

RESPIRATORY SYSTEM

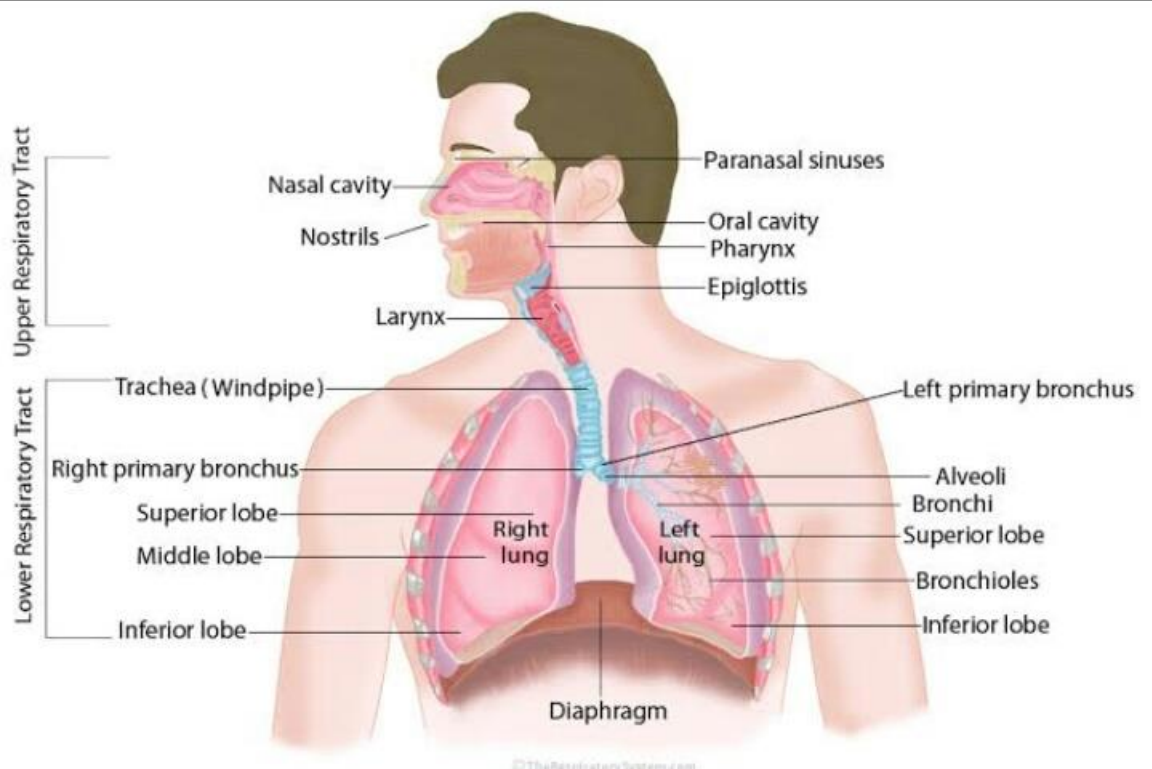
Respiration is a procedure in which atmospheric air is exchanged with carbon dioxide at the respiratory surface (Lungs). During this process food is oxidized to produce carbon dioxide, water and energy.



This process involves:-

- Intake of environment oxygen
- Oxidation of food
- Elimination of carbon dioxide and water
- Conservation of energy in the form of ATP.

NOTE: Exchange of gases between the blood and the lungs is called external respiration and that between the blood and the cells is called internal respiration.



FUNCTION OF RESPIRATION

1. Pulmonary ventilation means in which the inflow and outflow of air occurs between the atmosphere and lung alveoli.
2. Diffusion of oxygen and carbon dioxide among the alveoli and the blood.
3. Transport of oxygen and carbon dioxide in the blood and the body fluid to and from the body tissue cells.
4. Regulation of ventilation.

ANATOMY OF RESPIRATION: - It comprises respiratory tract and respiratory organs.

RESPIRATORY TRACT

It consists of pair of external nostrils, nasal cavity, internal nares, nasopharynx (throat), larynx (voice box), trachea (wind pipe), bronchi, bronchioles, alveolar duct and alveolar sac.

- External nares- There are a pair of slit at the lower end of nose which opens into nasal cavity.
- The anterior structure of the external nose has three functions.
 - a) Warming, moistening and filtering of the incoming air
 - b) Detecting olfactory stimuli
 - c) Modifying speech vibration as they pass through the large, hollow, resonating chamber
- Nasal cavity – It is the large cavity lined by mucous secreting epithelium and is divided into two nasal chambers by nasal septum.
- Anteriorly, the nasal cavity merge with the external nose, and posteriorly it communicates with the pharynx through two openings called the internal nares. In nasal chamber air is cleaned, warmed and filtered.

PHARYNX

The pharynx is 12-14 cm long tube that lies behind the nasal and mouth cavities and larynx. Thus, it belongs to both respiratory and digestive systems. Air flows into the anteriorly placed larynx and food goes into the posteriorly oesophagus. During swallowing, the epiglottis covers the entrance to the larynx.

Nasopharynx - It is the upper narrow part pharynx in which the internal nares open.

Oropharynx – It is the oral part of pharynx.

Laryngopharynx – It is laryngeal part of pharynx.

LARYNX (VOICE BOX)

It is a small box like structure situated in the neck, anterior to oesophagus and is supported by these cartilages:

- a) Thyroid cartilage (Adam's apple)
- b) Cricoid cartilage
- c) Arytenoid cartilage

Working of larynx:

1. When sound is not produced vocal cords remains at an acute angle inside the larynx but for the production of sound vocal cords are brought parallel and closer to each other with help of laryngeal muscles.

2. Now the current of air is passed through them under pressure from lungs which sets the vocal cords into vibration and sound is produced is converted into speech with the help of buccal cavity, lips and cheeks.

TRACHEA (WIND PIPE)

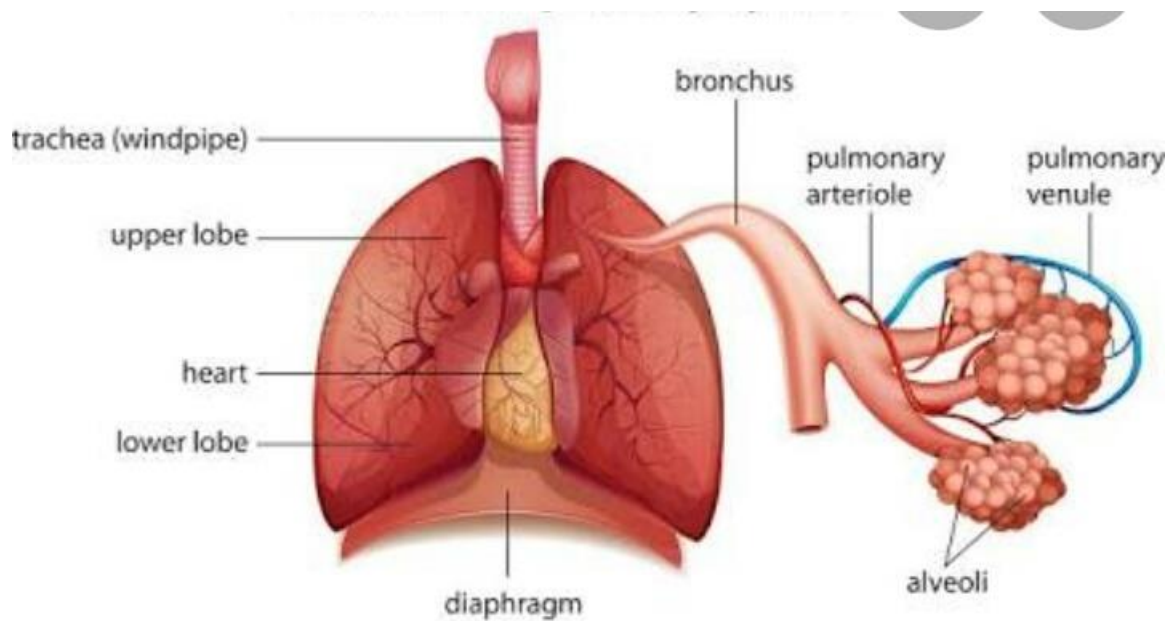
It is a long, thin walled (12cm) tube running through the neck is supported by C- shaped cartilaginous ring prevent it from collapsing. It lies in front of oesophagus and descends vertically from sixth cervical vertebra between the two lungs. In the thoracic region, it divides into pair of pulmonary bronchi. The whole respiratory passage i.e. branching network of trachea constitutes trachea-bronchial tree.

BRONCHI & BRONCHIOLES

- ✓ Primary bronchi enter into right and left lungs where they further divided into secondary bronchi, tertiary bronchi and bronchioles.
- ✓ Each bronchiole is about 1mm in diameter and is divided into number of alveolar ducts each about 0.2mm in diameter.
- ✓ Each alveolar duct enters into alveolar sac.
- ✓ The total surface area of alveolar sac in man is approx. 100mm^2

RESPIRATORY ORGAN (LUNGS)

1. Pair of conical lungs is situated in a tight thoracic cavity.
2. Each lung is soft, spongy, elastic and pinkish in colour.
3. Left lung is enclosed into 2 membrane called pleura.
4. Inner membrane is called pleura and outer is called parietal pleura space between these two membranes is called pleural cavity which is filled by pleural fluid.
5. It lubricates and prevents the lungs against shock.
6. The total number alveolar sac is about 300-400 million through which exchange of respiratory gases occur.



Mechanism of Breathing

- i. Lungs do not have their own well developed musculature. Therefore breathing is brought about by the change in the size of chest cavity in which the lungs are placed.
- ii. Mechanism of breathing involves alternate expansion and contraction of the chest cavity which lead to intake of oxygen called inspiration and outgo of carbon dioxide is called expiration.

Following structures take part in breathing mechanism

- ✓ Two sets of intercostal muscles i.e. external and internal intercostal.
- ✓ Abdominal muscles
- ✓ Muscular diaphragm present between the chest and abdominal muscles.

INSPIRATION: - During this process the external intercostal muscles contract, internal intercostal muscles and abdominal muscles relax and diaphragm become flattened, which increase the volume of thoracic cavity and lowering the pressure of air into lungs. Now the atmospheric air reaches into the lungs through respiratory tract.

EXPIRATION: - During this process the internal intercostal and abdominal muscles contract and external intercostal muscles relax. The same time diaphragm become shaped and moves upward. This decreases the volume of chest cavity and increases the pressure inside the lungs. So, the foul air is forced out through the respiratory tract. Normal person breathe 16-20 time per minute.

Regulation of respiration: - Control of respiration is normally involuntary. Voluntary control is exerted during actions such as speaking and singing but is over ridden if blood CO_2 rises (Hypercapnia).

Respiratory centre: - This is comprised of group of nerve cell that control the rate of depth of respiration. They are situated in the brain stem. The interrelationship between these groups of cell is complex.

In the medulla there are inspiratory neuron and expiratory neurons. Neurons in the pneumotaxic and apneustic centre situated in the Pons influences the inspiratory and expiratory neurons of the medulla. Motor impulses leave-taking the respiratory centre permit in the phrenic and intercostal nerve to the diaphragm and intercostal muscles.

Chemoreceptor: - These are receptors that respond to change in the partial pressure of oxygen and carbon dioxide in the blood and cerebrospinal fluid.

Central chemoreceptor- These are situated on the surface of the medulla oblongata and are submerged in cerebrospinal fluid.

Peripheral chemoreceptor – These are situated in the arch of the aorta and in the carotid bodies. They are more sensitive to small rise in arterial PCO_2 .

ARTIFICIAL RESPIRATION: - It is the forcing of air into the lungs of someone who has stopped breathing, usually by blowing through their mouth or nose, in order to keep the victim alive and help him/her to start breathing again.

Various methods of artificial respiration-

- ❖ Stretcher method
- ❖ Reflex stimulants
- ❖ Arm-lift back pressure method
- ❖ Mouth to mouth method
- ❖ Anal stretch