Chapter 4. Absorption by Roots

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Solution 1:

1. Osmosis – Osmosis is the movement of solvent molecules from a region of higher concentration to a region of lower concentration through a semi-permeable membrane.
2. Diffusion – It is the movement of molecules or ions from a region of higher concentration to a region of lower concentration to equalize the concentration of the two regions.
3. Turgor Pressure – It is the actual hydrostatic pressure developed inside a cell as a result of entry of water into it.
4. Hypertonic solution – A solution whose concentration is more than that of cell sap is called hypertonic solution.
5. Plasmolysis – The shrinkage of cytoplasm of a living cell as a result of exosmosis is known as plasmolysis.

Solution 2:

Diffusion	Osmosis
It is the movement of molecules of a substance from a region of higher concentration to a region of lower concentration.	It is the process in which water molecules moves through a semi-permeable membrane from a region of higher concentration to a region of lower concentration.

Solution 3:

Endosmosis	Exosmosis
1. The process of diffusion of water into the cell from outside is called endosmosis. 2. It occurs when the cell is placed in a hypotonic solution.	1. The diffusion of water from inside to outside of a cell is called exosmosis. 2. It occurs when the cell is placed in a hypertonic solution.

Solution 4:

The pressure of water developed inside the roots due to active absorption of water when transpiration is very low and the rate of absorption is high is known as root pressure.

Solution 5:

Permeability is the property of a membrane to allow the passage of both solute and solvent molecules.

Solution 6:

Root hairs absorb maximum water because in this region, the xylem is not fully mature but the epidermis and endodermis are still permeable to water.

Solution 7:

1. Roots help in the absorption of water.
2. They also help in the absorption of minerals.

Solution 8:

(i) Filtration and Diffusion:

Filtration	Diffusion
Filtration is the mechanical separation of a liquid from the undissolved particles floating on it.	Diffusion is the movement of substances from an area of higher concentration to an area of lower concentration.

(ii) Turgor Pressure and Osmotic Pressure:

Turgor Pressure	Osmotic Pressure
In a turgid cell, the pressure of the cell contents on the cell wall is called turgor pressure.	The pressure by which the water molecules tend to cross the semi-permeable membrane is called the osmotic pressure.

(iii) Hypotonic and Hypertonic Solution:

Hypotonic Solution	Hypertonic Solution
In this condition, the solution outside the cell has lower solute concentration than the cell sap.	In this condition, the solution outside the cell has higher solute concentration than the cell sap.

(iv) Osmosis and Diffusion:

Osmosis	Diffusion
It is the process in which water molecules move through a semi-permeable membrane from a region of higher concentration to a region of lower concentration.	It is the movement of molecules of a substance from a region of higher concentration to a region of their lower concentration.

(v) Flaccid condition and Turgid condition:

Flaccid condition	Turgid condition
The cell in the state of plasmolysis is said to be flaccid.	When a cell reaches a state when it cannot accommodate any more water i.e. it is fully distended, it is called turgid.

(vi) Plasmolysis and Deplasmolysis:

Plasmolysis	Deplasmolysis
When a cell is placed in hypertonic solution, water begins to pass out of the cell by osmosis with a consequent shrinkage of protoplasm. This phenomenon is called plasmolysis.	When a plasmolysed cell is placed in hypotonic solution or pure water, endosmosis takes place as a result of which water is reabsorbed by the protoplast of the cell and it regains its original position. This phenomenon is called deplasmolysis.

Solution 9:
Plasmolysis helps in the preservation of meat and fish by salting. It is also helpful in the preservation of jellies and jams by adding concentrated sugar solution to them. It helps in plasmolysing the spores of bacteria and fungi.

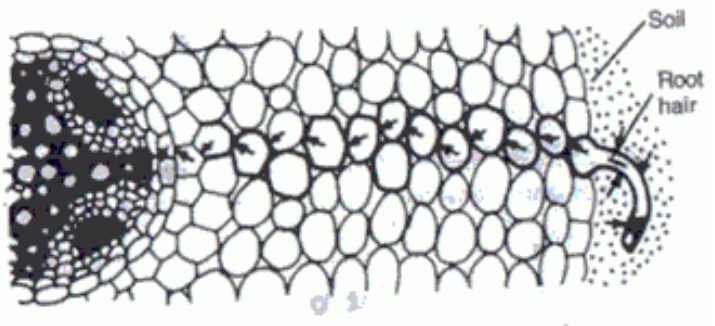
Solution 10:
Turgor pressure keeps the soft organs like flowers, young shoots, leaves, etc. in stretched form. It is also essential for the growth of the cells. Changes in the turgor pressure causes opening and closing of stomata.

Solution 11:

1. The epidermis and endodermis of root hairs are permeable to water.
2. Root hairs have a very large surface area.

Solution 12:

1. The main root with its many branches form a network in the soil. The root hairs get entangled in the soil particles and remain in close contact with the capillary water surrounding the soil particles. The epidermal cells of root hairs have vacuoles which contain cell sap. Generally, the cell sap is more concentrated than the soil solution. As a result the water enters inside the root hair cells by endosmosis. This water dilutes the epidermal cell sap solution. Then water enters into the cortical cells by osmosis and reaches the endodermal cells and then pericycle cells. From this layer water then enters in the xylem tissue. In this way, the water is absorbed and translocated up to xylem of In this way, the water is absorbed and translocated up to xylem of the root by osmosis.



2. (a) Cell wall separates the two solutions – cell sap and soil solution and is permeable which means it allows the water to enter inside the root hair cells by endosmosis.
(b)The cytoplasm contains vacuoles having cell sap or solution of mineral salts. This cell sap being more concentrated than the soil solution help in water absorption by endosmosis.
3. If the soil was watered with extremely concentrated solution of sodium chloride, the water will move out from the root hair due to osmosis and thus, plasmolysis will take place.

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Solution 13:

1. Osmosis
2. Root hair
3. Sugar solution
4. The level of the liquid in the capillary tube rises.

Solution 14:

1. Osmotic pressure
2. Isotonic solutions
3. Cohesive force
4. Active absorption
5. Xylem
6. Plasmolysis
7. Endosmosis
8. Endosmosis
9. Diffusion

Solution 15:

1. 1. Cell wall; 2. Cell membrane; 3. Vacuole; 4. Cytoplasm; 5. Nucleus.
2. Cell wall It is freely permeable.
   Cell membrane – It allows only water to pass through it as it is semi-permeable.
   Vacuole – It contains cell sap. The concentration of cell sap is more than the soil water. So, endosmosis takes place.
3. If a cell is placed in a concentrated cane sugar solution, plasmolysis takes place. If the plasmolysed cell is placed in water, deplasmolysis takes place.

Solution 16:
Xylem

Solution 17:
Plasmolysis

Solution 18:
The root hairs become flaccid when fertilisers are added to the moist soil around them because fertilisers with moist soil become hypertonic which causes plasmolysis in the cells of the root hair. The turgidity is lost and the cell becomes flaccid.

Solution 19:
Diffusion

Solution 20:
Endosmosis

Solution 21:

1. Plasmolysed cell
2. Plasma membrane
3. Large vacoule
4. The chloroplasts would be present in the shrunken protoplast.
5. Cell wall

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Solution 22:

1. The raisins swell up when placed in water because the water is hypotonic as compared to the raisins so the water enters inside the raisins as a result of

endosmosis.

2. Saline water is hypertonic. So any infectious agent such as bacteria in the throat gets plasmolysed and this cures the infection.
3. Jam, jellies and pickles are kept in hypertonic solution of sugar or salt in which plasmolysis of bacteria and fungi takes place. This kills the bacteria and fungi and hence, pickles, jam and jellies are preserved properly.
4. The leaves of the wilted lettuce become crisp when kept in cold water because they take up water due to endosmosis in hypotonic solution.

Solution 23:

Ascent of sap is the movement of water from the roots to the upper part of the plant.

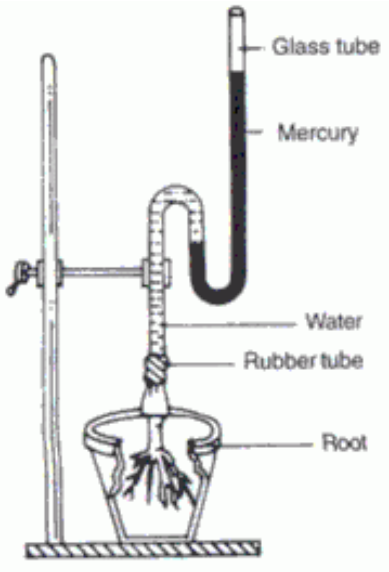
Solution 24:

Plants die when salt is sprinkled over them due to plasmolysis of cells. The salt makes the solution hypertonic inside the plant cells which lead to shrinkage of cells or exosmosis.

Solution 25:

Root Pressure is the pressure exerted on the liquid contents of the cortical cells of the root, under fully turgid condition, forcing a quantity of water into the xylem vessels and through them upwards into the stem up to a certain height.

Demonstration of Root pressure:



1. Take a well matured healthy herbaceous plant.
2. The stem of the plant is cut a few centimeters above the base with a sharp knife and attached to a manometer through a rubber tube.
3. After a few hours, the level of mercury rises in the manometer.
4. This is due to the pressure created by water exuded from the cut end of the plant on account of root pressure generated due to entry of water in the root cells.

Solution 26:

1. Water is one of the raw materials for photosynthesis.
2. Water is important for seed germination.
3. Water controls the opening and closing of stomata.

Solution 27:
Plants begin to die when concentrated solution of a fertilizer is given to potted plants because fertilizer along with soil water act as a hypertonic solution resulting in exosmosis.

Solution 28:

1. Plants absorb water by their roots.
2. Roots supply water to the stem and leaves of the plant.
3. In root hairs, the xylem is not fully mature and the endodermis and epidermis are permeable to water.
4. Water is absorbed by the plants through xylem in all directions.
5. The food on the other hand is transported with the help of phloem.

Solution 29:

1. The aim of the experiment is to show that conduction of water in plants takes place through xylem.
2. In shoot, (a) phloem has been removed. In shoot (b), xylem has been removed.
3. In shoot (b), xylem has been removed so the leaves are wilted. But in shoot (a), xylem has not been removed so the leaves are turgid.

Solution 30:

1. In (c), the water would move up the fastest.
2. In (b), the water would move up slowly.
3. To prevent evaporation of water.
4. Absorption of water by the roots.

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Solution 31:

1. (c) Water from the more concentrated solution to the less concentrated solution.
2. (d) plasmalemma
3. (c) hypertonic solution
4. (b) plasmolysis
5. (a) endosmosis
6. (b) endosmosis
7. (a) Plasmalemma
8. (b) imbibition
9. (c) reaching of water upwards against gravitational force
10. (b) by xylem
11. (d) Xylem
12. (b) root hairs
13. (d) none of the above
14. (a) xylem
15. (c) hydrostatic pressure in the root
16. (b) xylem is blocked