Long Answer Type Question

Q.1. Describe in brief the respiratory organs of man. [V. Imp.]

Ans. Human respiratory system : The following are the main respiratory organs:

(i) Nostrils : These are the paired openings that opens into two nasal chambers. They are lined up with ciliated epithelium and mucous cells. These cells prevent the entrance of dust into the lungs and help in warming and moistening the air. The nasal chamber opens into the pharynx.

(ii) Larynx: It is situated at the anterior part of trachea and communicates with the pharynx. The glottis is protected by a stiff cartilage called epiglottis. The larynx contains pairs of vocal cords which sets into vibrations when the air enters into it and produces the sound.

(iii) Trachea: It is a long ringed tube. It is supported by C-shaped elastic cartilaginous rings to prevent its collapsing. It is lined internally with mucous membrane to hold the dust particles, bacteria and other foreign bodies. It also warms the air.

(iv) Bronchi : Inside the thorax, the trachea bifurcates into two bronchi and each of which enters into one lung. In each lung, the bronchus undergoes repeated divisions to form the secondary and tertiary bronchi which further sub-divide into bronchioles. These bronchioles further redivide at its ends to form respiratory bronchioles.

(v) Lungs : There are two large bag like spongy structure which are the main respiratory organs. These are enclosed by double pleural membranes. The right lung consists of three lobes and left comprises two lobes. Inside the lungs, the respiratory bronchioles give rise to alveolar ducts, alveolar sac and finally smaller alveoli. Each lung contains millions of alveoli.

Q. 2. Explain the structure of human lungs in detail.

Ans. (i) The lungs are soft, spongy and elastic organs, pinkish in colour.

(ii) The upper most portion of lungs is called the apex and the inferior portion is called the *base*.

(iii) The left lung is smaller than the right lung.

(iv) Each lung is enclosed by two membranes called the $pleura$.

(v) The outer membrane is called parietal pleura and the inner membrane is known as visceral pleura.

(vi) A narrow space between the two pleura is filled with pleural fluid.

(vii) The left lung has two lobes: superior and inferior lobes.

(viii) The right lung has three lobes: superior, middle and inferior lobe.

(ix) The trachea at its lower bifurcates into a pair of primary bronchi which enter the right and left lungs.

(x) As soon as primary branches enters each lung it divides to form secondary bronchi.

(xi) These bronchi also have cartilaginous rings.

(xii) The tertiary bronchi sub-divides into smaller branches, the bronchioles.

(xiii) Each terminal bronchioles give rise to a number of very thin, irregular walled and vascularised bag like structures called alveoli.

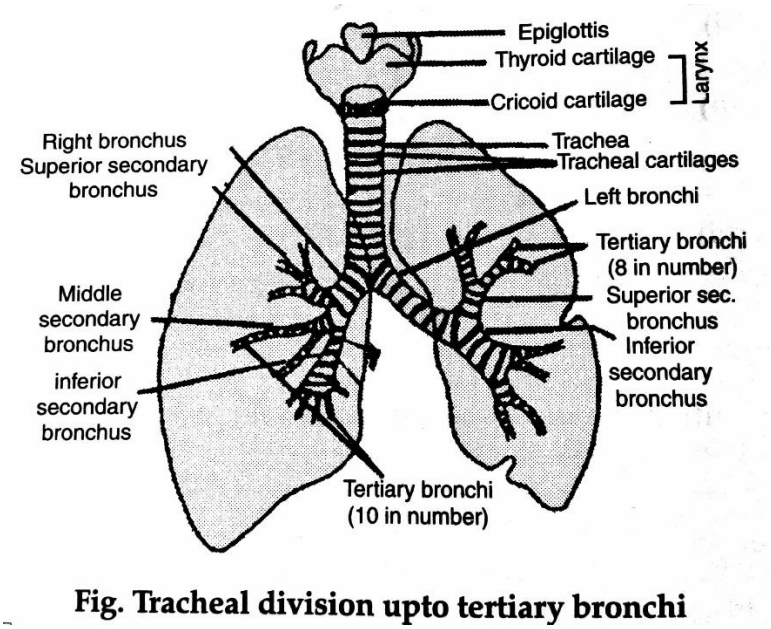

Fig. Tracheal division upto tertiary bronchi

Fig. Tracheal division upto tertiary bronchi

Q. 3. Why is it not healthy to breath in a closed room in winters where a large number of persons are sitting near an angithi ?

Ans. In a closed room there is no provision of fresh air coming into the room. The oxygen already present in the air of that room shall be gradually consumed. Moreover if more number of people are sitting in that room the percentage of oxygen will go on decreasing and the percentage of carbon dioxide will go on increasing by continuous use of oxygen during respiration. If in such a room there is angithi also then it is positively harmful for the persons sitting in the room. It is because burning of coal or wood in the angithi would consume oxygen very rapidly. Also it produce poisonous gases like carbon monoxide in addition to carbon dioxide.

Q. 4. Give a detail account on respiratory capacities.

Ans. The quantities of air the lungs can receive, hold or expel under different conditions are called pulmonary volumes. Many pulmonary volumes are collectively known as respiratory capacities.

(i) Inspiratory Capacity (IC): It is the total volume of air that can be inhaled after a normal expiration. It includes tidal volume plus the inspiratory reserve volume. (IC = TV + IRV). It is normal about 3000 to 3500 ml of air.

(ii) Functional Residual Capacity (FRC) : When a person breathes normally the amount which remains in the lung after normal expiration is called functional residual capacity. It is

the sum total of residual volume and the expiratory reserve volume (FRC RV+ERV). It is about 2500 ml of air.

(iii) Vital Capacity (VC) : It is the amount of air which one can inhale and exhale after a forced expiration and after a forced inspiration respectively. It varies from 3.5-4.5 litres in a normal adult person. It is the sum total of TV, IRV and ERV.

(iv) Total Lung Capacity (TLC): It is the total amount of air present in the lungs, and the respiratory passage after a maximum inspiration. It is the sum of the vital capacity and the residual volume. (TLC = VC + RV). It is 5000 to 6000 ml.

Q. 5. Explain why the following things happen:

(i) The more oxygen is released from oxyhaemoglobin in a more active tissue than in a less active one.

(ii) Oxygenation of blood promotes the release of carbon dioxide from the blood in the lungs.

(iii) Oxygen leaves the blood from tissue capillaries, out carbon dioxide enters the blood in tissue capillaries.

(iv) Erythrocytes can carry out anaerobic metabolism only.

(v) Gaseous exchanges continue in the lungs. without interruption even during expiration.

Ans. (i) The more oxygen is released from oxyhaemoglobin in a more active tissue because its partial oxygen pressure is lower than the least active tissue. The lower pO_2 in the active tissue causes the dissociation of oxyhaemoglobin to release sufficient oxygen required by the tissues.

(ii) The CO_2 from the tissue is carried in the blood in three different forms; bicarbonate in plasma and erythrocytes, carbamino-haemoglobin in erythrocytes and small amounts of dissolved carbon dioxide in plasma. On reaching the lungs blood is oxygenated. It donates H^+ which joins bicarbonate (HCOs) to form carbonic acid. This carbonic acid cleaves into $H_2O$and CO_2 by carbonic anhydrase. In this way the CO_2 is released from the carbaminohaemoglobin. The oxygen affinity of haemoglobin also gets enhanced with the fall in the blood pCO_2 resulting from the elimination of CO_2 from the blood in the lungs.

(iii) The blood in the tissue capillaries contains higher pO_2 than the tissue fluid. So, oxygen is released from oxyhaemoglobin and diffuse from the capillary blood to the tissue fluid and finally to the cells to the tissue fluid to raise its pCO_2 than the capillary blood. This enables carbon dioxide to diffuse from the tissue fluid to the capillary blood.

(iv) Erythrocytes lack mitochondria and respiratory enzymes to perform the process of aerobic respiration. Therefore, they undergo anaerobic respiration to carry out anaerobic metabolism only.

(v) Gaseous exchange continues in the lungs continuously because some air remains inside the lungs even after deepest exhalation. This air is called as residual volume which never get drived out and this is sufficient to proceed gaseous exchange without any interruption.

Q. 6. What is a respiratory centre ? What is its use in the process of respiration ?

Ans. Respiration is controlled by a respiratory centre located in the floor of the medulla oblongata of the brain. The centre is bilateral and its two halves are connected together by commissural neurons. The sides of this centre are connected with motor respiratory neurons. The nerve cells of the centre are connected with the breathing apparatus forming a reflex arc. These nerve cells are sensitive to chemical composition of blood. Half of the respiratory centre is an inspiratory centre and the other half is an expiratory centre. These two centres control the entire breathing in man with his knowledge about it. Dorsal respiratory group, ventral respiratory group and pneumotaxic groups act as respiratory centres in the brain.