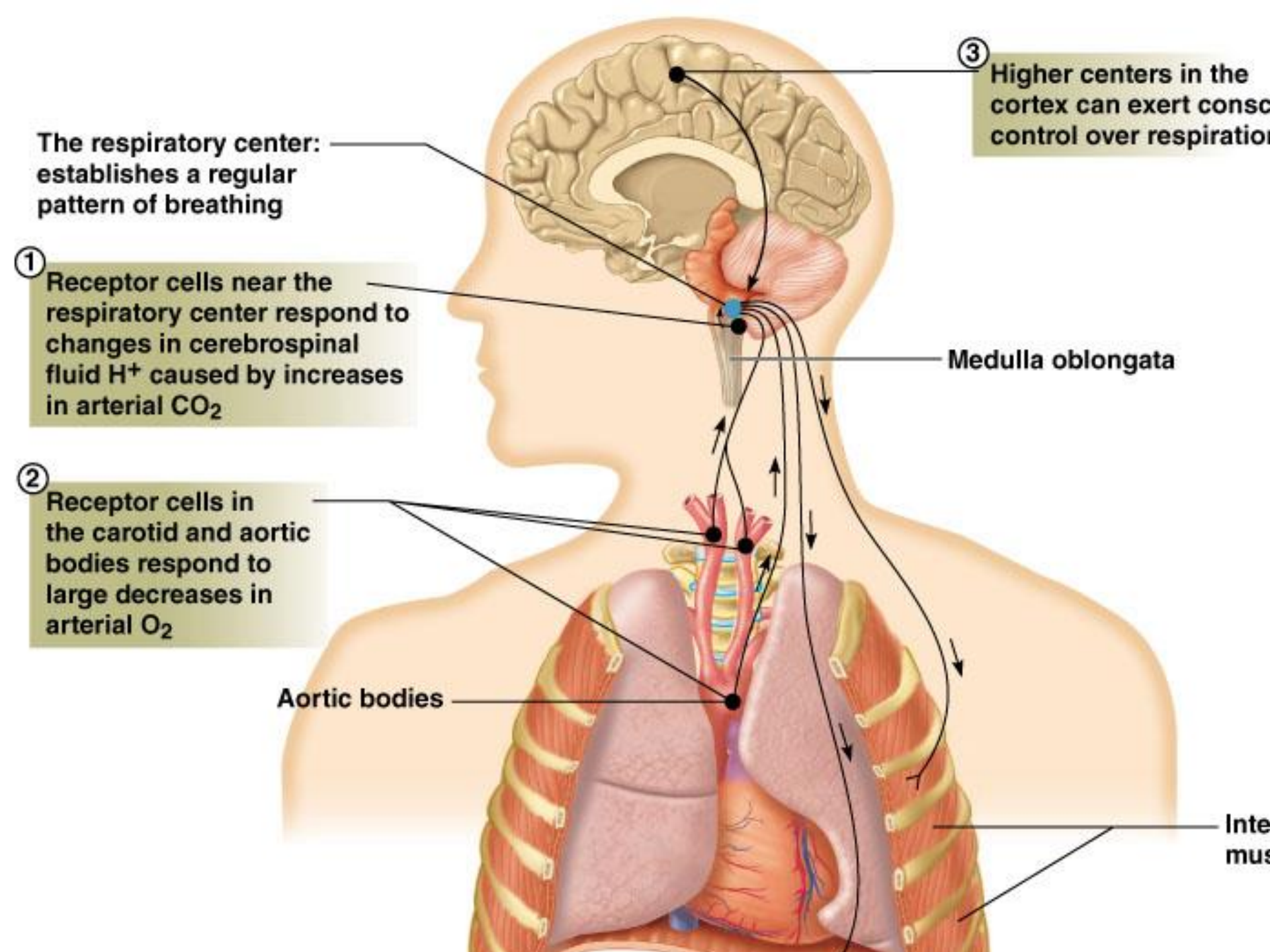
➔ Can not be further divided.

➔ When added together equal total lung capacity.

- Respiratory volumes are recorded by Spirometer.

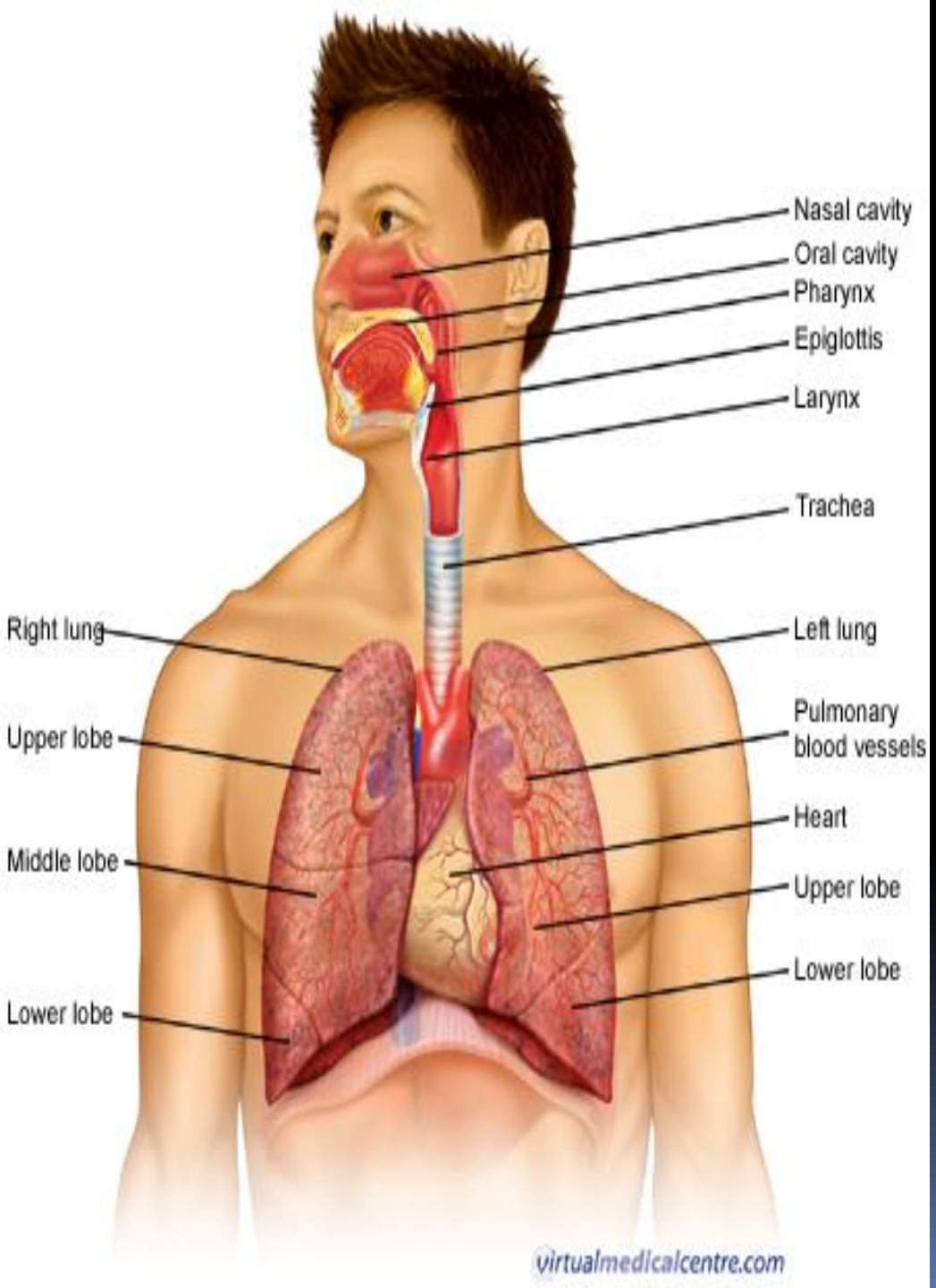
❑ Capacities

- A **capacity** is a measure of lung function that consists of 2 or more **volumes**.


The respiratory center: establishes a regular pattern of breathing
1 Receptor cells near the respiratory center respond to changes in cerebrospinal fluid H^+ caused by increases in arterial CO_2
2 Receptor cells in the carotid and aortic bodies respond to large decreases in arterial O_2
3 Higher centers in the cortex can exert consc control over respiratio
Medulla oblongata
Aortic bodies
Inte mus

Organs in the Respiratory System

STRUCTURE	FUNCTION
nose / nasal cavity	warms, moistens, & filters air as it is inhaled
pharynx (throat)	passageway for air, leads to trachea
larynx	the voice box, where vocal chords are located
trachea (windpipe)	keeps the windpipe "open" trachea is lined with fine hairs called *cilia* which filter air before it reaches the lungs
bronchi	two branches at the end of the trachea, each lead to a lung
bronchioles	a network of smaller branches leading from the bronchi into the lung tissue & ultimately to air sacs
alveoli	the functional respiratory units in the lung where gases are exchanged


Nasal cavity
Oral cavity
Pharynx
Epiglottis
Larynx
Trachea
Right lung
Left lung
Upper lobe
Pulmonary blood vessels
Heart
Middle lobe
Upper lobe
Lower lobe
Lower lobe
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THANK YOU

أي أسئلة متعلقة بالدرس؟

جزآكم الله خيرا

د / عمرو شلبي

بالتوفيق أن شاء الله