6 Plant Water Relations and Mineral Nutrition

6.0 : Introduction :

Q.1. Explain in brief about the process of water and mineral absorption in plants.

Ans: i. All land plants absorb water and mineral salts from soil by their root system.

ii. The unicellular root hair present in root helps in the absorption of water.

iii. There is a continuous path of water from the soil through the roots, stem, leaves and again to soil, via. atmosphere.

iv. From leaves,water is lost to the atmosphere mostly in the vapour form.

6.1 : Source of water for plants :

Q.2. Name the main source of water for plants.

Ans: Soil is the main source of water for plants.

Q.3. Classify the various types of water present in the soil.

Ans: The water present in the soil can be classified as:

i. Hygroscopic water: The water which is held very tightly by the soil particles due to adhesive force is called hygroscopic water.

ii. Combined water: The water present in the form of hydrated oxides of silicon, aluminium, etc. is called combined water.

These two waters are also called bound water and are not available to plants for absorption.

iii. Gravitational water: Some amount of water which is held by gravitational force, goes down through large pores between the soil particles and reaches the water table. This type of water is known as gravitational water and goes beyond the reach of roots of most of the plants, hence not available to plants.

iv. Capillary water: In between the small, non-colloidal soil particles, very fine spaces or capillaries are present. Water held in these capillaries is called capillary water.

Capillary water is available to the plants for absorption.

Q.4. Which is the only water available to the plants for absorption?

Ans: Capillary water is available to the plants for absorption.

Q.5. Define imbibition and diffusion. How do these processes help in absorption of water?

Ans: Imbibition:

The adsorption of water by hydrophilic compounds is called imbibition.

Hydrophilic compounds like cellulose and pectic compounds which imbibe water are present in the root hair cell wall.

Diffusion:

The movement of ions, atoms or molecules of solutes, liquids or gases from the region of higher concentration to a region of their lower concentration till an equilibrium is attained is called diffusion.

Role of imbibition and diffusion in absorption of water:

i. Imbibition and diffusion playa vital role in the absorption of water.

ii. The hydrophilic compounds like cellulose and pectic compounds present in the root hair imbibe water.

iii. This imbibed water then enters the root hair by the process of diffusion.

iv. Thus, imbibition and diffusion are the two physical processes which help in the absorption of water.

Q.6. Write a note on facilitated diffusion.

Ans: i. Selective transport of large molecules across the cell membrane is called as facilitated diffusion.

ii. It takes place in presence of special proteins (porins) but does not involve expenditure of energy.
iii. Water soluble (hydrophilic) substances are transported by eight different aquaporins.

Q.7. Differentiate between Imbibition and Diffusion.
Ans:

No.	Imbibition	Diffusion
i.	It is a kind of diffusion in which water molecules are adsorbed to the surface of hydrophilic colloids.	It is the movement of molecules or ions of a solute or solvent from the region of higher concentration to that of its lower concentration.
ii.	It develops a pressure called imbibition pressure.	Diffusion pressure causes diffusion.

Q.8. Define symport, antiport and uniport transport of molecules.
Ans: i. Symport: Transport of two types of molecules in the same direction is called symport.
ii. Antiport: Diffusion of molecules in opposite directions is known as antiport.
iii. Uniport: Transport in which molecules move independent of the other.

Q.9. Why do wooden doors and windows swell during rainy season?
Ans: i. During rainy season,wooden doors and windows swell due to the adsorption of water by hydrophilic compounds (like cellulose and pectic compounds) through a process known as imbibition.
ii. The water molecules get tightly adsorbed on the surface of compounds without forming a solution.
iii. Due to imbibition, these compounds show swelling.

Q.10. Explain the terms:
i. Water potential ii. Imbibition iii. Diffusion iv. Osmosis
v. Plasmolysis vi. DPD
Ans: i. Water potential:
The kinetic or free energy possessed by molecules is called chemical potential. The chemical potential of water or the potential energy of water is known as water potential.
ii. Imbibition:
The adsorption of water by hydrophilic compounds is called imbibition.
iii. Diffusion:
Diffusion is the movement of ions, atoms or molecules of solutes, liquids or gases from the region of their higher concentration to a region of their lower concentration till equilibrium is attained.
iv. Osmosis:
It is defined as the diffusion of water or solvent from a solution of lower concentration to the solution of higher concentration through semi-permeable membrane.
v. Plasmolysis:
When a cell is kept in hypertonic solution, water comes out of the cell (exosmosis) which results in shrinkage of protoplasm. Such cell with shrunken protoplasm is called plasmolysed cell and the phenomenon is called plasmolysis.
vi. DPD:
DPD means' diffusion pressure deficit. The difference between the diffusion pressure of pure water and solution is called diffusion pressure deficit.

Q.11. Explain the term "Diffusion Pressure".
Ans: Diffusion Pressure:
i. Diffusion pressure is the potential ability of a solid, liquid or gas to diffuse from an area of its greatest concentration to an area of lesser concentration.
ii. It is represented as DPD.
iii. The diffusion pressure of pure solvent is always more.
iv. Diffusion pressure is the cause of diffusion and does not develop as a result of diffusion.

Q.12. Define osmosis. What are the types of osmosis?

Ans: Osmosis: The diffusion of water or solvent from a solution of lower concentration to a solution of higher concentration or from pure solvent to the solution through semi-permeable membrane, is called osmosis.

Types of Osmosis:

With reference to a cell, osmosis is of two types:

i. Endosmosis:

a. The entry of water molecules into a plant cell kept in a solution having lower solute concentration than that of cell sap (hypotonic solution), is called endosmosis.

b. Due to endosmosis, the cell becomes turgid.

ii. Exosmosis:

a. The loss of water molecules from a plant cell placed in a solution having higher solute concentration than that of cell sap (hypertonic solution), is called exosmosis.

b. Due to exosmosis, cell becomes flaccid.

Q.13. Differentiatebetween diffusion and osmosis.

Ans: Diffusion and Osmosis:

No.	Diffusion	Osmosis
i.	It takes place in solid, gas or liquid medium.	It takes place only in liquid medium.
ii.	It does not require presence of semi-permeable membrane.	It requires presence of semi-permeable membrane.
iii.	In diffusion, the movement of ions/atoms/molecules from region of higher concentration to the region of lower concentration takes place.	In osmosis, diffusion of only solvent from lower concentration of solution to higher concentration of solution occurs.
iv.	It is influenced by the diffusion pressure.	It is only influenced by the turgor pressure.
v.	It helps in equalising the concentration of the diffusing substance throughout the available space.	It does not equalise the concentration of solvent on the two sides of the system.

Q.14. Write the significance of osmosis.

Ans: Significance of osmosis:

i. Osmosis plays an important role in absorption of water by plants from the soil.

ii. Osmosis regulates the opening and closing of stomata.

iii. Osmosis maintains osmotic balance, i.e. osmoregulation in animal cells.

Q.15. Define Deplasmolysis.

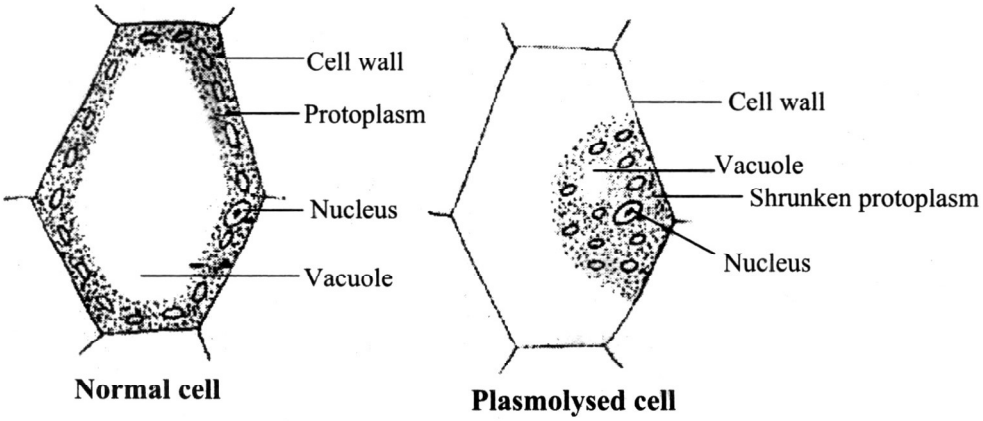
Ans: Deplasmolysis: When a plasmolysed cell is placed in water or hypotonic solution, it re-absorbs water by endosmosis and its protoplast regains its original shape and position. This phenomenon is called deplasmolysis.

Q.16. i. With the help of well labelled diagrams, describe the process of plasmolysis in plants, giving examples.

ii. Explain what will happen to a plant cell, if it is kept in a solution having higher water potential?

Ans: i. Plasmolysis:

When a plant cell is immersed in a solution which has higher solute concentration than the cell sap, it results in exosmosis and shrinkage of protoplasm, such cell with shrunken protoplasm is called plasmolysed cell and phenomenon is known as plasmolysis.



ii. Plasmolysed cell

When a plant cell is placed in a solution with higher water potential (Hypotonic solution), water will enter into the cell and turgor pressure will be developed.

Q.17. Write a short note on the following:

i. Osmotic Pressure (OP) **ii. Turgor Pressure (TP)**

Ans: i. Osmotic Pressure (OP):

a. Osmotic pressure of a solution is the pressure which must be applied to the solution in order to prevent the entry of the solvent due to osmosis.
b. It is directly proportional to the number of solute molecules in a given amount of solvent and thus, it is also known as a colligative property of the solution.
c. For pure water, OP is zero.
d. When solute is added in water, OP develops, If more solute is added, OP increases.
e. Osmotic pressure of a solution is equal to a pressure needed to prevent the passage of pure water (solvent) into it through a semi-permeable membrane.

ii. Turgor Pressure (TP):

a. Turgor pressure is the hydrostatic pressure which develops inside the plant cell due to endosmosis.
b. Turgor pressure increases when water enters the cell.
c. Due to entry of water, the cell wall becomes rigid, for which it develops equal but opposite pressure on the cell contents. This is called wall pressure (WP).
d. In a fully turgid cell, the value of WP is equal to TP.

Q.18. Write a note on Diffusion pressure deficit (DPD).

Ans: Diffusion Pressure Deficit (DPD):

i. Diffusion pressure deficit (DPD) is. the difference between diffusion pressure of pure water and solution.
ii. DPD is also called suction force (SF) or suction pressure (SP).
iii. DPD, i.e. diffusion pressure deficit of a solution is initially equal to its osmotic pressure (OP).
iv. When water enters into a cell, the increasing turgor pressure (TP), forces the cytoplasm against cell wall.
v. The cell wall exerts an equal and opposite pressure (WP) on thecell sap. This can be represented as follows:

DPD = OP – TP (WP)
In this, DPD is diffusion pressure deficit.
OP is osmotic pressure
TP is turgor pressure.
WP is wall pressure.

Q.19. Write a note on water potential. OR
Briefly describe water potential.

Ans: Water Potential:

i. Potential energy present in water is called as water potential.
ii. Water potential of pure water at normal temperature and pressure is zero.
iii. When solutes are added, the value of water potential decreases, therefore water potential inside the plant cell or in a solution has negative value.
iv. Water potential is represented by greek letter (Psi).
v. The unit of measurement of water potential is Pascal (Pa).
vi. Water potential of protoplasm is equal but opposite to diffusion pressure deficit (DPD) or suction pressure (SP). Therefore, the water potential of pure water is zero.
vii. The direction of cell to cell movement of water depends on the difference in water potential between them.
viii. Water flows from a less negative water potential to more negative water potential.:

Q.20. What happens when a pressure greater than the atmospheric pressure is applied to pure water or a solution?

Ans: When a pressure greater than atmospheric pressure is applied to pure water or solution, its water potential increases.

Q.21. Explain why pure water has the maximum water potential?

Ans: Water molecules possess kinetic energy.
In liquid, they are in random motion that is both rapid and constant.
The greater the concentration of water in a system, the higher its kinetic energy or its water potential.
Thus, pure water has the maximum water potential.

Q.22. What is permeability?

Ans: The ability of a membrane to permit passage of substances is called permeability.

Q.23. Explain the concept of permeability.

Ans: Permeability:

i. The ability of a membrane to permit passage of substances is called permeability.
ii. Permeable membranes are of two types:
   a. Semi-permeable membrane:
   A membrane which allows the passage of solvent molecules but does not allow the passage of solute molecules is called semi-permeable membrane.
   e.g. Parchment paper.
   b. Selectively permeable membrane:
   A membrane which allows the passage of some (selectively not all) solutes along with the solvent molecules is called selectively or differentially permeable membrane.
   e.g. Cell membrane, tonoplast (vacuolar membrane) and organellar membranes, etc.
iii. Cell wall 'pf plant cell is freely permeable.
iv. It allows the passage of both solutes and solvent (water).
v. When there is deposition of suberin on cell wall, it becomes impermeable.
   e.g. Suberised walls of cork cells, which do not allow passage of either solute or solvent.

Q.24. Distinguish between semi-permeable and selectively permeable membrane.

Ans:

No.	Semi-permeable membrane	Selectively permeable membrane
i.	It allows the passage for solvents.	It allows the passage for some selective solutes along with the solvent molecules.
ii.	e.g. Parchment membrane.	e.g. Cell membrane.

6.2 : Absorption and movement of water :

Q.25. Name the region of the root from where absorption of water occurs.

Ans: Absorption of water occurs through the root hair region present just above the region of cell elongation.

Q.26. Describe root regions and structure of root hair.

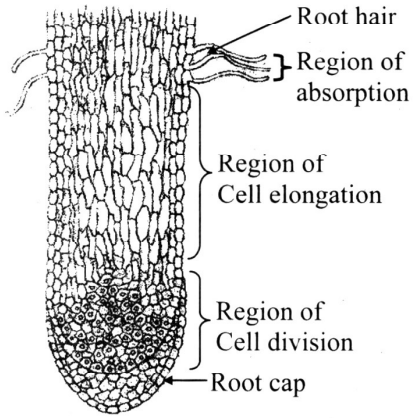
Ans: A typical root, of terrestrial plants has four regions from apex to the base of the root. These are:

i. **Region of cell division:** This is a region which lies at the tip of root, where the division of cell occurs.

ii. **Region of cell elongation:** Cells of this region undergo elongation, as a result, length of root increases.

iii. **Region of absorption:** This is the region for water absorption and bears root hairs. Root hairs absorb water and mineral salts from the soil.

iv. **Region of maturation:** Cells of this region undergo maturation and form different types of tissues.



Regions of root

Structure of root hair:

i. Root hairs are produced by the epidermal cells of root in the region of absorption. This region is called epiblema.

ii. Each root hair is unicellular.

iii. Root hair is elongated, delicate, unbranched and with prolonged epidermal cells.

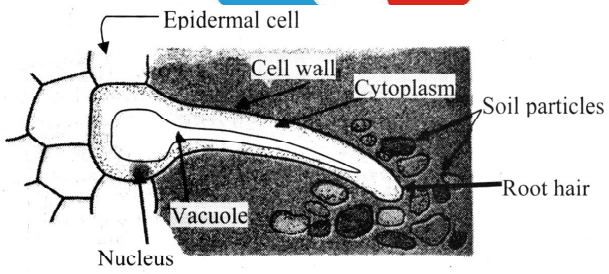
iv. It is tubular and colourless.

v. The cell wall of root is made up of strongly hydrophilic compounds such as pectic compounds and cellulose.

vi. The cell wall is freely permeable to both solutes and water.

vii. Internal to cell wall is present selectively permeable plasma membrane.

viii. Plasma membrane encloses cytoplasm with nucleus and a large vacuole containing cell sap in the centre.



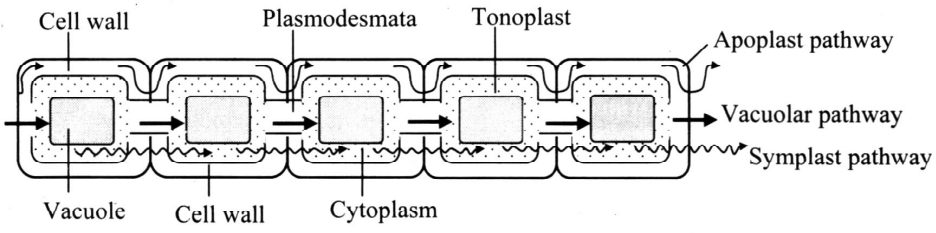
Structure of root hair

Q.27. With the help of a neat labelled diagram explain the two pathways of water across the root cells.

OR

Write about the apoplast and symplast pathways of water movement into the plant body.

Ans: Pathways of water across the root cells:



Pathways of water movement

Water moves from soil to xylem through epidermis, cortex, endodermis and peri cycle along different pathways, as apoplast pathway and symplast pathway.

Apoplast pathway:

i. In this pathway, water moves exclusively through cell walls and intercellular spaces.
ii. The movement is non-osmotic in nature and occurs due to imbibition.
iii. The cellulosic walls of root hair, cortical cells, endodermis and peri cycle are made up of cellulose, which is hydrophilic and permeable to water. Hence, the water moves through them by apoplast pathway.

Symplast pathway:

i. In this pathway, water moves from one cell to another through cytoplasmic bridges called plasmodesmata.
ii. Cytoplasm of adjacent cells are interconnected with each other by plasmodesmata forming a cytoplasmic network called symplast.
iii. Since, the water moves through symplast, it is called symplast pathway.
iv. The movement of water in this pathway occurs due to osmosis.
v. During symplast pathway, the water moves from root hair to cortex and from cortex to endodermis. Endodermal cells are provided with casparian strips which do not allow water to pass through.
vi. Water accumulates and develops hydrostatic pressure.
vii. When water reaches passage cells of endodermis, it moves through passage cells. It is forced into the xylem and conducted upwards.

Q.28. What is symplast pathway?

Ans: when water travels from cell to cell through cytoplasmic bridges, it is called symplast pathway.

Q.29.What is apoplast pathway?

Ans: Apoplast pathway is the pathway in which movement of water occurs exclusively through cell walls and intercellular spaces.

Q.30. Differentiate between Apoplast pathway and Symplast pathway.

Ans:

No.	Apoplast pathway	Symplast pathway
i.	In apoplast pathway, water moves from interconnecting cell walls and intercellular spaces.	In symplast pathway, water moves from one cell to another through cytoplasmic bridges called plasmodesmata.
ii.	The movement of water is non-osmotic.	The movement of water occurs due to osmosis.
iii.	Movement is fast.	Movement is slow.

Q.31. What is active absorption?

Ans: When metabolic energy is required for the absorption process, it is described as active absorption.

Q.32. Describe the mechanism of water absorption by plants.

Ans: There are two methods of absorption of water by plants. These are as follows:

Active absorption of water:

i. In active absorption, the wall of root hair imbibes large amount of water which enters the root hair by the process of osmosis.
ii. This water moves from root hair to the cortical cells and from one cortical cell to another by the gradient of water potential (diffusion pressure deficit).
iii. Root hair and cortical cells of the root possess higher O.P. than that of the soil. Due to which, water moves from cell to cell by osmosis.This is called gradient of water potential.
iv. When water enters the root hair cell by osmosis, it becomes fully turgid and its D.P.D. becomes zero.
v. Inner cortical cell possess higher D.P.D. therefore water moves into this cell by osmosis. Consequently

the inner cortical cell becomes turgid and its D.P.D. becomes zero.

vi. Water from this cell moves to the next inner cell. Hence, each cell becomes alternately turgid and flaccid and water moves from cell to cell in cortex.

vii. Metabolic energy is required to maintain high O.P. Hence, the process is called active absorption.

Passive absorption of water:

i. In passive absorption, living cells of root do not play any important role in water absorption.

ii. When the leaf looses water due to transpiration, it develops water deficit or suction pressure. To overcome this deficit, it draws water from the petiole.

iii. The petiole in turn draws water from the stem and the stem draws from the root. The suction force is thus transmitted from veins to root hair.

iv. The root system behaves as a physical absorbing organ through which water is absorbed due to suction pressure developed in roots owing to transpiration.

v. There is no expenditure of metabolic energy, hence the process is considered as passive absorption.

Q.33.Distinguish between active and passive absorption.

Ans:

No.	Active Absorption	Passive Absorption
i.	It is a physiological process.	It is a physical process.
ii.	There is expenditure of energy for active absorption.	There is no expenditure of energy for passive absorption.
iii.	It takes place against the concentration gradient.	It takes place along with concentration gradient.
iv.	It cannot occur in the absence of roots.	It can occur even in the absence of roots.
v.	Root cells play an active role in this type of water absorption.	Root cells have no active role in this type of water absorption.
vi.	It is found in certain reasons only.	It occurs throughout the year.
vii.	It creates a positive pressure in the xylem channels.	It creates a negative pressure in the xylem channels.
viii.	It is manifested in the form of root pressure.	It is manifested in the form of transpiration pull.

6.3 : Ascent of Sap :

Q.34. Define ascent of sap.

OR

What is ascent of sap?

Ans: The upward movement of water (sap) from roots to aerial parts of plant against the force of gravity is called ascent of sap or translocation of water.

Q.35. Define root pressure and give the name of instrument used to measure root pressure.

Ans: During absorption of water from soil by osmosis, the continuous flow of water develops hydrostatic pressure in roots. This pressure is known as root pressure. Manometer is used to measure root pressure. It is sealed over the stump.

Q.36. What is exudation ?

Ans: When the stem of well watered plant is cut a few centimeters above the soil level, sap in xylem flows out through the cut end. This phenomenon is known as exudation or bleeding.

Q.37. Why are living roots essential for root pressure to develop?

OR

What role does root pressure play in the water movement in plants?

Ans: i. Plants absorb water from soil by osmosis.

ii. The mineral ions are actively absorbed by the roots from soil.

iii. These mineral ions get accumulated in cortical cells of root which leads to osmotic entry of water.
iv. The continuous flow of water develops hydrostatic pressure in roots, known as root pressure.
v. Thus, living roots are essential for root pressure to develop which causes water movement in plants.

Q.38. Explain the term Guttation.

Ans: i. Guttation is the phenomenon in which water is removed in liquid phase (exudation of water) through intact plant parts.
ii. Guttation can be frequently seen when atmosphere is humid, transpiration is low and active absorption of water is more.
iii. This active absorption of water develops pressure in root, i.e. root pressure.
iv. Guttation is often observed early in the morning when excess of water collects in the form of droplets.
v. These droplets are formed at the special openings of veins near the tip of grass blades and leaves of many herbaceous plants.
vi. In ferns, guttation occurs through special glands called hydathodes.
vii. Water exuded by guttation contains salts.

Q.39. Why hydathodes are also called as chalk glands?

Ans: i. In ferns, guttation takes place through special openings called hydathodes.
ii. In ferns, water that exuded during guttation contains calcium salts.
iii. When exuded water evaporates off, a white crust remains on the surface.
iv. Hence, hydathodes are also called as 'chalk glands' .

Q.40. Describe the mechanism of ascent of sap with the help of cohesion tension theory.

Ans: Ascent of sap:

The upward movement of water and salts from roots to the aerial parts of the plants against the force of gravity is called ascent of sap or translocation of water.

Ascent of sap occurs in vascular plants through conducting elements of xylem namely tracheids and vessels.

Cohesion tension theory (Transpiration pull):

This theory was proposed by Dixon and Jolly in 1894. It is the most widely accepted theory and is based on the following principles:

i. Cohesion of water:

Cohesion means attraction between similar molecules. Water molecules have a strong mutual attraction (cohesion) due to which they cannot be separated from one another. The magnitude of cohesive force is found to be about 350 atm which is more than enough for ascent of sap in tall trees.

ii. Adhesion of water:

Adhesion means attraction between dissimilar molecules. There is a force of attraction between water and lignified cell wall of xylem. Due to this force, water molecules tend to stick to the walls of xylem ducts.

iii. Continuity of water column:

The cohesive and adhesive forces maintain a continuous water column formed in xylem duct from roots to the leaves.

iv. Transpiration pull:

In transpiration, leaves of plants loose a large amount of water through their stomata. This results in water deficit of the mesophyll cells. To compensate this water loss, mesophyll cells draw water from the xylem of the leaf.

Thus, a tension of about 20 atmospheres is created in the xylem of leaves. This tension or pull is called as transpiration pull. The transpiration pull is transmitted downwards from petiole and stem to roots. As a result, water column is pulled upwards.

Thus, transpiration pull along with cohesive force of water is responsible for the ascent of sap in plants, especially in the tall trees.

Q.41. State the objection to cohesion-tension theory.

Ans: Objection to cohesion-tension theory:

Owing to the variations in the. atmospheric temperature, air bubbles may enter "the water column and obstruct the cohesion between water molecules. It may break the continuity of water column.

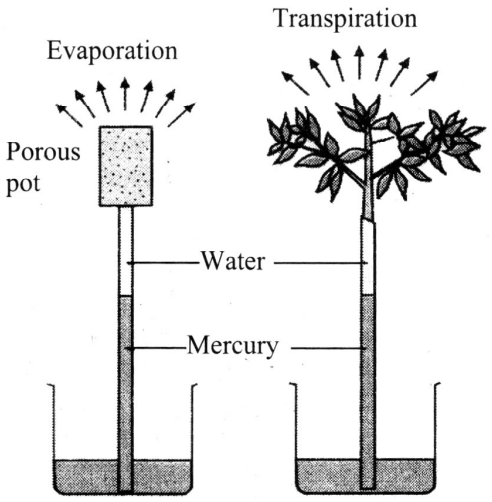
Q.42. On which principles, is the transpiration pull theory based?

Ans: Transpiration pull theory is based on three principles namely cohesion, adhesion and transpiration pull.

Q.43. Describe a physical demonstration of the cohesion-tension theory with suitable diagram.

Ans: Physical demonstration of the cohesion-tension theory:

i. A continuous water column is prepared, in order to explain cohesion-tension theory.
ii. At the top of continuous water column, a porous pot is placed.
iii. Water loss occurs from the pot by evaporation.
iv. This causes a tension over the water column.
v. This tension is demonstrated by a rise in the level of mercury.
vi. Plant shows a similar mechanism to absorb water from the soil.
vii. Thus, this experiment demonstrates the cohesion-tension theory.



Physical demonstration of Cohesion-Tension Theory

Q.44. Discuss the factors responsible for ascent of xylem sap in plants.

Ans: Factors like root pressure, capillarity, imbibition, cohesion-adhesion and transpiration pull are responsible for ascent of sap.

6.4 : Transpiration :

Q.45. How much water is lost to the atmosphere. by plants?

OR

What percentage of water is utilized for various activities of plants?

Ans: About 2% of the total water content is utilized by the plants, whereas the remaining, i.e. about 98% of water is lost to the atmosphere through aerial parts of a plant.

Q.46. Define transpiration.

Ans: Transpiration: The loss of water in the form of vapours from the aerial parts of the plant is called transpiration.

Q.47. Describe in brief the three types of transpiration.

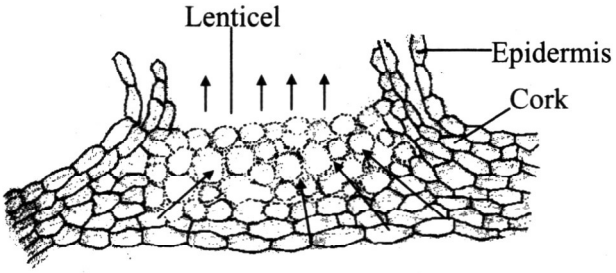
Ans: Types of Transpiration:

i. Cuticular Transpiration:

a. It takes place through the cuticle found on the surface of stem and leaves ..
b. Cuticle is a thin or thick layer on the epidermis of leaves and herbaceous stem.
c. It consists of cutin, which is a wax like substance that is deposited on the walls of epidermal cells.
d. Cuticle reduces the loss of water, but is not strictly impervious to water.
e. Cuticular transpiration depends on the thickness of the cuticle.
f. Thicker the cuticle, less will be the rate of transpiration.
g. Cuticular transpiration accounts for 8 to 10 % transpiration.
h. Cuticular transpiration takes place throughout day and night.

ii. Lenticular Transpiration:

a. It occurs through the lenticels present in the bark of old stems and pericarps of woody fruits.
b. Lenticels are fine pores composed of loosely arranged cells called complementary cells.
c. 0.1 to 1 % ofthe total transpiration occurs through lenticels. '
d. It occurs throughout day and night.



Lenticels showing lenticular transpiration

iii. Stomatal Transpiration:

a. It occurs through minute pores called stomata present in epidermis of young stem and leaves.
b. Opening and closing of stomata is controlled by epidermal cells called guard cells.
c. About 80 - 90% of the total water loss takes place through stomatal pores.
d. Stomatal transpiration occurs only during day time when stomata are open.

Q.48. Give an account of stomatal transpiration.

OR

Explain the process of stomatal transpiration.

Ans: Stomatal transpiration:

i. Loss of water through stomata is called stomatal transpiration.
ii. Stomatal transpiration takes place when the stomata are open (i.e. generally in day time) and the process stops when the stomata get closed (i.e. generally in night).
iii. Opening and closing of stomata occ,urs due to osmotic changes in guard cells.
iv. When the guard cells are turgid (due to endosmosis), the stomata get opened.
v. When guard cells become flaccid (due to exosmosis), the stomata get closed.

Q.49. Distinguish between cuticular transpiration and stomatal transpiration.

Ans:

No.	Cuticular transpiration	Stomatal transpiration
i.	Cuticular transpiration takes place through the cuticle.	Stomatal transpiration takes place through the stomata.
ii.	Cuticular transpiration accounts for 8 to 10% of total loss of water from plants.	Stomatal transpiration accounts for 80 to 90% of total loss of water from plants.
iii.	Cuticular transpiration depends upon the thickness of the cuticle.	Stomatal transpiration depends upon the number and size of stomata.
iv.	It occurs throughout day and right.	It occurs during day when stomata are open.