LIFE PROCESSES

NCERT Textbook Questions

Q.1. Why is diffusion in sufficient to meet the oxygen requirements of multicellular organisms like humans?

Ans. In large multicellular organisms like humans, the oxygen of air will have to travel large distances inside the human body to reach each and every cell of the body. Now, since diffusion is a very, very slow process, it will take a very long time to make oxygen available to all the body cells. Thus, diffusion is insufficient to meet the oxygen requirements of multicellular organisms like humans because the volume of human body is so big that oxygen (of air) cannot diffuse into all the internal cells of the human body quickly. So, when the size of the multicellular organism is large, then respiratory pigments (such as haemoglobin) present in blood take up the oxygen from the air in the lungs and carry it quickly to all the body cells.

Q.2. What criteria do we use to decide whether something is alive?

Ans. We can decide whether something is alive (or living) by using the following characteristics of livings things:

(*i*) Living things can move by themselves.

(*ii*) Living things need food, air and water.

(*iii*) Living things can grow.

(*iv*) Living things can respond to changes around them. They are sensitive.

(*v*) Living things respire (release energy from food).

(*vi*) Living things excrete (get rid of waste materials from their body).

(*vii*) Living things can reproduce. They can have young ones.

Q.3. What are outside raw materials used by an organism?

Ans. (*i*) An autotrophic organism (like a green plant) uses outside raw materials such as carbon dioxide, water and minerals along with sunlight to make its own food by the process of photosynthesis.

(*ii*) A heterotrophic organism (like an animal) uses outside raw material such as readymade organic food to grow, develop, synthesise proteins and other substances needed in the body.

(*iii*) Most of the organisms use oxygen (of air) as outside material for breaking down food and releasing energy for themselves in a process called respiration.

Q.4. What processes would you consider essential for maintaining life?

Ans. The various processes essential for maintaining life are: Nutrition, Respiration, Transport, Excretion, Controland Coordination, Growth, Movement and Reproduction.

Q.5. What are the differences between autotrophic nutrition and heterotrophic nutrition?

Ans. (*i*) In autotrophic nutrition, an organism synthesises its own organic food from simple inorganic materials like carbon dioxide, water and minerals present in the surroundings by using sunlight energy. In heterotrophic nutrition, an organism cannot synthesise its own food, it depends on other organisms for food.

(*ii*) Autotrophic nutrition takes place in green plants and certain bacteria which can carry out photosynthesis. Heterotrophic nutrition occurs in all animals, and non-green plants which cannot carry out photosynthesis.

Q.6. Where do plants get each of the raw materials required for photosynthesis?

Ans. The two raw materials required by the plants for photosynthesis are: Carbon dioxide and Water. The plants get carbon dioxide gas from the air (or atmosphere). The plants get water from the soil.

Q.7. What is the role of the acid in our stomach?

Ans. The role of acid in the stomach is to make the medium of gastric juice acidic so that the enzyme pepsin can break down proteins of the food effectively. This is because the enzyme pepsin can digest proteins effectively only in the acidic medium. Another role of acid is that it kills any bacteria which may enter the stomach with our food.

Q.8. What is the function of digestive enzymes?

Ans. Digestive enzymes are the biological catalysts which break down the complex food molecules (like carbohydrates, proteins and fats) into such small particles which can be absorbed from the alimentary canal into the blood stream.

Q.9. How is the small intestine designed to absorb digested food?

Ans. The inner surface of small intestine has 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. And the large inner surface area of small intestine helps in the rapid absorption of the digested food.

Q.10. What advantage over an aquatic organism does a terrestrial organism have with regard to obtaining oxygen for respiration?

Ans. The aquatic organisms use the oxygen dissolved in water for carrying out respiration. The amount of oxygen dissolved in water is, however, limited. The terrestrial organisms take oxygen from air which contains much higher amount of oxygen. Thus, a terrestrial organism has an advantage over an aquatic organism in regard to obtaining oxygen because it is surrounded by an oxygen-rich air from which it can take any amount of oxygen.

Q.11. What are the different ways in which glucose is oxidised to provide energy in various organisms?

Ans. There are two different ways in which glucose is oxidised to provide energy in various organisms: aerobic respiration, and anaerobic respiration. Aerobic respiration uses oxygen (of air) whereas anaerobic respiration takes place without oxygen.

(*i*) In aerobic respiration, the glucose food is completely broken down by the oxygen (of air) inhaled during breathing to form carbon dioxide and water, and a lot of energy is released.

(*ii*) In anaerobic respiration, the glucose food is incompletely broken down by micro-organisms like yeast in the absence of oxygen (of air) to form ethanol and carbon dioxide, but much less energy is released.

Q.12. How are oxygen and carbon dioxide transported in human beings?

Ans. In human beings, oxygen is carried from the lungs by the respiratory pigment haemoglobin which is present in red blood corpuscles. Haemoglobin has a very high affinity for oxygen. Carbon dioxide is more soluble in water than oxygen. So, most of the carbon dioxide produced during respiration in the human body is transported in the dissolved form in our blood.

Q.13. How are the lungs designed in human beings to maximise the area for exchange of gases?

Ans. There are millions of alveoli in the lungs. The presence of millions of alveoli in the lungs provides a very large area for the exchange of gases. And the availability of large surface area maximises the exchange of gases. For example, if all alveoli from the two human lungs are unfolded, they would give an area of about 80 square metres (which is nearly the size of a tennis court !).

Q.14. What are the components of transport system in human beings? What are the functions of these components?

Ans. The components of transport system in human beings are blood and lymph. The functions of blood and lymph are as follows:

(*i*) Red blood cells carry oxygen from the lungs to all the cells of the body. Blood plasma carries digested food, proteins, common salt, waste products (like carbon dioxide and urea) and hormones from one part to another part in the body.

(*ii*) Lymph puts into circulation large protein molecules by carrying them from the tissues into the blood stream (which could not be absorbed by blood capillaries due to their large size). Lymph also carries digested fat from intestine to other tissues, and excess fluid from the extra-cellular space back into blood.

Q.15. Why is it necessary to separate oxygenated and deoxygenated blood in mammals and birds?

Ans. The mammals and birds are warm-blooded animals which have high energy needs because they constantly require energy to maintain their body temperature. It is necessary to separate oxygenated blood and deoxygenated blood in mammals and birds because such a separation allows a highly efficient supply of oxygen to the body cells which is required for producing a lot of energy needed by them.

Q.16. What are the components of the transport system in highly organised plants?

Ans. The two components of transport in highly organised plants are xylem and phloem.

(*i*) Xylem tissue is made of dead cells in the form of xylem vessels and tracheids. It transports water and dissolved minerals from roots to all the parts of the plant.

(*ii*) Phloem tissue is made of living cells in the form of sieve tubes and companion cells. It transports food made in leaves by photosynthesis to all the parts of a plant.

Q.17 How are water and minerals transported in plants?

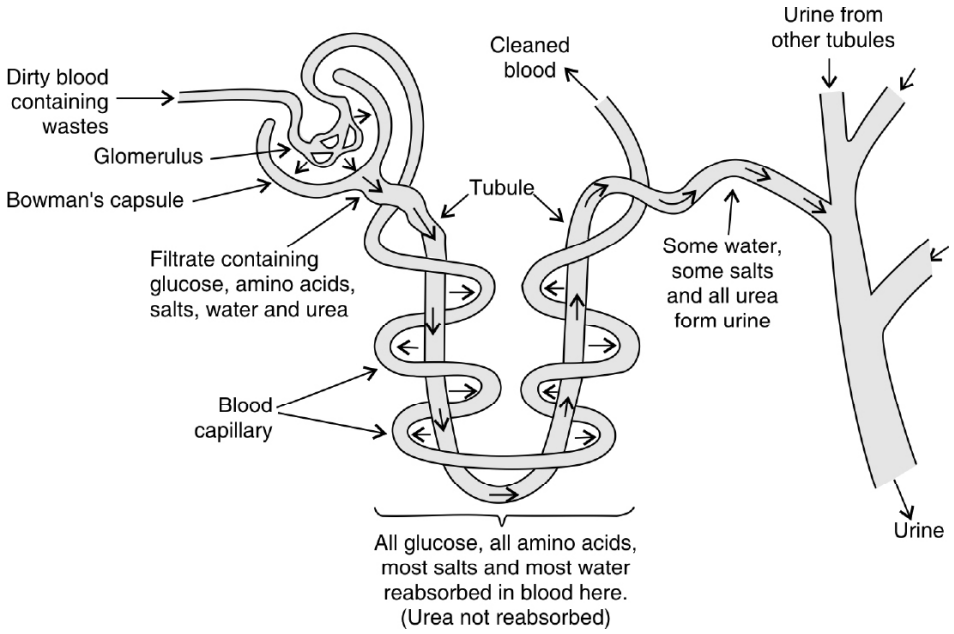
Ans. Water and the minerals dissolved in it are transported in plants by xylem tissue. In xylem tissue, the xylem vessels and tracheids of the roots, stems and leaves are interconnected to form a continuous water conducting channel which reaches all the parts of the plant. The mechanism of transport of water in plants is as follows: The leaves of plants have tiny pores called stomata. The water brought in by xylem to the leaves is constantly being lost by evaporation through stomata. The loss of water in the form of water vapour from the leaves of a plant is called transpiration. The continuous evaporation of water (or transpiration) from the cells of leaves creates a kind of suction which pulls up water from the roots through the xylem (just as a cold drink moves up the straw when we suck at the upper end of the straw). Thus, transpiration helps in the upward movement of water and dissolved minerals from the roots to the leaves.

Q.18. How is food transported in plants?

Ans. The transport of food (made by photosynthesis) in the plant leaves takes place through 'phloem tissue'. The phloem tissue consists of sieve tubes alongwith their companion cells. The mechanism of movement of food in phloem (or translocation) by utilising energy is described below: The sugar (food) made in leaves is loaded into the sieve tubes of phloem tissue by using energy from ATP. Water now enters into sieve tubes containing sugar by the process of osmosis due to which the pressure in the phloem tissue rises. This high pressure produced in the phloem tissue moves the food to all the parts of the plant having less pressure in their tissues. This allows the phloem to transport food according to the needs of the plant. The movement of food in phloem can be upwards or downwards depending on the requirements of the plant.

Q.19. Describe the structure and functioning of nephrons.

Ans. The nephron has a cup-shaped bag at its upper end which is called Bowman's capsule. The lower end of Bowman's capsule is tube-shaped and it is called a tubule. The Bowman's capsule and the tubule taken together make a nephron (Each kidney has about 1 million nephrons). One end of the tubule is connected to Bowman's capsule and its other end is connected to a urine-collecting duct of the kidney. The Bowman's capsule contains a bundle of capillaries which is called glomerulus. One end of glomerulus is attached to renal artery which brings the dirty blood containing the urea waste in it. The other end of glomerulus comes out of Bowman's capsule as a blood capillary, surrounds the tubule of nephron and finally joins a renal vein (putting urea-free clean blood into it). The function of glomerulus is to filter the blood passing through it. The dirty blood containing waste like urea (brought by renal



artery) enters the glomerulus. The glomerulus filters this blood. During filtration, the substances like glucose, amino acids, salts, water and urea, etc., present in the blood pass into Bowman's capsule and then enter the tubule of nephron. When the filtrate containing useful substances as well as the waste substances passes through the tubule, then the useful substances like all glucose, all amino acids, most salts, and most water, etc., are reabsorbed into the blood through blood capillaries surrounding the tubule. Only the waste substances urea, some unwanted salts and excess water remain behind in the tubule. The liquid left behind in the tubule of nephron is urine. The nephron carries this urine into the collecting duct of the kidney from where it is carried to ureter. From the ureter, urine passes into urinary bladder. Urine is stored in the bladder for some time and ultimately passed out of the body through urethra.

Q.20. What are the methods used by plants to get rid of excretory products?

Ans. (*i*) The plants produce carbon dioxide as a waste product during respiration and oxygen as a waste product during photosynthesis. The plants get rid of gaseous waste products through stomata in their leaves and lenticels in stems.

(*ii*) The plants store some of the solid and liquid wastes in their body parts such as leaves, bark and fruits. The plants get rid of stored solid and liquid wastes by the shedding of leaves, peeling of bark and felling of fruits.

(*iii*) The plants get rid of their wastes by secreting them in the form of gums and resins. The plants also secrete some waste substances into the soil around them.

Q.21. How is the amount of urine produced regulated?

Ans. The amount of urine produced is regulated by reabsorption of water and some of the dissolved substances into the blood through blood capillaries surrounding the tubules of nephrons. The amount of urine produced depends on how much excess water is present in the body and how much of dissolved wastes are to be excreted.

NCERT Exercises

Q.1 The kidneys in human beings are a part of the system for:

(*a*) nutrition (*b*) respiration (*c*) excretion (*d*) transportation

Ans. (*c*) excretion.

Q.2. 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.

Q.3. 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

Q.4. 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

Q.5. How are fats digested in our bodies? Where does this process take place?

Ans. Fats are digested in the small intestine in our body. The liver secretes an alkaline liquid called bile into small intestine. The salts present in bile emulsify (or break) large globules of fat present in our food into smaller globules making it easy for the enzymes to act on them and digest them. Pancreas secretes pancreatic juice into small intestine which also contains an enzyme called 'lipase'. The enzyme lipase breaks down the emulsified fat further. And finally, the enzymes present in intestinal juice brings about the complete digestion of fats by converting them into fatty acids and glycerol.

Q.6. What is the role of saliva in the digestion of food?

Ans. Saliva contains an enzyme called salivary amylase. The enzyme salivary amylase present in saliva breaks down the complex 'starch' carbohydrate present in food into a simpler sugar.

Q.7. What are the conditions necessary for autotrophic nutrition and what are its by-products?

Ans. Autotrophic mode of nutrition involves the making of food by green plants by the process of photosynthesis. The conditions necessary for autotrophic nutrition are the presence of: Carbon dioxide, Water, Chlorophyll and Sunlight. Carbon dioxide combines with water in the presence of sunlight energy (absorbed by chlorophyll) to form food like glucose. This glucose carbohydrate is used for providing energy to the plant. A part of glucose is stored

in plants as starch which can be used as a source of energy whenever the plant needs it. The major by-product of autotrophic nutrition (or photosynthesis) is oxygen gas which goes into the air.

Q.8. (*a*) What are the differences between aerobic and anaerobic respiration?

(*b*) Name some organisms that use the anaerobic mode of respiration.

Ans. (*a*)

Aerobic Respiration	Anaerobic Respiration
Aerobic respiration takes place in presence of oxygen	Anaerobic respiration takes place in absence of oxygen
It occurs in mitochondria	It occurs in cytoplasm
The end products are carbon dioxide and water	The end products are alcohol or lactic acid
38 molecules of ATP are released	Two molecules of ATP are released
It takes place in most living cells	It takes place in muscle cells, yeast and anaerobic bacteria

(*b*) Anaerobic mode of respiration is used by certain micro-organisms such as yeast and some bacteria known as anaerobic bacteria.

Q.9. How are the alveoli designed to maximise the exchange of gases?

Ans. There are millions of alveoli (thin-walled air-sacs) in the lungs. The presence of millions of alveoli in the lungs provides a very large area for the exchange of gases. And the availability of large surface area maximises the exchange of gases. For example, if all alveoli from the two human lungs are unfolded, they would give an area of about 80 square metres (which is nearly the size of a tennis court !).

Q.10. What would be the consequences of a deficiency of haemoglobin in our bodies?

Ans. The oxygen required for breathing and respiration (release of energy) is carried by haemoglobin present in our blood. The deficiency of haemoglobin in the blood of a person reduces the oxygen-carrying capacity of blood resulting in breathing problems, tiredness and lack of energy. The person looks pale and loses weight.

Q.11. Describe double circulation in human beings. Why is it necessary?

Ans. A circulatory system in which the blood travels twice through the heart in one complete cycle of the body is called double circulation. In the human circulatory system, the pathway of blood from the heart to the rest of the body and back to the heart is called systemic circulation; and the pathway of blood from the heart to the lungs and back to the heart is called pulmonary circulation. These two types of circulation taken together make double circulation. The double circulation is necessary to supply oxygenated blood to the whole body (except lungs), and then to get deoxygenated blood reoxygenated in the lungs.

Q.12. What are the differences between the transport of materials in xylem and phloem?

Ans. (*i*) Xylem tissue transports water and dissolved minerals in plants whereas phloem tissue transports the food (made by photosynthesis) to all the parts of the plant.

(*ii*) Xylem tissue carries the water and dissolved minerals only upwards from the roots of the plant but the movement of food from the leaves through phloem can be upwards as well as downwards depending on the requirements of the plant.

(*iii*) The upward movement of water and dissolved minerals in xylem tissue is caused by a suction force produced by the continuous evaporation of water (or transpiration) from the cells of leaves of the plant which pulls up water from the roots. On the other hand, the food made in leaves is transported through phloem tissue by utilising energy from ATP.

Q.13. Compare alveoli in the lungs and nephrons in the kidneys with respect to their structure and functioning.

Ans. (*i*) Structure. Alveoli in the lungs and nephrons in the kidneys, both possess an elaborate network of blood capillaries.

(*ii*) Functioning. Alveoli purify the deoxygenated blood by removing carbon dioxide from it and making it oxygenated by introducing oxygen in it (during the gaseous exchange). Similarly, nephrons purify the dirty blood by filtering out waste products like urea from it in the form of urine.