

**Class: XI**  
**Subject: Biology**  
**Topic: Transport in plants**  
**No. of Questions: 25**

Q1. Define water potential?

Sol. Water potential is the potential energy of water.

Q2. What are the factors affecting the rate of diffusion?

Sol. The main factors that affect the rate of diffusion are,

- (a) Temperature: The rate of diffusion increases with rise in temperature. This is because a rise in temperature increase the kinetic energy of the diffusing particles.
- (b) Density of diffusing substance: The rate of diffusion of a substance is inversely proportional to the square root of its density (i.e.) heavier the molecule, slower is the rate of diffusion.
- (c) Density of the medium: The rate of diffusion is slower, if the medium is concentrated. Thus, a gas would diffuse more rapidly in vacuum than in air.
- (d) Diffusion pressure gradient: The rate of diffusion is directly proportional to the difference of diffusion pressure at the two ends of a system and inversely proportional to the distance between the two.

Q3. What will happen to water potential when solutes are added?

Sol. Water potential is lowered when solutes are added.

Q4. Write the significance of plasmolysis.

Sol. Plasmolysis is a vital phenomenon and has the following importance:

- (a) The osmotic pressure of a cell can be measured by plasmolysis. The osmotic pressure of a cell is roughly equal to the osmotic pressure of a solution that causes incipient plasmolysis pressure of a solution that causes incipient plasmolysis in the cell.
- (b) Salting of pickles, meat, fishes, etc. and addition of sugar to jams, jellies, cut fruits, etc. prevent their decay by microbes, as the latter get killed due to plasmolysis.

- (c) Plasmolysis is helpful in determining whether a particular cell is living or dead as plasmolysis does not occur in a dead or non-living cell.

Q5. Which fractions of soil water are readily available to plants for absorption?

Sol. Capillary water is the fractions of soil water are readily available to plants for absorption.

Q6. Distinguish between active and passive absorption of water.

Sol.

Active absorption	Passive absorption
(i) Active absorption of water occurs due to the activity of root and root hairs.	(a) Passive absorption occurs due to the activity of the upper part of the plant such as shoot and leaves.
(ii) Water is absorbed by the osmotic or non-osmotic processes along or against DPD gradient.	(b) Water is absorbed as a result of tension created by transpiration pull.
(iii) It involves symplast movement of water	(c) It involves apoplast movement of water (i.e.) through cell walls and intercellular spaces.
(iv) It utilizes metabolic energy.	(d) It utilizes solar energy for transpiration.
(v) During active absorption of water, the root cells	(e) During passive absorption of water, root
(vi) It is independent of transpiration	(f) It takes place when transpiration is fast.
(vii) It creates a positive pressure in xylem channels.	(g) It produces a negative pressure in xylem

Q7. Distinguish between transpiration and evaporation.

Sol.

Transpiration	Evaporation
1. This is a physiological process that occurs in plants.	(a) This is a physical process that occurs from any free surface.
2. It involves living tissues.	(b) It may involve both living and non-living surfaces.
3. It is controlled by environmental factors as well as by plant factors such as osmotic pressure of the cells, thickness of cuticle, number and position of stomata, etc.	(c) It is influenced only by environmental factors.
4. It moistens the surface of leaves and young stems and protects them from the burning Sun.	(d) It causes dryness of free surfaces.
5. It is comparatively a slow process.	(e) It is comparatively a faster process.

Q8. Mention two ways of absorption of water in plants?

Sol. Two ways of absorption of water in plants are, (i) apoplast pathway and (ii) symplast.

Q9. What are the factors affecting water absorption?

Sol. The absorption of water is affected by a number of factors. They are

- Availability of soil water: Water uptake is directly affected by the amount of water available to the roots for absorption. The water content between field capacity and permanent wilting percentage is often termed as readily available water, because it can be absorbed readily by plants. If water is present in the soil below the permanent wilting percentage or beyond field capacity, the rate of water absorption will be reduced.
- Concentration of soil: The amount of soluble salts in the soil also affects water uptake by the roots. If the concentration of soil solution is more than that of the cell sap of root cells, water will tend to move out due to exosmosis. It is due to this reason that a field is irrigated properly after addition of fertilizers.
- Soil temperature: Most plants require temperatures ranging from 20- 35°C for optimum water absorption. A temperature above 35°C reduces water uptake by reducing the permeability of the plasma membrane. Low temperature of the soil reduced absorption of water.

(d) Aeration of soil: The roots of plants absorb water more efficiently in well aerated soils than in poorly aerated soils. In poorly aerated soils, the growth and metabolic activities of the roots are slowed down.

Accumulation of  $\text{CO}_2$  in soil air increases the viscosity of the protoplasm and decreases its permeability. This decreases the rate of water absorption.

Q10. Define wall pressure?

Sol. The pressure extended by the rigid cell wall on the protoplasm of cell opposite to the turgor pressure is called wall pressure.

Q11. Write the importance of diffusion in plants.

Sol.

- (a) Exchange of gases ( $\text{CO}_2$  and  $\text{O}_2$ ) through stomata takes place by diffusion.
- (b) Transpiration or loss of water from the aerial parts of the plant involves the process of diffusion.
- (c) Diffusion is involved in the passive uptake of mineral salts.
- (d) Fragrance from the flowers, to attract the pollinating animals, spreads in the air by diffusion.
- (e) Diffusion plays an important role in imbibition and osmosis.

Q12. Name the pores through which guttation occur?

Sol. Hydathodes are the pores through which guttation occur.

Q13. What is the value of water potential of pure water at normal temperature and pressure?

Sol. The value of water potential of pure water at normal temperature and pressure is zero.

Q14. What is transmembrane pathway?

Sol. Transmembrane is the movement through the cell membrane.

Q15. Mention two factors that affect water potential.

Sol. The two factors that affect water potential are, (i) the amount of solute and (ii) the external pressure.

Q16. Mention two external factors, which affect transpiration.

Sol. The two external factors, which affect the rate of transpiration, are atmospheric humidity and light.

(a) Atmospheric humidity: The diffusion of water vapour from the intercellular spaces of leaves to the outside atmosphere depends on the moisture content of the atmosphere. If the moisture content of the atmosphere is high, the rate of transpiration is relatively low but as the moisture in the air decreases, the rate of transpiration increases rapidly.

(b) Light: Light indirectly affects the rate of transpiration by regulating (a) the opening of stomata and (b) increasing the leaf temperature. In most plants, stomata open in the presence of light and close in darkness. Thus the rate of transpiration increases in light and decreases in the dark.

Q17. Define wilting.

Sol. Wilting is the loss of turgidity of leaves and other soft aerial parts of a plant, thereby causing them to droop.

Q18. Mention any two uses of transpiration of plants.

Sol. The two uses of transpiration to plants,

(a) It maintains the turgidity of cells.

(b) It reduces negative tension downwards to the roots and this help in the ascent of sap.

Q19. Which part of root is related with the absorption of water?

Sol. Root hairs are the part of root which is related with the absorption of water.

Q20. What is wall pressure?

Sol. In plants, due to turgor pressure, the protoplast of a plant cell presses the cell outwards. The cell wall being elastic, pushes the protoplast back with a pressure equal in magnitude but opposite in direction. This pressure is called wall pressure.

Q21. Due to low atmospheric pressure, the rate of transpiration will

- (a) Increase
- (b) Decrease rapidly
- (c) Decrease slowly
- (d) Remain unaffected

Sol. (a)

Q22. Guard cells help in

- (a) Transpiration
- (b) Protection against grazing
- (c) Fighting against infection
- (d) Guttation

Sol. (a)

Q23. The transpiration is regulated by the movements of

- (a) Subsidiary cells of the leaves
- (b) Guard cells of the stomata
- (c) Mesophyll tissue cells
- (d) Epidermal cells of the leaves

Sol. (b)

Q24. Steroid hormones easily pass through the plasma membrane by simple diffusion because they

- (a) Enter through pores
- (b) Contain carbon and hydrogen
- (c) Are water soluble
- (d) Are lipid soluble

Sol. (d)

Q25. Living cells placed in isotonic solution (0.9% saline) retain their size and shape. This is based on the concept of

- (a) Facilitated diffusion
- (b) Diffusion
- (c) Osmosis
- (d) Transpiration

Sol. (c)

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