CHAPTER – 4

Absorption by roots – The process involved

Question 1

List the three primary functions of root.

Answer

The three primary functions of root are:

1. Fixes the plant in soil giving it support.
2. Absorbs water and mineral nutrient from soil.
3. Conducts absorbed water and mineral to stem.

Question 2

Mention four purposes for which the plants need water.

Answer

Plants need water for:

1. Photosynthesis
2. Transpiration
3. Transportation
4. Mechanical stiffness

Question 3

Where are the mineral nutrients mostly used in plants?

Answer

The mineral nutrients are used by plants in formation of cell and cell organelles as well as in synthesis of various compounds and enzymes.

Question 4

List three main characteristics of the roots that enable them to draw water from the soil.

Answer

Three main characteristics of the roots that enable them to draw water from the soil are:

1. Surface area of roots is enormous.
2. Root hairs contain cell sap, of a higher concentration than that of the surrounding water.

3. Root hairs have thin walls.

Progress Check 2

Question 1

Write true or false.

(i) Diffusion is the movement of molecules from a region of their lower concentration to that of a higher one.

(ii) Osmosis includes diffusion, but not vice versa.

(iii) Osmosis is unidirectional.

(iv) Exosmosis may cause bursting of a cell.

(v) Semi-permeable membrane prevents the passage of the solute molecules.

(vi) In an experiment on osmosis, if external pressure is applied on a dilute solution, less water will pass into the concentrated solution.

Answer

(i) False
Corrected Statement — Diffusion is the free movement of molecules of a substance (solute or solvent, gas, liquid) from the region of their higher concentration to the region of their lower concentration when the two are in a direct contact.

(ii) True

(iii) True

(iv) False
Corrected Statement — Endosmosis may cause bursting of a cell.

(v) True

(vi) False
Corrected Statement — In an experiment on osmosis, if external pressure is applied on a dilute solution, more water will pass into the concentrated solution.

Question 2

In what way is active transport opposite to diffusion?

Answer . The difference between Diffusion and Active Transport is given below :-

Diffusion	Active transport
Diffusion is the free movement of molecules of a substance (solute or solvent, gas, liquid) **from the region of their higher concentration to the region of their lower concentration** when the two are in a direct contact.	It is the movement of a salt or an ion **from a region of its lower concentration to a region of its higher concentration** through a living membrane.

Question 3

A cell kept in a certain solution bursts after some time. Comment upon the kind of solution.

Answer

The solution is a hypotonic solution i.e., concentration of solute in it is less than that of cell sap. A cell when kept in hypotonic solution swells and finally bursts due to endosmosis.

Question 4

Which process — diffusion, osmosis or active transport, needs involvement of energy?

Answer

Active transport needs involvement of energy.

Question 5

Can we call diffusion passive transport? If so, how?

Answer

Yes, we can call diffusion as passive transport as it occurs according to concentration gradient i.e., from higher concentration of solute to lower concentration. It does not involve any energy expense.

Progress Check 3

Question 1

Name the following :

(i) The state of a cell when it cannot accommodate any more water.

(ii) Pressure of the cell contents on the cell wall.

(iii) The condition that is opposite to turgid.

(iv) The state of a plasmolysed cell after the re-entry of water.

(v) The pressure under which water passes from the living cells of a root into xylem.

Answer

(i) Turgid

(ii) Turgor Pressure

(iii) Flaccid

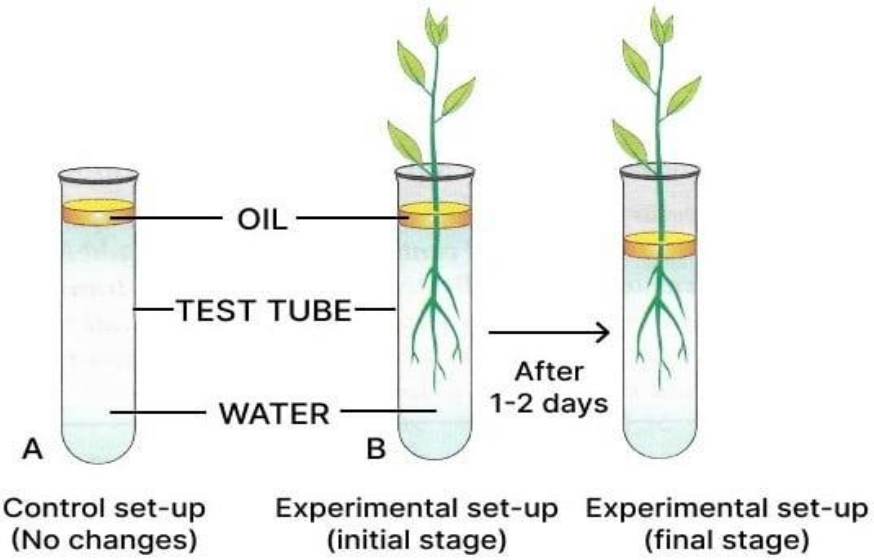
(iv) Deplasmolysed

(v) Root pressure

Progress Check 4

Question 1

Look at figure. Why was oil added over water in the test tubes?



Answer

Oil was added over water in the test tubes to avoid the loss of water due to evaporation.

Question 2

Look at the experiment shown in figure. Why was it necessary to take coloured eosin solution in water in the beaker?

Answer

Coloured eosin solution in water was taken to stain xylem vessel in order to show that there is upward movement of absorbed water.

Question 3

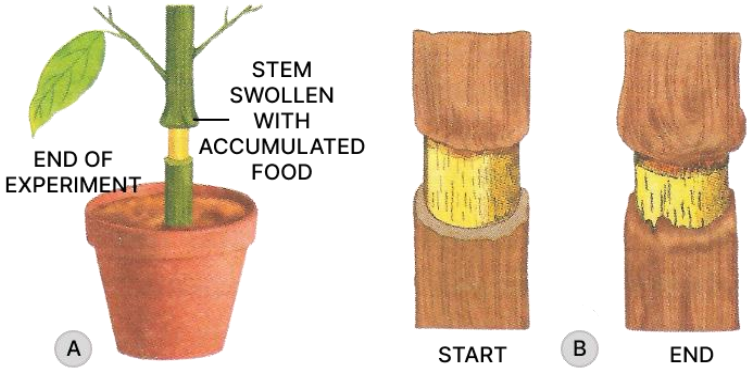
Which part of the stem, the xylem or the phloem, is located deeper internally ?

Answer

The xylem is located deeper and the phloem is relatively superficial in location.

Question 4

Look at figure. Why has the stem below the ring stopped growing and even slightly decayed?



Answer

The stem below the ring stopped growing and even slightly decayed because its food supply was cut. After girdling, the lower portion of stem remains alive for few days due to stored food in it but later it stops to grow.

MULTIPLE CHOICE TYPE

Question 1

The hydrostatic pressure of the cell sap on the cell wall is called :

1. Turgor pressure
2. Osmotic pressure
3. Wall pressure
4. Atmospheric pressure

Answer

Turgor pressure

Reason — Turgor pressure is the pressure applied by the cell contents on the wall of cell.

Question 2

When a cell in solution shrinks and loses its shape, then the solution is :

1. Isotonic
2. Potable water
3. Hypotonic
4. Hypertonic

Answer

Hypertonic

Reason — The concentration of solutes in hypertonic solution is more than the cell sap. When a cell is kept in such solution, water moves out of the cell and it shrinks.

Question 3

The process for which energy is required is :

1. Passive transport
2. Diffusion
3. Osmosis
4. Active transport

Answer

Active transport

Reason — Active transport involves use of energy as such transport is against the gradient.

Question 4

The highest water potential is that of :

1. 10% sugar solution
2. Honey
3. 10% salt solution
4. Pure water

Answer

Pure water

Reason — Water potential is the capacity of water to move out to higher concentrated solution. It is maximum for pure water.

Question 5

When the cells of a plant are fully distended, the condition is called :

1. Flaccidity
2. Shrinkage
3. Plasmolysis
4. Deplasmolysis

Answer

Deplasmolysis

Reason — When plasmolysed cell is kept in a hypotonic solution, it absorbs water and gets fully distended.

Question 6

Which of the following creates a suction force in plants ?

1. Transportation
2. Translocation
3. Transpiration
4. Transformation

Answer

Transpiration

Reason — Transpiration (loss of water through plant surface) creates a suction force called transpiration pull. It works with root pressure due to which the roots absorb water.

Question 7

The phenomenon by which living/dead plant cells absorb water by surface attraction is called :

1. Inhibition
2. Cohesion
3. Adhesion
4. Imbibition

Answer

Imbibition

Reason — Substances which are made up of cellulose or proteins are hydrophilic. They can imbibe water due to surface attraction.

Question 8

Which of the following is a living semi-permeable membrane ?

1. Cell wall
2. Cell membrane
3. Cellulose
4. None

Answer

Cell membrane

Reason — Cell membrane is semi-permeable due to its structure. It allows entry of some substances and prevent the movement of some other materials.

Question 9

Addition of salt to pickles is a method of killing the bacteria by :

1. Imbibition
2. Diffusion
3. Deplasmolysis
4. Plasmolysis

Answer

Plasmolysis

Reason — Adding salt to the pickle increases the concentration of solute outside the cells of bacteria. This results in movement of water outwards from the cell and thus bacteria gets killed.

Question 10

Root pressure can be measured by using :

1. Sphygmomanometer
2. Barometer
3. Manometer
4. Thermometer

Answer

Manometer

Reason — Manometer is the instrument to measure root pressure.

Question 11

Two plant cells are placed in two different liquids and observed after 4-6 hours.

Cell	Liquid	Change in the shape of plant cell
P	Water	Swollen

Cell	Liquid	Change in the shape of plant cell
Q	Sugar solution	Shrunken

Identify the correct pair of the processes happening in plant cells P and Q.

1. P - Plasmolysis, Q - Deplasmolysis
2. P - Plasmolysis, Q - Turgidity
3. P - Exosmosis, Q - Endosmosis
4. P - Endosmosis, Q - Exosmosis

Answer

P - Endosmosis, Q - Exosmosis

Reason — Plant cell P is placed in water, so the concentration of water molecules inside the cell is less than the surrounding, hence water molecules enter the cell causing the cell to swell up. Plant cell Q is placed in sugar solution, so the concentration of water molecules inside the cell is more than the surrounding, hence water will move out of the cell and as a result it will shrink.

Assertion Reason type

Question 12

Assertion. Roots absorb water and mineral nutrients from the soil.

Reason. Soil is the storehouse of all the essential minerals for photosynthesis that are absorbed by the plant through the roots of the plant by the process of diffusion.

1. Both A and R are True.
2. Both A and R are False.
3. A is True and R is False.
4. A is False and R is True.

Answer

A is True and R is False.

Explanation
Soil is the storehouse of different essential minerals but for photosynthesis, plant absorb Carbon dioxide from air.

Question 13

Assertion. Diffusion is the process of free movement of liquid molecules only. It does not occur in gaseous state.

Reason. The main condition which regulates the process of diffusion is the concentration gradient and not the state of matter. It always occurs from higher to lower concentration.

1. Both A and R are True.
2. Both A and R are False.
3. A is True and R is False.
4. A is False and R is True.

Answer

A is False and R is True.

Explanation
Diffusion is the process of free movement of liquid as well as gas molecules.

Question 14

Assertion. Translocation of prepared food material in plants always occurs through the phloem tissue in an upward direction.

Reason. Phloem is a kind of a complex permanent tissue in plants which surrounds the xylem tissue. It is present all throughout the plant-root, stem or leaves.

1. Both A and R are True.
2. Both A and R are False.
3. A is True and R is False.
4. A is False and R is True.

Answer

A is False and R is True.

Explanation
Translocation of prepared food material in plants always occurs through the phloem tissue in both upward and downward directions.

Question 15

Assertion. Active transport does not occur through a non-living semi-permeable membrane.

Reason. Active transport is in a direction opposite to that of diffusion, i.e., from a region of lower concentration to higher concentration.

1. Both A and R are True.
2. Both A and R are False.
3. A is True and R is False.

4. A is False and R is True.

Answer

Both A and R are True.

Explanation
Active transport does not occur through a non-living semi-permeable membrane because it requires energy (ATP) which can only be provided by living membrane.
Active transport moves molecules against their concentration gradient, from an area of lower concentration to an area of higher concentration, which requires energy input.

Very Short Answer Type

Question 1

Name the following:

(a) The condition of a cell placed in a hypotonic solution.

(b) The process by which intact plants lose water in the form of droplets from leaf margins.

(c) The process by which water enters root hairs.

(d) The tissue concerned with upward conduction of water in plants.

(e) The term for the inward movement of solvent molecules through the plasma membrane of a cell.

(f) The process by which molecules distribute themselves evenly within the space they occupy.

(g) The pressure which is responsible for the movement of water molecules across the cortical cells of the root.

Answer

(a) Turgidity

(b) Guttation

(c) Osmosis

(d) Xylem

(e) Endosmosis

(f) Diffusion

(g) Root pressure

Question 2

Give the equivalent terms for the following:

(a) Pressure exerted by the cell contents on the cell wall.

(b) The condition in which the cell contents are shrunken.

(c) Loss of water through a cut stem.

Answer

(a) Turgor pressure

(b) Flaccidity

(c) Bleeding

Question 3

Complete the following statements:

(a) Hypotonic solution is one in which the solution kept outside the cell has ..... solute concentration than inside the cell.

(b) Active transport is one in which the ions outside the roots move in by utilising ..... .

(c) The bending movements of certain flowers towards the sun and the sleep movements of certain plants at night are examples of ..... .

Answer

(a) Hypotonic solution is one in which the solution kept outside the cell has ***lower*** solute concentration than inside the cell.

(b) Active transport is one in which the ions outside the roots move in by utilising ***energy from the cell***.

(c) The bending movements of certain flowers towards the sun and the sleep movements of certain plants at night are examples of ***turgor movements***.

Question 4

Fill in the blanks by choosing the correct alternative from those given in brackets.

(a) When placed in a more concentrated solution, the cell contents will ..... **(shrink / swell up)**.

(b) The pressure by which the ..... molecules tend to cross the semi-permeable membrane is called osmotic pressure. **(salt / water)**

(c) Active transport is in a direction ..... to that of diffusion. **(opposite / same)**

Answer

(a) When placed in a more concentrated solution, the cell contents will ***shrink***.

(b) The pressure by which the ***water*** molecules tend to cross the semi-permeable membrane is called osmotic pressure.

(c) Active transport is in a direction ***opposite*** to that of diffusion.

Question 5

Match the items in column I with those in column II

Column I	Column II
(a) Xylem	(i) semi-permeable
(b) Phloem	(ii) permeable
(c) Cell membrane	(iii) downward flow of sap
(d) Root pressure	(iv) upward flow of water
(e) Cell wall	(v) guttation

Answer

Column I	Column II
(a) Xylem	(iv) upward flow of water
(b) Phloem	(iii) downward flow of sap
(c) Cell membrane	(i) semi-permeable
(d) Root pressure	(v) guttation
(e) Cell wall	(ii) permeable

Short Answer Type

Question 1

Differentiate between the following :

(a) Plasmolysis and Deplasmolysis

(b) Turgor Pressure and Wall Pressure

(c) Hypotonic and Hypertonic solution

(d) Turgidity and Flaccidity

Answer

(a) Difference between Plasmolysis and Deplasmolysis

Plasmolysis	Deplasmolysis
It refers to the shrinkage of the cytoplasm and withdrawal of the plasma membrane from the cell wall caused due to the withdrawal of water when placed in a hypertonic solution.	Deplasmolysis is the recovery of a plasmolysed cell when it is placed in water, wherein the cell's protoplasm again swells up due to the re-entry of water.
In Plasmolysis, the cell becomes flaccid.	In Deplasmolysis, the cell becomes turgid.

(b) Difference between Turgor pressure and Wall pressure

Turgor Pressure	Wall Pressure
Turgor pressure is the pressure of the cell contents on the cell wall.	Wall pressure is the pressure exerted by the cell wall on the cell content.
It helps keeps plant stems erect, keeps leaves expanded, involve in opening and closing of stomata, etc.	It helps maintain the structure of cells and the plant.
It acts towards the outside from the cell.	It acts towards the inside of the cell.

(c) Difference between Hypotonic and Hypertonic solution

Hypotonic Solution	Hypertonic Solution
The solution outside the cell has a lower solute concentration than the fluids inside the cell.	The solution outside the cell has higher solute concentration than the fluids inside the cell.
Endosmosis occurs as the water molecules move into the cell.	Exosmosis occurs as the water molecules move out from the cell.
When placed in Hypotonic Solution, the cell slightly enlarges or even bursts.	When placed in Hypertonic Solution, the cell shrinks in size and loses shape.

(d) Difference between Turgidity and Flaccidity

Turgidity	Flaccidity
It is the state of a cell in which the cell wall is rigid and stretched by an increase in the volume of vacuoles due to the absorption of water.	It is the condition in which the cell content is shrunken and the cell is not tight.
It occurs when the cell is placed in Hypotonic solution.	It occurs when the cell is placed in Hypertonic solution.
It is caused by Endosmosis.	It is caused by Exosmosis.
Water moves into the cell.	Water moves out of the cell.

Question 2

Mention whether the following statements are true (T) or false (F). Correct the false statements by altering the last word only.

(a) Addition of salt to pickles prevents the growth of bacteria because they turn turgid.

(b) Cells that have lost their water content are said to be deplasmolysed.

(c) Xylem is the water conducting tissue in plants.

(d) The protoplasm shrinks, when a cell is kept in hypotonic solution.

(e) The cell wall of the root cell is a differentially permeable membrane.

Answer (a) False
Corrected statement — Addition of salt to pickles prevents the growth of bacteria because they turn ***flaccid***.

(b) False
Corrected statement — Cells that have lost their water content are said to be ***plasmolysed***.

(c) True

(d) False
Corrected statement — The protoplasm shrinks, when a cell is kept in ***hypertonic solution***.

(e) False
Corrected statement — The cell wall of the root cell is a ***permeable*** membrane.

Question 3

Mention whether the following statements are true (T) or false (F) and give explanation in support of your answer.

(a) Guttation is another name for bleeding in plants.

(b) Soaked seeds burst their seed coats.

(c) If the phloem of a twig is removed keeping the xylem intact, the leaves of a twig wilt.

(d) Guttation in plants occurs maximum at mid-day.

(e) Raisins when submerged in water swell up due to endosmosis.

Answer

(a) False
Reason — Guttation is the process by which drops of water appear along leaf margins due to excessive root pressure whereas bleeding is the loss of cell sap through a cut stem.

(b) True
Reason — The seeds and grains swell up when soaked in water due to imbibition and endosmosis. The force generated by water thus absorbed is strong enough to make the seeds coats burst.

(c) False
Reason — The leaves of the twig remain turgid since its xylem is intact and xylem is responsible for water conduction in plants.

(d) False
Reason — Guttation is the exudation of drops of xylem sap on the tips of leaves and occurs due to excessive root pressure. It is maximum when root pressure is maximum which occurs in the early mornings or at night. This is because during these times, transpiration is very low and water absorption is very high.

(e) True
Reason — When raisins are submerged in water, concentration of solute inside the raisins is more than the concentration of water. Water acts as a hypotonic solution for raisins due to which endosmosis occurs. As raisins absorb water due to endosmosis, they swell up.

DESCRIPTIVE TYPE

Question 1

Give two examples of turgor movements in plants.

Answer

Two examples of turgor movements in plants.

(i) The rapid dropping of the leaves of the sensitive plant ***Mimosa pudica***, is an outstanding example of turgor movement. If one of the leaves is touched, even lightly, the leaflets fold up and within 2 to 3 seconds, the entire leaf droops. If the leaf is touched somewhat strongly, the wave of folding and drooping spreads from the stimulated leaf to all neighbouring leaves.

(ii) Turgor movements are found in **insectivorous plants** whose leaves close up to entrap a living prey. When the insect comes in contact with the leaf, it loses its turgor hence closing the leaves of the plant.

Question 2

Define the following terms:

(a) Imbibition

(b) Diffusion

(c) Osmosis

(d) Osmotic pressure

(e) Active transport

(f) Tonicity

(g) Root pressure

Answer

(a) **Imbibition** — Imbibition is a phenomenon by which the living or dead plant cells absorb water by surface attraction. Its the passive absorption of water by substances such as cellulose (in cell wall) and starch.

(b) **Diffusion** — Diffusion is the free movement of molecules of a substance (solute or solvent, gas, liquid) from the region of their higher concentration to the region of their lower concentration when the two are in a direct contact.

(c) **Osmosis** — Osmosis is the movement of water molecules from their region of higher concentration (dilute solution or with a lower solute concentration) to their region of lower concentration (concentrated solution or with a higher solute concentration) through a semi permeable membrane.

(d) **Osmotic pressure** — Osmotic pressure is the minimum pressure that must be exerted to prevent the passage of the pure solvent into the solution when the two are separated by a semi-permeable membrane.

(e) **Active transport** — Active transport is the passage of a substance from its lower to higher concentration through a living cell membrane using energy from the cell.

(f) **Tonicity** — Relative concentration of the solutions that determine the direction and extent of diffusion is called tonicity.

(g) **Root pressure** — The upward flow of water due to heavy pressure from the roots is called root pressure. Thus, it is one of the forces to raise water up through the stem into the leaves.

Question 3

Give reasons for the following:

(a) If you sprinkle some common salt on grass growing on a lawn, it is killed at that spot.

(b) If you uproot a plant from the soil, its leaves soon wilt.

(c) It is better to transplant seedlings in a flower-bed in the evening and not in the morning.

(d) A plant cell when kept in a hypertonic salt solution for about 30 minutes becomes plasmolysed.

(e) Potato cubes when placed in water become firm and increase in size.

Answer

(a) When common salt is sprinkled on grass growing in lawn, the common salt acts as a hypertonic solution for the grass. The cells of grass start losing water, grass becomes flaccid and Plasmolysis occurs causing the protoplasm to go away from the cell wall. This creates gaps between the membrane and the cell wall. Grass cells shrink completely and ultimately get killed.

(b) If a plant is uprooted, the leaves continue losing water by transpiration, but there is no more water absorbed by the roots. This does not allow the compensation for the loss of water by transpiration hence the leaves of the uprooted plant wilt soon.

(c) Transplantation in the evening helps the seedlings to adjust for a longer time during the night (cooler temperatures) because the quantity of water absorbed exceeds the loss of water through transpiration. Therefore, it is better to transplant seedling in a flower bed in the evening and not in the morning.

(d) When a plant cell is kept in a hypertonic salt solution, it starts losing water due to Plasmolysis. As the solution outside the cell has higher solute concentration than the fluids inside the cell so exosmosis occurs. In 30 minutes, the plant cell will lose its distended appearance, the cytoplasm will shrink and the plasma membrane will withdraw from the cell wall causing the plant cell to turn plasmolysed.

(e) Potato cubes contain excess of salts and sugars as compared to the water in which the cubes are placed. Hence, due to endosmosis, water from the surrounding enters the potato cubes making them firm and increasing their size.

Question 4

What are the four main forces which contribute to the ascent of sap (upward movement of water and minerals) ? Name them and explain in short.

Answer

The four main forces which contribute to the ascent of sap are:

1. **Root pressure** — Root pressure builds up sufficient force to push the sap in the xylem vessels up to a certain height and may be enough for herbaceous plants.

2. **Capillary force** — Capillarity (narrow diameter) of xylem vessels causes the water from a lower level to rise to fill up the vacuum created by the loss of water due to transpiration from the leaves. Narrower the diameter of a tube, greater will be the height of water rising in it exerting a force called capillary force.

3. **Transpiration pull** — As the water is lost from the leaf surface by transpiration, more water molecules are pulled up due to the tendency of water molecules to remain joined (cohesion), and thus to produce a continuous column of water through the stem.

4. **Adhesion** — It causes the water to stick to the surface of cells thus drawing more water molecules from below when the leaf cells lose water during transpiration. This pulling force (or suction force) provided by the leaves is important for tall trees.

Question 5

What is transpirational pull? How is it caused?

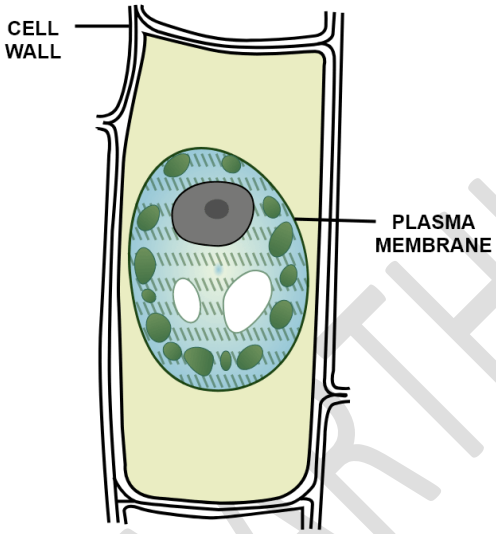
Answer

As water is lost from the leaf surface by transpiration, more water molecules are pulled up due to the tendency of water molecules to remain joined i.e. cohesion. This produces a continuous column of water throughout the stem which is known as 'transpiration pull'. A negative pressure or tension is produced in the xylem that pulls the water from the roots and soil. Transpirational pull is an important force which causes the ascent of sap.

Structured / Application / Skill Type Questions

Question 1

A leaf cell of a water plant was placed in a liquid other than pond water. After sometime, it assumed a shape as shown below:



(a) Give the term for the state of the cell it has acquired.

(b) Name the structure which acts as a selectively permeable membrane.

(c) Comment on the nature (tonicity) of the liquid surrounding the cell.

(d) Name any one feature of this plant cell which is not present in an animal cell.

(e) Redraw in the space provided, the diagram of the cell if it is soon placed in ordinary water for some time.

Answer

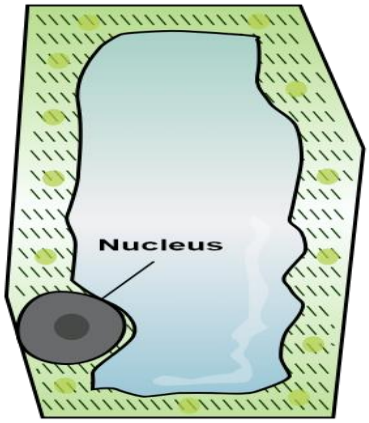
(a) Flaccid cell

(b) Plasma membrane

(c) The liquid surrounding the cell is hypertonic solution. It has higher solute concentration outside the cell than the fluids inside the cell.

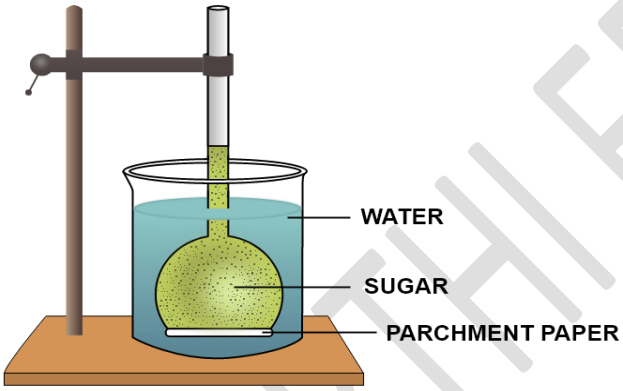
(d) Cell wall

(e) The cell will become turgid as follows:



Question 2

The diagram given below represents an experimental set-up to demonstrate a certain process. Study the same and answer the questions that follow:



(a) Name the process.

(b) Define the above named process.

(c) What would you observe in the experimental set-up after an hour or so?

(d) What control experiment can be set up for comparison?

(e) Keeping in mind the root-hair, cell and its surroundings, name the parts that correspond to (1) concentrated sugar solution (2) parchment paper and (3) water in the beaker.

(f) Name any other material that can be used instead of parchment paper in the above experiment.

(g) Mention any two advantages of the process to the plants.

Answer

(a) Osmosis

(b) Osmosis is the movement of water molecules from their region of higher concentration (dilute solution or with a lower solute concentration) to their region of lower concentration (concentrated solution or with a higher solute concentration) through a semi permeable membrane.

(c) After an hour or so, the level of sugar solution in the thistle funnel will rise and the level of water in the beaker will drop slightly.

(d) As a control, take another thistle funnel with plain water filled in it and suspend it in another beaker also containing water. Again mark the level on its stem.

(e) The corresponding parts are mentioned below:

1. Concentrated sugar solution → Cell sap (of higher concentration than that of the surrounding water) within the root hair.
2. Parchment paper → Cell membrane of root hair.
3. Water in the beaker → Water in soil.

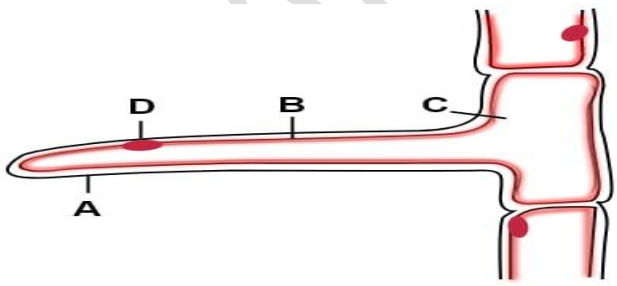
(f) The other substance that can be used instead of parchment paper in the above experiment is cellophane paper or animal bladder.

(g) Advantages of the osmosis process are —

1. It controls the absorption of water by root hairs from the soil.
2. It controls opening and closing of stomata during transpiration through its regulation of the turgidity of guard cells.

Question 3

The diagram below represents a layer of epidermal cells showing a fully grown root hair. Study the diagram and answer the questions that follow:



(a) Name the parts labelled A, B, C and D.

(b) The root hair cell is in a turgid state. Name and explain the process that caused this state.

(c) Mention one distinct difference between the parts labelled A and B.

(d) Draw a diagram of the above root hair cell as it would appear when a concentrated solution of fertilizers is added near it.

Answer

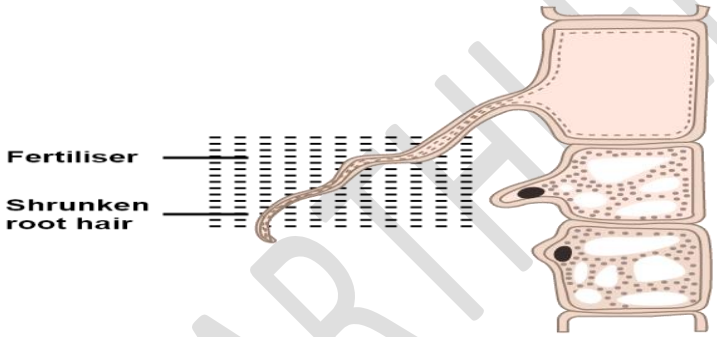
(a) The parts labelled A, B, C and D are:

- A → Cell wall
- B → Cell membrane
- C → Cytoplasm
- D → Nucleus

(b) A root hair gets turgid because of the absorption of water from the surrounding. Absorption of water by root hair is achieved by the process of **Osmosis**. Root hairs contain cell sap which has a higher concentration of salts as compared to the outside soil water. This causes the water from the surrounding to move in because of endosmosis and in the process the root hair gets turgid.

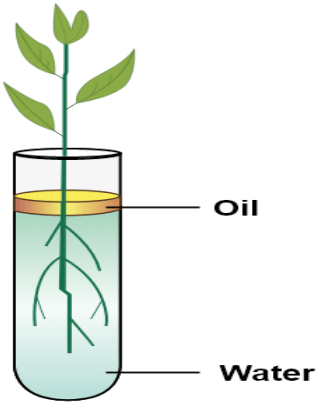
(c) The cell wall of a root hair is freely permeable and allows both salt and water to pass through whereas the cell membrane of a root hair is semi-permeable and does not allow large dissolved salt molecules to pass through.

(d) Below is the diagram of the root hair cell as it would appear when a concentrated solution of fertilizers is added near it:



Question 4

Study the diagram given below and answer the questions that follow:



(a) Name the process being studied in the above experiment.

(b) Explain the process mentioned in (a) above

(c) Why is oil placed over water?

(d) What do we observe with regard to the level of water when this set up is placed in (1) bright sunlight (2) humid conditions (3) windy day?

(e) Mention any three adaptations found in the roots of the plant which enable them to carry out the process mentioned in (a).

Answer

(a) The process of absorption of water by plant roots through osmosis is being studied here.

(b) Absorption of water by the root is by means of root hairs. A root hair contains cell sap which has a higher concentration of salts as compared to the outside soil water. This difference sets of osmosis and the outside soil water diffuses into the root hair. From the cell bearing root hair, water continues to pass to adjoining cells one after another to finally enter the xylem vessels. The turgidity acquired by the cells in the process also helps to push the water upwards through the xylem vessels.

(c) The surface of water is covered with oil to prevent any loss of water by evaporation.

(d) Roots absorb water and hence, the level of water in set up A falls down. Since the surface of water was covered with oil, there will be no effect of factors such as bright sunlight, humid conditions and windy day on the given set up. Hence, the level of water.

(d) Below are the observations with regard to the level of water for the different situations:

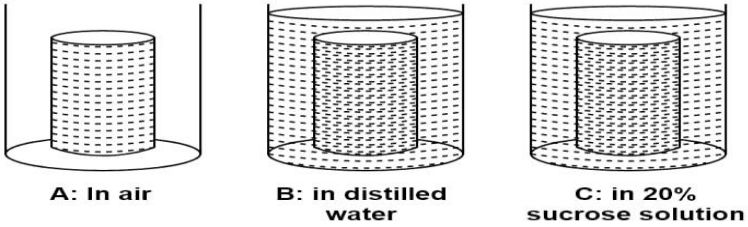
- Bright Sunlight — When this set up is placed in bright sunlight, the water level in the test tube is seen to be less when compare to its initial marking as the rate of transpiration is very high.
- Humid Conditions — When this set up is placed in humid conditions, the water level in the test tube decreases from its initial mark, but at a very slow rate as the rate of transpiration is reduced.
- Windy Day — When this set up is placed in windy day the rate of transpiration highly increases thus the level of the water in the test tube is seen to decrease fast from its initial marking.

(e) Adaptations in plants to foster the process of absorption of water by plant roots:

1. Large surface area provided by rootlets and root hairs.
2. Root hairs contain cell sap at a higher concentration than that of the surrounding water
3. Root hairs with thin walls.

Question 5

Three cylinders of potato were carefully dried on a blotting paper and weighed. Each piece weighed 3 grams. Each one was placed in the beaker as shown below:



Answer the following questions:

(a) After 48 hours, which potato cylinder would be the heaviest?

(b) The movement of which substance is mainly responsible for the weight change in the potato cylinders?

(c) Name and define the process which is responsible for the movement of substance mentioned in answer (b).

(d) Write specific names of the processes which occur in beakers B and C [kinds of processes defined in answer (c)].

(e) Would there be any difference in the weight of the potato cylinder in beaker A after 48 hours? Give reason.

Answer

(a) After 48 hours, Cylinder B kept in distilled water will be the heaviest as distilled water will act as a hypotonic solution for Potato Cylinder. The Potato Cylinder will absorb distilled water from the beaker through the process of endosmosis and its weight will increase.

(b) Movement of water between potato cylinders and beakers is mainly responsible for the weight change in the potato cylinders.

(c) The physical process which is responsible for the movement of substance mentioned in answer (b) is Osmosis. Osmosis is the movement of water molecules from their region of higher concentration to their region of lower concentration through a semi-permeable membrane.

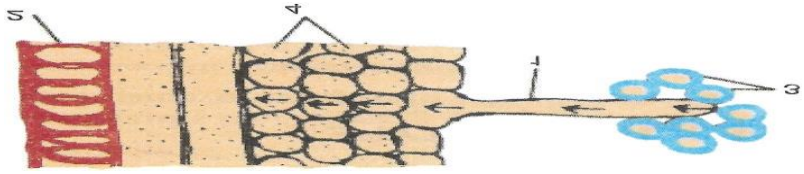
(d) The process that takes place in beaker B is osmosis, which is diffusion of water across the membrane of the potato slice cells. Plasmolysis occurs in beaker C as the potato shrinks due to hypotonic solution of 20% sucrose solution.

(d) Beaker B → Endosmosis
Beaker C → Exosmosis

(e) There will be no change in the weight of the potato cylinder in beaker A because it is kept in air. As there is no movement of water between potato cylinder and beaker so no significant change in the weight of the potato cylinder is observed in beaker A.

Question 6

The figure given below is a diagrammatic representation of a part of the cross-section of the root in the root hair zone. Study the same and then answer the questions that follow:



(a) The parts labelled as 1, 2, 3 and 4 are :

1. Root hair, Xylem vessel, Soil particles, Cortex respectively.
2. Xylem vessel, Soil particles, Root hair, Cortex respectively.
3. Root hair, Xylem vessel, Cortex, Soil particles respectively.
4. Cortex, Soil particles, Xylem vessel, Root hair respectively.

(b) The process that enables the passage of water from soil into the root hair is :

1. Diffusion
2. Active transport
3. Osmosis
4. Passive absorption

(c) The kind of force which exists between a liquid and any surface is called as :

1. Cohesive force
2. Adhesive force
3. Capillarity
4. Suction force

(d) The kind of force between the same kind of liquid molecules is :

1. Capillary force
2. Transpirational pull
3. Adhesive force
4. Cohesive force

(e) Sometimes exudation of water occurs from the margin of the leaves in early morning or night. It is termed as :

1. Transpiration
2. Bleeding
3. Guttation
4. Osmosis

Answer

(a) Root hair, Xylem vessel, Soil particles, Cortex respectively.

(b) Osmosis

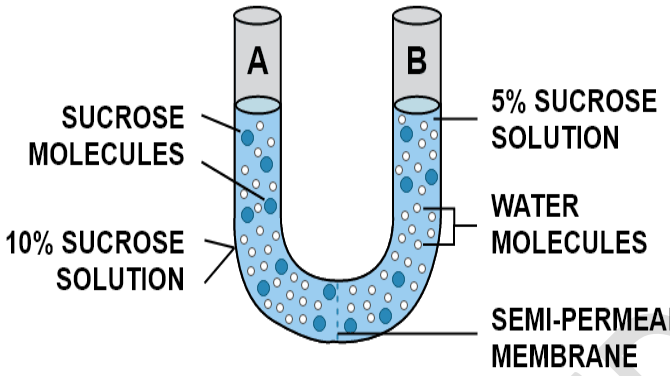
(c) Adhesive force

(d) Cohesive force

(e) Guttation

Question 7

Study the experimental setup in the figure and then answer the questions that follow.



(a) What phenomenon is being studied by this setup?

(b) Explain the phenomenon mentioned in (a) above.

(c) What is meant by 'semipermeable membrane'?

(d) What will you observe in the setup after about half an hour? Give a reason for your answer.

Answer

(a) Osmosis phenomenon is being studied by this setup.

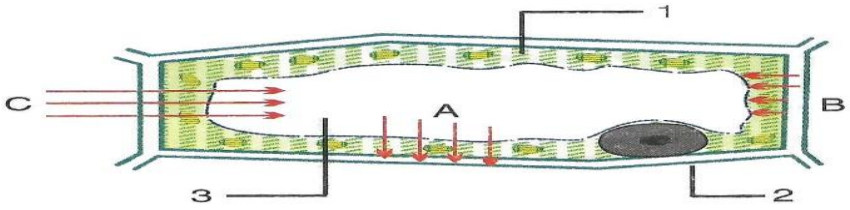
(b) Osmosis is the movement of water molecules from their region of higher concentration (dilute solution or with a lower solute concentration) to their region of lower concentration (concentrated solution or with a higher solute concentration) through a semi permeable membrane.

(c) A semipermeable membrane is a membrane which allows the passage of molecules selectively. It allows a solvent such as water molecules to pass through it freely but prevents the passage of the solute (sugar or salt molecules in solution).

(d) Water molecules will continue to pass from 5% sucrose solution to 10% sucrose solution through the semipermeable membrane due to osmosis. This will continue till the concentration of water molecules becomes the same in both ends of the setup.

Question 8

Given below is the figure of a plant cell showing different kinds of pressure acting upon it. Study the figure and answer the questions that follow:



(a) In the figure, 1, 2 and 3 represent :

1. Cytoplasm, Nucleus, Vacuole respectively
2. Vacuole, Cytoplasm, Cell wall respectively.
3. Cytoplasm, Cell membrane and vacuole respectively.
4. Cytoplasm, Cell wall and Vacuole respectively.

(b) B in the figure represents :

1. Osmotic pressure
2. Turgor pressure
3. Wall pressure
4. Diffusion pressure

(c) A in the figure represents :

1. Imbibition pressure
2. Wall pressure
3. Turgor pressure
4. Osmotic pressure

(d) C in the figure represents :

1. Turgor pressure
2. Osmotic pressure
3. Wall pressure
4. Imbibition pressure

(e) Draw a neat and labelled diagram of a plasmolysed plant cell.

Answer

(a) Cytoplasm, Cell wall and Vacuole respectively.

(b) Wall pressure

(c) Turgor pressure

(d) Osmotic pressure

(e) Labelled diagram of a plasmolysed plant cell is given below :