Questions **Page Number: 95**

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

Solution:

Multi-cellular organisms like humans have very big bodies and require a lot of oxygen to diffuse into the body quickly in order to meet the oxygen requirement. Diffusion is a slow process which will take a lot of time to circulate oxygen to all the body cells. Because of its slow nature, diffusion is insufficient to meet the oxygen requirements of multicellular organisms like humans.

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

Solution:

Walking, breathing, growth and other visible changes can be used to determine whether something is alive or dead. However, some living things will have changes that are not visible to our eye; Hence, the presence of the life process is a fundamental criterion to decide whether something is alive.

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

Solution:

The outside raw material is used by organisms for food and oxygen. Raw materials' requirement varies on the complexity of the organism and the environment it is living.

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

Solution:

Life processes such as respiration, digestion, excretion, circulation and transportation are essential for maintaining life.

Questions **Page Number: 101**

1. What are the differences between autotrophic nutrition and heterotrophic nutrition?

Solution:

Autotrophic Nutrition	Heterotrophic Nutrition
Organism prepares its own food and is not dependent on any other organism.	An organism that does not prepare its own food and is dependent on other organisms for food.
Food is prepared from CO_2, water, and sunlight.	Food cannot be prepared from CO_2, water, or sunlight.
Chlorophyll is required for food preparation.	Chlorophyll is not required for food preparation.
Green plants and certain bacteria have autotrophic modes of nutrition.	All animals and fungi, most bacteria, have heterotrophic modes of nutrition.

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

Solution:

Plants require the following raw material for photosynthesis:

1. CO_2 is obtained from the atmosphere through stomata
2. Water is absorbed by plant roots from the soil.
3. Sunlight is an essential raw material for photosynthesis
4. Nutrients are obtained by soil by plant roots

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

Solution:

HCl present in the stomach dissolves food particles and creates an acidic medium. In an acidic environment, protein-digesting enzymes, pepsinogen, are converted into pepsin. HCl in the stomach also acts as a protective barrier against many disease-causing pathogens.

4. What is the function of digestive enzymes?

Solution:

Digestive enzymes break complex food molecules into simpler ones. This will make the food absorption process easy and effective. Absorbed food is transported to all parts of the body by the blood.

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

Solution:

The small intestine has small projections called microvilli, which increase the surface volume, making the absorption more effective. Within the villi, there are numerous blood vessels that absorb digested food and carry it to the bloodstream. Blood transports food to each part of our body.

Questions **Page Number: 105**

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

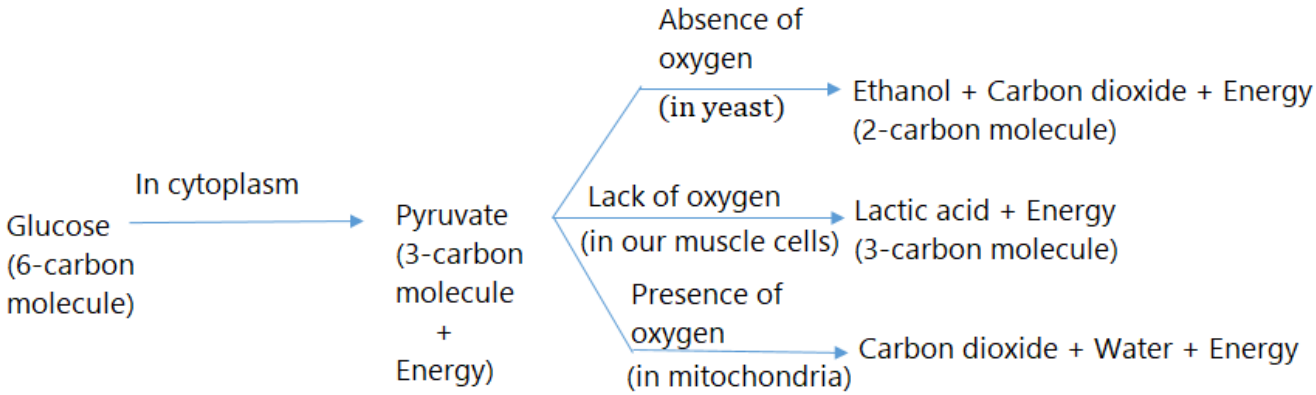
Solution:

Terrestrial organisms breathe by using atmospheric oxygen, whereas aquatic organisms take oxygen dissolved in water. The oxygen level is high in the atmosphere when compared to oxygen in the water. Hence, terrestrial organisms need not breathe fast to obtain organisms, whereas aquatic organisms need to breathe faster to get the required oxygen.

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

Solution:

In the cytoplasm, Glucose is first broken down into two 3 carbon compounds called pyruvate by the process known as Glycolysis. Further breakdown takes place in different organisms by different processes.



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

Solution:

Oxygen and Carbon dioxide are transported in human beings via the bloodstream. Oxygen is carried to the cells, whereas carbon dioxide is carried away from the cells. The exchange of gases takes place between the alveoli of the lungs and the surrounding blood capillaries. Oxygen is absorbed by the blood capillaries from the lungs' alveoli by diffusion, while carbon dioxide is absorbed by the lungs' alveoli from the blood capillaries by diffusion.

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

Solution:

- The lungs are an important part of the body. The passage inside the lungs divides into smaller and smaller tubes, which finally terminate in balloon-like structures called alveoli.
- The alveoli provide a surface where the exchange of gases can take place. The walls of the alveoli usually contain an extensive network of blood vessels. We know that when we breathe in, we lift our ribs, flatten our diaphragm and the chest cavity becomes larger.
- Because of this action, the air is sucked into the lungs and fills up the expanded alveoli.

- The blood brings the essential carbon dioxide from the rest of the body and supplies it to the alveoli; the oxygen in the alveolar air is taken up by the blood in the alveolar blood vessels to be transported to all other cells of the body. During the normal breathing cycle, when air is taken in and let out, the lungs always contain a residual volume of air so that there is sufficient time for oxygen to be absorbed and carbon dioxide to be released.

Questions **Page Number: 110**

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

Solution:

The heart, blood and blood vessels are the main components of the transport system in human beings.

Functions of these components

Heart

The heart pumps oxygenated blood throughout the body. It receives deoxygenated blood from the various body parts and sends impure blood to the lungs for oxygenation.

Blood

Blood transports oxygen, nutrients, CO_2, and nitrogenous wastes.

Blood vessels

Blood vessels, arteries and veins carry blood to all parts of the body.

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

Solution:

Mammals and birds are warm-blooded animals which keep their body temperature constant irrespective of the environment they live. This process requires a lot of oxygen for more cellular respiration so that warm-blooded animals produce more energy to balance their body temperature. Hence, it is very important for warm-blooded animals to separate oxygenated and deoxygenated blood to keep their circulatory system efficient.

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

Solution:

There are two types of conducting tissues in highly organised plants that carry out the transport system 1) Xylem 2) Phloem. Xylem conduct water and minerals from roots to the rest of the plant parts. Similarly, Phloem transports food materials from the leaf to other parts of the plant.

4. How are water and minerals transported in plants?

Solution:

Xylem parts of the tracheids and vessels of roots, stems and leaves are interconnected to form a continuous system of water-conducting channels that reaches all parts of the plant. Transpiration creates a suction pressure which forces water into the xylem cells of roots. After this, there will be a steady movement of water from the root xylem to all parts of the plant connected through conducting interconnected water-conducting channels.

5. How is food transported in plants?

Solution:

Food is transported in plants by a special organ called the phloem. Phloem transports food materials from leaves to different parts of a plant. Transportation of food in phloem is achieved by the expenditure of energy from ATP. This increases osmotic pressure in the tissue, causing water to move. This pressure moves material in the Phloem to the tissues with less pressure. This helps in the transportation of food materials as per the needs. Example, Sucrose.

Questions **Page Number**: **112**

1. Describe the structure and functioning of nephrons.

Solution:

Nephrons are the filtration units of the kidney, which are large in numbers. Some substances in the initial filtrate, such as glucose, amino acids, salts and a major amount of water, are selectively re-absorbed as the urine flows along the tube.

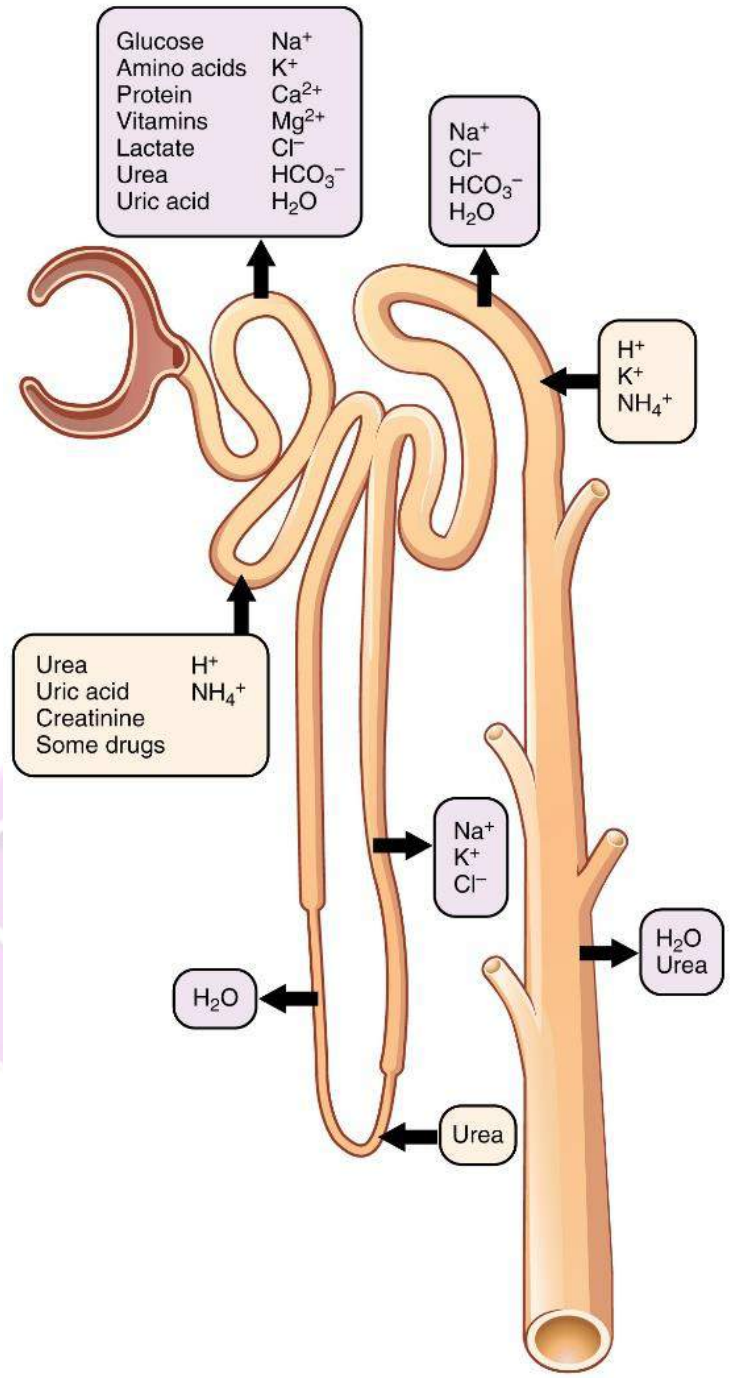
The main components of Nephrons are

Glomerulus

Bowman's Capsule

Long Renal Tube

Structure of Nephron


Glucose
Amino acids
Protein
Vitamins
Lactate
Urea
Uric acid
Na+
K+
Ca2+
Mg2+
Cl−
HCO3−
H2O
Na+
Cl−
HCO3−
H2O
H+
K+
NH4+
Urea
Uric acid
Creatinine
Some drugs
H+
NH4+
Na+
K+
Cl−
H2O
Urea
H2O
Urea

Functioning of Nephron

- The blood enters the kidney through the renal artery, which branches into many capillaries associated with the glomerulus.
- The water and solute are transferred to the nephron at Bowman's capsule.
- In the proximal tubule, substances such as amino acids, glucose, and salts are selectively reabsorbed, and unwanted molecules are added to the urine.
- The filtrate then moves down into the loop of Henle, where more water is absorbed. From here, the filtrate moves upwards into the distal tubule and finally to the collecting duct. The collecting duct collects urine from many nephrons.
- The urine formed in each kidney enters a long tube called the ureter. From the ureter, it gets transported to the urinary bladder and then into the urethra.

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

Solution:

Plants can get rid of excess water by transpiration.

For other wastes, plants use the fact that many of their tissues consist of dead cells and that they can even lose some parts, such as leaves. Many plant waste products are stored in cellular vacuoles. Waste products may be stored in leaves that fall off.

Other waste products are stored as resins and gums, especially in old xylem. Plants also excrete some waste substances into the soil around them.

3. How is the amount of urine produced regulated?

Solution:

The amount of urine produced depends on the amount of excess water and dissolved waste present in the body. Other factors may be the environment and the ADH hormone, which regulates the production of urine.

Questions **Page Number: 113**

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

(a) nutrition

(b) respiration

(c) excretion

(d) transportation

Solution:

The answer is (c) excretion

The excretory system of human beings (Fig. 6.13) includes a pair of kidneys, a pair of ureters, a urinary bladder and a urethra. Kidneys are located in the abdomen, one on either side of the backbone. Urine produced in the kidneys passes through the ureters into the urinary bladder, where it is stored until it is released through the urethra.

2. The xylem in plants is responsible for

(a) transport of water

(b) transport of food

(c) transport of amino acids

(d) transport of oxygen

Solution:

In plants, the Xylem is responsible for the transport of water. Hence, the answer is (a)

3. The autotrophic mode of nutrition requires

(a) carbon dioxide and water

(b) chlorophyll

(c) sunlight

(d) all of the above

Solution:

The autotrophic mode of nutrition requires carbon dioxide, water, chlorophyll and sunlight from the preparation of food. Hence, the answer is (d) all of the above.

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

(a) cytoplasm.

(b) mitochondria

(c) chloroplast

(d) nucleus

Solution:

The breakdown of pyruvate to give carbon dioxide, water and energy take place in mitochondria. Hence, the answer is (b) mitochondria

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

Solution:

- The small intestine is the place for the complete digestion of carbohydrates, fats and proteins. It receives the secretions of the liver and pancreas for this purpose.
- The food coming from the stomach is usually acidic in nature, and it has to be made alkaline so that pancreatic enzymes can act on it. Bile juice produced in the liver accomplishes this process.
- Fats are usually present in the intestine in the form of larger globules, which makes it difficult for enzymes to act on them. The bile salts help in breaking down larger globules into smaller globules. The pancreas helps in secreting pancreatic juice, which contains enzymes like trypsin for digesting proteins and 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 proteins to amino acids, complex carbohydrates into glucose and finally, fats into fatty acids and glycerol.

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

Solution:

The food we intake is complex in nature; if it is to be absorbed from the alimentary canal, then it has to be broken into smaller molecules. This process is mainly done with the help of biological catalysts called enzymes. The saliva contains an enzyme called salivary amylase that breaks down starch, which is a complex molecule to give sugar. The food is mixed thoroughly with saliva and moved around the mouth while chewing the muscular tongue. Hence, saliva plays a pivotal role in the digestion and absorption of food.

7. What are the necessary conditions for autotrophic nutrition, and what are its byproducts?

Solution:

- The energy and carbon requirements of the autotrophic organism are obtained by the process of photosynthesis.
- It is defined as the process by which autotrophs take in substances from the outside surroundings and convert them into stored forms of energy.
- This substance is taken in the form of carbon dioxide and water, which are converted into carbohydrates in the presence of sunlight and chlorophyll.
- The main purpose of carbohydrates is to provide energy to the plant. The carbohydrates are not utilised immediately, but they are stored in the form of starch, which serves as an internal energy reserve.
- The stored energy can be used as and when required by the plant.

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

Solution:

Aerobic respiration

- The process takes place in the presence of free oxygen.
- The products of aerobic respiration are CO_2, water and energy.
- The first step of aerobic respiration (glycolysis) takes place in the cytoplasm, while the next step takes place in mitochondria.
- The process of aerobic respiration takes place in all higher organisms.
- In this process, complete oxidation of glucose takes place.

Anaerobic respiration

- The process takes place in the absence of free oxygen.
- The products of anaerobic respiration are ethyl alcohol, CO_2 and a little energy.
- Even in anaerobic respiration, the first step takes place in the cytoplasm, while the next step takes place in mitochondria.
- In this process, the glucose molecules are incompletely broken down.
- The process of anaerobic respiration takes place in lower organisms like yeast, some species of bacteria and parasites like tapeworms.

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

Solution:

- The lung is an important part of the body. The passage inside the lungs divides into smaller and smaller tubes, which finally terminate in balloon-like structures called alveoli.
- The alveoli provide a surface where the exchange of gases can take place. The walls of the alveoli usually contain an extensive network of blood vessels. We know that when we breathe in, we lift our ribs, flatten our diaphragm and the chest cavity becomes larger.
- Because of this action, the air is sucked into the lungs and fills up the expanded alveoli.
- The blood brings the essential carbon dioxide from the rest of the body and supplies it to the alveoli; the oxygen in the alveolar air is taken up by the blood in the alveolar blood vessels to be transported to all other cells of the body. During the normal breathing cycle, when air is taken in and let out, the lungs always contain a residual volume of air so that there is sufficient time for oxygen to be absorbed and carbon dioxide to be released.

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

Solution:

Haemoglobin is a protein responsible for the transportation of oxygen to the body cells for cellular respiration. A deficiency of Haemoglobin can affect the oxygen-carrying capacity of RBCs. This lead to a lack of oxygen in our body cells. Haemoglobin deficiency leads to a disease called anaemia.

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

Solution:

Double circulation means, in a single cycle, blood goes twice in the heart. The process helps in separating oxygenated and deoxygenated blood to maintain a constant body temperature.

The double circulatory system of blood includes

- Pulmonary circulation
- Systemic circulation.

Pulmonary circulation

The right ventricle pumps deoxygenated blood into the lungs, where it is oxygenated. The oxygenated blood is brought back to the left atrium, and from there, it is pumped into the left ventricle. Finally, blood goes into the aorta for systemic circulation.

Systemic circulation

The oxygenated blood is pumped to various parts of the body from the left ventricle. The deoxygenated blood from different parts of the body passes through the vena cava to reach the right atrium. The right atrium transfers the blood into the right ventricle.

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

Solution:

Transport of Materials in Xylem	Transport of Materials in Phloem
Xylem tissue helps in the transport of water and minerals.	Phloem tissue helps in the transport of food.
Water is transported upwards from roots to all other plant parts.	Food is transported in both upward and downward directions.

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

Solution:

Alveoli	**Nephrons**
Structure	**Structure**

(i) Alveoli are tiny balloon-like structures present inside the lungs.	(i) Nephrons are tubular structures present inside the kidneys.
(ii) The walls of the alveoli are one cell thick, and it contains an extensive network of blood capillaries.	(ii) Nephrons are made of glomerulus, Bowman's capsule, and a long renal tube.
Function	**Function**
(i) The exchange of O_2 and CO_2 takes place between the blood of the capillaries that surround the alveoli and the gases present in the alveoli.	(i) The blood enters the kidneys through the renal artery. The blood is entered here, and the nitrogenous waste in the form of urine is collected by the collecting duct.
(ii) Alveoli are the site of gaseous exchange.	(ii) Nephrons are the basic filtration unit.