

Chapter – 1

Life Processes

In Text Questions-Pg-95

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

Answer:

- Diffusion is the passive movement of ions, atoms, and molecules from a region of higher concentration to a region of low concentration.
- It occurs slowly and only up-to small distances therefore it will take long time to transport oxygen to all parts of the human body as the volume of the multicellular organism like human is. So diffusion would be insufficient to meet the oxygen requirements.
- Also, unlike single celled organisms, multicellular organisms are not in direct contact with the external environment, so diffusion cannot occur easily.

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

Answer: We can decide whether something is living by observing certain characteristics of living things like:-

1. Can Move by Themselves (Locomotion)
2. Living things need food, air and water (Metabolism)
3. Living things grow (cell division)
4. Living things respond to stimuli (Responsiveness)
5. Living things respire (Respiration; gaseous exchange)
6. Living things excrete (Excretion)
7. Living things can reproduce (Reproduction)
8. Living things are aware. (Consciousness)

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

Answer: Outside raw materials used by an organism are:-

1. Autotrophic Organism- mainly use outside raw materials such as carbon dioxide, water, minerals and sunlight to synthesize its own food through photosynthesis.

2. Heterotrophic Organism- use outside raw material such as ready-made, organic food to grow and synthesize important substances needed in the body.

Most of the organisms need oxygen (from outside air) for the process of respiration.

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

Answer: If any organism needs to stay alive, there are few processes that are absolutely important to occur.

These processes are:

1. Nutrition:- Any organism that needs to continue living needs some form of nutrition (eg: food). This nutrition provides them with the energy for bodily functions.

2. Respiration:- An organism needs to breathe and respire. Through respiration, organisms acquire oxygen from the environment and use it for the breakdown food sources and release energy which they use to carry out metabolic processes.

3. Transportation:- Transportation or circulation is also important for an organism to live. It helps in carrying oxygen and nutrients throughout the body.

4. Excretion:- An organisms body produces waste products that are harmful for the body and hence need to be removed. So excretion takes place to make sure that the body gets rid of these harmful and toxic contents.

5. Control and coordination:- Control and coordination needed to make sure that the entire body functions well. The various processes occurring

inside any organism's body are interlinked or dependant on each other or connected to each other. So if there is no control and coordination among them, the entire system can breakdown.

In Text Questions-Pg-101

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

Answer:

autotrophic nutrition	heterotrophic nutrition
<ul style="list-style-type: none">- Autotrophic nutrition is the type of nutrition in which an organism makes its own food.- In this mode of nutrition, an organism prepares its own food and is hence dependant upon basic raw materials like, chlorophyll, sunlight, carbon dioxide and water.- It cannot take place without chlorophyll.- Green plants and algae show autotrophic nutrition.	<ul style="list-style-type: none">Heterotrophic nutrition is the type of nutrition in which an organism obtains nutrition by feeding on other organisms.- In this mode of nutrition, an organism does not require any raw material since it does not make its own food.- Chlorophyll is not required.- Animals and non green plants (like pitcher plant) show heterotrophic nutrition.

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

Answer: 1. Plants use water, minerals and carbon dioxide as raw materials in the presence of sunlight and chlorophyll to perform photosynthesis.

2. They obtain water and minerals from the soil and carbon dioxide from the atmosphere.
3. Chlorophyll is already present in green plants.
4. Only a certain percentage of sunlight reaching the plant is absorbed by the plants.

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

Answer: The role of acid in the stomach is as follow:

1. To provide an acidic medium for the activation of the protein-digesting enzyme pepsin.
2. To kill the harmful bacteria which may enter the stomach with intake of food.

Q. 4 What is the function of digestive enzymes?

Answer: Digestive enzymes help in breaking the large food particles into small simpler particles which are easily absorbed by blood and transported to body cells. For example- amylase converts starch into simpler sugar and pepsin coverts protein into simpler particles are digestive enzymes.

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

Answer: The surface of the intestine is made up of finger-like projections known as villi. The main function of the villi is to increase the surface area for the absorption of the digested food in the small intestine. Blood vessels within villi absorb digested food and transport it to body cells via the bloodstream.

In Text Questions-Pg-105

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

Answer: Terrestrial organism obtains oxygen for respiration from the atmosphere where the oxygen content is high, whereas, aquatic

organisms obtain oxygen dissolved in the water which is very low when compared to the amount in atmosphere. For this reason, aquatic animals breathe faster to obtain as much oxygen as possible, on the other hand, terrestrial animal does not have to breathe faster and thus spends less energy than aquatic organism.

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

Answer: Glucose is a six carbon molecule that is metabolised in different ways.

In different organisms, glucose is broken down in the cytoplasm first giving rise to pyruvate which is a three carbon molecule.

This pyruvate will now be utilised differently by different organisms. There are three pathways of glucose breakdown:

1. Anaerobic 2. Aerobic 3. Lack of oxygen

1. Anaerobic pathway:

- Takes place when oxygen is absent.
- Pyruvate gets converted into ethanol and carbon dioxide.
- Example: Yeast during fermentation.

2. Aerobic pathway:

- Takes place in the presence of oxygen.
- Pyruvate is broken down into carbon dioxide and water.
- Higher amount of energy produced.
- Example: In mitochondria.

3. Lack of Oxygen:

- This state may be reached due to vigorous activity.
- Oxygen is lacking and pyruvate gets converted into Lactic acid.
- Accumulation of lactic acid leads to muscle cramps.
- Example: In human muscle cells.

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

Answer:

- The gaseous exchange takes place between the blood and lungs more specifically between the alveoli and surrounding blood capillaries.
 - Carbon dioxide and oxygen are the two main gases that are exchanged.
 - The blood capillaries absorb the oxygen from the alveoli through diffusion.
 - Carbon dioxide, on the other hand, is absorbed by the alveoli from blood capillaries via diffusion.
-
- Haemoglobin is a respiratory pigment that aids in the transport of these gases.
 - The haemoglobin molecule has an extremely high affinity for oxygen i.e. the oxygen molecules can bind to the haemoglobin molecules easily.
 - One molecule of haemoglobin binds four molecules of oxygen.
 - When haemoglobin is bound to oxygen, it is called oxyhaemoglobin.
 - Haemoglobin can also bind to carbon dioxide molecules. When haemoglobin is bound to carbon dioxide molecules, it is known as carboxyhemoglobin.
-
- Oxygen from lungs to the cells is carried in the form of oxyhemoglobin.
 - Carbon dioxide is transported from the various cell to the lungs in the various forms, like: carboxyhemoglobin, carbonic acid, sodium and potassium bicarbonates.

The blood serves as a transport system for both carbon dioxide and oxygen. Oxygen is carried to the cells whereas carbon dioxide is carried away from the cells.

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

Answer: The structure of the lung can be described as follow:

Each lung receives bronchi which divide into bronchioles. These bronchioles further end with a large number of alveoli. These alveoli are small, round balloon-like structure, that is further connected with veins and arteries. These alveoli because of balloon-like structure provide a larger surface area and occupy very less volume. Hence they provide a larger surface thus maximizing the surface area for the exchange of gases inside the lungs.

In Text Questions-Pg-110

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

Answer: There are three components of the transport system in human beings- blood, blood vessels and the heart.

- The heart pumps oxygenated blood (haemoglobin+4molecules of inhaled oxygen) to all cells of the body; the blood then picks up CO₂ released from the cell during cellular respiration and becomes deoxygenated again which is sent to lungs for purification/oxygenation.

- Blood is made of cell fragments and plasma. It contains red blood cells, white blood cells, and platelets. It helps in the transport of oxygen to cells, exhaling carbon dioxide by picking it from cells and in the transport of nutrients and nitrogenous wastes too.

- Blood vessels (veins, arteries or capillaries) are responsible for carrying blood through the tissues and organs.

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

Answer: Birds and mammals are warm blooded animals. They maintain a constant body temperature by cooling and warming their bodies in warmer and cooler environment respectively. To maintain this constant temperature, they require large amount of oxygen for cellular respiration. So, it is necessary to separate oxygenated and deoxygenated blood because the circulatory system becomes more efficient and supplies more amount of oxygen needed to maintain this constant body temperature.

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

Answer: The components of the transport system in highly organized plants are xylem tissue and phloem tissue.

- **Xylem tissues:** The xylem tissue is responsible for the transport of water and minerals from the root to the leaves. They are made of long hollow chains of dead and tough xylem cells.

- **Phloem tissue:** The Phloem tissue is responsible for the transportation of food from the plant to all parts of the body. The phloem tissue is made of sieve tubes, companion cells, phloem parenchyma cell and phloem fibres.

Q. 4 How are water and minerals transported in plants?

Answer:

- The minerals are dissolved in the water. Unlike human beings, plants do not have a circulatory system.
- They use the two vascular tissues called xylem and phloem for transportation of water and minerals.

- The main materials of transport are gases, water, hormones, minerals, organic material etc.

Transport in Plants:

Water transport:

- The root hair absorbs water.
- The water gets transported and reached xylem vessels.
- There is a continuous uptake of water from the root to the xylem vessels.
- This continuous uptake creates a root pressure which allows water to be pushed upwards from the root to the plant body.
- In tall plants, like trees, this pull of water is created because of transpiration.
- Transpiration occurs through leaves (water from root reaches leaves and gets evaporated).

Mineral transport:

- Minerals are transported via xylem as well.
- Minerals are dissolved in the water and transported along with it.
- Organic compounds that are produced during photosynthesis get transported through phloem sieve tubes.

Q. 5 How is food transported in plants?

Answer: Food are stored in plants in the form of sucrose but sucrose is heavy molecules and can't be transported so it is broken down into simple molecules called glucose and transferred from source leaves to different parts of plants through phloem and its subparts called companion cells, based on gradient and ATP are utilized in this process.

In Text Questions-Pg-112

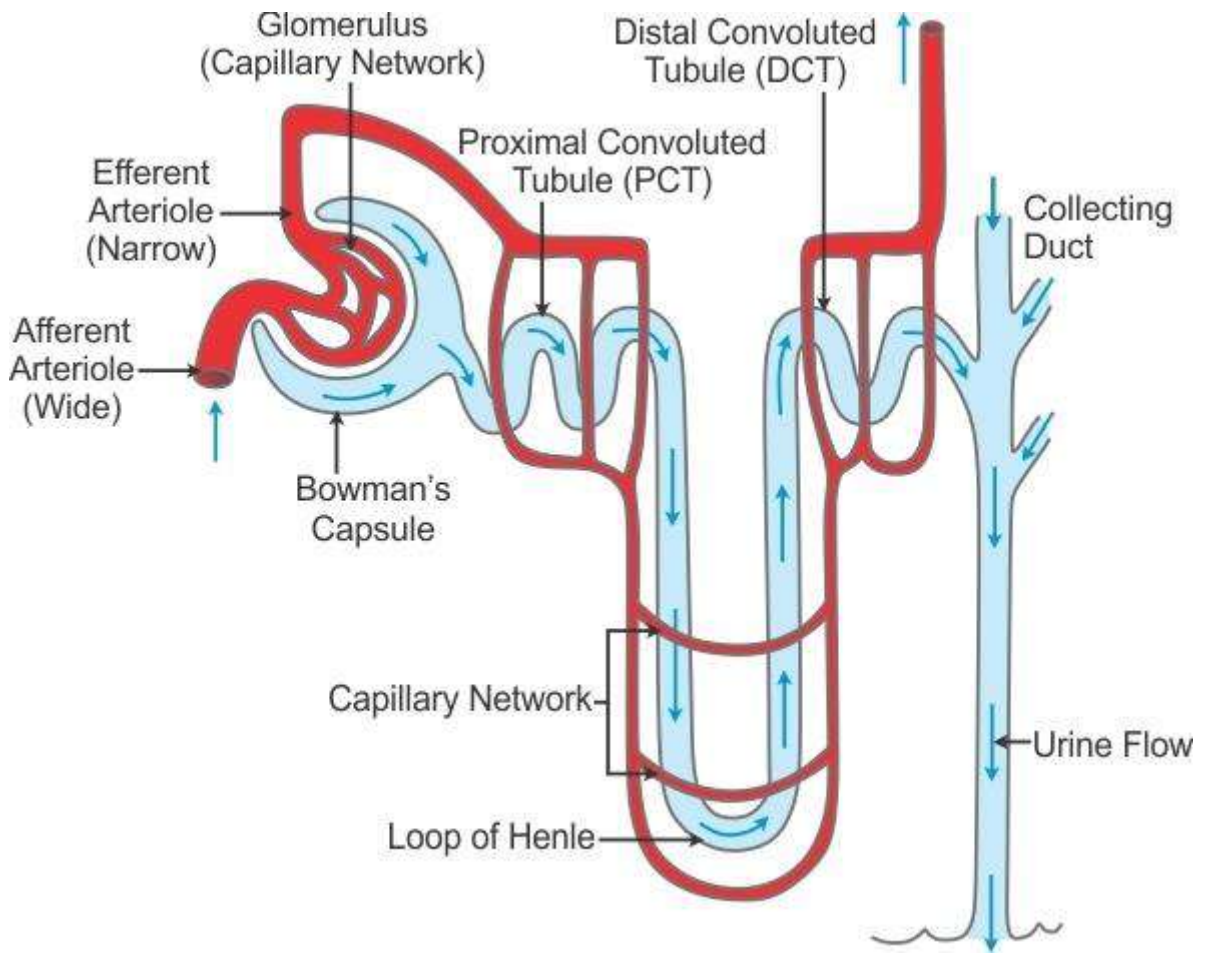
Q. 1 Describe the structure and functioning of nephrons.

Answer: STRUCTURE - a nephron consists of a renal corpuscle and a long complicated renal tubule.

- Nephron has a cup-shaped bag known as Bowmans Capsule.
- The lower end of the Bowmans Capsule is known as the Tubule.
- One end of Tubule is connected to Urine-Collecting Duct.
- Bowmans Capsule contains bundles of blood capillaries known as Glomerulus.
- One part of Glomerulus attached to Renal Artery bringing in the dirty blood(Containing Urea) while the other end coming out of Bowmans Capsule containing the clean blood
- Renal tubule is divided into three parts- proximal convoluted tubule (PCT), the loop of Henle and distal convoluted tubule (DCT) which ends by joining a collecting tubule.

Functions:-

- Glomerulus filters the blood passing through it
- It also removes other harmful substances from our body like urea
- Useful substances like glucose, essential amino acids, salts and major amount of water is selectively reabsorbed by tubular part of nephron



Q. 2 What is the method used by plants to get rid of excretory products?

Answer: There are various methods in plants to get rid of excretory products-

- The excess of water is transpired by transpiration. Transpiration is a phenomenon where moisture is taken up to the leaves from roots and is released into the atmosphere.
- Some plants store waste products in their leaves which are automatically removed when the leaves fall-off.
- Waste products like tannins, resins (in non-functional old xylem) and gums are stored in barks which are eliminated by peeling of the bark.
- Oxygen is produced as a by-product in photosynthesis and carbon dioxide is produced as a result of respiration. These gases are released from stomata in leaves of plants.

Q. 3 How is the amount of urine produced regulated?

Answer: The amount of urine is regulated by reabsorption of water through blood capillaries. The reabsorption takes place through tubules of nephrons which is a functional unit of kidney. Amount of urine depends on concentration of water converted into urine and amount of water into body thus maintains the neutral concentration of cell volume all over body.

Exercise-Pg-113

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

- A. Nutrition
- B. Respiration
- C. Excretion
- D. Transportation

Answer: Kidney has nephrons which is its functional unit. Nephrons function in filtering the blood, and excreting urine after re-absorbing the required substances from the blood.

Q. 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

Answer:

Transport of water

Xylem transports water and also minerals from roots to all other parts of the plant.

Q. 3 Autotrophic mode of nutrition requires:

(a) carbon dioxide and water.(b) chlorophyll.(c) sunlight.(d) all of the above.

A. Carbon dioxide and water

B. Chlorophyll

C. Sunlight

D. all of the above

Answer:

(d) All of the above

Plants are autotrophic. They use carbon dioxide, water in the presence of sunlight and chlorophyll to produce their own food and also release oxygen as a by-product.

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

A. Cytoplasm

B. Mitochondria

C. Chloroplast

D. Nucleus

Answer: Mitochondria function as the power house of cell by producing energy in the cell i.e. ATP.

Q. 5 How is fat digested in our bodies? Where does this process take place?

Answer: Fats are digested in our body in following ways

1. Our liver secretes alkaline fluid called bile juice into intestine which is use to emulsify fats into small fat globules.
2. The pancreas secrete another enzyme called “lipase” which further acts on small fat globules ad emulsify it further into simple glucose molecules.

3. These glucose molecule when oxidized in presence of oxygen release energy. The fat are digested in our body inside small intestine.

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

Answer: Role of saliva in digestion of food-

- Saliva is secreted by the salivary glands and it moistens (wets) the food and helps in creating a food bolus that can be easily swallowed.
- The enzyme present in saliva is salivary amylase which breaks down the complex starch present in food to simple sugars like maltose which can be digested easily.

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

Answer: Autotrophic nutrition is a process where the organism prepares its food from the simple inorganic materials like water, mineral salts and carbon dioxide in the presence of sunlight. All the green plants possess an autotrophic mode of nutrition.

The autotrophic organisms contain a green coloured pigment called chlorophyll which helps in trapping energy from the sun. They prepare their own food by utilizing solar energy, water, and carbon dioxide by the process of photosynthesis. This results in forming of glucose.

The conditions that are necessary for autotrophic nutrition (to perform photosynthesis) are water and minerals (obtained from soil), carbon dioxide (obtained from atmosphere) in the presence of chlorophyll (present in the leaves of plant) and sunlight.

Q. 8 A What are the differences between aerobic and anaerobic respiration?

Answer:

aerobic respiration?	anaerobic respiration?
1) Takes place in the presence of oxygen.	1) Takes place in the absence of oxygen.
2) Complete breakdown of food occurs during aerobic respiration.	2) Partial breakdown of food occurs in anaerobic respiration.
3) 1 molecule of Glucose gives 38 ATP(Energy) molecules.	3) 1 molecule of Glucose gives 2 ATP(Energy) molecules.
4) The end products are CO ₂ and water.	4) The end products are lactic acid(in case of animal muscles) and ethanol and CO ₂ (In case of yeast plants)
5) Produces a large amount of energy.	5) Less amount of energy is produced.
6) The chemical equation for the above process: $\text{Glucose} \xrightarrow[\text{(in cytoplasm)}]{\text{Glycolysis}} \text{Pyruvate}$	6) The chemical equation for above process: $\text{Glucose} \xrightarrow[\text{(in cytoplasm)}]{\text{Glycolysis}} \text{Pyruvate}$

Q. 8 B Name some organisms that use the anaerobic mode of respiration.

Answer: Bacteria like *Clostridium perfringens* and yeast like *Saccharomyces cerevisiae* are organisms that respire and survive anaerobically i.e. without oxygen.

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

Answer: Alveoli are small, round balloon like structures connected with thousands of arteries & veins. Since they are spherical, they require less volume and provide a large surface area for exchange of gases.

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

Answer: The haemoglobin is responsible for the transportation of oxygens to the cells in the different part of the body.

The deficiency of the haemoglobin in the blood of a person reduces the oxygen-carrying capacity of the blood resulting in the improper supply of oxygen to the tissue of the body which results in breathing problems, tiredness and lack of energy. The person looks pale and loses weight.

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

Answer: Blood circulation refers to the path taken by the blood throughout the body to transport the various gases and nutrients required. In human beings, the circulatory system is closed and double circulation takes place. In double circulation, the blood goes through the heart twice during each cardiac cycle.

Mechanism of double circulation:

There are two pathways of blood flow in double circulation.

1. Systemic circulation 2. Pulmonary circulation

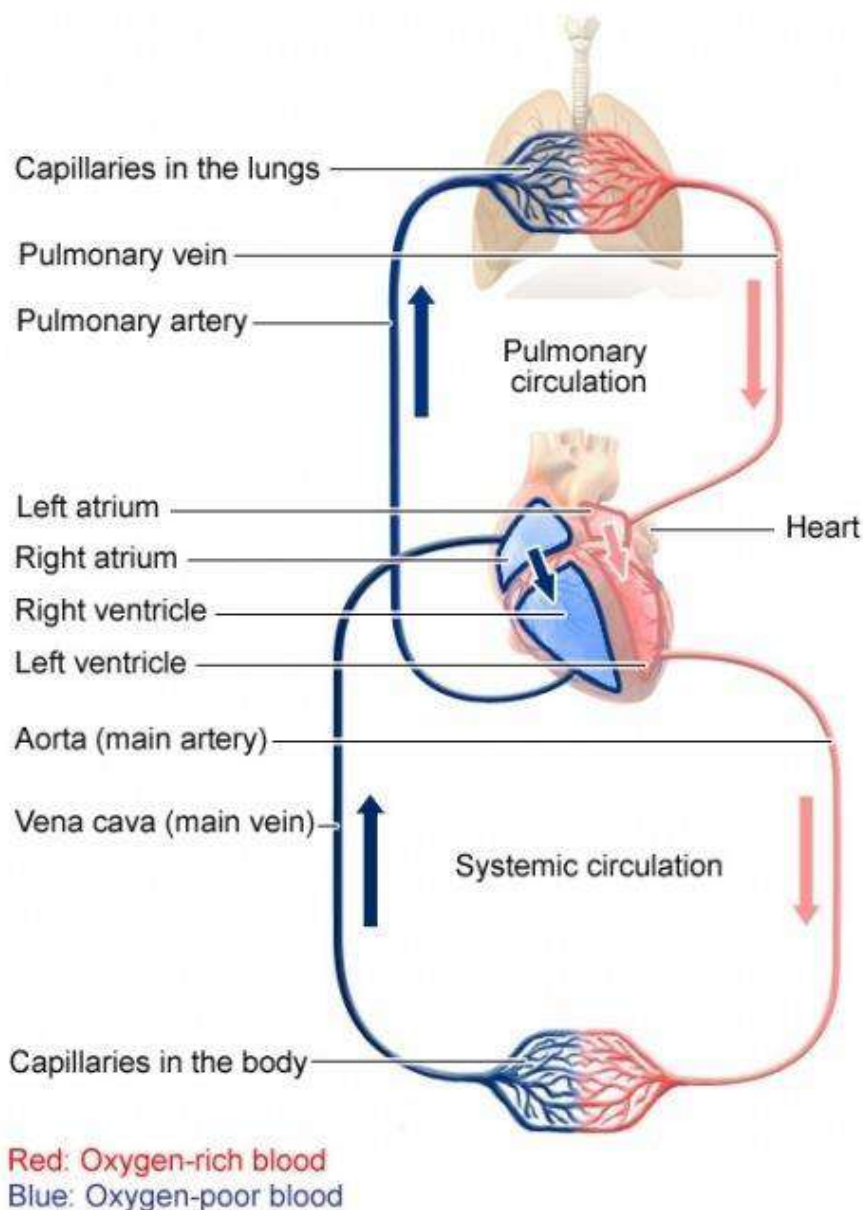
Systemic circulation:

- The oxygenated blood is pumped into the aorta from where it circulates to the various parts of the body.
- The deoxygenated blood is collected by veins and venules and pumped back into the superior vena cava and then to the right atrium.
- When the deoxygenated blood enters, it gets carried to the right ventricle via the right atrium.

- Here, it undergoes pulmonary circulation.

Pulmonary circulation:

- The right ventricle pumps blood into the pulmonary artery.
- This deoxygenated blood is carried to the lungs to get oxygenated.
- After oxygenation of the blood, it gets carried back and the pulmonary vein pumps this oxygenated blood to the left atrium which pumps it into the left ventricle.
- The left ventricle pumps this oxygen-rich blood to the aorta for systemic circulation.



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

Answer: Transport of materials in Xylem-

- Water and minerals are transported by the xylem tissues which occur with the help of transpiration pull from roots to all part of the plant.

Transport of materials in phloem-

- Phloem tissues help in transport of food in all directions by utilizing energy in the form of ATP.

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

Answer:

S.No.	alveoli	Nephron
1	They are tiny balloon-like structures present inside the lungs	They are tubular structure present inside the kidney
2	The walls of alveoli are very thin	Each nephron has two components-Bowman's capsule and tubules
3	Alveoli are surrounded by the extensive network of blood capillaries	Blood capillaries from two patches-glomerulus and peritubular capillaries
4	Alveoli are the sites of gaseous exchange; oxygen and carbon dioxide are exchanged between the blood of capillaries and the gases	Nephrons regulate the concentration of water and salts by filtering the blood, reabsorbing what is needed and excreting the non-required as urine

S.No.	Alveoli	Nephron
1	They are tiny balloon-like structures present inside the lungs	They are tubular structure present inside the kidney
2	The walls of alveoli are very thin	Each nephron has two components-Bowman's capsule and tubules
3	Alveoli are surrounded by the extensive network of blood capillaries	Blood capillaries from two patches-glomerulus and peritubular capillaries
4	Alveoli are the sites of gaseous exchange; oxygen and carbon dioxide are exchanged between the blood of capillaries and the gases	Nephrons regulate the concentration of water and salts by filtering the blood, reabsorbing what is needed and excreting the non-required as urine