

Respiratory System ⇒ Meaning → Respiration is the process of obtaining and using oxygen, while eliminating carbon dioxide. The system in which human beings inhale oxygen and exhale carbon dioxide is known as Human Respiratory System. The human respiratory system is composed of various organs, which play a vital role in the process of respiration.

(1) Pathway of Air into the body ⇒

1. Nose → The nose is a special organ to detect odours. It has a significant role in respiration. It consists of two parts:
 - (a) External feature → Nose is composed of a triangulate framework of the bone and cartilage covered by skin. In the inner side of the nose, there are two oval-shaped opening called nostrils.
 - (b) Internal or Nasal Cavities → There are two nasal cavities or nasal passage inside the nose. Air enters in the nasal passage.
2. Pharynx → The pharynx is a funnel-shaped tube that connects our nasal and oral cavities to the larynx.
3. Larynx → After pharynx, air passes ~~through~~ through larynx or voice box. It is composed mainly of cartilage. It consists of two pairs of membranes. Air causes the vocal cords to vibrate, thus producing sound.
4. Trachea → After larynx, air passes into trachea that is also named as wind pipe. The trachea is a tube with cylindrical shape. It lies in front of oesophagus and extends from the larynx. The wall of trachea are made of hyaline cartilage.
5. Bronchi → There are two bronchi that branch off from the trachea. These structures are referred to as the right and left primary bronchi. The primary bronchi branch off

into bronchial tree, where air passes through the secondary bronchi which enters the lobes within the lungs.

3. Bronchioles → Bronchioles are the finest conducting pathways within the respiratory system. These bronchioles are the last pathway for air before it reaches the alveoli, where it is combined with blood.

4. Lungs → There are two lungs in human body. Lungs are the vital organs for respiration. These are cone-shaped organs, with the apex above. The base of the lungs lies resting on the floor of the thoracic cavity, on the diaphragm. The lungs are divided into lobes by fissures. The left lung has two lobes and right lung has three lobes.

subdivides its walls become thinner and finally end in the alveoli. It looks like a bunch of grapes. The exchange of oxygen and carbon dioxide between blood and air occurs through the walls of alveoli. Approximately, there are 300 million alveoli in each lung.

8. **Diaphragm.** The diaphragm is the primary muscle used in the process of inspiration. It is a dome shaped sheet of muscle that is inserted into the lower ribs. It performs an important function in respiration. As the diaphragm contracts, the volume of the thoracic cavity increases and air is drawn into the lungs.

9. **Alveoli.** The alveoli are the areas where oxygen is transferred into the blood in exchange of carbon dioxide. It means that gas exchange takes place in alveoli. The air passes through the alveolar ducts into alveolar sac where it is met with capillary networks. Air is diffused into the blood through various chemical reactions.

(II) MECHANICS OF BREATHING

External Respiration: The process of external respiration consists of two phases: inspiration and expiration. The description of these phases is given below:

1. **Inspiration.** It is a process by which air enters into the lungs. In this process intercostal muscles and diaphragm play a very significant role. The diaphragm and intercostal muscles contract. The diaphragm moves downwards. The intercostal muscles make the rib cage move upwards. Both the actions increase the volume of thoracic cavity and also reduce atmospheric pressure allowing the air to rush into the airways and then to the alveoli.

2. **Expiration.** It is a process by which carbon dioxide is expelled out from the lungs. In this process, the diaphragm and intercostal muscles relax. Hence, the diaphragm and intercostal muscles assume the previous positions. It means that the volume within the thoracic cavity decreases. This decrease of volume causes an increase in pressure above atmospheric pressure which forces the air out up through airway.

In the process of inspiration, generally 79% nitrogen, 20% oxygen and 0.04% carbon dioxide and water vapour are inhaled while in the process of expiration 79% nitrogen, 16% oxygen and carbon dioxide and water vapours are exhaled.

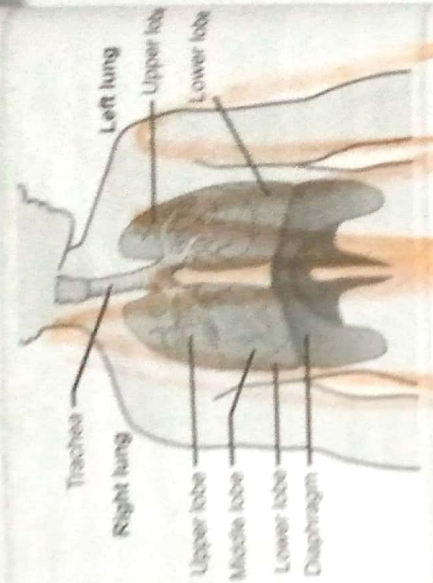


Fig. 3.4: Lungs and Diaphragm

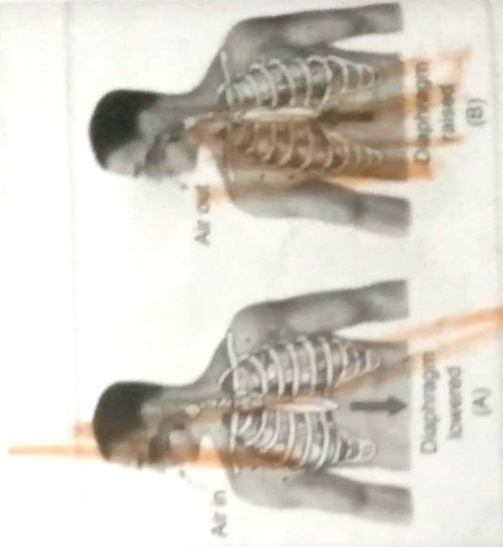


Fig. 3.5: (A) Actions during Inspiration
(B) Actions during Expiration