Transport In Pl ants

Very Short Answer Questions

1 Marks

2 Marks

Chapter

- **1.** What happens when a pressure greater than atmospheric pressure is applied to pure water or a solution?
- **Ans:** (1) Increase in water potential takes place when a pressure greater than atmospheric pressure is applied to pure water or a solution.

(2) Diffusion of water takes place when pressure builds up inside the cell against the cell wall, this is known as pressure potential.

- 2. How is the mycorrhizal association helpful in absorption of water and minerals in plants?
- **Ans:** (1) The symbiotic association of fungi with the root systems is called mycorrhiza. The fungal hyphae forms a network around the round which helps increase in the surface area.

(2) Increase in surface area due to fungal hyphae increases the absorption of water and minerals through the soil.

Short Answer Questions

1. What are the factors affecting the rate of diffusion?

Ans: Factors which affect rate of diffusion are:

(1) The Gradient of concentration: Rate of diffusion affected by gradient of concentration in positive manner like with increases in rate of diffusion concentration gradient increases across the barrier.

(2) Permeability of membrane: Permeability of membrane increases with increase in Rate of diffusion which helps in diffusion of substance inside the cell

(3) Temperature: With the increase in temperature rate of diffusion increases because high temperature makes cells more permeable.

(4) Pressure: In cell diffusion takes place from high partial pressure to low partial pressure therefore pressure also affects the rate of diffusion.

2. What are porins? What role do they play in diffusion?

Ans: Porins are proteins present on the outer membrane of cells and they form huge holes or pores in the outer membrane. It is present in plastids, mitochondria and some bacteria.

Porins help in diffusion of substances passively, it allows small protein molecules to move across membranes.

3. Describe the role played by protein pumps during active transport in plants.

Ans: (1) Protein pump uses energy against concentration gradient to pump the molecule inside the plant cell. It is specific on carrying the substances across the membrane.
(2) It is made up of specific types of proteins which are called trans-membrane proteins. These protein transport substances across the membrane by deriving energy from ATP. By this after entering into cytoplasm the protein complex gets dissociated to produce the specific substance.

4. Explain why pure water has the maximum water potential?

Ans: (1) Water potential helps to understand the concept of water movement. Water potential is denoted by the symbol ψ (psi).

(2) Water molecules are rapid and constant in liquid and gaseous state due to this it possesses kinetic energy.

(3) Water potential is directly proportional to both kinetic energy and concentration of water, hence when there is high water concentration the water potential and kinetic energy will be high.

(4) Pure water has a high concentration of water therefore its water potential is maximum.

5. Briefly describe water potential. What are the factors affecting it?

Ans: (1) Water potential is the concept of water movement from one area to another. It takes place via Osmosis, mechanical pressure, gravity etc. It is denoted by the symbol ψ (psi) and expressed in Pascal. Pure water does not have any type of impurities therefore its water potential and kinetic energy is high.

(2) Factors affecting the water potential are solute potential and pressure potential. At atmospheric pressure the solute potential and water potential are the same. Turgidity of plants increases the pressure potential.

6. (1) With the help of well-labelled diagrams, describe the process of plasmolysis in plants, giving appropriate examples.

Ans: Plasmolysis: Movement of water takes place outside the cell which causes shrinking of cell cytoplasm away from its cell wall. Hypertonic solution causes the shrinkage of cell cytoplasm because to make the solution normal the water moves out of the cell. This process can be observed if we sprinkle salt over the cut raw onion.



Diagram showing the process of plasmolysis

(2) Explain what will happen to a plant cell if it is kept in a solution having higher water potential.

Ans: Higher water potential inside the cell builds up the pressure in the cytoplasm of the cell against the cell wall. This is called turgor pressure. This pressure causes an increase in the size of the cell, but the rigidity of the cell wall prevents it from bursting due to this cell swell.

7. Explain why xylem transport is unidirectional and phloem transport bi - directional.

Ans: (1) The movement of water and minerals takes place by Xylem by capillary action to all parts of the plant. Utilization of these water takes place in photosynthesis and rest of them are released via transpiration. This causes an increase in the demand of water, by this the transportation of water takes place in unidirectional flow.

(2) Transportation of food from source to sink takes place by phloem. This food stores in leaves because leaves carry out photosynthesis. This source and sink sometimes get changes which causes reverse flow of food due to this the phloem transports is bi-directional.

8. What role does root pressure play in water movement in plants?

Ans: (1) Due to active absorption of the nutrients from the soil, root pressure develops the positive pressure which causes uptake of water from the soil via root.
(2) Transpiration pull maintains the movement of water in a continuous chain-

like fashion from root to the shoot.

9. What essential roles do the root epidermis play during mineral absorption in plants?

Ans: (1) The plasma membrane embedded with transport protein in root endodermis, which allows the movement of various solutes in appropriate quantities to the xylem.

(2) Absorption of minerals takes place by epidermal cells. The suberin layer in root endodermis allows the active transport unidirectionally.

Short Answer Questions

3 Marks

1. Discuss the factors responsible for ascent of xylem sap in plants.

Ans: The factors which responsible for ascent of xylem sap are:

(1) Cohesion – It is the mutual attraction between water molecules which causes upward movement of water.

(2) Surface tension – It causes the attraction of water molecules. Due to this the surface tension increases causing the high capillarity of water. It is more in water in liquid state than in gaseous state.

(3) Adhesion – It is the attraction of water molecules to the polar molecules like the teachers' elements.

All these factors cause high tensile strength and high capillarity.

2. Describe transpiration pull model of water transport in plants. What are the factors influencing transpiration? How is it useful to plants?

Ans: (1) The process of loss of water from the aerial part of the plant is known as transpiration. It causes suction force in xylem which is known as transpiration pull. This transportation of water from the xylem to the aerial part of the plant is also known as the cohesion-tension model of water transport.

(2) The factors which influence transpiration are temperature, speed, humidity, wind, number of stomata, distribution of stomata, canopy structure, etc.

(3) Transpiration helps in the transportation of water and minerals to other parts of plants, due to continuous water transport the temperature inside the plant was maintained. It also helps to keep the turgidity of the cell.

1. Explain pressure flow hypothesis of translocation of sugars in plants.

Ans: (1) As per pressure flow hypothesis, preparation of food takes place inside the plant in the form of glucose.

(2) The prepared food converted into sucrose before transporting it to the source cell

(3) Hydrostatic pressure increases due to movement of water into adjacent phloem.

(4) Movement of sucrose takes place through the phloem sieve cells.

(5) The sucrose which is already present in the sink region is converted into starch or cellulose, which reduces the hydrostatic pressure in the sink cells. Hence, due to the difference in pressure between the source and sink translocation of sugar takes place from one place to other and removal of sucrose takes place by active transport.

2. What causes opening and closing of the guard cell of the stomata during transpiration?

Ans: (1) The exchange of gases in leaves takes place through the pores present which is known as stomata.

(2) Each stomata consists of a bean shaped guard cell which is thick and elastic to the inner side.

(3) Change in the turgidity of the guard cell causes the opening and closing of stomata.

(4) Increase in turgidity causes the bulging of guard cells due to this the stomatal pore gets open due to radial arrangement of microfibrils.

(5) When the stomata loses its turgidity the pores get close and the stomata retain its original shape and the microfibrillar get arranged longitudinally.

Differentiate between the following: Diffusion and Osmosis

Ans:

Diffusion	Osmosis
This substance moves from the region of higher concentration to the region of lower concentration.	In this water and substances in solution move from the region of high concentration to the region of low concentration.
Movement does not occur against the concentration gradient.	Movement occurs against the concentration gradient in case of solute.
Semipermeable membrane is not required because transportation takes place through intercellular space.	It takes place through a semipermeable membrane because a semipermeable membrane only allows a solute particle to pass through it.

2. Transpiration and Evaporation

Ans:

Transpiration	Evaporation
Loss of water takes place through the aerial part of the plant.	Loss of water takes place from any free surface of the plant.
It is a type of both physical and physiological process.	It is only a type of physical process.

3. Osmotic Pressure and Osmotic Potential

Ans:

Osmotic pressure	Osmotic potential
It is the pressure required to	It allows the movement of
stop the diffusion of water	water from the region of
through a semipermeable	high water solution to the
membrane.	region of low water solution.
It increases with increase in	It decreases with increase in
the concentration of solute	the concentration of solute
particles.	particles.
It is the positive pressure applied.	It is negative to osmotic pressure applied.

4. Imbibition and Diffusion

Ans:

Imbibition	Diffusion
It is a type of diffusion in which absorption of water takes place by solids and colloids, which cause an increase in the volumes of solid. Example, Absorption of water through dry seeds.	It is the movement of ions and particles along the concentration gradient from intercellular parts of plants.
Movement of water molecules takes place inside the solid or	It allows all the movement of all the three matters like solid, liquid

colloidal particles.	and gaseous.

5. Apoplast and Symplast pathways of movement of water in plants.

Ans:

Apoplast pathway	Symplast pathways
Movement of water takes place through the adjacent cell walls of the epidermis and cortex.	Movement of water takes place through the interconnected protoplasts of the epidermis, cortex, endodermis, and root pericycle.
Crossing of the cell membrane does not take place in apoplast pathway.	Movement of water occurs via cell membrane.
It allows fast movement of water.	It allows slow movement of water.

6. Guttation and Transpiration.

Ans:

Guttation	Transpiration
Loss of water takes place from leaves in the form of droplets in the vein ending.	Water loss takes place through leaves in the form of vapour through the plant surface, stomata and lenticels.
It does not take place when water is deficient and it prevents wilting therefore it takes place at night.	Deficiency of water takes place, which causes wilting of leaves therefore it occurs at day.