LIFE PROCESSES

Text Book Q&A

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

In the case of a single-celled organism, no specific organs for taking in food, exchange of gases or removal of wastes may be needed because the entire surface of the organism is in contact with the environment.

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.

This situation creates a need for a transportation system for carrying food and oxygen from one place to another in the body.

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

All living organisms show one or more of the following general characteristics. They all

(i) Breathe

(ii) Grow

(iii) Move

(iv) Respond to outside change

(v) Need food

(vi) Reproduce

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

Water used in photosynthesis is taken up from the soil by the roots in terrestrial plants.

Other materials like nitrogen, phosphorus, iron and magnesium are taken up from the soil.

Nitrogen is an essential element used in the synthesis of proteins and other compounds.

This is taken up in the form of inorganic nitrates or nitrites. Or it is taken up as organic compounds which have been prepared by bacteria from atmospheric nitrogen.

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

Autotrophic nutrition	Heterotrophic nutrition
The type of nutrition in which organisms synthesize organic materials (carbohydrates) from inorganic substances (water, carbon dioxide, minerals, etc.).	The type of nutrition in which energy is derived from the organic substances that are obtained from plants or animals.
Green plants and autotrophic bacteria.	All animals, fungi and heterotrophic bacteria.

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

Two raw materials required for photosynthesis are

(i) Water

(ii) Carbon dioxide

Plants absorb water present in the soil particles through **roots** by the process of **osmosis**.

Carbon dioxide gas is absorbed through **stomata** present on the leaves by the process of simple **diffusion**.

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

- Hydrochloric acid (HCl) secreted by gastric glands provides acidic medium in the stomach.
- Acidic environment in stomach is **required for the action of** protein digesting enzyme **pepsin** secreted in the stomach.
- Acid **also kills the microorganisms** which enter the body along with the food.

7. What is the function of digestive enzymes?

Secretions	Secreted by	Function
1. Salivary amylase	Salivary glands	Breakdown of starch
2. Pepsin	Stomach	Breakdown of proteins
3. Bile	Liver	Emulsification of fats
4. Pancreatic amylase	Pancreas	Breakdown of starch
5.Trypsin	Pancreas	Breakdown of proteins
6. Pancreatic lipase	Pancreas	Breakdown of fats
7. Intestinal juice	Small intestine (Ileum)	Contains enzymes which complete digestion of Starch to glucose Proteins to amino acids Fats to fatty acids and glycerol.

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

This is the longest part of the alimentary canal which is fitted into a compact space because of extensive coiling.

The digested food is taken up by the walls of the intestine.

The inner lining of the small intestine has numerous finger-like projections called villi which increase the surface area for absorption.

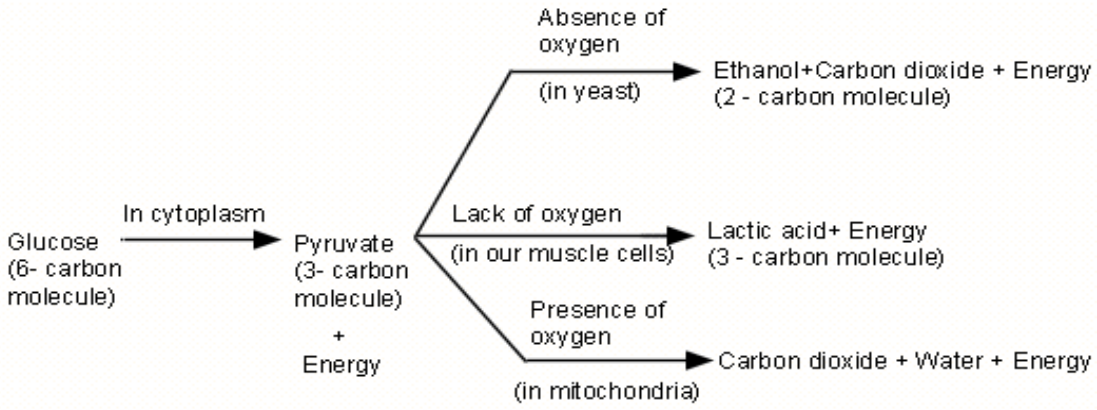
The villi are richly supplied with blood vessels which take the absorbed food to each and every cell of the body, where it is utilised for obtaining energy, building up new tissues and the repair of old tissues.

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

Terrestrial animals can breathe the oxygen in the atmosphere, but animals that live in water need to use the oxygen dissolved in water.

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.

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



Break down of glucose by various pathways

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

Transport of oxygen

- Oxygen enters blood in the alveoli region of the lungs.
- Blood contains respiratory pigment **haemoglobin** which has high affinity for oxygen.

- Oxygen binds with haemoglobin and is then is then carried to various body parts through blood circulation.
- In the tissue region oxygen diffuses from blood to the tissue.

Transport of carbon dioxide

- Tissues have more concentration of carbon dioxide which diffuses into the blood.
- CO_2 is mainly transported in the dissolved form through blood plasma.
- Once blood reaches alveoli, CO_2 diffuses out into the lungs.

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

Within the lungs, the passage divides into smaller and smaller tubes which finally terminate in balloon-like structures which are called alveoli.

The alveoli provide a surface where the exchange of gases can take place.

The walls of the alveoli contain an extensive network of blood-vessels to maximize the area for exchange of gases

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

Basic things required for transportation of material in human body.

Components of the transport system	Functions
Blood	Fluid medium to carry materials
Heart	A pump to push the fluid
Blood vessels	A network of tubes to carry this fluid to various body parts
Platelets	A system to maintain and repair the network of tubes damaged.

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

The separation of the right side and the left side of the heart prevents the mixing of oxygenated and deoxygenated blood.

Separation of oxygenated and deoxygenated blood allows a highly efficient supply of oxygen to the body.

This is specially useful in animals that have high energy needs like birds and mammals, which constantly use energy to maintain their body temperature.

15. What are the components of the transport system in highly organized plants?

Xylem and phloem.

16. How are water and minerals transported in plants?

The events during movement of water and minerals in plants are as follows:

The tissue responsible for it is **xylem**

Water enters roots through special structures called root hair. These are the epidermal outgrowths of roots.

Root hairs of plants are in direct contact with the film of water in between the soil particles.

Water and minerals dissolved in it enters through root hair due to osmosis and move through root cortex, endodermis, root xylem, stem xylem, xylem of petiole and finally to leaves.

This creates **concentration difference** and hence water is forced to move in.

The pressure that forces water in is called **root pressure**.

Since root pressure is not sufficient to pull water, suction force created by **transpiration** pulls water till the leaves.

17. How is food transported in plants?

The translocation of food, hormones other substances, takes place in the sieve tubes with the help of adjacent companion cells both in upward and downward directions.

Material like sucrose is transferred into phloem tissue from the leaf, using energy from ATP.

This increases the osmotic pressure of the tissue causing water to move into it.

This pressure moves the material in the phloem to tissues which have less pressure.

This allows the phloem to move materials according to the plant's needs.

18. Describe the structure and functioning of nephrons.

Nephron is the excretory unit of kidney.

Structure

- Each nephron has a cup shaped upper end, called Bowman's capsule.
- It contains cluster of capillaries arising from renal artery called glomerulus.
- Bowman's capsule leads into tubular structures.

Function

(i) Filtration of water and waste material

- The waste material is brought into kidneys by renal arteries.
- Blood is filtered in the Bowman's capsule and the filtrate moves to tubular structure.

(ii) Reabsorption of excess water and useful products

- 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 amount of water reabsorbed depends on:

- How much excess water is there in the body and on
- How much of dissolved waste is there to be excreted.

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

No	Wastes produced in the plant body	Mode of waste removal
1	O_2 produced during photosynthesis	Removed through stomata and body surface.
2	CO_2 produced during respiration	Removed through stomata and general body surface.
3	Excess water absorbed	Removed by transpiration mainly through stomata
4	Metabolic wastes: Gums, resins and other chemical substances	
		Give out some volatile waste materials from roots into the surrounding soil.
		Waste products may be stored in the form of gums and resins in old woody (Xylem) regions
		Waste material is sometimes stored in vacuoles.
		Waste material may also be stored in plant parts like leaves, which are periodically shed-off.

Plants remove their excretory wastes in following ways.

Photosynthetic waste, oxygen gas is removed through stomata and body surface.

Respiratory waste carbon dioxide is also removed by simple diffusion through stomata and general body surface

Excess water is removed by the process of transpiration mainly through stomata

Plants store metabolic wastes in their dead cells like xylem.

In living tissues, wastes material is sometimes stored in vacuoles.

Waste material may also be stored in plant parts like leaves, which are periodically shed-off.

Waste products may be stored in the form of gums and resins in old woody (Xylem) regions

Plants also give out some volatile waste materials from roots into the surrounding soil.

20. How is the amount of urine produced regulated?

- The urine forming in each kidney eventually enters a long tube, the ureter, which connects the kidneys with the urinary bladder.
- Urine is stored in the urinary bladder until the pressure of the expanded bladder leads to the urge to pass it out through the urethra.
- The bladder is muscular, so it is under nervous control.

21. What is lymph?

Lymph is a light-yellow circulatory fluid containing lymphocytes which help body fight against infection. Lymph flows in lymph vessels.

22. List the components of lymphatic system.

i. Lymph
ii. Lymphatic vessels and capillaries.
iii. Lymph glands
iv. Lymph nodes

23. What are the functions of lymph?

i. Lymph contains lymphocytes which fight against infection and help in body's defense mechanism.
ii. Lymph also carries digested fat.
iii. Lymph returns proteins and fluid from circulation to tissues.

24. Why lymph is also called extra cellular tissue fluid?

Lymph is also known as **extra cellular tissue** fluid as it bathes the cells and lies outside cells.

25. Differentiate between blood and lymph.

	Blood	**Lymph**
Colour	Red (RBCs present).	Light yellow (RBCs absent).
Components	RBC, WBC platelets and plasma	Some WBC and plasma
Moves through	Arteries, veins and capillaries	Lymphatic vessels and capillaries
Movement out of vessels	Only moves in vessels	Can come out of vessels and bathe the tissues as extra cellular fluid
Functions	Transportation of various materials, defense, clotting, etc.	Transportation of fats, fighting against infections
Direction of flow	Circulates from heart to body parts and back.	Only from body parts to heart

26. Name the parts of human excretory system and give their respective functions.

Part of excretory system	Function
Renal artery	Bring waste material to kidneys
Kidneys	Excretory organ in human beings which perform the function of excretion and osmoregulation
Ureter	Carry urine from kidney to urinary bladder
Urinary bladder	Stores urine till it is thrown out of the body
Urethra	Throws urine out of body

27. Explain the structure of nephron.

Nephron is the basic filtration unit in the kidney. There are large numbers of nephrons present in each kidney.

Each nephron consists of a cup shaped structure called Bowman's capsule at one end.

The renal artery entering the kidney branches of and these branches enters the Bowman's capsule

Inside the Bowman's capsule the renal arteriole further branches to form a tuft of capillary cluster called the Glomerulus.

The Bowman's capsule leads to a long tubular part of nephron. This part is surrounded by a network of capillaries

At the end of the tubular part is a collecting duct.

Collecting ducts from all nephrons finally join and connects with the ureter.

28. What is dialysis?

Dialysis is the technique of removing excretory wastes and other toxic waste artificially from the blood by passing it through long cellulose tubes coiled in a tank with dialysing solution.

As the blood passes through this artificial kidney the excretory and toxic wastes diffuses out and clean blood is pumped back in to the patient.

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