IN CHAPTER QUESTIONS

PART - 1

Q1. Why is diffusion insufficient to meet the oxygen requirements of multi-cellular organisms like humans?

Ans. Every living cell requires oxygen for performing cellular respiration. In unicellular organisms (e.g., *Amoeba*), the single cell is in direct contact with environment. Oxygen passes into it through diffusion. In simple multicellular organisms (e.g. *Hydra*), every cell may also take oxygen through diffusion from environment. This is not possible in complex multicellular organisms like humans. The body is covered by dead cells. The living cells are not in contact with external environment. Air containing intercellular spaces are absent. Therefore, quick diffusion cannot occur. Cell to cell diffusion is a very slow process. Passage of oxygen from lungs to toes through cell to cell diffusion will take about three years. Therefore, diffusion cannot meet the oxygen requirement of multicellular organisms like humans.

Q2. What criteria do we use to decide whether something is alive ?

Ans. The major criterion which is used to decide whether something is alive is movements. Movements may be that of locomotion (e.g. running of dog), movement of a part (e.g. chewing cud by cow), breathing movements, growth movements (in plants) and movement of molecules in metabolic reactions, maintenance and repair of cellular structures.

Besides movements, other criteria found in living beings that distinguish them from the non-living are presence of protoplasm, self built organisation, self repair, reproduction and various life processes like metabolism, nutrition, respiration, growth, exchange of materials, transportation, excretion and irritability. All living beings have a definite life span and life cycle.

Q3. What are outside raw materials used by an organism ?

Ans. Food by heterotrophic organisms ; carbon dioxide, minerals and water by autotrophic organisms ; oxygen by all aerobic organisms.

Q4. What processes would you consider essential for maintaining life ?

Ans. Life processes nutrition, metabolism, respiration, exchange of materials, transportation, excretion and awareness.

PART - 2

Q1. What are the difference between autotrophic nutrition and heterotrophic nutrition ?

Ans. Autotrophic nutrition : The process through which organisms are able to build up their own organic food from raw materials which are obtained from outside, in the form of carbon dioxide and water in the presence of chlorophyll and sunlight. The organisms having autotrophic mode of nutrition or can make their own food are called autotrophs or autotrophic organisms.

e.g. Green plants and some bacteria.

Heterotrophic nutrition : Mode of nutrition in which the organisms derive their nutrition by taking readymade food from other dead or living plants and animals. The survival of heterotrophs depends directly or indirectly on autotrophs.

e.g. Animals, fungi and most of bacteria.

Q2. Where does the plants get each of the raw materials for photosynthesis ?

Ans. (i) Carbon Dioxide - Air through stomata.

(ii) Water - Soil through roots.

(iii) Minerals - Soil through roots.

Q3. What is the role of acid in our stomach ?

Ans. Hydrochloric acid (HCl) is component of gastric juice. It has five functions,

(i) Softening of food, (ii) Conversion of pepsinogen and prorennin into active forms of pepsin and rennin (iii) Acidify the food for proper action of pepsin. (iv) Killing of microoganisms present in food. (v) Stoppage of action of salivary amylase.

Q4. What is the function of digestive enzymes ?

Ans. Digestive enzymes are hydrolytic enzymes which bring about hydrolytic splitting of complex organic substances into simple, soluble and absorbable substances, e.g.,

Protein $\xrightarrow{\text{enzyme}}$ Peptides $\xrightarrow{\text{enzyme}}$ Amino acids.

Q5. How is small intestine designed to absorb digested food ?

Ans. Small intestine is lined by epithelium which is specialised to absorb. It has mechanism to increase its absorbing surface area several times. (i) Villi are transverse folds of intestine wall that not only increase surface area but also reach deep into the lumen of intestine for absorption of digested food. Villi possess blood capillaries and lacteals (lymph vessels) for quick transport of absorbed food. (ii) Microvilli are the columnar cells of the intestinal epithelium have fine microscopic outgrowths called microvilli. Microvilli increase the surface area of epithelial cells.

PART - 3

Q1. What advantage over an aquatic organism does a terrestrial organism have with regard to obtaining oxygen for respiration?

Ans. Air contains about 21% of oxygen while water has less than 1% oxygen in dissolved state. A terrestrial organism is able to get several times more oxygen than an aquatic organism.

Q2. What are thedifferent ways in which glucose is oxidised to provide energy in various organisms?

Ans. The different ways in which glucose is oxidised to provide energy in various organisms

1. Aerobic respiration

$$\underset{(1\text{ molecules})}{\text{Glucose}} \xrightarrow[(\text{in cytoplasm})]{\text{Glycolysis}} \underset{(2\text{ molecules})}{\text{Pyruvate or Pyruvic acid}} + \text{Energy [2 ATP]}$$

$$\xrightarrow[(\text{in mitochondria})]{\text{Oxygen}} 6CO_2 + 6H_2O + \text{Energy [38 ATP]}$$

2.Anaerobic respiration

Fermentation [Alcohol fermentation] :

$$\text{Glucose} \xrightarrow[(\text{in cytoplasm})]{\text{Glycolysis}} \underset{(2\text{ molecules})}{\text{Pyruvate}} \xrightarrow[(\text{yeast})]{\text{No } O_2 \text{ required}} \underset{\text{Ethanol}}{2(C_2H_5OH)} + 2CO_2 + \underset{(2\text{ ATP})}{\text{Energy}}$$

Anaerobic respiration in muscle cells [Lactic acid fermentation]:

$$\underset{(1\text{ molecule})}{\text{Glucose}} \xrightarrow[(\text{in cytoplasm})]{\text{Glycolysis}} \underset{(2\text{ molecules})}{\text{Pyruvate}} \xrightarrow[(\text{in cytoplasm})]{\text{No } O_2 \text{ required}} \underset{2\text{ molecules}}{\text{Lactic acid}} + \underset{2\text{ATP}}{\text{Energy}}$$

Q3. How is oxygen and carbon dioxide transported in human beings?

Ans. **Oxygen :** (i) 97% in combined state with haemoglobin called oxyhaemoglobin.

(ii) 3% dissolved in plasma.

Carbon dioxide : (i) 5–7% as dissolved in plasma. (ii) 70% as sodium bicarbonate in plasma. (iii) 23% in combined state with haemoglobin called carbaminohaemoglobin.

Q4. How are the lungs designed in human beings to maximize the area for exchange of gases.

Ans. Each lung has a highly branched respiratory tract called respiratory tree. A primary bronchus divides into secondary bronchi, secondary into segmental bronchi, segmental bronchus into bronchioles which divide into terminal bronchioles, respiratory bronchioles, alveolar sacs and alveoli. Alveoli are small rounded pouches which are extremely thin walled and possess a network of capillaries over their surface. They function as respiratory surfaces. The total area of all the alveoli is more than 80 m^2. It is several times more than the surface area of the whole human body.

PART - 4

Q1. What are the components of the transport system in human beings ? What are the functions of these components ?

Ans. Human transport system has two components, blood vascular system and lymphatic system.

Blood Vascular System. It consists of blood, blood vessels (tube) and heart.

(1) Heart-It is pumping organ of blood vascular system.

(2) Blood- It is made up of plasma and three types of cells – red blood corpuscles, white blood corpuscles and blood platelets.

(a) Blood Plasma-

(i) Transport of nutrients, excretory materials, hormones etc.

(ii) Antibodies in the form of immunoglobins.

(iii) Prothrombin and fibrinogen proteins for blood clotting.

(b) Red Blood Corpuscles-Transport of oxygen as oxyhaemoglobin.

Transport of about 23% carbon dioxide as carbaminohaemoglobin.

(c) White Blood Corpuscles-Phagocytosis of germ cells,

production of antibodies and histamine.

(d) Blood Platelets-Formation of thromboplastin for blood clotting.

(3) Blood Vessels- They are of Three Type

(i) Arteries. Taking away blood from heart to different body parts.

(ii) Veins. Transporting blood towards heart from various body parts.

(iii) Capillaries. Exchange of materials between blood and living cells through tissue fluid.

Lymphatic System. It consists of lymph, lymph vessels and lymph nodes.

Lymph. (i) Collection of extra tissue fluid and passing it back into blood.

(ii) Picking up tissue secretions and passing into blood.

(iii) Attracting and carrying germs to lymph nodes.

Lymph Vessels. Collection of lymph and passing the same into veins.

Lymph Nodes. (i) Lymph organs specialized to filter germs. (ii) Maturation of lymphocytes.

Q2. Why it is necessary to separate oxygenated and deoxygenated blood in mammals and birds ?

Ans. Mammals and birds are warm blooded animals. They constantly use energy to maintain their body temperature. They have a higher energy needs and require more oxygenated blood for their cells. It is important that their oxygenated blood does not mix up with deoxygenated blood.

Q3. What are the components of the transport system in highly organised plants ?

Ans. Transport system of highly organised plants consists of xylem and phloem.

(i) Xylem. It is used in transport of water and minerals. Xylem is made of tracheids, vessels, xylem fibers and xylem parenchyma. Tracheids and vessels constitute the tracheary elements or channels for transport of water and minerals.

(ii) Phloem. It is used for transport or translocation of organic solutes or food. Phloem consists of sieve tubes, companion cells, phloem fibers and phloem parenchyma. Sieve tubes constitute the channels for the transport of food materials.

Q4. How are water and minerals transported in plants ?

Ans. In xylem tissue, vessels and tracheids of the roots, stems and leaves are interconnected to form a continuous system of water-conducting channels reaching all parts of the plant. At the roots, cells in contact with the soil actively take up ions. This creates a difference in the concentration of these ions between the root and the soil. Water, therefore, moves into the root from the soil to eliminate this difference. This means that there is steady movement of water into root xylem, creating a column of water that is steadily pushed upwards.evaporation of water molecules from the cells of a leaf creates a suction which pulls water from the xylem cells of roots(transpiration).

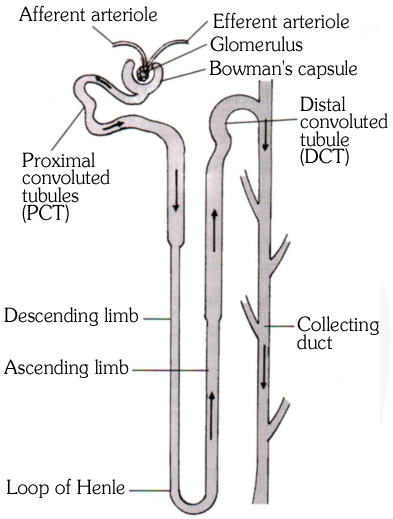
Q5. How is food transported in plants.

Ans. Food is transported in dissolved form through phloem. This process is called as translocation.

PART - 5

Q1. Describe the structure and functions of nephron.

Ans.



Nephron

The nephron is the functional unit of the kidney. A nephron consists of a twisted tubule closed at one end, open at the other with a network of associated blood vessels. Each kidney of man is formed of about one million nephrons.

Each nephron has a length of about 3 cm. It is differentiated into 4 regions having different anatomical features and different physiological roles.

Nephron : The 4 regions are :

(a) Bowman's capsule

(b) Proximal convoluted tubule (PCT)

(c) Loop of Henle

(d) Distal convoluted tubule (DCT)

(a)Bowman's capsule

It is a large double walled cup. It lies in the renal cortex. It contains a tuft of capillaries called glomerulus and the outer wall is continuous with the rest of the nephron. The space between the two walls of the Bowman's capsule is continuous with the lumen of the next part of the nephron. The bowman's capsule and the glomerulus together constitutes the renal corpuscle or malpighian body.

(b) PCT

It starts from the back of the Bowman's capsule and it is highly convoluted. It lies in the renal cortex. The wall consists of a single layer of cuboidal cells bearing a lot of microvilli on the surface.

(c)Loop of Henle

It is a U shaped segment of the nephron located in the renal medulla. It consists of two straight parallel limbs : a descending limb which is a continuation of the PCT and enters into the renal medulla and an ascending limb which re-enters the renal cortex and joins the DCT.

(d)DCT

It is greatly twisted like the PCT and lies in the renal cortex. The terminal relatively short part of the DCT is called the collecting tubule. It opens into the collecting duct.The collecting ducts receive the collecting tubules of several nephrons.

Q2. What are the methods used by plants to get rid of excretory products ?

Ans. The method used by plants to get rid of excretory products are

(i) The oxygen which is produced during the process of photo-synthesis gets removed through stomata.

(ii) The carbon dioxide which is produced during the process of respiration also gets removed through stomata.

(iii) The excess of water gets removed through transpiration.

(iv) Some other wastes get removed along with dead cells when plant lose some parts such as leaves.

(v) Some waste products are stored in cellular vacuoles.

(vi) Some waste products are stored as resins and gums, especially in old xylem.

(vii) Plants also excrete some waste substances into the soil around them.

(viii) Some waste substances are also eliminated through petals, fruits and seeds.

Q3. How is the amount of urine produced regulated ?

Ans. Amount of urine is regulated by volume of blood and amount of antidiuretic hormone (ADH).ADH is a hormone released by pituitary gland. Volume of blood is determined by presence or absence of extra water in the body. More blood volume will increase pressure in the glomerulus. It increases the amount of glomerular or nephric filtrate. ADH is not secreted. Dilute urine is allowed to pass through the kidneys. The amount of urine is higher than the normal.

In case the body has no extra water or is deficient of water, lesser glomerular filtrate will be produced. ADH is secreted. It helps in withdrawing a good amount of water from urine. Therefore, only concentrated urine is passed out. Amount of urine is smaller than the normal.

EXERCISES

Q1. The kidneys in human beings are a part of the system for
(A) nutrition.
(B) respiration.
(C) excretion.
(D) transportation.
Ans. (C) Excretion.

Q2. The xylem in plants are responsible for
(A) transport of water.
(B) transport of food.
(C) transport of amino acids.
(D) transport of oxygen.
Ans. (A) transport of water.

Q3. The autotrophic mode of nutrition requires
(A) carbon dioxide and water.
(B) chlorophyll.
(C) sunlight.
(D) all of the above.
Ans. (D) all of the above.

Q4. The breakdown of pyruvate to give carbon dioxide, water and energy takes place in
(A) cytoplasm.
(B) mitochondria.
(C) chloroplast.
(D) nucleus.
Ans. (B) mitochondria.

Q5. How are fats digested in our bodies? Where does this process take place?
Ans. The small intestine is the site of the complete digestion of carbohydrates,proteins and fats.Fats are present in the intestine in the form of large globules which makes it difficult for enzymes to act on them. Bile salts from Liver break them down into smaller globules increasing the efficiency of enzyme action. The pancreas secretes pancreatic juice which contains enzymes lipase for breaking down emulsified fats. The walls of the small intestine contain glands which secrete intestinal juice. The enzymes present in it finally convert the fats into fatty acids and glycerol.

Q6. What is the role of saliva in the digestion of food?

Ans. Salivary glands secrete saliva which contains a digestive enzyme called ptyalin or salivary amylase that breaks down starch.

$$\text{Starch} \xrightarrow[\text{Amylase}]{\text{Salivary}} \text{Maltose} + \text{Dextrin}$$

Q7. What are the necessary conditions for autotrophic nutrition and what are its by-products?

Ans. Requirements for photosynthesis

(A) Sunlight (B) Photosynthetic pigment
(C) Carbon dioxide (D) Water

The sugar produced in photosynthesis is stored in the form of starch in plants and it is the source of reserved internal energy.

$$6CO_2 + 12\ H_2O \xrightarrow[\text{Chlorophyll}]{\text{Sunlight}} C_6H_{12}O_6 + 6H_2O + 6O_2$$

(from air) (from soil) (Glucose)

Q8. What are the differences between aerobic and anaerobic respiration?
Name some organisms that use the anaerobic mode of respiration.

Ans. Differences between aerobic and anaerobic respiration

S.NO	Features	Aerobic Respiration	Anaerobic Respiration
1	O_2 requirement	O_2 required	Not required
2	Occurs in	Cytoplasm and mitochondria	Cytoplasm only
3	Breakdown	Complete breakdown of glucose takes place	Incomplete breakdown of glucose takes place
4	End products	CO_2 and H_2O	CO_2 and ethyl alcohol or lactic acid
5	Energy produced from one glucose molecule	38 ATP	2 ATP

Yeast and most of bacteria use the anaerobic mode of respiration.

Q9. How are the alveoli designed to maximise the exchange of gases?

Ans. Alveoli are small pouches or sacs. Large number of alveoli occur inside each lung. The whole surface of an alveolus functions as respiratory surface. Due to large number of alveoli in each lung, a very large area of respiratory surface becomes available (about 80 m^2) for exchange of gases. The walls of alveoli are very thin and they are surrounded by blood capillaries.

Q10. What would be the consequences of a deficiency of haemoglobin in our bodies?

Ans. Haemoglobin is the respiratory pigment that transports oxygen to the body cells for cellular respiration. Deficiency of haemoglobin in blood lead to deficiency of oxygen in the body cells which can lead to a disease called anaemia.

Q11. Describe double circulation of blood in human beings. Why is it necessary?

Ans. Double circulation

In double circulation, the blood passes twice through the heart to supply once to the body.

(i) Systemic circulation

In this, blood completes its circulation from left ventricle to right auricle through the body organs.(systemic organs)

Oxygenated blood from lungs → heart → Systemic arteries → Body parts → Systemic veins → heart

(ii) Pulmonary circulation

In this, blood completes its circulation from right ventricle to left auricle through the lungs.

Deoxygenated blood from body → heart → Pulmonary arteries → lungs parts → Pulmonary veins → heart

The right portion of heart is known as pulmonary heart and it has deoxygenated blood.

The left portion of heart is known as systemic heart and it has oxygenated blood.

Such separation allows a highly efficient supply of oxygen to the body. This is useful in animals that have high energy needs, such as birds and mammals, which constantly use energy to maintain their body temperature.

Q12. What are the differences between the transport of materials in xylem and phloem?

Ans.

Transport by xylem	Transport by phloem
(1) Transport of water and minerals	(1) Transport of food
(2) Upward movement to all other plant parts from roots	(2) upward and downward movement
(3) It occurs due to physical forces such as transpiration	(3) Require energy in form of ATP

Q13. Compare the functioning of alveoli in the lungs and nephrons in the kidneys with respect to their structure and functioning.

Ans.

Alveoli	Nephron
Alveoli are functional unit of lungs.	Nephrons are tubular structures present inside the kidneys.
Alveoli provide a wide surface for gaseous exchange.	The surface area of a nephron is not much more.
The walls of the alveoli are one cell thick and it contains an extensive network of capillaries.	Nephrons are made of glomerulus, blood bowman's capsule, and a long renal tube.
The exchange of O_2 and CO_2 takes place between the blood of the capellaries that surround the alveoli and the gases present in the alveoli	The blood enters the kidney & filtrate collects in collecting duct. the collecting duct collects the urine from nephrons and passes it to ureter.
Alveoli are the site of gaseous exchange.	Nephrons are the basic filtration unit.