

Chapter 6

Life Processes

Intext Questions

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

Solution: The size of the multi cellular organism is very much large as compared to unicellular one. Diffusion is a passive mode of transport and can transfer gases up to a very small distance only. This mode will not be sufficient for multi cellular organism needs.

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

Solution: The main criteria to decide whether something is alive or not is the presence of life processes like:

- Living things grow and respond to the changes in their surrounding environment.
- Living things respire, excrete and show movement.
- Living things reproduce. They produce young ones.

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

Solution: Minerals, water and gases like carbon dioxide and oxygen are the outside raw materials used by an organism.

Question 4: What processes would you consider essential for maintaining life?

Solution: Processes essential for maintaining life are as follows:

- Nutrition
- Respiration
- Reproduction
- Excretion
- Movement and Locomotion

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Question 1: What are the differences between autotrophic nutrition and heterotrophic nutrition?

Solution:

Autotrophic Nutrition	Heterotrophic Nutrition
Mode of nutrition in which an organism synthesizes its own food from the simple inorganic materials like carbon dioxide and water present in the surroundings with the help of sunlight.	Mode of nutrition in which an organism cannot synthesize its own food from simple inorganic materials like carbon dioxide and water and depends on other organisms for its food
Eg: All plants and blue green bacteria	Eg: All animals, humans and yeast

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

Solution:

Raw Materials for Photosynthesis	Source
Carbon Dioxide	Atmosphere
Water	Ground Water
Solar Energy	Sun

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

Solution: HCl mainly performs two functions. They are:

As it turns the gastric juice acidic, the enzyme pepsin gets activated and starts digesting the proteins.

Another function is that it kills bacteria which may enter the stomach along with the food.

Question 4: What is the function of digestive enzymes?

Solution: The function of the digestive enzyme is to fasten the process of breaking up of complex molecules into simpler and absorbable molecules. It makes their absorption and assimilation easy.

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

Solution: Small intestine is especially adapted for absorbing the digested food. The inner surface of the 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. This large surface area helps in the rapid absorption of digested food.

On Page 105

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

Solution: A terrestrial animal has an advantage over an aquatic animal in regard to obtaining oxygen for respiration that it is surrounded by an oxygen rich atmosphere from where it can take any amount of oxygen.

Question 2: What are the different ways in which glucose is oxidized to provide energy in various organisms?

Solution: During Aerobic Respiration (All animals and humans)

Glucose $\xrightarrow{\quad}$ Pyruvate (through Glycolysis) $\xrightarrow{\quad}$ $6\text{CO}_2 + 6\text{H}_2\text{O} + 38 \text{ ATP}$ (In the presence of oxygen)

During Anaerobic Respiration (Yeast)

Glucose \rightarrow Pyruvate (through glycolysis) \rightarrow $2\text{C}_2\text{H}_5\text{OH} + 2\text{CO}_2 + 2\text{ATP}$

During Anaerobic respiration (found in muscles during strenuous exercise)

Glucose \rightarrow Pyruvate (through Glycolysis) \rightarrow lactic acid + 2 ATP

Question 3: How is the oxygen and carbon dioxide transported in human beings?

Solution: Oxygen and carbon dioxide are transported in human beings through a dedicated gas transport system. This system is mainly composed of the following parts –

Lungs: Lungs help in breathing in the oxygen rich air and breathing out the carbon dioxide rich air.

Heart: Heart pumps the deoxygenated blood to lungs for oxygenation and pumps oxygenated blood to different parts of the body.

Veins: Veins usually carry deoxygenated blood from different parts of the body to heart. One exception is the pulmonary vein which carries oxygenated blood from lungs to heart.

Arteries: Arteries usually carry oxygenated blood from heart to different parts of the body. One exception is pulmonary artery which carries deoxygenated blood from heart to lungs.

Note: Oxygen in blood is carried by a red pigment called haemoglobin. As the blood passes through the tissues of the body, the oxygen present in it diffuses into the cells due to its higher concentration in blood. Carbon dioxide is produced as a waste product during respiration in the cells of the body tissues. This carbon dioxide diffuses into the blood due to its higher concentration in the body tissues.

Question 4: How are the lungs designed in human beings to maximize the area for exchange of gases?

Solution: Each bronchus divides in the lungs to form a large number of smaller tubes called bronchioles. These bronchioles have tiny air sacs at the ends called the alveoli. The presence of alveoli in the lungs provides a very large surface area for the exchange of gases.

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

Solution: Three different organs form three types of transport system in human beings. They are:

Heart: Heart is a pumping organ and pumps blood. As the blood carries gases, food and waste products along with it, thus heart forms a major component of transport system.

Lungs: The main job of the lungs is to facilitate transport of oxygen and carbon dioxide to and from the body respectively.

Liver: Food goes to liver after it has been absorbed by the small intestine. From liver only, it gets distributed to all the parts of the body. Liver forms hepatic portal system.

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

Solution: Such a separation allows a highly efficient supply of oxygen to the body cells which is necessary for producing high amount of energy. This energy is useful in maintaining the high energy needs of the warm blooded animals as they constantly require energy to maintain their body temperature.

Question 3: What are the components of the transport system in highly organized plants?

Solution: The plant transport system in highly organized plants contains the following –

Xylem – To transport water and minerals from roots to the other parts of the plant

Phloem – To transport food and hormones from leaves to the other parts of the plant

Question 4: How are water and minerals transported in plants?

Solution: The continuous evaporation of water (transpiration) from the cells of a leaf creates a kind of suction pressure which pulls up water through the xylem vessels. The pressure at the top of the xylem vessels in the leaves is lowered whereas the pressure at the bottom remains high.

Question 5: How is food transported in plants?

Solution: The movement of the food in phloem takes place by utilizing energy. The food prepared in leaves is loaded into the sieve tubes of the phloem tissue by using energy from ATP. Water now enters into the sieve tubes containing food 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 the parts having less pressure or as per the need of the plant.

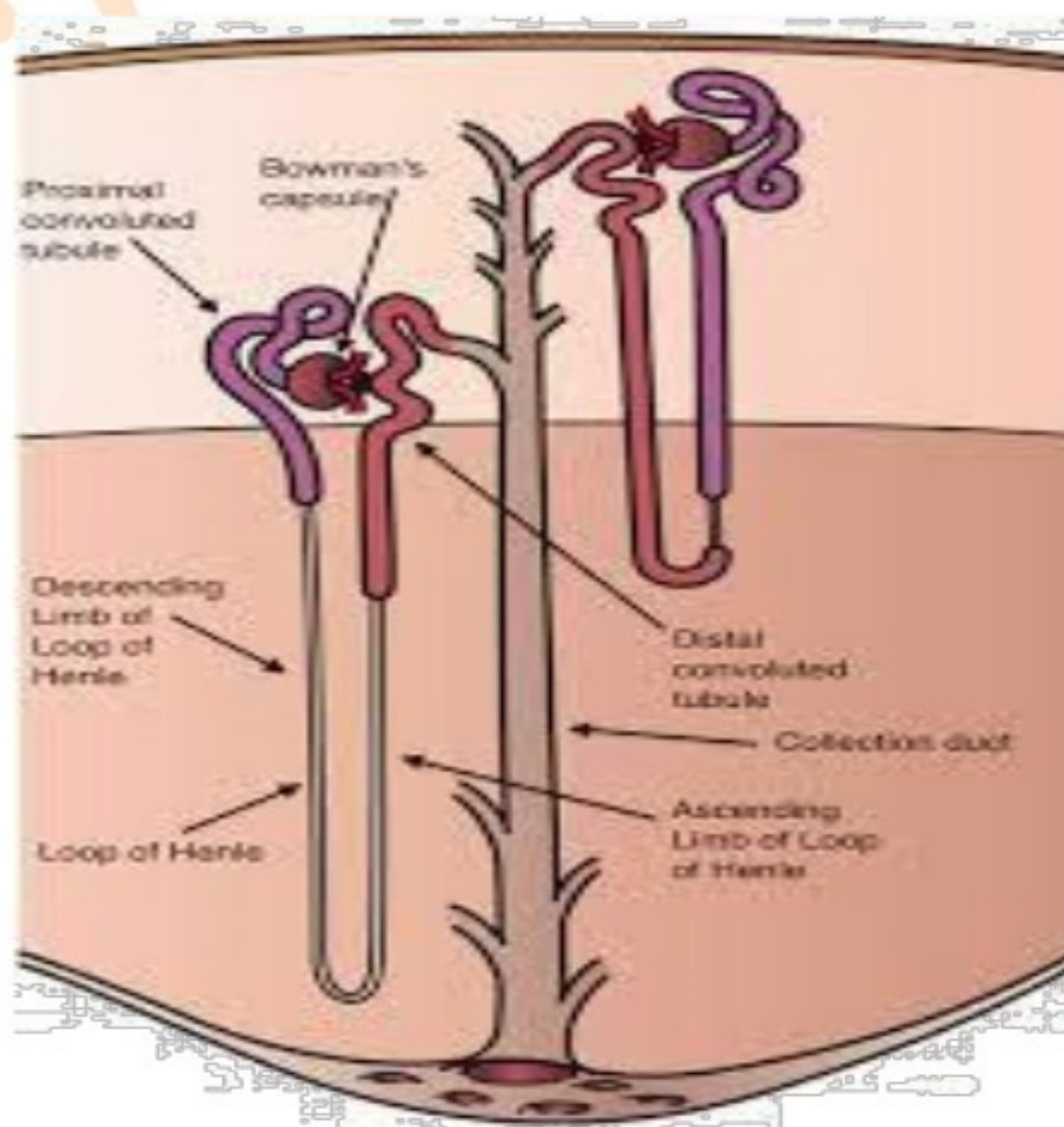
On Page 112

Question 1: Describe the structure and functioning of nephrons.

Solution: Structure of a Nephron – A nephron has a cup shaped bag at its upper end which is called the Bowman's capsule. The lower end of the Bowman's capsule is tube shaped and is called the tubule. The Bowman's capsule and the tubule together make a nephron.

One end of the tubule is connected to the Bowman's capsule and other one is connected to the urine collecting duct of the kidney. The Bowman's capsule contains a bundle of blood capillaries which is called the glomerulus. One end of the glomerulus is attached to the renal artery which brings the dirty blood containing the urea waste. The other end of the glomerulus comes out of the Bowman's capsule surrounded the tubule of a nephron and joins the renal vein to put urea free clean blood into it.

Function: Nephron is the functional unit of kidney. Its function is to reabsorb the molecules like glucose, water, amino acids and filter out urea from the passing blood.



Question 2: What are the methods used by plants to get rid of excretory products

Solution: Some of the plant wastes and the methods by which they are removed are mentioned below:

The gaseous wastes of respiration and photosynthesis in plants (carbon dioxide, oxygen) are removed through stomata in leaves and lenticels in stems and released in the air.

Solid wastes are removed by shedding of leaves, peeling of bark and felling of fruits.

Plants also get rid of wastes in the form of gums and resins.

Plants also excrete some waste substances into the soil around them.

Question 3: How is the amount of urine produced regulated?

Solution: The kidney has a mechanism to reabsorb water from the filtrate. This depends on how much water is left in the body and in the filtrate. The comparative concentration of the water gives a signal to the brain which then takes the required corrective action of either reabsorbing water or releasing it.

Exercise

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

- a) Nutrition
- b) Respiration
- c) Excretion
- d) Transportation

Solution: (c)

Question 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: (a)

Question 3: The autotrophic mode of nutrition requires

- a) Carbon dioxide and water
- b) Chlorophyll
- c) Sunlight
- d) All of the above

Solution: (d)

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

- a) Cytoplasm
- b) Mitochondria
- c) Chloroplast
- d) Nucleus

Solution: (b)

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

Solution: Fats are present in the intestine in the form of large globules which makes it difficult for the enzymes to act on them. Bile salts break them into smaller globules thus increasing the efficiency of enzyme action. The pancreas secretes pancreatic juice which contains enzyme

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called lipase for breaking down the emulsified fats. The walls of the small intestine contain glands which secrete intestinal juice. Intestinal juice contains enzymes which finally turn fat globules into fatty acids and glycerols.

Question 6: What is the role of saliva in the digestion of food?

Solution: Saliva contains the enzyme amylase which breaks complex molecules into sugar.

Question 7: What are the necessary conditions for autotrophic nutrition and what are its by products?

Solution: The necessary conditions for autotrophic nutrition are the availability of Sunlight, carbon dioxide and chlorophyll.

The by product of autotrophic nutrition is starch and oxygen.

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

Solution:

Aerobic Respiration	Anaerobic Respiration
Aerobic respiration takes place in the presence of oxygen	Anaerobic respiration takes place in the absence of oxygen.
Complete breakdown of food occurs in aerobic respiration	Partial breakdown of food occurs in anaerobic respiration
The end products in aerobic respiration are carbon dioxide and water	The end product in anaerobic respiration may be ethanol and carbon dioxide as found in yeast or lactic acid as seen in animal muscles
Aerobic respiration releases 38 ATP per glucose molecule	Anaerobic respiration produces only 2 ATP per glucose molecule.

Some of the organisms where anaerobic respiration is found are yeast and bacteria.

Question 9: How are the alveoli designed to maximize the exchange of gases?

Solution: The alveoli are the tiny air sacs to increase the surface area to maximize the exchange of gases. Moreover, alveoli have very thin walls and are surrounded by thin large number of blood capillaries to facilitate diffusion.

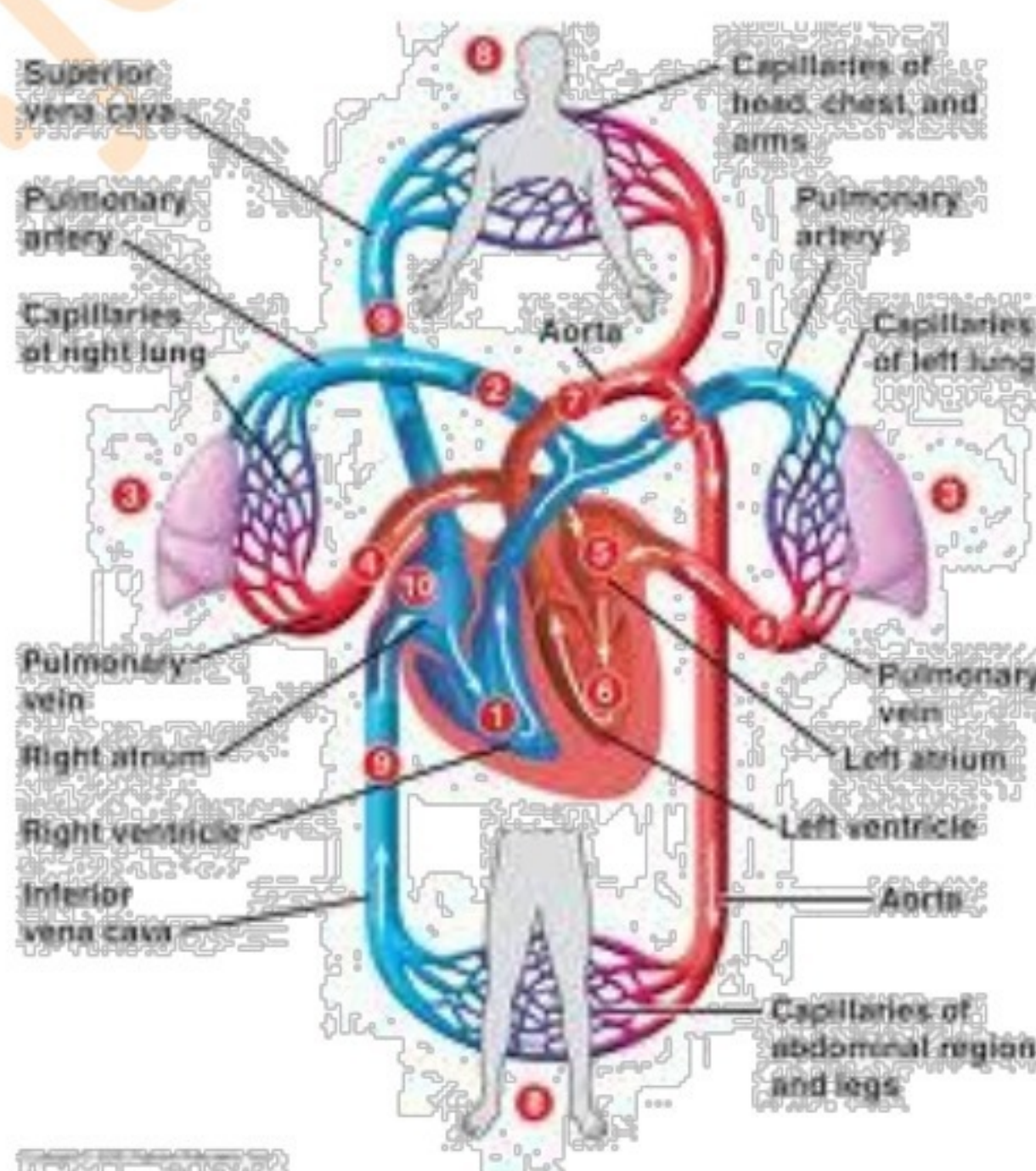
Question 10: What would be the consequences of a deficiency of haemoglobin in our bodies?

Solution: Deficiency of haemoglobin means lesser oxygen carrying capacity of the blood. Thus our body tissues will get lesser oxygen and the person suffering from haemoglobin deficiency feels fatigued (Anaemia)

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

Solution: 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 lungs and back to the heart is called pulmonary circulation. The pathway of the blood from the heart to the rest of the body is called systemic circulation. These two types of circulation taken together make double circulation.

Human beings have four chambered heart. The right side and the left side are completely separated to prevent the oxygenated and de oxygenated blood from mixing. Such a separation allows a highly efficient supply of oxygen to the body cells in order to fulfill the high energy needs because humans constantly require energy to maintain their body temperature.



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

Solution:

Xylem	Phloem
Xylem carries water and minerals from the roots of the plant towards the shoots.	Phloem carries food materials and the hormones across the different parts of the plant
The transport through xylem is a kind of passive transport as it does not require energy.	The transport through phloem is a kind of active transport as it utilizes ATP.

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

Solution:

Alveoli	Nephrons
Alveoli are sac like structures	Nephrons are a network of very fine tubules
Alveoli have network of blood capillaries on their walls	Nephrons act like transit point for blood capillaries
Exchange of materials takes place through diffusion	Exchange of materials takes place due to difference in pressures.