

Chapter 1- Transportation in Plants

Multiple Choice Questions:

Put a tick mark (✓) against the correct alternative in the following statements:

(a) Diffusion occurs when molecules move:

1. from lower concentration to higher concentration.
2. from higher concentration to lower concentration through a membrane.
3. from higher concentration to lower concentration.
4. when energy is used.

Solution: (3) from higher concentration to lower concentration.

(b) Ascent of sap in plants takes place through.

1. Cortex
2. Epidermis
3. Xylem
4. Phloem

Solution: (3) Xylem

(c) If the xylem vessels of a plant are plugged:

1. The leaves will turn yellow
2. No food will be made
3. The plant will wilt (shrivel)
4. The plant will continue to grow

Solution: (3) The plant will wilt (shrivel)

(d) Force responsible for the ascent of sap is:

1. Capillary force
2. Root pressure
3. Transpirational pull
4. All the three

Solution: (4) All the three

(e) Raisins swell when put in:

1. Rain water
2. Tap water
3. Mustard oil
4. Saturated sugar solution

Solution: (1) Rain water

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(f) The root-hairs are suited for absorbing water from the soil because:

1. They have a large surface area
2. They have a large surface area
3. They contain a solution of higher concentration than the surrounding water.
4. All the three.

Solution: (4) All the three.

(g) Transpiration is defined as:

1. the rise of water up to the stem of a plant.
2. the elimination of water with dissolved water products.
3. the loss of water as water vapour from the aerial parts of a plant.

4. the loss of water as water vapour from the roots as well as the leaves of the plant.

Solution: (3) the loss of water as water vapour from the aerial parts of a plant.

(h) Which one of the following favours the fastest transpiration rate?

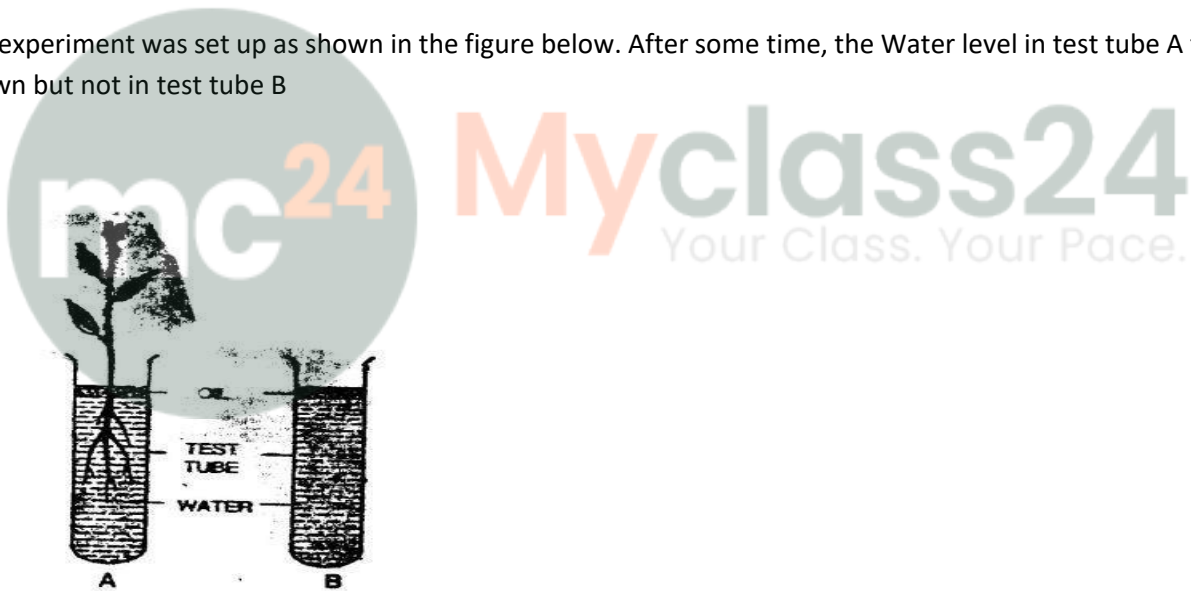
1. A cool, humid, windy day,
2. A hot, humid, windy day,
3. A hot, humid, still day,
4. A hot, dry, windy day.

Solution: (4) A hot, dry, windy day.

Short Answer Questions:

Questions: 1

An experiment was set up as shown in the figure below. After some time, the Water level in test tube A fell down but not in test tube B



Why was there a fall in the water level of test tube A and not in that of test-tube B?

Solution:

In the test tube, A the water level falls because the plant absorbed the water through its roots dipped in water. Here no water will be lost because of evaporation of the water surface due to the presence of oil. In test tube B the water level stays unchanged as it does not contain a rooted plant. The oil on the water surface prevents the water from being evaporated.

Question 2.

How are roots useful to the plants? Give any two points.

Solution:

Roots are useful to the plants in the following way:

1. It absorbs water and minerals from the soil and transports it upward to various parts of a plant.
2. Roots are important to make the plant rigidly fixed to the ground.

Question 3.

What do xylem vessels carry?

Solution:

The water and minerals absorbed by the roots to the stem and leaves are carried by the xylem vessels.

Question 4.

Name the plant tissue which helps in carrying the food to different parts.

Solution:

Phloem.

Question 5.

Define the terms:

- (a) semi-permeable membrane
- (b) osmosis.

Solution:

(a) **Semi-permeable membrane:** the movement of solvent molecules is allowed through a membrane (e.g. @ water molecules), but it prevents the movement of solute particles (e.g. sugar or salt molecules).

For example Egg membrane, parchment membrane, cellophane paper etc. are semi-permeable membranes.

(b) **Osmosis:** A semi-permeable membrane through which the diffusion of water molecules from a region where water is more concentrated to a region where it is less concentrated is called osmosis. In other words, osmosis is the diffusion of water from its pure state or dilute solution into a stronger or concentrated solution through a semi-permeable membrane.

Question 6.

Under what conditions do plant transpire?

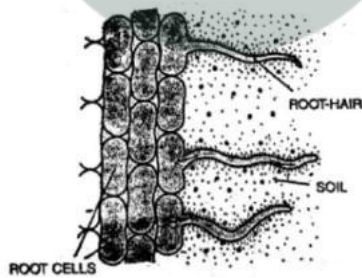
- (a) more quickly and
- (b) most slowly?

Solution:

- (a) Transpiration is faster on hot summer days as compared to cold winters.
- (b) In humid air, transpiration is reduced. Air cannot hold any water molecules when it is already laden with moisture (humidity).

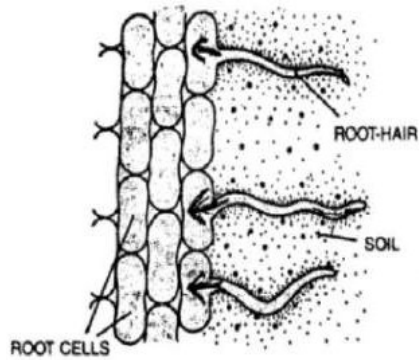
Question 7.

Given here is an enlarged diagram of a part of the root. Draw arrows on the diagram to show the movement of water passing through different parts.



Solution:

Path of water through the root hair to the xylem vessels.



Question 8.

Why is the structure of the root hair quite suitable for absorbing water from the soil?

Solution:

The root hair is suitable for absorbing water from the soil in the following three ways:

1. A large surface area has root hairs. More the surface area, greater is absorption.
2. The cell wall is of cellulose nature and forms the permeable membrane, and the plasma membrane around the vacuole forms the semi-permeable membrane.
3. Root hairs have a solution (cell sap) of a higher concentration than the surrounding soil water.

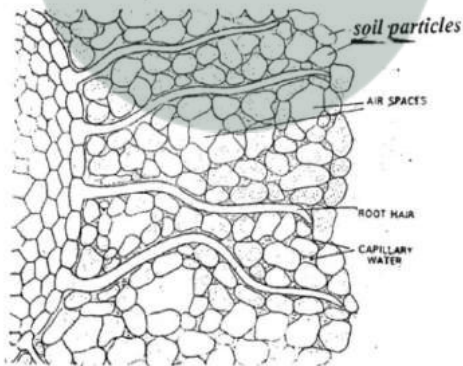
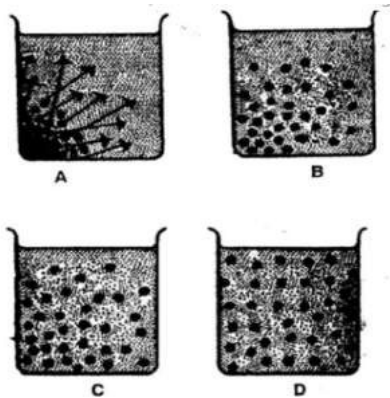


Fig. Unicellular root hairs through the soil particles

Practical Question.

In an experimental setup, a dye was placed at the bottom of a beaker filled with water as shown in figure A, below. After some time, the entire water in the beaker got coloured uniformly as shown in figure D.



(a) Name and define the phenomenon shown in the experiment.

Solution.

The phenomenon is diffusion. The process in which the molecules or atoms move from the region of higher concentration to the region of lower concentration is called diffusion.

(b) In all the four figures, two kinds of molecules are shown symbolically -larger and smaller. Which molecules are of the solute and which are of the solvent?

(a) Larger: (b) Smaller:

Solution:

(a) The larger molecules are of the solute (dye)

(b) The smaller molecules are of the solvent (water)

(c) If all the dark shaded molecules in A are tightly enclosed in a cell membrane, what will be the nature of the movement of the molecules, if any?

Solution: The left side of figure A has a concentration of solvent molecules. The cell membrane will act as a semi-permeable membrane and will allow only the solvent molecules of water to move towards the solute particles. So the solvent molecules will move towards the solute particles. This will show the phenomenon or process of osmosis.

Question 9.

Briefly explain, how transpiration helps in upward conduction of water in plants?

Solution:

(a) The plants continuously absorb water through their roots. This water is sent up through the stem to all parts of the plant, including the leaves. Only a little amount, of water, is retained in the plant or utilised by it in photosynthesis. The rest of it gets evaporated into the atmosphere as water vapour through the Stomata present in the epidermis of the leaves and other aerial parts of the plant. This creates a suction pressure which pulls up water from xylem of the roots to the stem and then to the leaves.

(b) Xylem tissues are narrower in its diameter, in the form of capillary tubes (tracheids and fibres), greater will be the force. Whenever the xylem vessels lay empty, such as during the loss of water by transpiration, the water from below rises into them by a capillary force.

During day time, water is lost from the surface of the leaves by the process of transpiration. In this process, more and more water molecules are pulled up due to their tendency of retaining joined (cohesion). Such pulling force created by the leaves is very important in the case of tall trees where upward conduction of water takes place.

Question 10.

How does temperature, light intensity and wind affect transpiration?

Solution:

Temperature: On hot summer days, transpiration is faster as compared to cold winters.

Light intensity. The transpiration rate is increased due to the increase in light intensity. During daytime in the sunlight, the rate of transpiration is faster. This is because the stomata remain open to allow the inward diffusion of carbon dioxide for photosynthesizing dark, the stomata and hence transpiration hardly occurs at night.

Wind: Transpiration is more when the wind is blowing faster water evaporates faster from the leaves.