

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

**Answer**

Unlike the unicellular organisms, the multi-cellular organisms have complex body structures with specialized cells and tissues to perform various necessary functions of the body. Since these cells are not in direct contact with surrounding environment so, simple diffusion cannot meet the oxygen requirement of all these cells.

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

**Answer**

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 life processes is a fundamental criterion that can be used to decide whether something is alive or not.

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

**Answer**

Various outside raw materials used by an organism are as follows:

- Food as source of supplying energy and materials.
- Oxygen for breakdown of food to obtain energy.
- Water for proper digestion of food and other functions inside the body.

The raw materials required by an organism will vary depending on the complexity of the organism and its environment.

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

**Answer**

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

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

**Answer**

Autotrophic Nutrition	Heterotrophic Nutrition
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Food is synthesised from simple inorganic raw materials such as CO <sub>2</sub> and water.	Food is obtained directly or indirectly from autotrophs. This food is broken down with the help of enzymes.
Chlorophyll is required.	Chlorophyll is not required.
Food is generally prepared during day time.	Food can be obtained at all time.
All green plants and some bacteria have this type of nutrition.	All animals and fungi have this type of nutrition.

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

### Answer

The following raw materials are required for photosynthesis:

- Carbon Dioxide: Plants get CO<sub>2</sub> from atmosphere through stomata.
- Water: Plants absorb water from soil through roots and transport to leaves.
- Sunlight: Sunlight, which is absorbed by the chlorophyll and other green parts of the plant.

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

### Answer

Following are the roles of acid in our stomach:→ The hydrochloric acid present in our stomach dissolves bits of food and creates an acidic medium. In this acidic medium, enzyme pepsinogen is converted to pepsin, which is a protein-digesting enzyme.  
→ It also kills many bacteria and other microorganisms that enter along with the food.

Q. What is the function of digestive enzymes?

### Answer

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.

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

### Answer

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

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

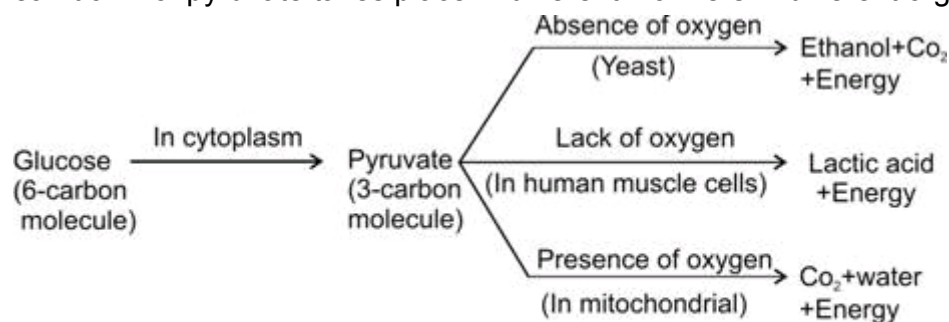
**Answer**

Terrestrial organisms take up oxygen from the atmosphere whereas aquatic animals obtain oxygen from water. Air contains more  $O_2$  as compared to water. Since the content of  $O_2$  in air is high, the terrestrial animals do not have to breathe faster to get more oxygen. Therefore, unlike aquatic animals, terrestrial animals do not need adaptations for gaseous exchange.

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

**Answer**

At first glucose (6 carbon molecules) is broken in the cytoplasm of cells of all organisms. This process yields a 3 carbon molecule compound called pyruvate. Further break down of pyruvate takes place in different manners in different organisms.



- Anaerobic Respiration: This process takes place in absence of oxygen, e.g. in yeast during fermentation. In this case, pyruvate is converted into ethanol and carbon dioxide.
- Aerobic Respiration: In aerobic respiration, the breakdown of pyruvate takes place in presence of oxygen to give rise to 3 molecules of carbon dioxide and water. The release of energy in aerobic respiration is much more than anaerobic respiration.
- Lack of Oxygen: Sometimes, when there is lack of oxygen, especially during vigorous activity, in our muscles, pyruvate is converted into lactic acid (3 carbon molecule compounds). Formation of lactic acid in muscles causes cramp.

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

**Answer**

→ Transport of Oxygen: The respiratory pigments (haemoglobin) present in red blood cells take up the oxygen from the air to the lungs. They carry the oxygen to tissues which are deficient in oxygen.

→ Transport of carbon dioxide: Carbon Dioxide is more soluble in water. Hence, it is mostly transported from body tissues in the dissolved form in our blood plasma to lungs where it diffuses from blood to air in the lungs and then expelled out through nostrils.

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

### **Answer**

Lungs contain millions of alveoli which provide a surface for the exchange of gases. An extensive network of blood vessels is present in the wall of the alveoli. By lifting our ribs and flattening the diaphragm, the chest cavity becomes spacious. Air is sucked into the lungs and alveoli. The oxygen from the breath, diffuses into the blood and  $\text{CO}_2$  from the blood brought from the body, diffuses out into the air.

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

### **Answer**

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 helps in the transport of oxygen, nutrients,  $\text{CO}_2$ , and nitrogenous wastes.

→ The blood vessels (arteries, veins, and capillaries) carry blood either away from the heart to various organs or from various organs back to the heart.

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

### **Answer**

It is necessary to separate oxygenated and deoxygenated blood to maintain efficient supply of oxygen into the body. This system is essential in animals that have high energy need. For example, animals like mammals and birds which constantly use this energy to maintain their body temperature.

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

**Answer**

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 food materials from the leaves to different parts of the plant body.

Q. How are water and minerals transported in plants?

**Answer**

Water and minerals are transported through xylem cells from soil to the leaves. The xylem cells of roots stem and leaves are interconnected to form a conducting channel that reaches all parts of the plant. The root cells take ions from the soil. This creates a difference between the concentration of ions of roots and soil. Therefore, there is a steady movement of water into xylem. An osmotic pressure is formed and water and minerals are transported from one cell to the other cell due to osmosis. The continuous loss of water takes place due to transpiration. Because of transpiration, a suction pressure is created as a result of which water is forced into the xylem cells of roots. The effect of root pressure for transportation in plants is more important in night while during day time transpiration pull becomes the major driving force.

Q. How is food transported in plants?

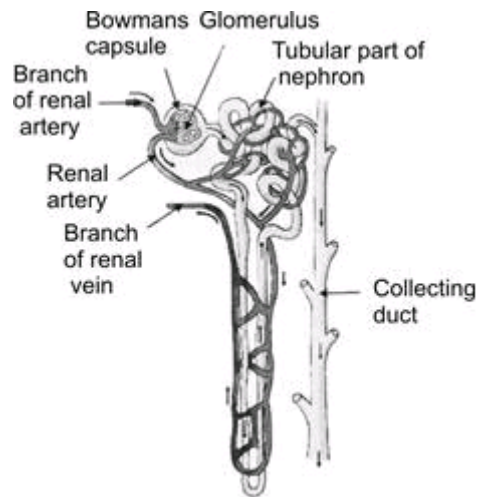
**Answer**

Phloem transports food materials from the leaves to different parts of the plant. The transportation of food in phloem is achieved by utilizing energy from ATP which helps in creating osmotic pressure that transport food from the area of high concentration to low concentration.

Q. Describe the structure and functioning of nephrons.

**Answer**

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.



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.

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

**Answer**

Plants can get rid of excess of water by transpiration. Waste materials may be stored in the cell vacuoles or as gum and resin, especially in old xylem. It is also stored in the leaves that later fall off.

Q. How is the amount of urine produced regulated?

**Answer**

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 Anti-diuretic hormone (ADH) also regulates the amount of urine produced.

## Exercise

1. The kidneys in human beings are a part of the system for
  - (a) nutrition.
  - (b) respiration.
  - (c) excretion.
  - (d) transportation.► (c) excretion.
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.► (a) transport of water.
3. The autotrophic mode of nutrition requires
  - (a) carbon dioxide and water.
  - (b) chlorophyll.
  - (c) sunlight.
  - (d) all of the above.► (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.► (b) mitochondria.
5. How are fats digested in our bodies? Where does this process take place?

## Answer

Fats are present in the form of large globules in the small intestine. The small intestine receives the secretions from the liver and the pancreas. The bile salts (from the liver) break down the large fat globules into smaller globules so that the pancreatic enzyme lipase can easily act on them. This is referred to as emulsification of fats. This process takes place in the small intestine.

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

## Answer

The role of saliva in the digestion of food:  
→ It moistens the food for easy swallowing.

→ It contains a digestive enzyme called salivary amylase, which breaks down starch into sugar.

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

**Answer**

Autotrophic nutrition takes place through the process of photosynthesis. Carbon dioxide, water, chlorophyll pigment, and sunlight are the necessary conditions required for autotrophic nutrition. Carbohydrates (food) and  $O_2$  are the by-products of photosynthesis.

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

**Answer**

<b>Aerobic respiration</b>	<b>Anaerobic respiration</b>
It occurs in the presence of $O_2$ .	It occurs in the absence of $O_2$ .
It involves the exchange of gases between the organism and the outside environment.	Exchange of gases is absent.
It occurs in cytoplasm and mitochondria.	It occurs only in cytoplasm.
It always releases $CO_2$ and $H_2O$ .	End products vary.

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

**Answer**

Alveoli provide a surface for the exchange of gases. An extensive network of blood vessels is present in the wall of the alveoli. By lifting our ribs and flatten the diaphragm, the chest cavity becomes spacious. Air is sucked into the lungs and alveoli. The oxygen from the breath, diffuses into the blood and  $CO_2$  from the blood brought from the body, diffuses out into the air.

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

**Answer**

Haemoglobin is the respiratory pigment that transports oxygen to the body cells for cellular respiration. Therefore, deficiency of haemoglobin in blood can affect the oxygen supplying capacity of blood. This can lead to deficiency of oxygen in the body cells. It can also lead to a disease called anaemia.



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

**Answer**

During a single cycle blood goes twice in the heart which is known as double circulation. It is necessary in human being to separate oxygenated and de-oxygenated blood because this makes their circulatory system is more efficient and helps in maintaining constant body temperature.

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

**Answer**

<b>Xylem</b>	<b>Phloem</b>
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.
Transport in xylem occurs with the help of simple physical forces such as transpiration pull.	Transport of food in phloem requires energy in the form of ATP.

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

**Answer**

<b>Alveoli</b>	<b>Nephrons</b>
<b>Structure</b>	<b>Structure</b>
Alveoli are tiny balloon-like structures present inside the lungs.	Nephrons are tubular structures present inside the kidneys.
The walls of the alveoli are one cell thick and it contains an extensive network of blood capillaries.	Nephrons are made of glomerulus, bowman's capsule, and a long renal tube.
<b>Function</b>	<b>Function</b>
The exchange of O <sub>2</sub> and CO <sub>2</sub> takes place between the blood of the capillaries that surround the alveoli and the gases present in the alveoli.	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 collecting duct.
Alveoli are the site of gaseous exchange.	Nephrons are the basic filtration unit.