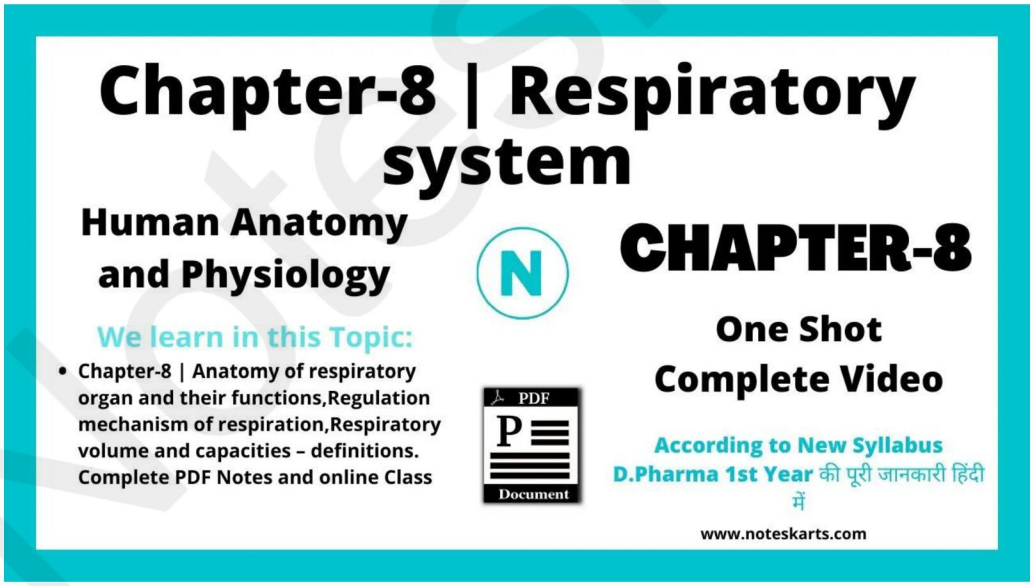
Chapter-8
Human Anatomy & Physiology

D.Pharma 1st Year Notes

Chapter- 8

Respiratory system

- **Anatomy of respiratory organs and their functions.**
- **Regulation Mechanism of respiration.**
- **Respiratory volumes and capacities – definitions**



Video Dekhne Ke Liye QR scan Kare

Respiratory system

- The respiratory system is a biological system consisting of specific organs and structures used for gas exchange in animals and plants.
- The respiratory system comprises the lungs to regulate body pH, the vocal cords to produce sound, and the olfactory bulbs to sense scent.
- Respiration include the ventilation of lungs for inward and outward movement of air alveolar air. Excretion of water vapour.
- Supplying air to the larynx for voice production.

Anatomy of respiratory organs and their functions.

Parts of respiratory system

The human respiratory system consists of following organs-

1. **Nose**
2. **Pharynx (throat)**
3. **Larynx (voice box)**
4. **Trachea(windpipe)**
5. **Bronchi and bronchioles**
6. **Lungs**
7. **Alveoli**

1. Nose

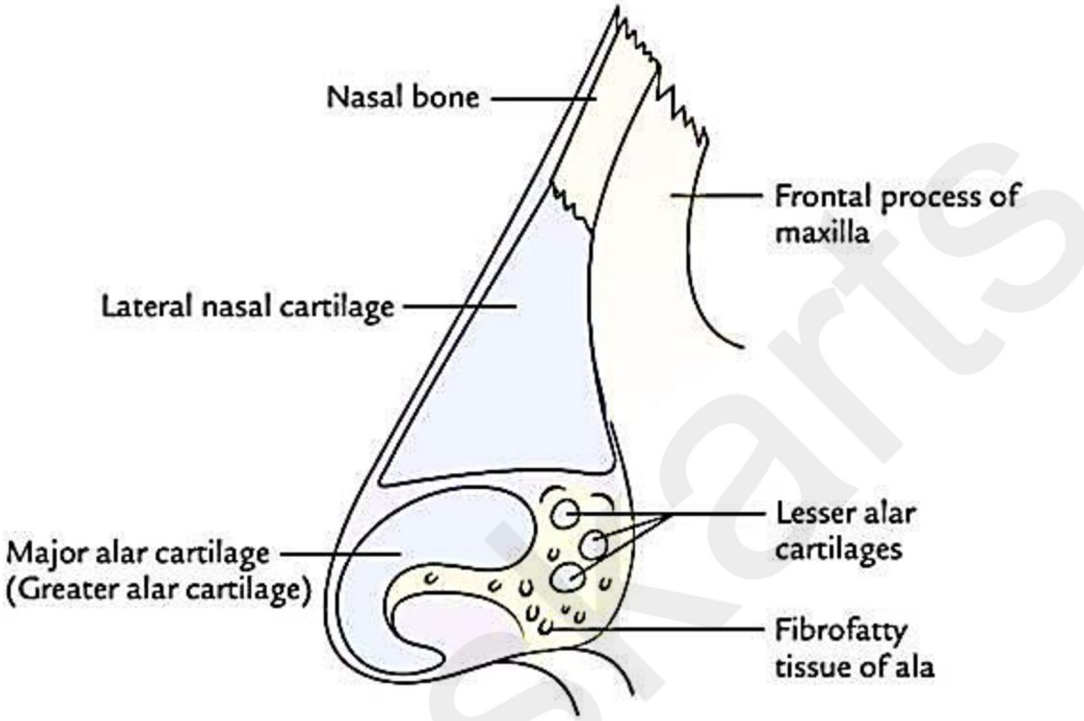
- Nose is present between the forehead and the upper limp, which receive the inhaled air and forms a passage for the air to reach the nasal cavity or nasal chamber.
- Nose performs the process of worming, moistening and filtering of the inhaled air.

Structure-

- The nose is divided into an external (the nose) and an internal (nasal activity)
- Nose is the bony and a cartilaginous structure.
- Its bony part is made up of the frontal, nasal and maxillae bone.

- Nasal cavity is a large irregular shaped cavity divided by septum.
- At the base of nose, two opening separated by nasal septum cartilage.

Diagram:



Function -

- Respiration is the major pathway for the inhaled air is middle meatus this produce nasal cycle.
- Air conditioning
- Air at - 5°to 55° temperature reach the nasopharynx at 31°-37° temp.
- The turbinates make the inhaled air water saturated so that the lungs receive 100 % humid air

Defence-

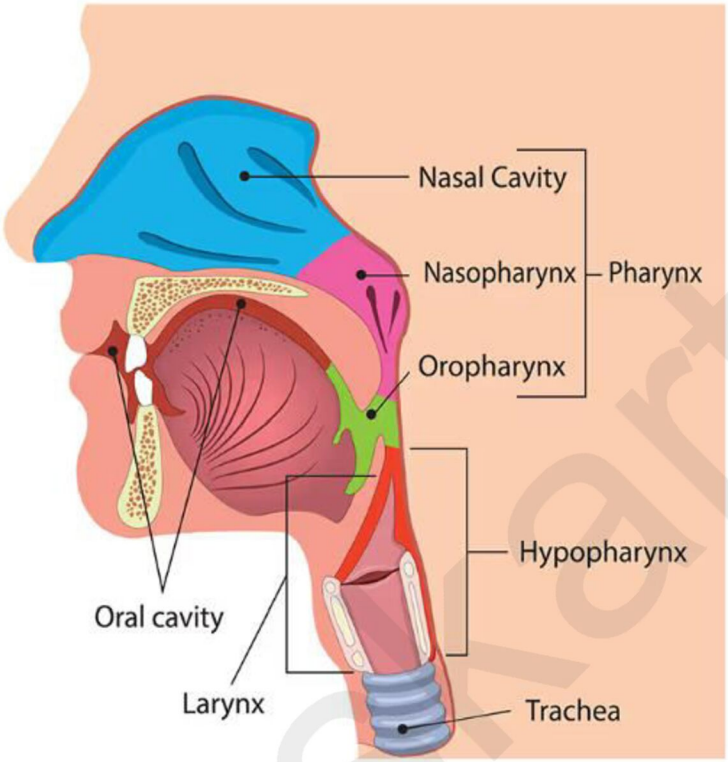
- The mucociliary system hold back 95% of the air particles (including) bacteria and viruses and convey them to the nasopharynx.

2. **Pharynx**

- Pharynx is a funnel shaped tube extending from the internal nares to the posterior part of oesophagus and anterior part of larynx.

- It is made up with skeleton muscles

Structure –



It can be divided into three parts

1. **Nasopharynx -**
   - It is the part of pharynx lies immediately posterior to the nasal cavity.
2. **Oropharynx -**
   - This is part of pharynx lies immediately posterior to the oral cavity.
3. **Hypopharynx or laryngopharynx -**
   - This part of pharynx lies just inferior to the oropharynx and superior to the oropharynx.

Function -

- It have the respiratory or digestive both function so it provide passageway for the air and food.
- The epithelium of the oral and pharyngeal part is supplied with olfactory nerve ending for sensation of taste.

- The tonsils (part of lymphatic system from a ring where the oral cavity joins the pharynx and provides protection against foreign attacks of antigens.

3. Larynx

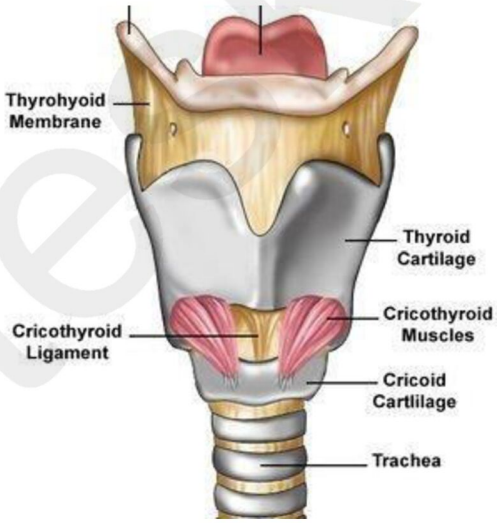
- It is present as a triangular chamber in the front upper part of neck.
- A prominent elevation called the adam's apple.

Structure

- Larynx is present in the anterior neck at the 3rd to 6th cervical vertebral level. It joins the hypopharynx with trachea.
- It skeleton is made up of 3 single (thyroid , cricoid and epiglottis) and 3 paired (arytenoid, corniculate, and cuneiform) cartilages.

Epiglottis:- It is the leaf like cartilage which covers the larynx.

Diagram



Function

Sound production -

- Sound possesses pitch , volume and resonance (or tone)
- This pathway is present between larynx and trachea.
- The air inhaled is humidified filtered and warmed as it passes through the larynx.

4. Trachea-

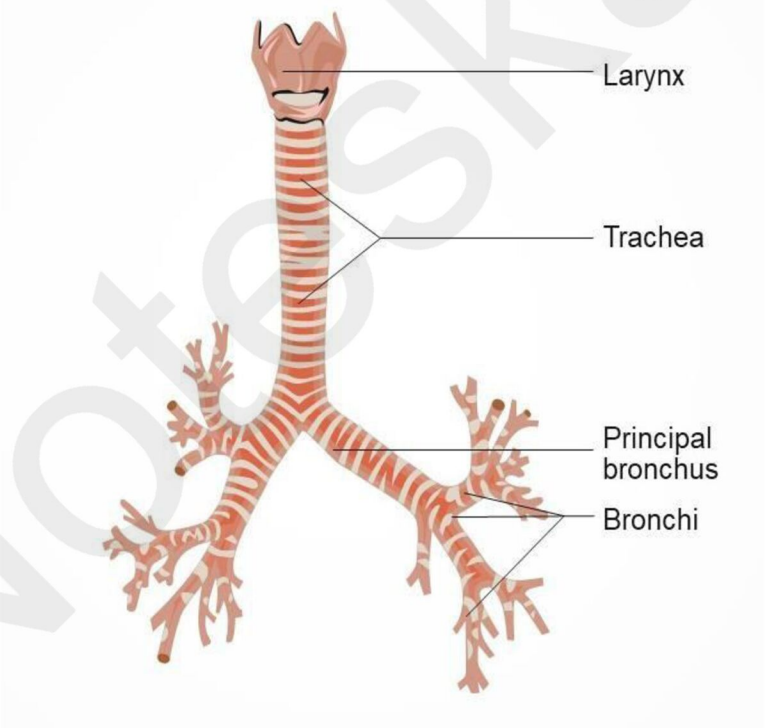
- Trachea is known as windpipe.
- It is 10-11 cm long continuous pathway from the larynx.
- It lies in the median plane in front of the esophagus.

Structure

- Trachea is composed of 16-20 C -shaped structure
- The trachea are covered by following three tissue layer-

1. **Outer layer-** Made up of fibrous and elastic tissue.
2. **Middle layer -** Made up of cartilage and bands.
3. **Inner layer-** Made up of ciliated columnar epithelium containing goblet cells

Diagram



Function

- The cartilage and elastic tissue of trachea are arranged such that they prevent kinking and obstruction of the airway.
- It act as a mucociliary.
- It warms, humidified and filter the inhaled air.

5. Bronchi and bronchioles

- Bronchi (Singular bronchus are airway passage in the respiratory tract.
- They carry the inhaled air into lungs.

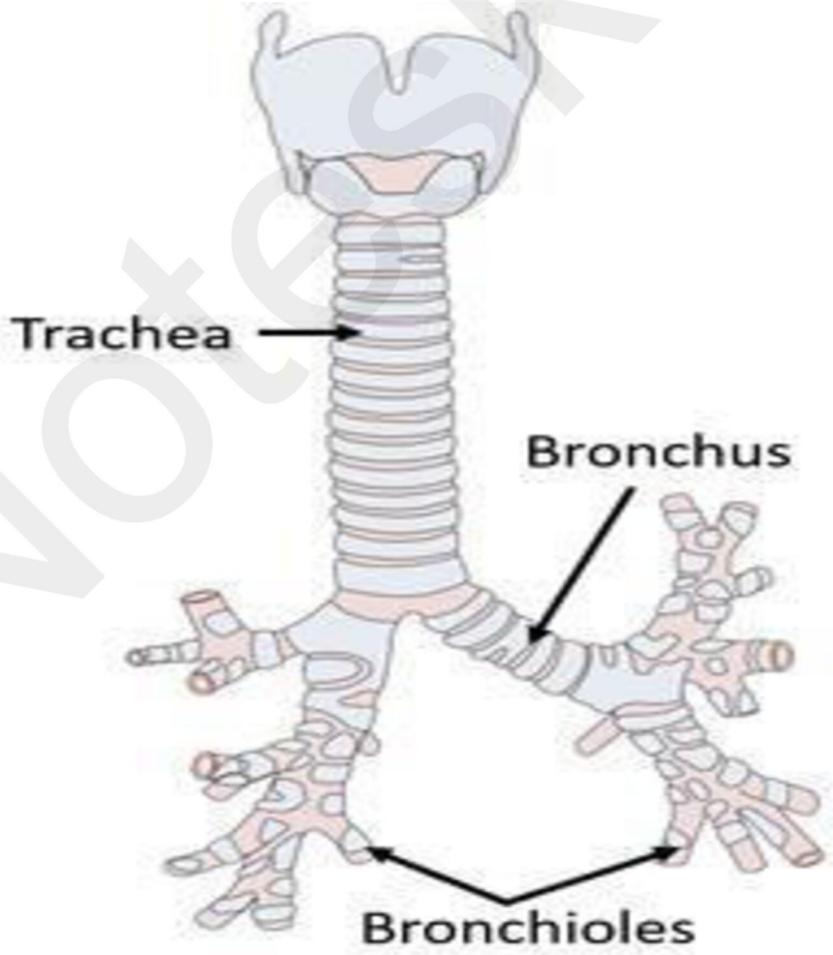
Structure

- Bronchi are made up of complete cartilage rings the right left bronchus are different from each other as the format is shatter and wider.

Function

- They provide a passageway for the air.
- They warms and humidify particulate matter
- They generate cough reflex.

Diagram:



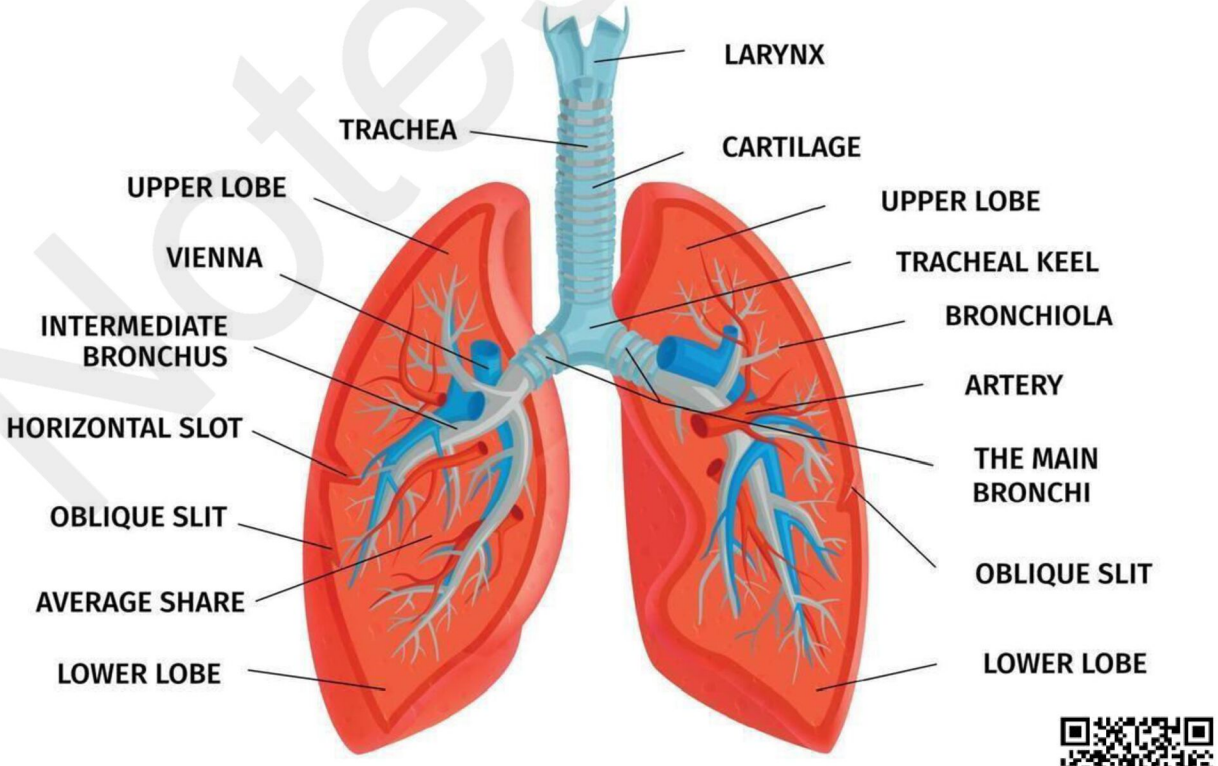
6. Lungs

- Lungs are present in the thoracic cavity as two cone -shaped lobes separated by the heart and other structure of mediastinum.
- Lungs extending from the diaphragm reach up to slightly above the clavicles .
- In the medial surface of left lung , cardiac notch ,is present , which is a concave area holding the heart.

Structure

It have the following parts -

1. **Apex-** Lungs have a round apex which extend up to the root of neck .
2. **Base-** Lungs have a concave and semilunar base which is associated with the thoracic surface of the diaghromy.
3. **costal surface –** Lungs have a concave costal surface which is associated with the costal cartilages , ribs and intercostal muscles.
4. **Medial surface -** Lungs have a concave medial surface which has a somewhat triangular shaped hilium.



Functions

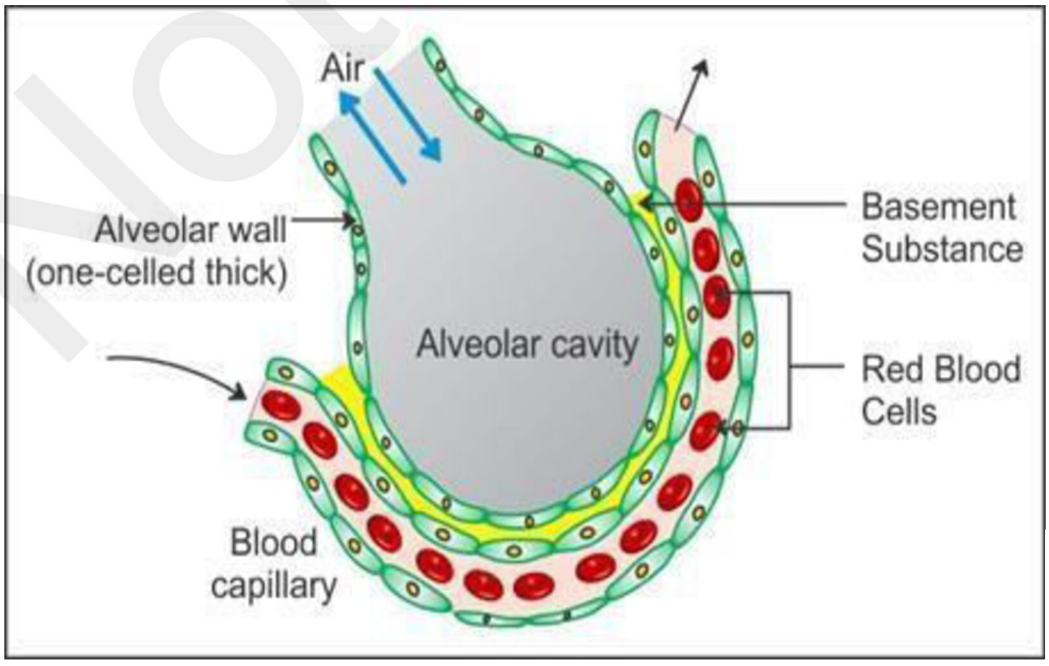
- They alter the blood pH by altering the partial pressure of carbon dioxide.
- They filter out small blood clots formed in the veins.
- They filter out gad micro-bubble formed in the venous blood stream
- They alter the blood concentration of some biological substance and drugs.
- They form a soft, shock-absorbent protective layer for the heart.
- The bronchial secretion contains immunoglobulin-A, which provides protection against respiratory infection.

7. Aleoli

- The final termination of respiratory bronchioles are the alveolar ducts which is turn from alveoli surrounded by capillaries .
- These are the hollow cavity found in the mammalian lunga .
- Pulmonary alveoli are the spherical projection of respiratory bronchioles.

Structure

- A human lung has around 300 million alveoli each of them covered with a thin capillary occupying 70% of its area some alveolar walls have pores between the alveoli , these pores are called kohn.



Function

- They functionalize external respiration means respiration occurs between alveoli or blood by diffusion.
- It works for projection against microbes.

Regulation Mechanism or respiration

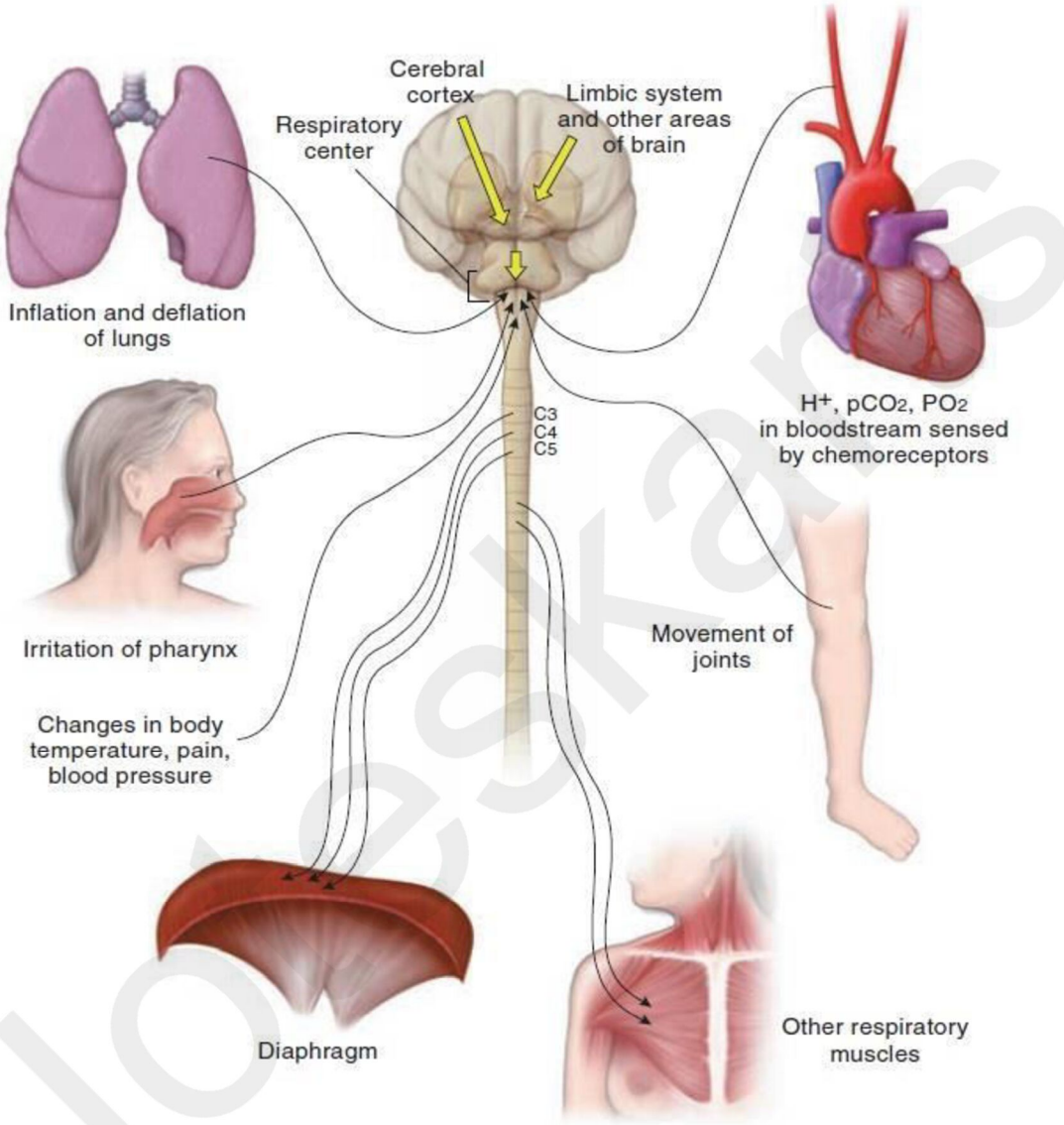
- The process by which the respiratory organs allow the air to move in and out of the lungs is termed as breathing.
- It is a simple give and take process , since oxygen -rich air is taken in form the atmosphere and in exchange carbon dioxide -rich air is given out to the atmosphere to be utilize by the plants for photosynthesis breathing process continues throughout the life of an organism.
- Breathing rate is the number of times an individual breathes in a minutes.
  - **For example, breathing rate increases on walking fast, running, ir after a heavy exercise , and decrease when in a relaxed state.**

The two phases of breathing process are discussed here.

1. **Inhalation or inspiration-** The series of event includes
   - On contraction of the diaphragm and external intercostal, the thoracic cavity increases in size.
   - The lungs also attain the new increases size of the thoracic cavity as they are tightly adhered to the thorax walls
   - As a result the gas pressure with in the lungs decreases and a partial vaccume is produced to suck air into lungs.
   - Air moves into to the lungs till the intrapulmonary and the atmospheric pressure attains equilibrium.
2. **Expiration or Exhalation -This includes-**
   - On relaxation the inspiratory muscles gains back their resting length, the rib cage descends, and the lungs recoil.

- Thus, the gases form with in flow out to equalize the pressure both inside and outside the lungs.

Diagram



The intrapleural pressure is always negative ,and prevent the lungs from collapsing.

Respiratory volumes and capacities –

Respiratory volumes:

- Lung volumes are also known as respiratory volumes.
- It refers to the volume of gas in the lungs at a given time during the respiratory cycle.

- Lung capacities are derived from a summation of different lung volumes.
- The average total lung capacity of an adult human male is about 6 litres of air.
- Lung volumes measurement is an integral part of pulmonary function test.

Respiratory capacities:

- Respiratory capacity (pulmonary capacity) is the sum of two or more volumes.
- Factors such as age, sex, body build, and physical conditioning have an influence on lung volumes and capacities.
- Lungs usually reach their maximum capacity in early adulthood and decline with age after that.

Or

Respiratory capacities are measures of the volume of air involved in different phases of the respiratory cycle. They provide important information about lung function and can help in diagnosing respiratory conditions. The key respiratory capacities include:

1. **Vital Capacity (VC)**: This is the maximum amount of air a person can exhale after a maximum inhalation. It represents the total volume of air that can be moved in and out of the lungs and is a sum of the tidal volume, inspiratory reserve volume, and expiratory reserve volume. VC = TV + IRV + ERV.
2. **Total Lung Capacity (TLC)**: This is the total volume of air the lungs can hold, including all the air in the lungs after a maximal inhalation. It is the sum of the vital capacity and the residual volume. TLC = VC + RV.
3. **Inspiratory Capacity (IC)**: This is the maximum amount of air that can be inhaled after a normal expiration. It includes the tidal volume and inspiratory reserve volume. IC = TV + IRV.
4. **Functional Residual Capacity (FRC)**: This is the volume of air remaining in the lungs after a normal exhalation. It includes the expiratory reserve volume and residual volume. FRC = ERV + RV.

Human Anatomy and Physiology Complete Chapter Class

Subscribe Our YouTube Channel "Noteskarts" and Watch Complete Videos and Exit Exam Related Updates

Share With Your Friends