NCERT FOLDER

Intext Questions

1 Why is diffusion insufficient to meet the oxygen requirements of multicellular organisms like humans? **Pg 95**

Sol. Multicellular organisms such as human beings have complex body designs and large body size. Thus, they bear specialised cells and tissues for performing various necessary functions of the body such as intake of food and oxygen etc. Unlike, unicellular organisms, multicellular organisms do not have all the cells of the body in direct contact with the environment. Hence, diffusion cannot meet their oxygen requirements as per their body needs.

2 What criteria do we use to decide whether something is alive? **Pg 95**

Sol. Visible movements like growth of organisms, green colour of plants or running of animals etc., acts as the main criteria to decide whether something is alive or not.

3 What are outside raw materials used by an organism? **Pg 95**

Sol. Carbon based molecules, i.e. food is used by body from outside to meet its energy need. Oxygen is used to oxidise food which release energy. So, food and oxygen are the basic raw materials used by an organism.

4 What processes would you consider essential for maintaining life? **Pg 95**

Four basic processes that are essential for maintaining life are:

(*i*) **Nutrition** It is the process of transferring source of energy from outside to the body of an organism.

(*ii*) **Respiration** It is the process of acquiring oxygen from outside into the body and using it for the breakdown of food sources to release energy for cellular needs.

(*iii*) **Transportation** It is the process of carrying food and oxygen from one place to another in the body.

(*iv*) **Excretion** It is the process of removing byproduct and waste products from body which are formed during energy generating reactions.

5 What are the differences between autotrophic and heterotrophic nutrition? **CBSE 2013; Pg 101**

Sol. The differences between autotrophic and heterotrophic nutrition are as follows:

Features	Autotrophic Nutrition	Heterotrophic Nutrition
Food	In this mode of nutrition, food is prepared by organism itself.	In this mode of nutrition, food is obtained from other organisms (autotrophs).
Inorganic substances	The raw materials are required by the organism (autotrophs).	The raw materials are not required.
Digestion	This process is absent.	This process is required for the conversion of complex molecules into simpler and more soluble ones.
Chlorophyll	It is present in autotrophs for trapping light.	It is absent.
Status	They are known as producers.	They are known as consumers.

6 Where do plants get each of the raw materials required for photosynthesis? **Pg 101**

Sol. The raw materials for photosynthesis are carbon dioxide and water. These are taken up by the plants in the following ways:

(*i*) CO_2 is taken up through the stomata from the atmosphere in case of land plants, while the aquatic plants take up CO_2 dissolved in water.

(*ii*) Water is taken up or is absorbed by the roots through the process of osmosis and is transported to the leaves containing photosynthetic cells by the xylem vessels.

7 What is the role of acid in our stomach? **Pg 101**

Sol. Hydrochloric acid (HCl) is the acid secreted inside the stomach and plays the following roles.

It is important for the body because :

(*i*) It makes medium inside the stomach acidic, which is necessary for the activation of enzyme called pepsin. It converts inactive pepsin into active pepsin.

(*ii*) It also kills any bacteria, entering the stomach along with the food.

8 What is the function of digestive enzymes? **Pg 101**

Sol. Digestive enzymes help to breakdown large and insoluble food molecules into small water soluble molecules, e.g. enzyme amylase breaks down starch and enzyme trypsin helps to breakdown proteins.

9 How is small intestine designed to absorb digested food? **CBSE 2016; Pg 101**

Sol. The small intestine is the main region for the absorption of digested food. The inner lining of small intestine is covered by millions of tiny finger-like projections called villi. The presence of villi gives the inner walls of the small intestine a very large surface area for the absorption of digested food.

Exercises (On Page 110)

1 The autotrophic mode of nutrition requires

(a) carbon dioxide and water (b) sunlight
(c) chlorophyll (d) All of these

Sol. (*d*) All of the above

2 How are fats digested in our bodies? Where does this process take place?

Sol. The small intestine is the site of the complete digestion of fats. The upper part of the small intestine receives bile juice, which contains bile salts for breakdown of fats into smaller globules thereby, increasing the efficiency of the enzyme action. This process is known as emulsification. Bile also makes the medium alkaline. The walls of small intestine secrete intestinal juice containing enzyme lipase. It finally converts the fats into fatty acids and glycerol. Thus, completing fat digestion.

3 What is the role of saliva in the digestion of food?

Sol. Saliva is secreted by the salivary glands in the mouth. It contains the enzyme salivary amylase, which breaks down starch into maltose.

4 What are the necessary conditions for autotrophic nutrition and what are its byproducts?

Sol. The necessary conditions for autotrophic nutrition are :

(*i*) water (*ii*) carbon dioxide
(*iii*) sunlight (*iv*) chlorophyll

The byproduct of autotrophic nutrition is oxygen, which is released into the atmosphere through stomata.

SUMMARY

- **Nutrition** is the process of transfer of energy source from outside to the body of living organisms, providing energy necessary for performing basic life processes like nutrition, respiration, reproduction, etc.
- **Nutrients** are the energy providing substances when consumed by living beings.
- **Autotrophic Nutrition** is the mode of nutrition performed by green plants; some bacteria etc., for manufacturing their own food from inorganic sources, i.e. CO_2 and water. The organisms are called autotrophs.
- **Photosynthesis** is the process by which green plants synthesise organic food as carbohydrates in the presence of sunlight, chlorophyll, water, CO_2 and some other raw materials.
- **Chloroplasts** are the site of photosynthesis, present in leaves of a plant. They contain a green coloured pigment, chlorophyll that traps solar energy from Sun.
- **Heterotrophic Nutrition** The heterotrophs cannot synthesise their own food, but are dependent on the autotrophs for their nutrition. It can be of three types:
- **Holozoic nutrition** (e.g. *Amoeba*, humans), **saprotrophic nutrition**, (e.g. fungi) and **parasitic nutrition** (e.g. licks, lice, leech, etc.)
- **Nutrition in *Amoeba*** which is a unicellular omnivores gathers and ingests food with pseudopodia. It lacks special organs for nutrition. **Nutrition in human beings** involves breakdown of complex substances ingested from outside in the body by different parts of alimentary canal.
- **Human digestive system** consists of alimentary canal, i.e. a tube-like structure consisting of mouth, pharynx, oesophagus, stomach, small intestine and large intestine.
- **Mouth** is first part of digestive system which helps in intake of food. Tongue a muscular organ bearing taste buds. It also helps in mixing the chewed food with saliva. Teeth help in chewing of food. Mouth opens into buccal cavity that further opens into pharynx.
- **Oesophagus** or the food pipe helps in the transfer of food down to stomach.
- **Stomach** J-shaped organ which stores and partially digest the food entering through the food pipe.
- **Intestine** is the main organ of digestion and absorption. Small intestine is longer in length compared to large intestine.
- **Anus** is the end point of the alimentary canal from where the waste is removed out from the body.
- **Digestive glands** are the salivary, gastric intestinal glands along with pancreas and liver.
- **Salivary glands** (in mouth) secrete saliva containing salivary amylase which helps in the digestion of starch.
- **Gastric glands** present in stomach secrete digestive juice containing pepsin, HCl and mucus.
- **Intestinal glands** present in the walls of small intestine secrete intestinal juice containing amylolytic, proteolytic and lipolytic enzymes.
- **Liver** is the largest gland of our body and it secretes bile juice for emulsification of fats.
- **Pancreas** secretes pancreatic juice containing trypsin, amylase and lipase enzyme.
- The process of digestion in all involves ingestion, i.e. intake of food by mouth, digestion, absorption, i.e. passage of digested food from alimentary canal to blood, assimilation, i.e. distribution of digested food to cells of the body and egestion, i.e. the elimination of undigested food (waste) from the body.

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NCERT FOLDER

Intext Questions

1 What advantage over an aquatic organism does a terrestrial organism have with regard to obtaining oxygen for respiration? **Pg 105**

Sol. A terrestrial organism can obtain oxygen directly from the air and has slow breathing rate, whereas an aquatic organism has to obtain oxygen dissolved in water and so, it has high breathing rate. Since the amount of oxygen dissolved in water is fairly low as compared to the amount of oxygen in air. So, aquatic organisms have high breathing rate. Therefore, terrestrial organisms have much easier access to oxygen and have an advantage over aquatic organisms.

2 What are the different ways in which glucose is oxidised to provide energy in various organisms? **Pg 105**

Sol. Utilisation of glucose for the production of energy depends upon the availability of oxygen. In the presence of oxygen (aerobic respiration), glucose is broken down aerobically in mitochondria, whereas in the absence of oxygen (anaerobic respiration), glucose is broken down anaerobically in cytoplasm to produce comparatively lesser amount of energy.

3 How is oxygen and carbon dioxide transported in human beings? **Pg 105**

Sol. When we inhale air, oxygen reaches the alveoli in lungs, which is surrounded by thin capillaries. These capillaries carry blood in them. The oxygen diffuses from the alveoli walls to the blood in capillaries. This blood travels through the body. Haemoglobin binds with oxygen and carries it along with blood. Carbon dioxide is produced as a waste product in respiration in the cells of tissues. This carbon dioxide is transported in dissolved form in the blood, which carries it back to the lungs, where it diffuses into alveoli and then to trachea and finally from nostrils to out of the body into air.

4 How are the lungs (alveoli) designed in human beings to maximise the area for exchange of gases? **CBSE 2015; Pg 105**

Sol. In lungs, balloon-like structures called alveoli are present that provide maximum surface area for the exchange of gases. The alveoli have very thin walls and contain an extensive network of blood vessels to facilitate the exchange of gases.

Exercises

(On Page 113)

1 The breakdown of pyruvate to give carbon dioxide, water and energy takes place in

(a) cytoplasm
(b) mitochondria
(c) chloroplast
(d) nucleus

Sol. (*b*) This kind of breakdown requires the presence of oxygen and takes place in mitochondria.

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

Sol. Refer to text on Pg. 166.

Organisms using anaerobic mode of respiration are anaerobes. e.g. yeast, bacteria.

3 How are the alveoli designed to maximise the exchange of gases?

Sol. The bronchus, within the lungs divide into smaller tubes called bronchioles and finally terminate in balloon-like structures called 'alveoli'. The alveoli are made up of thin moist membranes which are richly supplied with blood and provide a very large surface area for the gaseous exchange.

SUMMARY

- **Respiration** is the process by which food is oxidised to release energy at cellular levels. As a catabolic process it causes biochemical oxidation of nutrients such as glucose.
- **Aerobic respiration** is the complete breakdown of food in the presence of oxygen. It releases large amount of energy in the form of ATP molecules.
- **ATP** is Adenosine Triphosphate, the energy currency of every cell.
- **Anaerobic respiration** is incomplete breakdown of food occurring in the absence of oxygen, releasing small amount of energy. It can be alcoholic fermentation, i.e. sugar breaks into ethanol and CO_2, lactic acid fermentation, i.e. sugar breaks into lactic acid.
- **Exchange of gases in plants** The energy produced in plants by respiration is utilised in growth and life functions.
- **In leaves** occurs through diffusion of oxygen through stomata into the cells of the leaf.
- **In roots** occurs by diffusion from air present in soil particles to the roots.
- **In stems** occurs through small pores present in the stems called lenticels.
- **Exchange of gases in animals** may occur through their skin or through specific respiratory organs.
  These organs have structures that increase the surface area and are in contact with oxygen rich atmosphere.
- **In aquatic organisms** The rate of breathing is higher as these organisms utilise oxygen dissolved in water which is present in lesser amount compared to others. Respiration occurs through gills and body surfaces.
- **In terrestrial organisms** These organisms use atmospheric oxygen for respiration.
- **Human Respiratory System** consists of a nose, larynx, trachea,lungs with bronchi and bronchioles and alveoli.
- **Nostrils and nasal passage** initiate the process of respiration by breathing in the air.
- **Larynx** is located in neck, helps in sound production.
- **Trachea,** a non-collapsible air conducting tube, exhibit to presence of incomplete rings of cartilages; which also helps keep it open.
- **Bronchi and bronchioles** are the branches into which trachea further divides. Bronchioles are formed by repeated branching of bronchi.
- **Alveoli** are the functional units of kidney. These provide surface area for gaseous exchange in humans.
- **Lungs** are the primary organs for respiration, present in the thoracic cavity.
- **Ribs** are 12 pairs of bones, helps in respiration by movement of intercoastal muscles attached to them.
- **Diaphragm** is a muscular partition between thorax and abdomen. It forms the base of chest cavity and helps in breathing.
- **Gaseous Exchange in Humans** Oxygen is absorbed *via* inhalation. Exchange of oxygen and carbon dioxide occurs between blood and alveoli. Carbon dioxide is exhaled through lungs, i.e. exhalation and oxygen is assimilated in the body.
- **Haemoglobin** is the pigment present in Red Blood Cells (RBCs) which takes up the oxygen from the air in lungs and carries it to the tissues.

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NCERT FOLDER

Intext Questions

1 What are the components of the transport system in human beings? What are the functions of these components? **Pg 110**

Sol. The components of the transport system in human beings includes:

(*i*) Heart It pumps the blood to be circulated and also receives the blood from different body parts.

(*ii*) Blood It is a fluid connective consisting of two main components:

(*a*) **Plasma** It transports food, carbon dioxide nitrogenous wastes and harmones etc., in dissolved form.

(*b*) **Blood corpuscles** These include RBCs, WBCs and platelets. RBCs transport respiratory gases, WBCs protect body from harmful pathogens and blood platelets help in preventing loss of blood at the time of injury.

(*iii*) **Blood vessels** These carry blood to and fro from different parts of the body. These are of three main types:

(*a*) **Arteries** These transport blood from heart to different body parts.

(*b*) **Veins** These transport blood towards heart from various body parts.

(*c*) **Capillaries** These allows exchange of materials between blood and tissues.

(*iv*) **Lymph** It carries digested and absorbed fat from intestine and drains the excess fluid from the extracellular spaces back into the blood.

2 Why is it necessary to separate oxygenated and deoxygenated blood in mammals and birds? **CBSE 2016, Pg 110**

Sol. Mammals and birds are warm-blooded animals, so they constantly need energy in order to maintain their body temperature. Due to this high energy need, they require more oxygen. Thus, it is important that their oxygenated blood should not get mixed up with deoxygenated blood in order to make circulatory system much more efficient.

3 What are the components of the transport system in highly organised plants? **Pg 110**

Sol. The main components of the transport system in highly organised plants are xylem and phloem. Xylem consists of tracheids and vessels conducting water and minerals (obtained from the soil) to the leaves. Phloem consists of sieve tubes and companion cells. It helps to transport food, materials etc., from leaves to various parts of the plant.

4 How are water and minerals transported in plants? **Pg 110**

Sol. Water and minerals are transported through xylem in plants. The cells in roots that are in contact with soil actively take up ions, creating a difference in concentration of ions between the cell sap of roots and soil water.

Water moves into the roots to eliminate this difference of concentration forming a steady movement of water in the root xylem. This creates a column of water that is steadily pushed upwards. Loss of water from leaves creates a suction that pulls water from the xylem of the roots to aerial parts.

5 How is food transported in plants? **Pg 110**

Sol. The transportation of food is carried by phloem in plants by utilising energy (ATP). This helps in increasing the osmotic pressure of the tissue causing water to move into it. Thus, the generated pressure allows the movement of materials from phloem to the tissue, which have less pressure.

Exercises

(On Page 113)

1 What would be the consequences of a deficiency of haemoglobin in our bodies? **CBSE 2012**

Sol. Haemoglobin efficiently binds with oxygen and transports it to various parts of the body. Deficiency of haemoglobin is referred to as anaemia. The consequence of such condition is that the blood is unable to carry sufficient amount of oxygen as required by the body and would cause less respiration. Also, less energy would be liberated. In anaemia, the person feels weak, skin becomes pale, person feel lethargic and is unable to perform heavy physical work.

2 Describe double circulation in human beings. Why is it necessary? **CBSE 2012, 11, 10**

Or Why is blood circulation in human heart called double circulation? **NCERT Exemplar**

Sol. During double circulation in human beings blood passes through heart twice for completing one cycle of circulation.

The double circulation includes the following processes:

(*i*) **Pulmonary circulation** In this circulation, the deoxygenated blood is pushed by right ventricle to the lungs for oxygenation through pulmonary artery. This oxygenated blood is then brought back to the left atrium of the heart through pulmonary veins.

(*ii*) **Systemic circulation** In this circulation, oxygenated blood brought to left atrium goes to the left ventricle. It is then passed on to different body parts of body through aorta.

3 The xylem in plants are responsible for
(*i*) transport of water
(*ii*) transport of food
(*iii*) transport of amino acid
(*iv*) transport of oxygen

Sol. (*i*) Xylem in plants is responsible for the transport of water and minerals that is obtained from the soil to the leaves.

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

Or How is transportation of water in xylem tissue different from translocation of food in phloem tissue? **CBSE 2009**

Sol. The differences between transport of materials in xylem and phloem are as follow:

Transport in Xylem	*Transport in Phloem*
Xylem transports water and minerals in plants.	Phloem transports the products of photosynthesis, amino acids and other organic substances in plants.
The movement of water is unidirectional in xylem.	The movement of substances can be multidirectional.
Major operating forces are diffusion and transpirational pull.	Energy (ATP) is required for translocation.
It is not influenced by metabolic inhibitors.	Phloem transport is inhibited by metabolic inhibitors.
It is carried out by xylem vessels and tracheids.	Takes place in sieve tubes with the help of adjacent companion cells.

SUMMARY

- **Transportation** is the life process of movement of biologically important substances or self from one part of the body to other.
- **Human circulatory system** consists of blood, a heart and network of blood vessels.
- **Blood** is a specialised connective tissue consisting of plasma and formed elements (i.e RBC, WBC and platelets). It helps in the transport of nutrients, gases, waste products, etc. It also regulates body temperature and pH.
- **Heart** is present between the lungs in the thoracic cavity slightly tilted to left. Human heart is four-chambered consisting of two auricles and two ventricles each separated by septum.
- **Blood vessels** associated with circulatory system are the arteries, veins and capillaries.
- **Arteries** take oxygenated blood from the heart to various body parts. They are thick-walled and have no valves.
- **Veins** transport deoxygenrated blood from body tissues to the heart. They are thin-walled with valves to prevent the backflow of blood.
- **Capillaries** are thin, narrow tubes which connect arteries to veins, allowing exchange of materials between blood and body cells.
- **Blood Pressure (BP)** is the force exerted by blood on the walls of a blood vessel. It is measured by **sphygmomanometer**. The normal range of BP in human body is 120/80 mm Hg.
- **Lymph** is similar to plasma with less proteins. It carries digested and absorbed fat from intestine and drains back excess fluid to blood.
- **Transportation in plants** consists of two pathways using two different conducting tissues.
- **Xylem** transports water and minerals obtained from the soil.
- **Phloem** transorts food prepared from the leaves to other parts of plant, i.e translocation.
- **Transport of water** occurs due to transpiration pull and root pressure.
- **Transpiration** is the loss of water in the form of vapour from aerial parts of plant. The pressure exerted by transpiration on the walls of xylem is called transpiration pull. It cause upward movement of water and minerals.
- **Transport of Food** The products of photosynthesis are transported from the leaves to other parts by using energy derived from ATP.

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NCERT FOLDER

Intext Questions 112

1 Describe the structure and functioning of nephron.
Pg 112 ; CBSE 2014

Sol. **Structure of nephron** Nephron is the basic filtering unit found in kidney. It is a long coiled tubule whose one end is connected to the double walled cup-shaped structure called Bowman's capsule and the other end to a urine collecting duct. Bowman's capsule contains a bundle of blood capillaries, known as glomerulus that is followed by the tubular part of nephron, which forms loops at some places. For figure refer to "Structure of nephron" on Pg. 195.

Functioning of nephron

(*i*) Glomerulus filters the blood passing through it.

(*ii*) It also ensures to remove only harmful substances from the body that include nitrogenous materials.

(*iii*) The useful substances like glucose, amino acids, salts and a major amount of water is selectively reabsorbed by the tubular part of nephron.

(*iv*) Some substances like K^+ are actively secreted into the urine through the tubule.

(*v*) The collecting duct collects the urine and passes it to the ureter.

2 What are the methods used by plants to get rid of excretory products? **Pg 112; CBSE 2013, 12**

Sol. Some of the methods employed by plants to get rid of excretory products are as follows:

(*i*) Gaseous wastes (i.e. carbon dioxide and oxygen) are removed through stomata in leaves and lenticels in stems to the air.

(*ii*) Plants get rid of excess water by transpiration.

(*iii*) Some waste products are stored as resins and gums.

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

(*v*) Waste products may be stored in leaves, bark or any other plant part, which fall off or get rid of by plants.

3 How is the amount of urine produced regulated?
Pg 112; CBSE 2013, 12

Sol. The amount of urine formed depends on how much excess water is produced in the body and on how much of dissolved wastes is to be excreted. More water and dissolved wastes in the body will produce more urine. On the other hand, less water and less dissolved wastes will produce less urine.

Exercises

(On Page 113)

1 The kidneys in human beings are a part of the system for
(a) nutrition
(b) excretion
(c) respiration
(d) transportation

Sol. (*b*) Kidneys are a part of the system for excretion. They remove nitrogenous wastes, excess water etc., from the blood.

2 Compare the functioning of alveoli in the lungs and nephrons in the kidneys with respect to their structure and functioning.
CBSE 2013

Sol. The functioning of alveoli in the lungs and nephrons in the kidneys is compared below:

Alveoli in the Lungs	*Nephrons in the Kidneys*
These are balloon-like structures found within the lungs.	These are long, coiled tubule-like structures present within the kidneys.
The thin-walled alveoli contains an extensive network of blood vessels.	Nephrons contain a bundle of blood capillaries called glomerulus. The tubular part of nephron also contains blood vessels for reabsorption of useful substances.
Alveoli provides a large surface area, where exchange of gases can takes place.	Nephrons help in filtering waste from blood, so that only harmful products are eliminated.
The phenomenon of diffusion is employed in exchange of gases in alveoli.	Nephrons apply selective reabsorption of useful substances into the blood capillaries.
A large number of alveoli are present in lungs.	Nephrons are very small in size, but are large in number in each kidney.

SUMMARY

Excretion is a biological process by which an organism removes harmful metabolic wastes from the body.

In **unicellular organisms** wastes are excreted *via* diffusion through cell surfaces while multicellular organisms have developed specialised organs of excretion.

Human excretory system It includes a pair of kidneys, ureters, a urinary bladder and a urethra. It removes nitrogenous waste products from the body.

Kidneys are primary organs of excretory system. These are bean-shaped, located towards the back of the abdominal cavity.

Nephrons are the structural and functional unit of kidneys.

Ureter are paired, thin, muscular tubes coming from each kidney which carry urine to urinary bladder.

Urinary bladder is a muscular, pear-shaped bag where urine is temporarily stored.

Urethra is a duct which transmits the urine stored in the bladder to the exterior of the body.

Formation of urine occurs to filter out waste products from the blood. It involves three stages i.e. ultrafilteration in glomerulus, selective reabsorption of useful substances like glucose, amino acids, etc., in tubular part and tubulur secretion, i.e. active secretion of ions, medicines, drugs, etc., from blood into urine.

Urine is the end product of filtration process containing urea, uric acid, ammonium salt and urochrome pigment (imparts yellow colour to urine)

Removal of urine Urine remains stored in the bladder until the pressure expands too much and control the urge to urinate.

Kidney disorders occur when one or both kidneys stop functioning or malfunctions.

Haemodialysis is the process used in case of kidney failures. It removes nitrogenous waste products from the body.

Excretion in plants occurs to remove the waste excreted by them during their life processes.

Gaseous waste products are carbon dioxide during respiration and oxygen during photosynthesis. These are excreted out through stomata and lenticels.

Liquid waste products are excess water, gums i.e. degradation product of internal tissues, resins, etc. These are excreted *via* stomata or hydathodes (guttation).

Solid waste products are stored waste substances in cell vacuoles and tissues with dead cell. Plants get rid of them by dropping their leaves.

Some plants wastes are useful products for human beings, e.g. essential oils, gums (used to make adhesives), resins, natural rubber (tyre industry) and tanin (for leather treatment), etc.

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