CBSE Class 11 Biology Important Questions

Chapter 17

Breathing and Exchange of Gases

1 Marks Questions

1.Define partial pressure of a gas.

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

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

Ans. Haemocyanin and haemoerythrin.

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. Vital Capacity is the volume of air breathed out by a maximum forceful expiration.

5.What is the role of carbonic anhydrase in RBC's?

Ans. About 70% of CO_2 reacts with water to form carbonic acid in RBCs in the presence of enzyme carbonic anhydrase. $CO_2 + H_2O \rightleftharpoons H_2CO_3$

6.What is carbamino haemoglobin?

Ans. Carbaminohaemoglobin is formed when CO2 combines with globin is reduced

haemoglobin.

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

Ans. Tracheoles.

8.What is the percentage of O2 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 maintains the ionic balance and electrochemical neutrality.

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

Ans. Larynx (Sound box)

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

Ans. Four molecules

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

Ans. Fleuron. It reduces the friction and keeps the two pleura together and the lungs inflated.

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

Ans. Alveoli of Lungs.

14.Cigarette smoking causes emphysema. Give reason.

Ans. Cigarette smoking damages alveolar walls due to alveolar sacs remaining filled with air

leading to decreased respiratory surface fore

15.Name the principle of exchange of gases.

Ans. Diffusion.

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

Ans. Amino group of refuced hoemoglobin combines with CO_2 forming carbaminohaemoglobin to transport CO_2.

17. Name the museles 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. Ans. During swallowing a cartilaginous flap like structure called epiglottis covers the glottis and prevents the entry of food into 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.

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2 Marks Questions

1.Give role of intercoastals muscles in respiration.

Ans. The contraction of the external intercoastals 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, pressure in the lungs increase. To equalize this pressure, the air from the lungs rushes out through the respiratory passage to bring about expiration.

2.Explain Erythrocytes can carry out anaerobic metabolism only.

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

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 O_2 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, O_2 supplied to the tissue, partial pressure of O_2 facilitates diffusion.

4.What is chloride shift? Explain.

Ans. The diffusion of chloride ions from blood plasma into RBS's is known as chloride shift.

a) Occurs from plasma to RBC's in human body.

b) It maintains ionic balance and electrochemical neutrality.

5.Explain briefly the first step is respiration?

Ans. First step in respiration is called breathing. In breathing atmospheric air is taken in by inspiration and alveolar air is released out by expiration. The exchange of O_2 and CO_2 between deoxygenated blood and alveoli, transport of gases throughout body by blood, exchange of O_2 and CO_2 between the oxygenated blood and tissues and utilization of O_2 by the cells are the other steps involved in it.

6.Write a note on bronchitis and its prevention.

Ans. It is "inflammation of the bronchi and is characterized by hypertrophy hyperplasia seromucous glands and goblet cells lining the bronchi"

Symptoms are coughing with thick greenish-yellow sputum. It shows infection, that excessive secretion of mucus. It is caused by pollutants as well as the cigarette smoking. Prevention of Bronchitis –

1) Avoiding exposure to allergens.

2) Treatment involves antibiotic theory & bronchodilator dugs, etc.

7.What is the difference between carbaminohaemoglobin and oxyhaemoglobin.

Ans.

	Oxyhaemoglobin	**Carbominohaemoglobin**
1.	It is formed by the combination of oxygen with the Fe^{2+} part of haemoglobin.	It is formed by the combination of carbon dioxide with the amine radical of haemoglobin.
	It formation occurs on the alveolar	Its formation occurs in the tissues.

2.	surface.	

8.What is functional residual capacity?

Ans. When a person inhales and exhales in a normal way, the volume air that remains in the lungs is known as functional residual capacity (FRC). It includes the residual volume and expiratory reserve volume, i. e, FRC = RV + ERV.

9.Describe the transport of O_2 and CO_2?

Ans. O_2 is transported as oxyhaemoglobin. In the alveoli of lungs (PO_2 is higher), O_2 gets bound to hemoglobin that dissociates at tissues where PO_2 and H^+ concentration are high. Approx 70% CO_2 transported as bicarbonate (HCO_3^-) with the help of the enzyme carbonic anhydrase, 20-25% CO_2 is carried by haemoglobin as carbaminohamoglobin. In tissues PCO_2 is high its gets bound to blood but in alveoli where PCO_2 is low and PO_2 is high, this removed 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

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3 Marks Questions

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

Ans. Hypoxia – It is a condition of oxygen shortage in the tissues. It is 2 kinds – artificial hypoxia and anaemic hypoxia.

Artificial hypoxia – It is the result of shortage of air over 2400m altitudes. The mountain sickness is caused by headache, dizziness, nausea, vomiting, mental fatigue and breathless mess etc.

Anaemic hypoxia – results due to reduced O_2 capacity of blood due to less content of Hb or carbon monoxide poisoning.

2.How is respiration regulated?

Ans. Respiratory centre located in floor of the medulla oblongata of the brain controls respiration. The centre is bilateral and its two halves which are connected together by commissural neurons. The sides of this centre are connected with motor respiratory neuron. The nerve cells of the centre are connected with the breathing apparatus forming a reflex arc. These nerve cells are secretive to chemical composition of blood. Half of the respiratory centre is an inspiratory centre and expiratory centre. It is believed that the inspiratory centre work in normal breathing and expiratory centre during other conditions like coughing, sneezing and laughing. These two centers control the entire breathing in man with his knowing about it. Dorsal respiratory group, ventral respiratory group and pneumoptaxic groups act as respiration centers in the brain.

Neumotaxic centre is located dorsally in upper pons. It transmits signals to inspiratory area. It controls the switch off point of inspiration.

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

Ans.

	Vital Capacity (VC)	**Total lung Capacity. (CT2C)**
1.	Sum total of tidal volume, expiratory reserve and inspiratory reserve volume.	Sum total of vital capacity and residual volume.
2.	VC = Vt + ERV + IRV	TLC = VC + RV
3.	Value is 3500-4500ml.	Value is 5000 – 6000ml
4.	Represents maximum amount of air that a person can expel after filling the lungs to the maximum.	Represents maximum total amount of air which can be present in lungs after maximum inspiratory effort.

4.Explain the mechanism of breathing in humans.

Ans. The mechanism of breathing in human involves breathing in of air in the lungs and breathing out of air from lungs thoracic cavity. The form is called inspiration and later expiration. The lungs are located in the closed thoracic cavity. A muscular partition called diaphragm separates the thoracic cavity from the abdominal cavity.

During inspiration the diaphragm is lowered due to contraction intercostals muscle. This result into the increase of volume of thorax causing fall of air pressure in the thoracic cavity lowers the pressure in the lungs and the air rushes from outside into lungs through external nares, trachea & bronchi.

During expiration the diaphragm move upward and the lateral thoracic walls move inwards due to the relaxation of muscles of diaphragm and the intercoastals muscles. This decrease the volume of thorax and the pressure inside the thorax and lungs is increased which results in the expulsion of some of air from the lungs to the atmosphere outside the body.

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

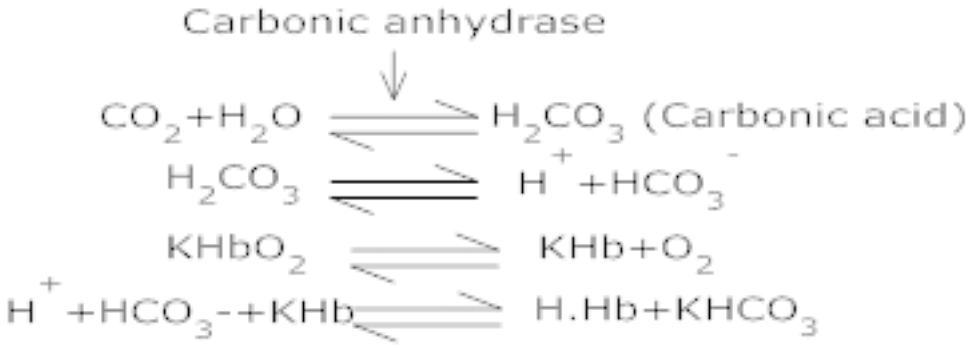
Ans. The relationship between O_2 tension and its absorption by haemoglobin produces a graph called oxygen dissociation curve (O_2 equilibrium curve). At about 100 mm Hg O_2

tension Hb is 98% saturated (complete formation of haemoglobin). As it falls, the saturation of Hb decreases slowly. When O_2 tension is about 40mm Hg, oxyhaemoglobin dissociates and O_2 is available to the tissues.

The O_2 gets bound to Hb in lung surface and it gets dissociated at 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_3^-) ions). Oxyhaemoglobin (HbO_2) 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)



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5 Marks Questions

1.Describe transport mechanism of CO_2.

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.

The remaining part of carbon dioxide enters the erythrocytes, where it reacts with the water to form carbonic acid (H_2 CO_3) ; this reaction is catalysed by carbonic anhydrase**.**

O Carbonic acid immediately dissociates into hydrogen ions (H^+) and bicarbonate (HCO_3^-)

O These H^+ ions combine with haemoglobin, after the oxyglobin ($KHbO_2$) dissociates to liberate the oxygen ; as a result haemoglobinic acid (H.Hb) is formed.

O The majority of bicarbonate ions (HCO^-_3) diffuses out of the erythrocytes into the plasma, following a concentration gradient.

O In response, chloride ions (Cl^-) diffuse from the plasma into the erythrocytes (Chloride shift) and electrical neutrality is maintained.

O The chloride ions combine with potassium to form potassium chloride.

O In the plasma the bicarbonate ions combine with sodium and transported as sodium bicarbonate ($NaHCO_3$)

O Nearly 70% of the carbon dioxide is transported in this form.

(iii) In the form of carbaminohaemoglobin

O Same amount of CO_2 reacts with the amine radicals (NH_2^+) of haenoglobin and form carbaminohaemoglobin ($HbCO_2$) molecule.

O About 23% of carbon – dioxide is transported in this form.

2. Describe in brief the respiratory organs of man.

Ans. The following are the main respiratory organs:-

1)Nostrils – These are the paired openings situated at the anterior and posterior ends of the nasal chambers. They are lined up with ciliated epithelium and mucous cells. These prevent the entrance of dust into lungs and help in warming and moistening the air. The nasal chamber opens interiorly by external nostril and posterior internal nostril into the pharynx.

2)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 set into vibrations when the air enters into it and produces the sound.

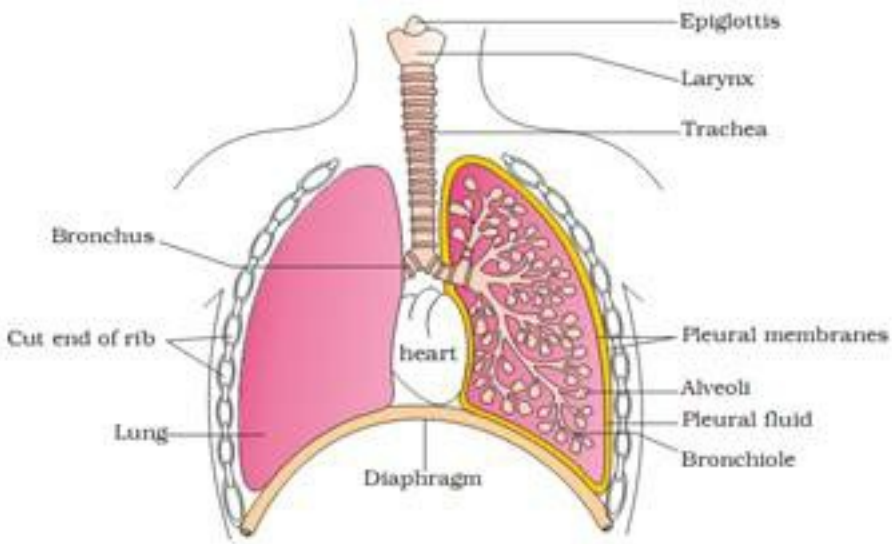

Figure 17.1 Diagrammatic view of human respiratory system (Sectional view of the left lung is also shown)

3)Trachea – It is a long ringed tube. It is supported c – shaped elastic cartilaginou 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.

4)Bronchi – Inside the thorax, the trachea bifurcates into two branchy and each of which enters into one lung. In each lung, the bronchus again redivides into numerous small branches known as bronchioles. These bronchioles further divide at its ends to form respiratory bronchioles.

5)Lungs – There are two large bag-like spongy structures which are the main respiratory organs. These are enclosed by double pleural membranes. The lungs are divided externally by lobes. The right lung consists of four lobes and left by two lobes. Inside the lungs, the respiratory bronchioles give rise to alveolar ducts, alveolar sac and finally alveoli. Each lung contains millions of alveoli. Each alveolus is exceptionally thin walled. Its walls are highly permeable and richly supplied with blood capillaries.

The blood is supplied to the lungs by a pair of pulmonary arteries. These bring blood which poor in oxygen & rich in CO_2. The exchange of gases occurs in the alveoli of the lungs. 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. When inspiration occurs, the O_2 is taken into lungs. O_2 mixes with air already present in alveoli and becomes alveolar air, whose PO_2 is 100 m Hg.

As PO_2 of blood in the vessels is 40 mmHg oxygen differs into blood vessels from alveoli and the oxyhaemoglobin is formed when oxygen combines loosely with the Fe^{++} ions of haemoglobin.

Oxygenated blood from the lungs reaches the left auricle through pulmonary vein; to left ventricle is pumped at through aorta also.

The branch supplying blood to heart muscles is coronary artery. In heart muscles, as the PO_2 is lower than that of the blood in the branches of coronary artery, oxyhaemoglobin dissociates and releases O_2 to cardiac muscles.