# Important Questions for Class 11

# Biology

# Chapter 17 – Breathing and Exchange of Gases

**1 Mark**

**1. Define partial pressure of a gas.**

**Ans:** Partial pressure of gas is the pressure contributed by an individual gas in a mixture of gases, and it is denoted as PO2 for O2 and PCO2 for O2.

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

**Ans:** Haemocyanin and hemoerythrin.

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

**Ans:** Alveolar air – The air present in the alveoli.

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

**4. Define vital capacity.**

**Ans:** The volume of air exhaled by a maximum strong expiration is referred to as vital capacity.

**5. What is the role of carbonic anhydrase in RBCs?**

**Ans:** In the presence of the enzyme carbonic anhydrase, about 70% of $CO_2$ interacts with water to generate carbonic acid in RBCs.

**6. What is carbamino haemoglobin?**

**Ans:** Carbaminohaemoglobin is formed when $CO_2$ combines with globin reduces haemoglobin.

**7. Name the place where actual exchange of gases takes place in insects.**

**Ans:** Tracheoles.

**8. What is the percentage of $O_2$ in inspired & expired air?**

**Ans:** Inspired air has 21% $O_2$ and expired air has 16% $O_2$ .

**9. What is the utility of chloride shift?**

**Ans:** It preserves electrochemical neutrality and ionic balance.

**10. Name the organ in human respiratory system which produces sound.**

**Ans:** Larynx (Sound box) is the organ in the human respiratory system that produces sound.

**11. How many oxygen molecules can be carried out by one hemoglobin molecule.**

**Ans:** Four molecules of oxygen can be carried by one hemoglobin molecule.

**12. Give the name and function of a fluid filled double membranous layer which surrounds the lungs.**

**Ans:** Fleuron. It decreases friction and maintains the two pleurae together, as well as the lungs inflated.

**13. Which organ of our respiratory system acts as primary site of exchange of gases?**

**Ans:** Alveoli of Lungs acts as primary site of exchange of gases.

**14. Cigarette smoking causes emphysema. Give reason.**

**Ans:** Cigarette smoking harms alveolar walls by keeping alveolar sacs full with air, resulting in a reduction in respiratory surface area.

**15. Name the principle of exchange of gases.**

**Ans:** Diffusion is the principle of gaseous exchange.

**16. What is the role of oxyhaemoglobin after releasing molecular oxygen in the**

**Ans:** To transport CO2, the amino group of reduced haemoglobin mixes with CO2 to create carbaminohemoglobin.

**17. Name the muscles which facilitate breathing.**

**Ans:** External and internal intercostals muscles, situated between ribs.

**18. How is the entry of food pivoted in the respiratory tract?**

**Ans:** During swallowing, the epiglottis, a cartilaginous flap-like structure, covers the glottis and prevents food from entering the respiratory tract..

**19. About 97% of $O_2$ is transported by RBCs in the blood. How does the remaining 3% of $O_2$ transported?**

**Ans:** In simple solution form through plasma.

**Short Answer Questions** **2 Marks**

**1. Give role of intercostals muscles in respiration.**

**Ans:** The external intercostals muscles and diaphragm contract, increasing the volume of the thoracic cavity and lowering the pressure in the lungs. Fresh air reaches the lungs and fills the void, resulting in inspiration.

The volume of the thoracic cavity reduces when the inspiratory muscles relax, and the pressure in the lungs rises as a result. Expiration occurs when air from the lungs rushes out through the respiratory tract to balance the pressure.

**2. Explain Erythrocytes can carry out anaerobic metabolism only.**

**Ans:** To undertake aerobic respiration, erythrocytes lack mitochondria and respiratory enzymes. As a result, they exclusively need aerobic respiration to perform anaerobic metabolism.

**3. Describe how our brain gets a continuous supply of oxygen form the atmosphere.**

**Ans:** Passage of air which contains oxygen:

Inhalation of fresh air → trachea → bronchi → lungs → alveoli → diffusion of O2 into blood (RBC) → formation of oxygemoglobin → some in plasma → pulmonary vein → carry it to heart

→ left auricle → to ventricle → Dorsal aorta → Carotid artery to the brain dissociation of

oxyhaemoglobin, O2 supplied to the tissue, partial pressure of O2 facilitates diffusion.

**4. What is chloride shift? Explain.**

**Ans:** Chloride shift is the movement of chloride ions from blood plasma into RBSs. In the human body, it occurs from plasma to RBCs. Also, It maintains electrochemical neutrality and ionic balance.

**5. Explain briefly the first step is respiration?**

**Ans:** Breathing is the first step of respiration. Inspiration draws atmospheric air into the lungs, whereas expiration pushes alveolar air out. Other phases include the exchange of O2 and CO2 between deoxygenated blood and alveoli, the transport of gases throughout the body by blood, the exchange of O2 and CO2 between oxygenated blood and tissues, and the use of O2 by cells.

**6. Write a note on bronchitis and its prevention.**

**Ans:** It's defined as "bronchial inflammation characterised by hypertrophy, hyperplasia, seromucous glands, and goblet cells lining the bronchi." Coughing with thick greenish-yellow phlegm is one of the symptoms. The increased mucus discharge indicates infection. Pollutants, as well as cigarette smoking, are to blame. Bronchitis Prevention - 1) Avoiding Allergen Exposure.

2) Antibiotic theory and bronchodilator dugs, among other things, are used in treatment.

**7. What is the difference between carbaminohaemoglobin and oxyhaemoglobin.**

**Ans:** The difference between carbaminohaemoglobin and oxyhaemoglobin is as follows :

| Carbaminohaemoglobin | Oxyhaemoglobin |
|---|---|
| It is generated when oxygen reacts with the Fe2+ component of haemoglobin. | It is created when carbon dioxide reacts with the amine radical of haemoglobin. |
| The alveolar surface is where it forms. | It is made up of cells that are found in the tissues. |

**8. What is functional residual capacity?**

**Ans:** The volume of air that remains in the lungs after a person inhales and exhales normally is known as functional residual capacity (FRC). The residual volume as well as the expiratory reserve volume are included which is, FRC = RV + ERV

**9. Describe the transport of O2 and CO2?**

**Ans:** Oxyhaemoglobin transports oxygen. O2 is bound to haemoglobin in the alveoli of the lungs (where PO2 is higher) and dissociates in tissues with high PO2 and H+ concentrations. With the help of the enzyme carbonic anhydrase, approximately 70% of CO2 is transported as bicarbonate (HCO -), while the remaining 20%-25% is carried by haemoglobin as carbaminohamoglobin. When PCO2 levels are high in tissues, it binds to blood, but when PCO2 levels are low and PO2 levels are high in alveoli, it is eliminated from blood.

**10. Name the organs of respiration in the following organisms.**

**a) Flatworms b) Birds c) Frog d) Cockroach**

**Ans:** a) Body surface b) lungs c) skin and lungs d) Network of trachea.

**3 Marks**

**1. What is hypoxia, artificial hypoxia & Anaemic hypoxia?**

**Ans:** Hypoxia is a situation in which there is a lack of oxygen in the tissues. Artificial hypoxia and anaemic hypoxia are the two types.

Artificial hypoxia is caused by a lack of oxygen at elevations above 2400 metres. Mountain sickness is characterised by headaches, dizziness, nausea, vomiting, mental exhaustion, and a lack of breath, among other symptoms.

Anaemic hypoxia is caused by a decrease in blood O2 capacity as a result of low Hb levels or carbon monoxide poisoning.

**2. How is respiration regulated?**

**Ans:** Respiration is controlled by the respiratory centre, which is located in the floor of the medulla oblongata of the brain. The centre is bipolar, with two sides that are joined by commissural neurons. Motor respiratory neuron connects the sides of this

centre. A reflex arc is formed when the center's nerve cells link with the breathing apparatus. The chemical composition of blood affects the secretion of these nerve cells. Inhalatory and expiratory centres make up half of the respiratory centre. It is thought that the inspiratory centre is active during normal breathing and the expiratory centre is active during coughing, sneezing, and laughing. These two centres, without man's knowledge, control all of his respiration. Respiration centres in the brain include the dorsal respiratory group, ventral respiratory group, and pneumoptaxic group. The neumotaxic centre is found in the upper pons, dorsally. It sends signals to the inspiratory region. It regulates the point at which inspiration is turned off.

**3. Differentiate between vital lung capacity and total lung capacity.**

**Ans:** The difference between vital lung capacity and total lung capacity is as follows:

| **Vital Lung Capacity** | **Total Lung Capacity** |
|---|---|
| Sum total of tidal volume, expiratory reserve and inspiratory reserve volume. | Sum total of vital capacity and residual volume. |
| VC = Vt + ERV + IRV | TLC = VC + RV |
| | |

| | |
|---|---|
| Value is 3500-4500ml. | Value is 5000 – 6000ml |
| After inflating the lungs to capacity, this is the maximum amount of air a person may evacuate. | After maximum inspiratory effort, represents the maximum total amount of air that can be present in the lungs. |

**4. Explain the mechanism of breathing in humans.**

**Ans:** In humans, breathing involves inhaling air into the lungs and exhaling air from the lungs into the thoracic cavity. The process is known as inspiration, which is followed by expiry. The lungs are positioned in the thoracic cavity, which is closed. The diaphragm, a muscular wall, separates the thoracic cavity from the abdominal cavity.

The diaphragm is lowered during inspiration due to the contraction of the intercostals muscle. As a result of the increased volume of the thorax, the air pressure in the thoracic cavity falls, lowering the pressure in the lungs, and air rushes in from the outside through the external nares, trachea, and bronchi.

Because the diaphragm and intercoastals muscles relax during expiration, the diaphragm moves higher and the lateral thoracic walls slide inwards. As the volume of the thorax decreases, the pressure inside the thorax and lungs rises, causing some air to be expelled from the lungs and into the atmosphere outside the body.

**5. Define oxygen dissociation curve? Why it has sigmoidal pattern?**

**Ans:** The graph produced by the connection between O2 tension and its absorption by haemoglobin is known as the oxygen dissociation curve (O2 equilibrium curve). Hb is 98 percent saturated at about 100 mm Hg O2 tension (complete formation of

haemoglobin). The saturation of Hb gradually reduces as it declines. Oxyhaemoglobin dissociates and O2 is accessible to the tissues when O2 tension is around 40mm Hg. The O2 binds to Hb on the lung surface and then dissociates in the tissues.

**6. What is the role of carbonic anhydrase? Show by series of reactions how carbonic anhydrase starts the reactions leading to the formation of hemoglobinic acid?**

**Ans:** Carbonic Anhydrate : $CO_2$ reacts with water in presence of carbonic anhydrase in erythrocytes, Carbonic acid ($H2CO_3$) is dissociated into hydrogen ($H^+$) and bicarbonate ($HCO^-$) ions). Oxyhaemoglobin (HbO ) of RBC's is weakly acidic and remain in association with $K^+$ ions as $KHbO_2$. $H^+$ ions combine with haemoglobin. Bricarbonate ions diffuse out into plasma and combine with haemoglobin to from haemoglobinic acid (H. Hb)

**5 Marks**

**1. Describe transport mechanism of CO2.**

**Ans:** 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: Carbonic anhydrase catalyses the reaction in which the leftover carbon dioxide enters the erythrocytes and combines with the water to generate carbonic acid (H2 CO3). Carbonic acid dissociates into hydrogen ions (H+) and bicarbonate almost instantly (HCO -3). After the oxyglobin (KHbO2) dissociates to free the oxygen, these H+ ions mix with haemoglobin to generate haemoglobinic acid (H.Hb). Following a concentration gradient, the bulk of bicarbonate ions (HCO- ) diffuse out of the erythrocytes into the plasma. Chloride ions (Cl-) diffuse from the plasma into the erythrocytes (Chloride shift), maintaining electrical neutrality. Potassium chloride is formed when chloride ions interact with

potassium. Bicarbonate ions mix with sodium in the plasma and are transferred as sodium bicarbonate (NaHCO3). Carbon dioxide is delivered in this form for over 70% of the time.

iii. In the form of carbaminohaemoglobin: The amine radicals (NH +) of haenoglobin combine with the same quantity of CO2 to generate carbaminohaemoglobin (HbCO2) molecule. Approximately 23% of carbon dioxide is transferred in this manner.

**2. Describe in brief the respiratory organs of man.**

**Ans:** The main respiratory organs are as follows:-

1) Nostrils - The paired apertures at the front and posterior ends of the nasal chambers are known as nostrils. They're lined up with mucous cells and ciliated epithelium. These serve to keep dust out of the lungs while also warming and moistening the air. Internally, the nasal chamber opens into the pharynx by the external nostril and posterior internal nostril.

2) Larynx - Located at the front of the trachea, the larynx interacts with the pharynx. A stiff cartilage called the epiglottis protects the glottis. When air enters the larynx, it causes vibrations in the vocal chords, which make sound.

3) Trachea - This is a ringed tube that runs the length of the throat. To keep it from collapsing, it is supported by c-shaped elastic cartilaginou rings. It's lined on the inside with mucous membrane to keep dust, bacteria, and other foreign objects out. It also helps to warm the air.

4) Bronchi - The trachea divides into two branches inside the thorax, each of which leads to one lung. The bronchus divides into several little branches known as bronchioles in each lung. These bronchioles split into respiratory bronchioles at their ends.

5) Lungs — The major respiratory organs consist of two big bag-like spongy structures. These are separated from the rest of the body by two pleural membranes. The lungs are separated into lobes on the outside. The right lung has four lobes,

while the left has two. The respiratory bronchioles give rise to alveolar ducts, alveolar sacs, and finally alveoli inside the lungs. There are millions of alveoli in each lung. Each alveolus has an extremely thin wall. It has porous walls that are densely packed with blood capillaries.

A pair of pulmonary arteries transport blood to the lungs. These deliver blood that is low in oxygen and high in CO2. The lungs' alveoli are where gases are exchanged. The oxygenated blood from alveolar capillaries is called by pair of pulmonary vein to be conveyed to the heart.

**3. Explain how our heart muscles get a continuous supply of atmospheric oxygen.**

**Ans:** The O2 is absorbed into the lungs during inspiration. Alveolar air, which has a PO2 of 100 m Hg, is formed when O2 reacts with the air already present in the alveoli. Because the PO2 of blood in arteries is 40 mmHg, oxygen enters blood vessels differently than it does in alveoli, and oxyhaemoglobin is generated when oxygen loosely interacts with the Fe++ ions of haemoglobin.

The pulmonary vein transports oxygenated blood from the lungs to the left auricle, and the aorta transports blood to the left ventricle.

Coronary artery is the branch that supplies blood to the heart muscles. Because the PO2 in heart muscles is lower than the blood in coronary artery branches, oxyhaemoglobin dissociates and releases O2 to cardiac muscles.