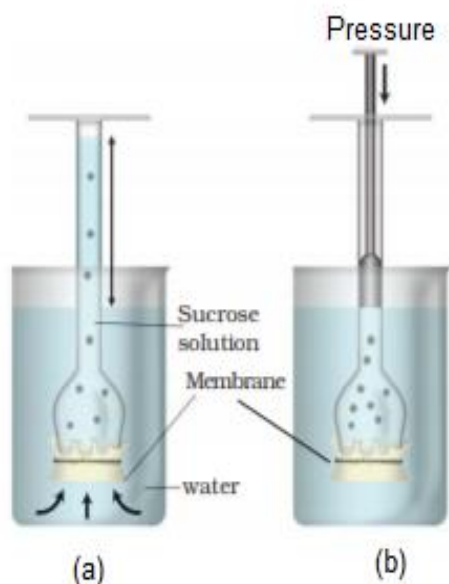


**Each question from 1 to 10 carries 1 score.**

- 1) Fill in the blanks from the given options (Hypertonic, Hypotonic, Isotonic)  
Cells swell when placed in \_\_\_\_\_ solutions and shrink in \_\_\_\_\_ solutions.
- 2) The water potential of pure water at standard temperatures and which is not under any pressure, is \_\_\_\_\_.
- 3) What are Casparian stripes?
- 4) State the equation of water potential. Define pressure potential.
- 5) Mention the process of absorption of water by dry seeds which helps in seed germination.
- 6) Gaseous movement within the plant body takes place by \_\_\_\_\_.
- 7) What are porins?
- 8) Define transpiration.
- 9) State how the cellulose micro fibrils of guard cells helps to perform the function of stomata.
- 10) Define Imbibition.

**Each question from 11 to 20 carries 2 scores.**

- 11) Define osmosis
- 12) What is the relationship between osmotic pressure and osmotic potential?
- 13) What is turgor pressure?
- 14) In the picture given below Fig. (a) demonstrates the process of Osmosis . What happens when an external pressure is applied from the upper part of the funnel as in Fig (b). What is that pressure termed as?

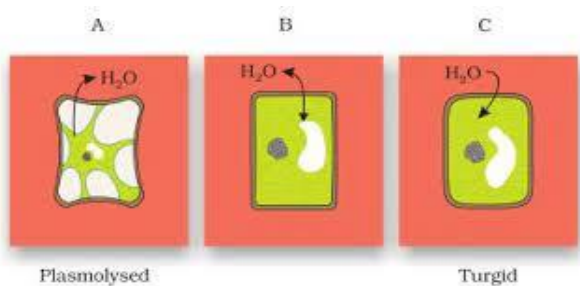


- 15) What is mycorrhiza? How is it helpful to the plants?
- 16) The absorption of water by dry wood is a classical example for Imbibition.  
What are the factors essential for Imbibition?
- 17) How is turgor pressure developed within the cell? What is its significance?
- 18) State why solutions have a lower water potential than pure water.
- 19) What causes the opening and closing of guard cells of stomata during transpiration?
- 20) What is role of Casparian stripes in the movement of water through root layers?

**Each question from 21 to 25 carries 3 scores.**

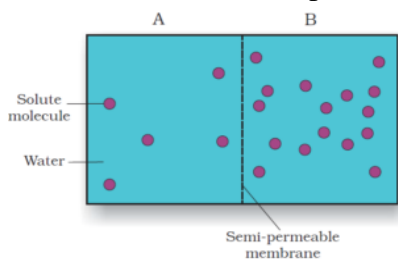
- 21) List the external and plant factors which control the rate of transpiration.
- 22) Briefly describe the cohesion-tension-transpiration pull model of water transport. List the physical properties of water that helps in the ascent of xylem sap.

23) The diagram given below represents a plant cell which is kept in three types of solutions, A, B & C. Identify the types of solutions and explain how these solutions effect the movement of water in and out of the cell.

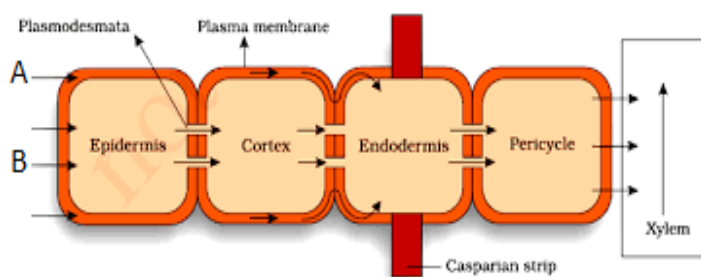
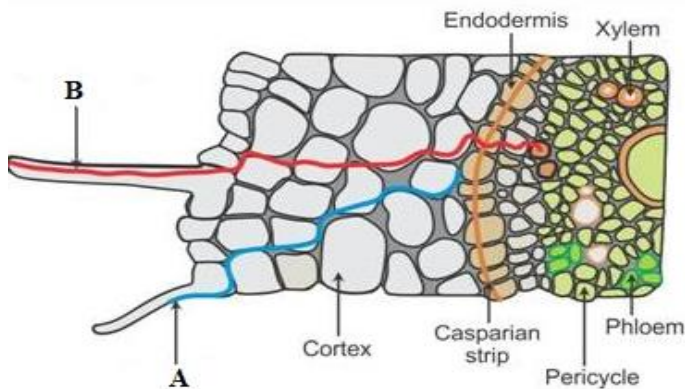


24) Observe the figure given below and answer the following questions.  
Two chambers, A and B, containing solutions are separated by a semi-permeable membrane.

- Solution of which chamber has a higher water potential?
- Solution of which chamber has a lower solute potential?
- In which direction will osmosis occur?
- Define the term Solute potential



25) Water absorbed by the root hairs, move deeper into root layers by two distinct pathways which is mentioned the given figure as A & B. Identify and explain the pathways.



## Answers

- 1) Hypotonic, Hypertonic      2) Zero.
- 3) The band of suberin depositions on the walls of endodermis is called as Casparian strip.
- 4)  $\Psi_w = \Psi_s + \Psi_p$ . The pressure exerted by the protoplasts due to entry of water into the cell against the rigid cell.
- 5) Imbibition.      6) Diffusion.
- 7) The porins are proteins that form huge pores in the outer membranes of the plastids, mitochondria and some bacteria allowing molecules up to the size of small proteins to pass through.
- 8) Transpiration is the evaporative loss of water by plants which occurs mainly through the stomata.
- 9) Cellulose micro fibrils of the guard cells are oriented radially and making it easier for the stoma to open.
- 10) It is a type of diffusion in which water is absorbed by solids –colloids ,results in an increase in volume.
- 11) Movement of water molecules from a region of higher concentration to a region of lower concentration through a semipermeable membrane.
- 12) Numerically osmotic pressure is equal to osmotic potential but sign is opposite.
- 13) It is the pressure build up against the cell wall due to movement of water into the cell.
- 14) When an external pressure is applied from the upper part of the funnel it prevents the entry of water from diffusing into the funnel through the membrane. This pressure is called as osmotic pressure.
- 15) A mycorrhiza is a symbiotic association of a fungus with a root system of some plants. The fungal hyphae have a very large surface area that absorb water and mineral from the soil and it provides it to the roots, in turn the roots provide sugars and  $N_2$ -containing compounds to the fungus
- 16) 1. Water potential gradient between the absorbent and the liquid imbibed.  
2. Affinity between the adsorbant and the liquid.
- 17) When water diffuses into the cell a pressure is build up in the cytoplasm against the cell wall, and is called Turgor pressure. This pressure is responsible for enlargement and extension growth of cells.
- 18) When solute is dissolved in pure water, the solution has fewer free water and the concentration of water decreases. As a result water potential of the solution is decreased. Hence, all solutions have lower  $\Psi_w$ .
- 19) When turgidity increases within the guard cells, the thin outer walls bulge out and force the inner walls to form a crescent shape. When the guard cells lose its turgidity, due to water loss the elastic inner walls regain their original shape, the guard cells become flaccid and the stoma closes.
- 20) The Casparian stripes present on the walls of the endodermis are suberin depositions which are impermeable to water. It resist the flow of water by apoplastic movement and so the movement of water through endodermis is purely symplastic, which is a slow process.
- 21) External- temperature, light, humidity, wind  
Plant factors-number and distribution of stomata, percent of open stomata, water status of plant, canopy structure etc
- 22) The transpiration driven ascent of xylem sap depends mainly on the following physical properties of water:
  - Cohesion – mutual attraction between water molecules.
  - Adhesion – attraction of water molecules
  - Surface Tension – water molecules are attracted to each other inThese properties give water, high tensile strength and high capillarity.  
As a result a continuous water column or xylem sap is created within the xylem cells.  
During transpiration water evaporates through the stomata. To compensate that loss the mesophyll cells takes more and more water from the xylem which results in the upward movement of water through xylem.
- 23) A - Hypertonic solution. Water moves out of the cell and the cell is plasmolysed.  
B- Isotonic solution. There is no net flow of water towards the inside or outside the cell.  
C- Hypotonic solution. Water diffuses into the cell, and the cell is said to be turgid
- 24) a- A , b- B , c- from A to B.  
d - All solutions have a lower water potential than pure water.  
The magnitude of this lowering of water potential due to dissolution of a solute is called solute potential
- 25) A- Apoplast movement .It occurs exclusively through the intercellular spaces and the walls of the cells.  
B - Symplast movement. During symplastic, the water travels through the plasmodesmata. Water has to enter the cells through the cell membrane, hence the movement is relatively slower. Symplastic movement may be aided by cytoplasmic streaming.