CBSE TEST PAPER-01

CLASS - XI BIOLOGY

(Breathing and Exchange of gases)

General Instruction:

- All questions are compulsory.
- Question No. 1 to 3 carries one marks each. Question No. 4 to 6 carry two marks each. Question No. 7 and 8 carry three marks each. Question No. 9 carry five marks.

1. Define partial pressure of a gas.

2. Name the other pigments which are present in animals besides haemoglobin.

3. What is the difference between alveolar air and inspired air?

4. Give role of intercostal muscles in respiration.

5. Explain Erythrocytes can carry out anaerobic metabolism only.

6. Describe how our brain gets a continuous supply of oxygen from the atmosphere.

7. What is hypoxia, artificial hypoxia & Anaemic hypoxia?

8. How is respiration regulated?

9. Describe transport mechanism of CO_2

CBSE TEST PAPER-1

CLASS - XI BIOLOGY (Breathing and Exchange of gases)

[ANSWERS]

Ans 01. Pressure contributed by an individual gas in a mixture of gases is called partial pressure of the gas and it is represented as PO_2 for O_2 and PCO_2 for CO_2.

Ans 02. Haemocyanin and haemoerythrin.

Ans 03. Alveolar air – The air present in the alveoli.

Inspired air – The amount of air inspired at a time.

Ans 04. The contraction of the external intercostal muscles & diaphragm increases the volume of the thoracic cavity lowers the pressure in the lungs. To fill up the gap, the fresh air reaches to the lungs resulting in the inspiration.

The relaxation of the inspiratory muscles decreases the volume of the thoracic cavity and subsequently, the pressure in the lungs increase. To equalize this pressure, the air from the lungs rushes out through the respiratory passage to bring about expiration.

Ans 05. Erythrocytes lack mitochondrial and respiratory enzymes to perform the process of aerobic respiration. Therefore, they undergo anaerobic respiration to carry out anaerobic metabolism only.

Ans 06. Passage of air which contains oxygen:

Inhalation of fresh air → trachea → bronchi → lungs → alveoli → diffusion of O_2 into blood (RBC) → formation of oxyhaemoglobin → some in plasma → pulmonary vein → carry it to heart → left auricle → to ventricle → Dorsal aorta → Carotid artery to the brain dissociation of oxyhaemoglobin, O_2 supplied to the tissue, partial pressure of O_2 facilitates diffusion.

Ans 07. Hypoxia – It is a condition of low pO_2 levels in the tissues. It is of four types:

(1) Hypoxic Hypoxia: In this type, the partial pressure of oxygen in the blood going to the tissues is too low to saturate the hemoglobin. Like in cases of Altitude sickness or in cases of cardiopulmonary failures where lungs are unable to transfer oxygen to blood efficiently

(2) Anaemic Hypoxia: In this type, the amount of functional hemoglobin is too small, and hence the capacity of the blood to carry oxygen is too low. Like in cases of Carbon Monoxide Poisoning or Methaemoglobinaemia

(3) Stagnant Hypoxia: In this type, the blood is or may be normal but the flow of blood to the

tissues is reduced or unevenly distributed.

(4) Histotoxic Hypoxia: In this type, the tissue cells are poisoned and are therefore unable to make proper use of oxygen.

Ans 08.

- Human beings have a significant ability to maintain and moderate the respiratory rhythm to suit the demands of the body tissues. This is done by the neural system.
- A specialized center present in the medulla region of the brain called respiratory rhythm center is primarily responsible for this regulation.
- Another center present in the pons region of the brain called pneumotaxic center can moderate the functions of the respiratory rhythm center.The neural signal from this center can reduce the duration of inspiration and thereby alter the respiratory rate.
- A chemosensitive area is situated adjacent to the rhythm center which is highly sensitive to CO_2 and H^+ ions. The increase in these substances can activate this center, which in turn can signal the rhythm center to make necessary adjustments in the respiratory process by which these substances can be eliminated.
- Receptors associated with aortic arch and carotid artery also can recognize changes in CO_2 and H^+ concentration and send necessary signals to the rhythm center for remedial actions.
- The role of oxygen in the regulation of respiratory rhythm is quite insignificant.

Ans 09. Transport of CO_2 in the blood.

(i) In the dissolved form: About 5 – 7 % of carbon – dioxide is transported in dissolved form in the plasma of blood.

(ii) In the form of bicarbonate: Nearly 70% of the carbon dioxide is transported in this form, carbon dioxide enters the erythrocytes, where it reacts with the water to form carbonic acid, (H_2CO_3) this reaction is catalyzed by carbonic anhydrase.

- At the tissue site where the partial pressure of CO_2 is high due to catabolism, CO_2 diffuses into blood (RBCs and plasma) and forms HCO_3^- and H^+.
- At the alveolar site where pCO_2 is low, the reaction proceeds in the opposite direction leading to the formation of CO_2 and H_2O.

- Thus, CO_2 trapped as bicarbonate at the tissue level and transported to the alveoli is released out as CO_2

(iii) In the form of carbaminohaemoglobin: About 23% of carbon – dioxide is transported in this form.