



HUMAN PHYSIOLOGY AND CLINICAL BIOCHEMISTRY

Topic: Respiration

Lecture 1

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REFERENCE: OPEN ACCESS

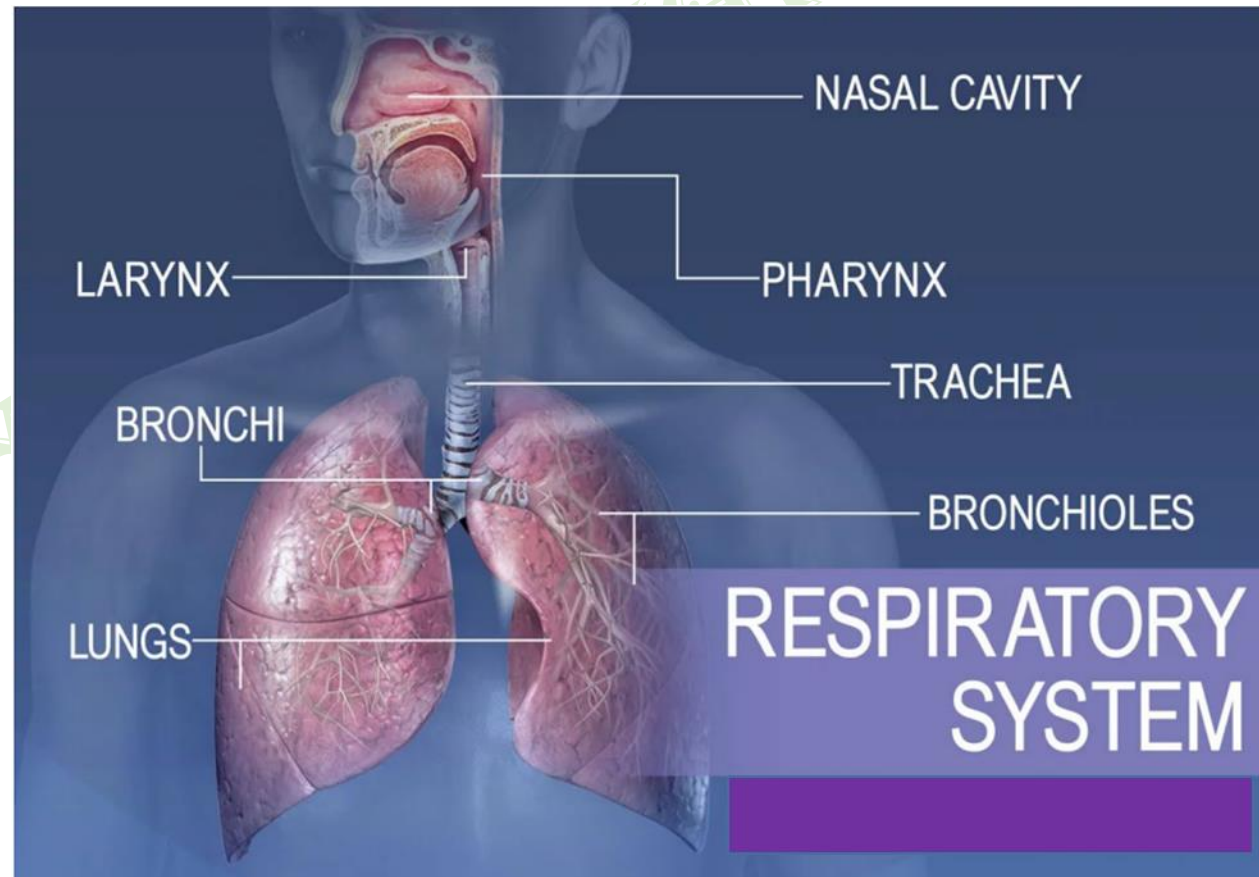


RESPIRATION

- Exchange of oxygen and carbon dioxide gases between an organism and the environment is called respiration.

The Lungs and Respiratory System allow us to breathe.

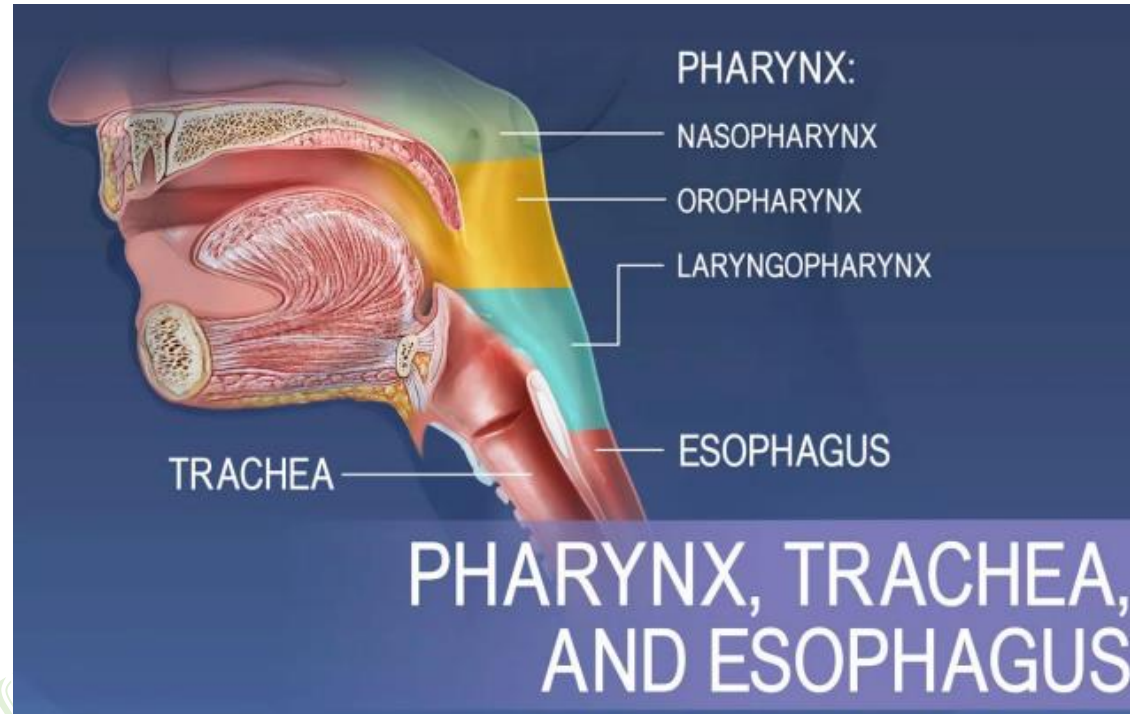
They bring oxygen into our bodies (called inspiration, or inhalation) and send carbon dioxide out (called expiration, or exhalation).



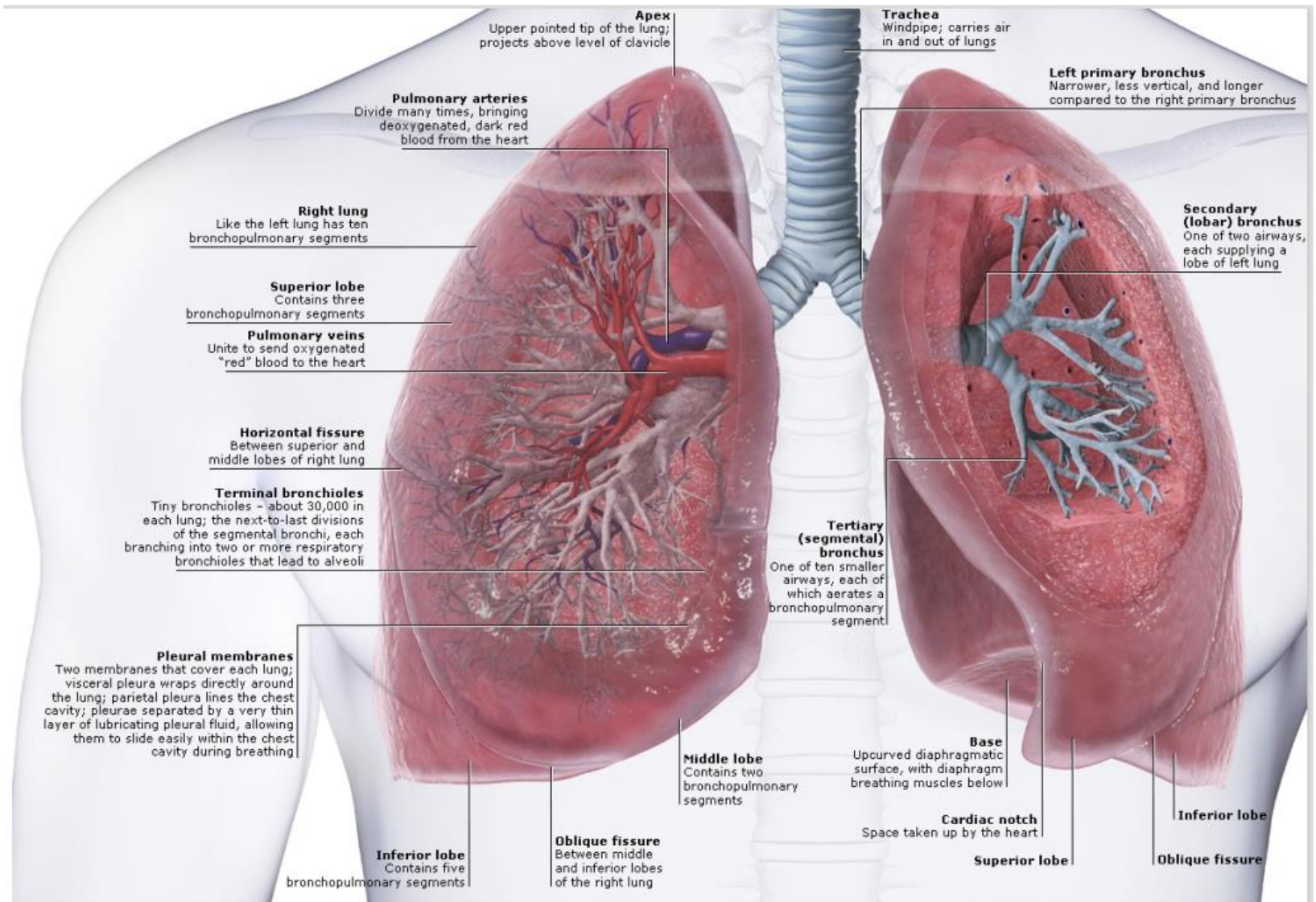


Parts of the Respiratory System

Nose and Mouth: Air enters the respiratory system through the nose or the mouth. If it goes in the nostrils, the air is warmed and humidified. Cilia (tiny hairs) protect the nasal passageways and other parts of the respiratory tract, filtering out dust and other particles that enter the nose through the breathed air.



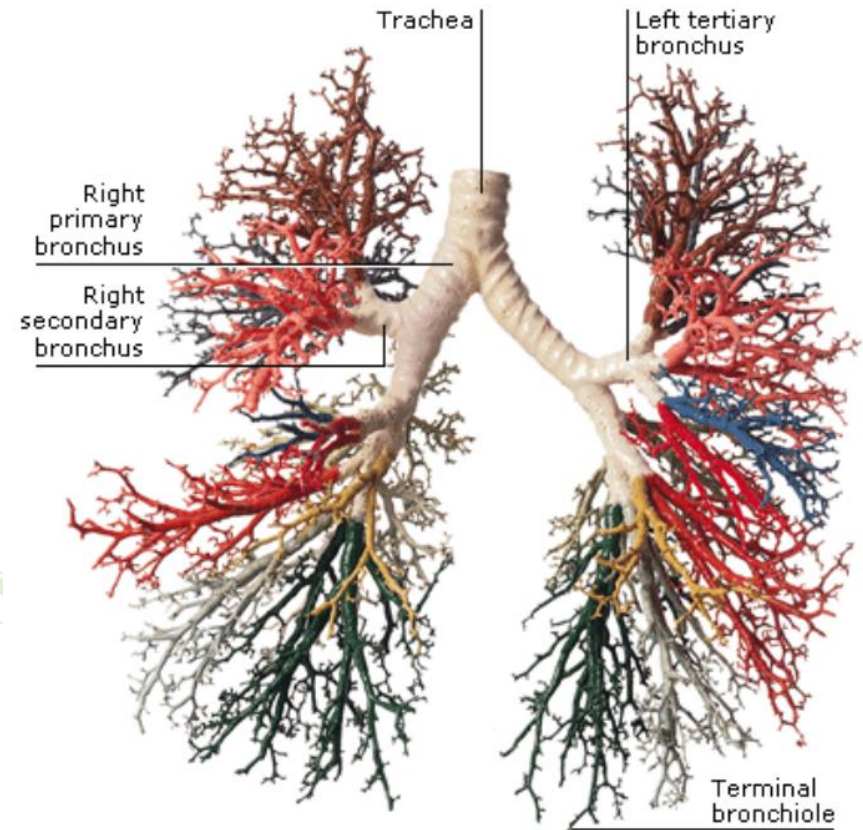
- **Pharynx (throat):** The nasal cavity and the mouth openings meet at the pharynx at the back of the nose and mouth. **The pharynx is part of the digestive system as well as the respiratory system** because it carries both food and air. At the bottom of the pharynx, this pathway divides in two, the esophagus, which leads to the stomach and the other for air. The **epiglottis**, a small flap of tissue, covers the air-only passage when we swallow, keeping food and liquid from going into the lungs.
- **The Larynx** (voice box): Top part of Trachea. This short tube contains a pair of vocal cords, which vibrate to make sounds.





Tracheobronchial tree: Network of alveoli, bronchioles, bronchi and trachea.

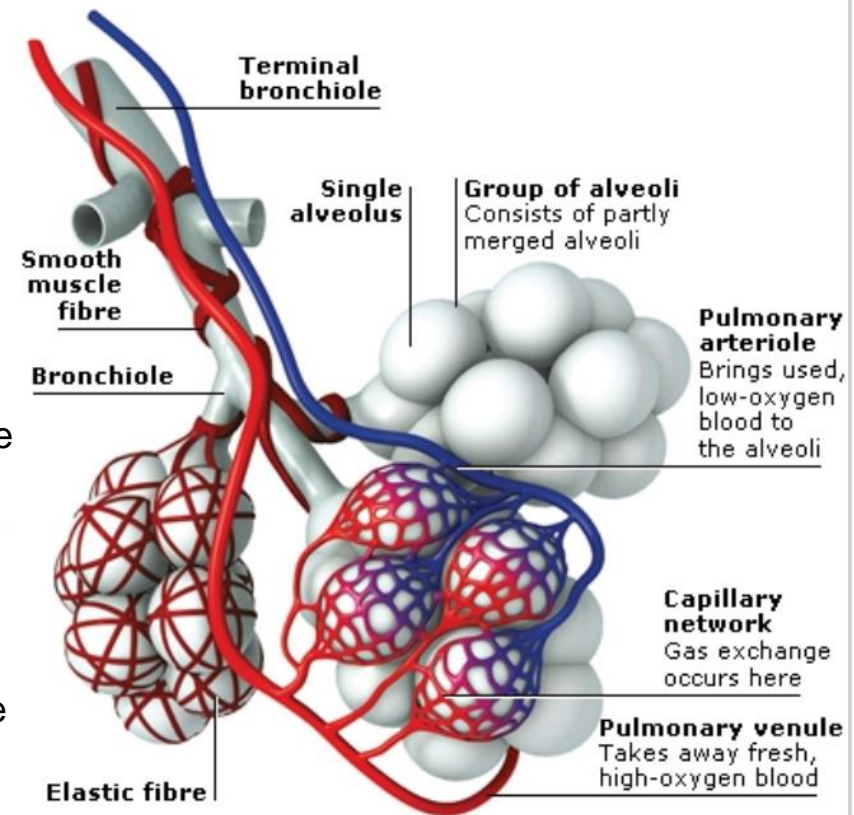
- **Trachea:** The walls of the trachea are strengthened by stiff rings of cartilage to keep it open. The trachea is also lined with cilia, which sweep fluids and foreign particles out of the airway so that they stay out of the lungs.
- **Carina:** The angle made between the two primary bronchi when they diverge at the tracheal bifurcation; it is richly innervated with sensory nerve endings to respond to the arrival of any aspirated material by initiating a cough reflex; it may be visualised as a ridge within the bronchial tree when using a bronchoscope.



- **Bronchi:** At its bottom end, the trachea divides into left and right air tubes called bronchi, which connect to the lungs. Within the lungs, the bronchi branch into smaller bronchi and even smaller tubes called bronchioles.



- **Lungs:** The functional units of respiration and are key to survival (each lung weighing approximately 1.1 kg). The structure of the lung is well suited for efficient exchange of respiratory gases.
- **Alveoli:** Bronchioles end in tiny air sacs called alveoli, where the exchange of oxygen and carbon dioxide actually takes place.
- Each person has hundreds of millions of alveoli in their lungs.
- The alveoli (singular: alveolus) are tiny hollow air sacs that comprise the basic unit of respiration.
- Alveoli are found within the lung parenchyma and are found at the terminal ends of the respiratory tree, clustered around alveolar sacs and alveolar ducts.
- Each alveolus is approximately 0.2 mm in diameter.
- There are around 300 million to 1 billion alveoli in the human lungs, covering an area of 70 square metres.





The tracheobronchial tree is a branching structure of tubes of an ever-decreasing diameter that start at the larynx and end in the alveoli. It can broadly be divided into conduction and respiratory zones.

1. **Conduction zone**

- Gas is warmed and humidified as it is conducted from the oropharynx to the functional portion of the lung where gas exchange occurs.
- The conduction zone is composed of the trachea, bronchi, bronchioles and terminal bronchioles.
- Their function is to optimise gas delivery to the functional portion of the lung.
- Their walls contain cilia to remove particulates from the inspired gas and cartilage to ensure that they do not collapse in expiration.

2. **Respiratory zone**

- The respiratory zone is an extension of the tracheobronchial tree at the level of the terminal bronchioles.
- It is composed of respiratory bronchioles, alveolar ducts and alveoli, and is the location of gas transfer within the lung.



Cellular respiration

Glucose (blood sugar) is the body's main energy source. Cellular respiration occurs in every body cell when oxygen reacts with glucose to free its energy in chemical form.

The end products are carbon dioxide and water, which is known as metabolic water and amounts to about 300ml daily throughout the body. The whole process is called aerobic (oxygen-requiring) cellular, or internal, respiration

