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

Answer 1:
In multi-cellular organisms, all the cells may not be in direct contact with the surrounding environment. Thus, simple diffusion will not meet the requirements of all the cells.

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

Answer 2:
Any visible movement such as walking, breathing, or growing is generally used to decide whether something is alive or not. However, a living organism can also have movements, which are not visible to the naked eye. Therefore, the presence of molecular movement inside the organisms used to decide whether something is alive or not.

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

Answer 3:
An organism uses outside raw materials mostly in the form of food (Since life on earth depends on carbon based molecules, most of these food sources are also carbon-based) and oxygen. The raw materials required by an organism can be quite varied depending on the complexity of the organism and its environment.

Question 4:

What processes would you consider essential for maintaining life?

Answer 4:

Life processes such as nutrition, respiration, transportation, excretion, etc. are essential for maintaining life.

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Question 1:

What are the differences between autotrophic nutrition and heterotrophic nutrition?

Answer 1:

	Autotrophic nutrition		*Heterotrophic nutrition*
1.	Food is synthesised from simple inorganic raw materials such as CO_2 and water.	1.	Food is obtained directly or indirectly from autotrophs. This food is broken down with the help of enzymes.
2.	Presence of green pigment (chlorophyll) is necessary.	2.	No pigment is required in this type of nutrition.
3.	Food is generally prepared during day time.	3.	Food can be prepared at all times.
4.	All green plants and some bacteria have this type of nutrition.	4.	All animals and fungi have this type of nutrition.

Question 2:

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

Answer 2:

The following raw materials are required for photosynthesis:

- The raw material CO_2 enters from the atmosphere through stomata.
- Water is absorbed from the soil by the plant roots.
- Sunlight, an important component to manufacture food, is absorbed by the chlorophyll and other green parts of the plants.

Question 3:
What is the role of the acid in our stomach?

Answer 3:
Role of the acid (HCl) in our stomach:

- Kills germs present in the food.
- Makes the food acidic, so that pepsin can digest protein.

Question 4:
What is the function of digestive enzymes?

Answer 4:
Digestive enzymes such as amylase, lipase, pepsin, trypsin, etc. help in the breaking down of complex food particles into simple ones. These simple particles can be easily absorbed by the blood and thus transported to all the cells of the body.

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

Answer 5:
The small intestine has millions of tiny finger-like projections called villi. These villi increase the surface area for food absorption. Within these villi, many blood vessels are present that absorb the digested food and carry it to the blood stream. From the blood stream, the absorbed food is delivered to each and every cell of the body.

Question 1:

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

Answer 1:

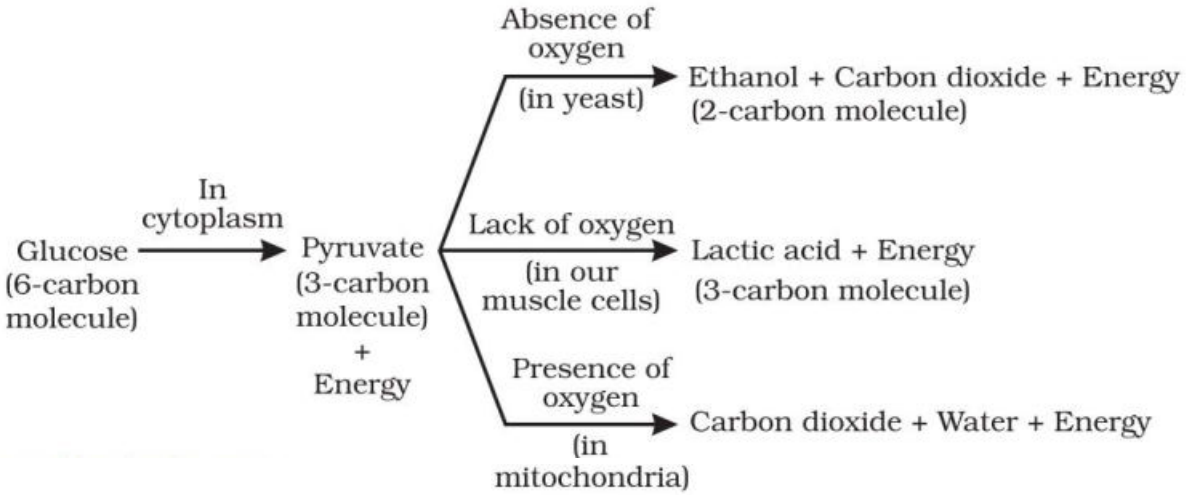
Since the amount of dissolved oxygen is fairly low compared to the amount of oxygen in the air, the rate of breathing in aquatic organisms is much faster than that seen in terrestrial organisms. Therefore, unlike aquatic animals, terrestrial animals do not have to show various adaptations for better gaseous exchange.

Question 2:

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

Answer 2:

Glucose is first broken down in the cell cytoplasm into a three carbon molecule called pyruvate. Pyruvate is further broken down in the following ways to provide energy:



Question 3:

How is oxygen and carbon dioxide transported in human beings?

Answer 3:

Haemoglobin transports oxygen molecule to all the body cells for cellular respiration. The haemoglobin pigment present in the blood gets attached to O_2 molecules that are obtained from breathing. It thus forms oxyhaemoglobin and the blood becomes oxygenated. This oxygenated blood is then distributed to all the body cells by the heart. After giving away O_2 to the body cells, blood takes CO_2 which is the end product of cellular respiration. Now the blood becomes de-oxygenated.

Since haemoglobin pigment has less affinity for CO_2, CO_2 is mainly transported in the dissolved form. This de-oxygenated blood gives CO_2 to lung alveoli and takes O_2 in return.

Question 4:

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

Answer 4:

The exchange of gases takes place between the blood capillaries that surround the alveoli and the gases present in the alveoli. Thus, alveoli are the site for exchange of gases. The lungs get filled up with air during the process of inhalation as ribs are lifted up and diaphragm is flattened. The air that is rushed inside the lungs fills the numerous alveoli present in the lungs. Each lung contains 300-350 million alveoli. These numerous alveoli increase the surface area for gaseous exchange making the process of respiration more efficient.

Question 1:

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

Answer 1:

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

- ***Heart*** pumps oxygenated blood throughout the body. It receives deoxygenated blood from the various body parts and sends this impure blood to the lungs for oxygenation.
- ***Blood*** is a fluid connective tissue, it helps in the transport of oxygen, nutrients, CO_2, and nitrogenous wastes.
- ***Blood vessels*** (arteries, veins, and capillaries) carry blood either away from the heart to various organs or from various organs back to the heart.

Question 2:

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

Answer 2:

Warm-blooded animals such as birds and mammals maintain a constant body temperature by cooling themselves when they are in a hotter environment and by warming their bodies when they are in a cooler environment. Hence, these animals require more oxygen (O_2) for more cellular respiration so that they can produce more energy to maintain their body temperature.

Thus, it is necessary for them to separate oxygenated and de-oxygenated blood, so that their circulatory system is more efficient and can maintain their constant body temperature.

Question 3:

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

Answer 3:

In highly organised plants, there are two different types of conducting tissues – *xylem* and *phloem*.

- ***Xylem*** conducts water and minerals obtained from the soil (via roots) to the rest of the plant.
- ***Phloem*** transports amino acids and food materials from the leaves to different parts of the plant body.

Question 4:

How are water and minerals transported in plants?

Answer 4:

The components of xylem tissue (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, as a result of which water is forced into the xylem cells of the roots. Then there is a steady movement of water from the root xylem to all the plant parts through the interconnected water – conducting channels.

Question 5:

How is food transported in plants?

Answer 5:

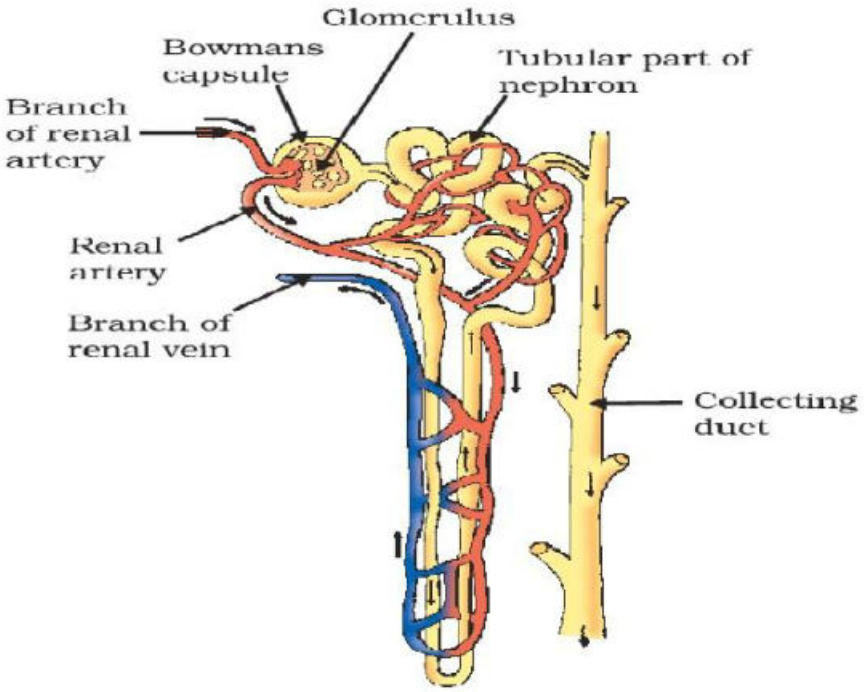
Phloem transports food materials from the leaves to different parts of the plant body. The transportation of food in phloem is achieved by utilizing energy from ATP. As a result of this, the osmotic pressure in the tissue increases causing water to move into it. This pressure moves the material in the phloem to the tissues which have less pressure. This is helpful in moving materials according to the needs of the plant. For example, the food material, such as sucrose, is transported into the phloem tissue using ATP energy.

Question 1:

Describe the structure and functioning of nephrons.

Answer 1:

Nephrons are the basic filtering units of kidneys. Each kidney possesses large number of nephrons, approximately 1-1.5 million. The main components of the nephron are glomerulus, Bowman's capsule, and a long renal tubule.



Structure of Nephron

Functioning of a nephron:

- The blood enters the kidney through the renal artery, which branches into many capillaries associated with glomerulus.
- The water and solute are transferred to the nephron at Bowman's capsule.

- In the proximal tubule, some substances such as amino acids, glucose, and salts are selectively reabsorbed and unwanted molecules are added in 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. Collecting duct collects urine from many nephrons.
- The urine formed in each kidney enters a long tube called ureter. From ureter, it gets transported to the urinary bladder and then into the urethra.

Question 2:

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

Answer 2:

Plants use completely different strategies for excretion than those of animals. They 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.

Question 3:

How is the amount of urine produced regulated?

Answer 3:

The amount of urine produced depends on the amount of excess water and dissolved wastes present in the body. Some other factors such as habitat of an organism and hormone such as Antidiuretic hormone (ADH) also regulates the amount of urine produced.