A. MULTIPLE CHIOCE TYPE:

Question 1:
Absorption of water by the plant cells by surface attraction is called:
(a) Diffusion
(b) Osmosis
(c) Imbibition
(d) Endosmosis
Solution 1:
c) Imbibition

Question 2:
A plant cell placed in a certain solution got plasmolysed. What was the kind of solution?
(a) Isotonic sugar solution
(b) Hypotonic salt solution
(c) Hypertonic salt solution
(d) Isotonic salt solution
Solution 2:
c) Hypertonic salt solution

Question 3:
The state of a cell in which the cell wall is rigid and stretched by the increase in volume due to the absorption of water is called.
(a) Flaccidity
(b) Turgidity
(c) Capillarity
(d) Tonicity
Solution 3:
b) Turgidity

Question 4:
Which one of the following is a characteristic NOT related with the suitability of the roots for absorbing water?
(a) Tremendous surface area
(b) contain cell sap at a higher concentration than the surrounding soil water
(c) Root hairs have thin cell walls
(d) Grow downward into the soil

Solution 4:
(d) Grow downward into the soil

Question 5:
Movement of molecules of a substance from the region of their higher concentration to the region of their lower concentration without the involvement a separating membrane, is called
(a) Osmosis
(b) Diffusion
(c) active transport
(d) Capillarity
Solution 5:
(b) Diffusion

Question 6:
Osmosis and diffusion are the same except that osmosis there is:
(a) a freely permeable membrane
(b) a cell wall in between
(c) a selectively permeable membrane in between
(d) an endless inflow of water into a cell
Solution 6:
(c) a selectively permeable membrane in between

Question 7:
The highest water potential (capacity to move out higher concentrated solution) is that of
(a) Pure water
(b) 10% salt solution
(c) Honey
(d) 50% sugar solution
Solution 7
(a) Pure water

Question 8:
The space between the cell wall and plasma membrane in a plasmolysed cell is filled with.
(a) isotonic solution
(b) hypotonic solution
(c) Hypertonic solution
(d) water

Solution 8:
(d) water

Question 9:
What is responsible for guttation?
(a) Osmotic pressure
(b) Root pressure
(c) suction pressure
(d) Capillarity
Solution 9:
(b) Root pressure

Question 10:
The most appropriate characteristic of a semipermeable membrane is that
(a) it has minute pores
(b) it has no pores
(c) it allows the solute to pass through but not the solvent
(d) it allows a solvent to pass through freely but prevents the passage of the solute.
Solution 10:
(d) it allows a solvent to pass through freely but prevents the passage of the solute

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 term for the inward movement of solvent molecules through the plasma membrane of a cell.
(e) The process by which molecules distributes themselves evenly within the space they occupy
(f) The pressure which is responsible for the movement of water molecules across the cortical cells of the root.
(g) The pressure which is responsible for the movement of water molecules across the cortical cells of the root.
Solution 1:
(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 of 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

Solution 2:
(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 lower solute concentration than …… the cell.
(b) Active transport is one in which the ions outside the roots are ……
(c) The bending movements of certain flowers towards the sun and the sleep movements of certain plants at night are examples of……

Solution 3:
(a) the fluids inside
(b) transported inside against their concentration gradient
(c) turgor movements

Question 4:
(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)**

Solution 4:
(a) Shrink
(b) Water
(c) opposite

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

Solution 5:

	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) Guttation and bleeding
(d) Turgidity and Flaccidity

Solution 1:

(a)

Plasmolysis	**Deplasmolysis**
1. 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. 2. In Plasmolysis, the cell becomes flaccid.	1. 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. 2. In deplasmolysis, the cell becomes turgid.

(b)

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.

(c)

Guttation	**Bleeding**
Guttation is the process by which drops of water appear along leaf margins due to excessive root pressure.	Bleeding is the loss of cell sap through a cut stem.

(d)

Turgidity	**Flaccidity**

1. It is the state of a cell in which the cell cannot accommodate any more water and it is fully distended.	1. It is the condition in which the cell content is shrunken and the cell is not tight.

Question 2:

(a) Mention whether the following statements are true (T) or false (F)

(i) A plant cell placed in hypotonic solution gets Plasmolysed.
(ii) Addition of salt to pickles prevents growth of bacteria because they turn turgid.
(iii) Cells that have lost their water content are said to be deplasmolysed.
(iv) Xylem is the water conducting tissue in plants.
(v) The shrinkage of protoplasm, when a cell is kept in hypotonic solution.
(vi) The cell wall of the root cell is a differentially permeable membrane.

(b) Correct the false statements by altering the last word only.

Solution 2:

(a) (i) False
(ii)False
(iii) False
(iv) True
(v) False
(vi) False

(b) (i) A plant cell placed in hypotonic solution gets turgid.
(ii) Addition of salt to pickles prevents growth of bacteria because they turn flaccid.
(iii) Cells that have lost their water content are said to be plasmolysed.
(iv) The shrinkage of protoplasm, when a cell is kept in hypertonic solution.

Question 3:

What is the difference between 'flaccid' and 'turgid'? Give one example of flaccid condition in plants.

Solution 3:

The cell is said to be turgid when the plant cell wall becomes rigid and stretched by an increase in the volume of vacuoles due to the absorption of water when placed in hypotonic solution. On the other hand, the cell is said to be flaccid when the cell contents get shrunken when the cell is placed in hypertonic solution and the cell is no more tight. Flaccidity is the reverse of turgidity.

Example: Weeds can be killed in a playground by sprinkling excessive salts around their base.
Or
A plant cell when immersed in hypertonic solution like salt solution for about 30 minutes will become flaccid or limp.

Question 4:

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 turns flaccid.

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

Solution 4:

(a) Common salt when sprinkled on the grass causes the Plasmolysis of grass cell ultimately leading them to death. Hence, if we sprinkle some common salt on grass growing on a lawn, it is killed at the spot.

(b) If a plant is uprooted, the leaves continue losing water by transpiration, but there is no more water absorbed 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 causes stress to the seedlings. If the seedlings are transplanted in the morning, they would have to immediately bear the additional stress of excessive transpiration occurring during the hot afternoon. 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) In a hypertonic solution, the solution outside the cell has higher solute concentration than the fluids inside the cell. Therefore, water flows out from the plant cell due to exosmosis. The cytoplasm shrinks and the plasma membrane withdraws away from the cell wall and this the cell becomes flaccid. Hence a plant cell when kept in a hypertonic salt solution for about 30 minutes turns flaccid.

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 5:

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

Solution 5:

(a) True.

Plasmolysis occurs due to outflow of water from the cell when placed in hypertonic solution due to which the cytoplasm shrinks away from the cell wall. On the other hand, deplasmolysis is the result of the re-entry of water into the plasmolysed cell when placed in hypotonic solution due to which the protoplasm again swells up pressing tight against the cell wall.

(b) False.
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.

(c) False.
There is only one seed coat in a seed.

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

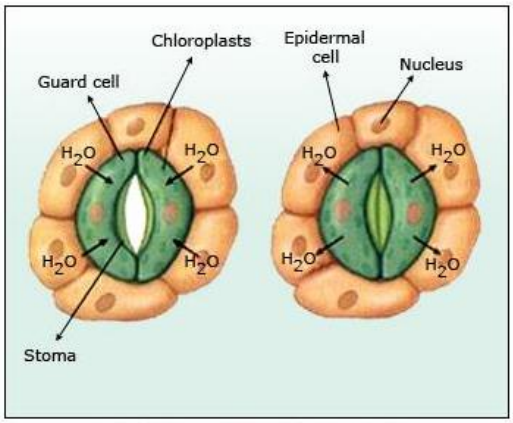
(e) False.
Guttation occurs due to excessive root pressure. It is maximum when root pressure is maximum which occurs in the early mornings or at night. This is because during these times, transpiration is very low and water absorption is very high.

(f) False.
Dry seeds when submerged in water swell up due to imbibitions. On contact with water dry seeds imbibe water and swell up.

D. LONG ANSWER TYPE:

Question 1:
Give two examples of turgor movements in plants.
Solution 1:
Examples of turgor movements in plants:
(i) In Mimosa pudica, a sensitive plant, the stimulus of touch leads to loss of turgor at the base of the leaflets and at the base of the petioles called pulvinus. This causes the folding and drooping of leaves of the plant.
(ii) The leaves of insectivorous plants close up to entrap a living prey. When the insect come in contact with the leaf, it loses it turgor hence closing the leaves of the plant.
(iii) The bending movements of certain flowers towards the sun.
(Any two)

Question 2:
Explain the mechanism of closing and opening of the stomata.
Solution 2:
The closing and opening of the stomata depends on the turgidity of the guard cells. Each guard cell has a thicker wall on the side facing the stoma and a thin wall on the opposite side. Guard cells contain chloroplasts. As a result of the synthesis of glucose during photosynthesis and some other chemical changes, the osmotic pressure of the contents of the guard cells increases and they absorb more water from the neighbouring cells, thus becoming turgid. Due to turgor, the guard cells become more arched outwards and the aperture between them widens, thereby opening the stoma.



Opening and Closing of Stoma

At night or when there is shortage of water in the leaf, the guard cells turn flaccid and their inner rigid walls become straight, thus closing the stomatal aperture.

Question 3:

Concentration of mineral nutrient elements is higher inside the root hairs than in the surrounding soil. How do roots take them in from the soil?

Solution 3:

If the concentration of mineral nutrient elements is higher inside the root-hairs than in the surrounding soil, then roots take them in from the soil by 'active transport'. In active transport, the mineral ions are forcibly carried from the surrounding soil i.e. the region of their lower concentration into the roots i.e. the region of their higher concentration through the cell membrane by expenditure of energy. This energy is supplied by the cell in the form of ATP.

Question 4:

Explain how soaked seeds swell up and burst their seed coats.

Solution 4:

When soaked in water, the seeds swell up due to imbibition and endosmosis. During these two processes water enters the cell. Due to endosmosis, at some point, the seed coat is unable to bear the turgor pressure and hence, the seed coat bursts.

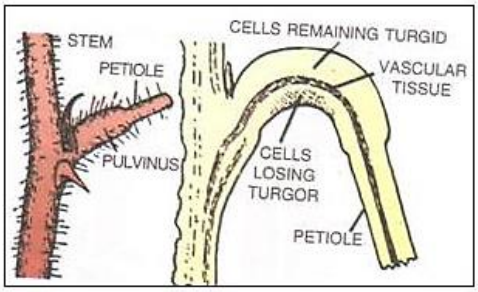
Question 5:

Leaves of the sensitive plant wilt and droop down on a slight touch. What mechanism brings about this change?

Solution 5:

Leaves of the sensitive plant wilt and droop down on a slight touch due to turgor movement. Petiole of sensitive plant is held up by turgid pulvinus tissue. The stimulus of touch leads to loss of turgor at the base of the leaflets and at the base of the petioles i.e. pulvinus. The cells of the

lower side of pulvinus lose water and the petiole collapses. This causes the wilting and drooping of the leaves

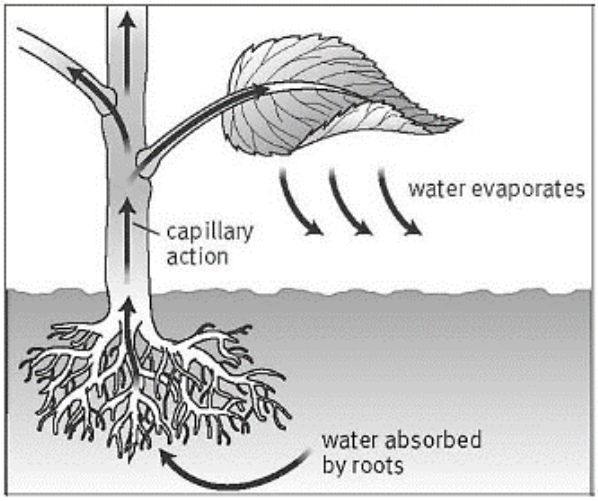


Question 6:

What is transpiration pull? How is it caused?

Solution 6:

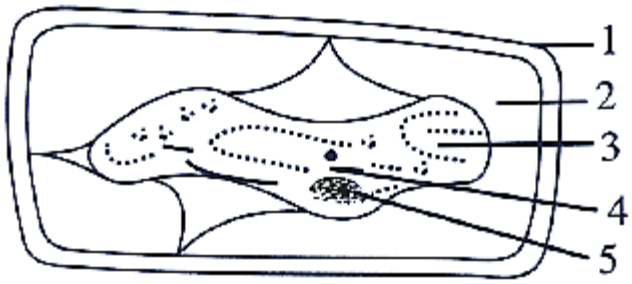
As water is lost from the leaf surface by transpiration, more water molecules are pulled up due to the tendency of water molecules to remain joined i.e. cohesion. This produces a continuous column of water throughout the stem which is known as 'transpiration pull'. A negative pressure or tension is produced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



E. STRUCTURED/ APPLICATION/ SKILL TYPE:

Question 1:

The following diagram represents a plant cell after being placed in a strong sugar solution.



Guidelines 1 to 5 indicate the following:
(1) Cell wall, (2) Strong sugar solution, (3) Protoplasm (4) Large vacuole, (5) Nucleus

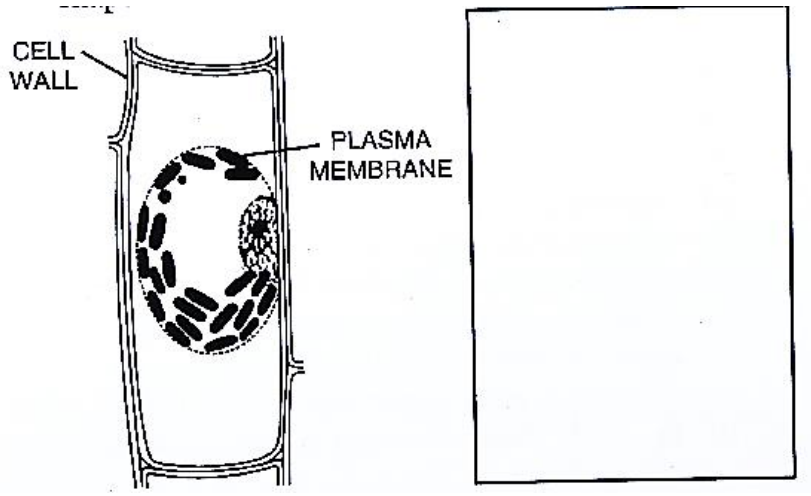
(a) What is the state of the cell shown in the cell shown in the diagram?
(b) Name the structure which acts as a selectively permeable membrane.
(c) If the cell had been placed in distilled water instead of strong sugar solution, which feature would not have been seen?
(d) Name any one feature of this plant cell which is not present in an animal cell.

Solution 1:

(a) The cell is flaccid i.e. it is plasmolysed.
(b) Plasma Membrane
(c) Plasmolysis would not occur and flaccidity would not be seen i.e. the protoplasm would not have shrunken away from the cell wall.
(d) Cell Wall is absent in animal cell.

Question 2:

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

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

Solution 2:

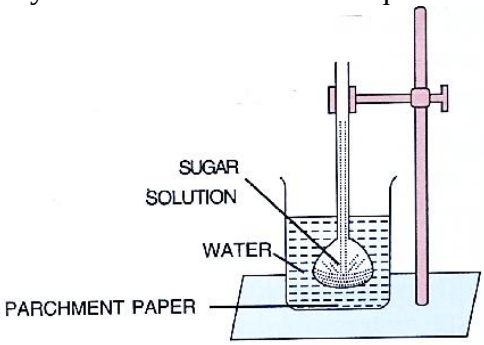
(a) Flaccid Cell

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

(c)

Question 3:

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 substance that can be used instead of parchment paper in the above experiment.
(g) Mention two advantages of the process to the plants.

Solution 3:

(a) Osmosis

(b) Osmosis is the diffusion of water molecules across a semi-permeable membrane from a more dilute solution (with a lower solute concentration) to a less dilute solution (with a higher solute concentration).

(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) For control experiment, the beaker will contain the water. At the same time, instead of the sugar solution; the thistle funnel with the cellophane paper tied on its mouth and inverted in the beaker will also contain water.

(e)

(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.

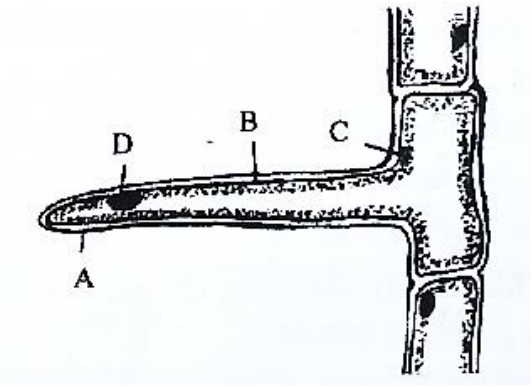
(3) water in the beaker water in soil.

(f) cellophane paper, egg membrane, animal bladder (any one)

(g) (i) The roots of plants absorb water and minerals from surrounding soil due to osmosis.
(ii) Osmosis allows plants to absorb water from the soil which helps plants to keep cells alive in roots, stems and leaves.
(iii) Osmosis is also important in the opening and closing of stomata which is an important feature for the processes like transpiration and photosynthesis. (Any two)

Question 4:

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.

Solution 4:

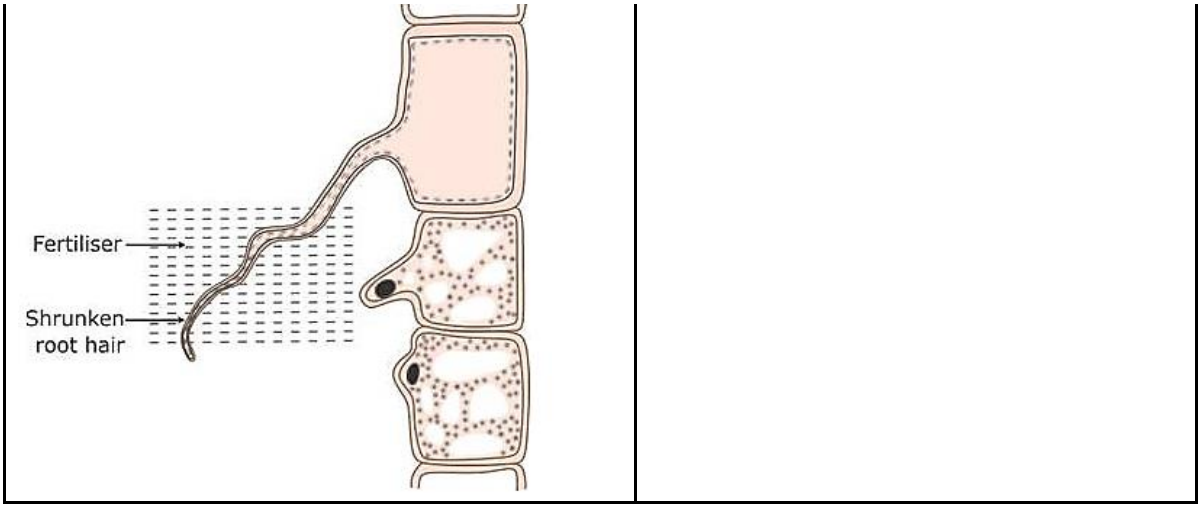
(a)

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. The concentration of water in the surrounding is more than that of the interior of the cell; this causes the water from the surrounding to move in because of endosmosis.

(c)

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



Question 5:

Two potato cubes each 1 cm^3 in size, were placed separately in two containers (A&B), the container (A) having water and the other (B) containing concentrated sugar solution. After 24 hours when the cubes were examined, those placed in water were found to be firm and had increased slightly in size and those placed in concentrated sugar solution were found to be soft and had somewhat decreased in size. Use the above information to answer the questions that follow:

(a) Account for the firmness and increase in the size of the potato cubes placed in water.

(b) Account for the softness and decrease in size of the potato cubes which were places in sugar solution.

(c) name and define the physical process being investigated in this experiment.

Solution 5:

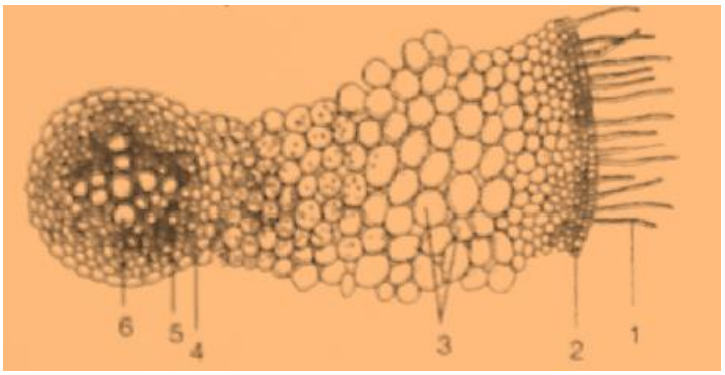
(a) Water is hypotonic to the potato cells, due to which endosmosis occurs and water enters the potato cells. The protoplasm swells up pressing tight against the cell wall. The cells are fully distended i.e. turgid. This causes the firmness and increase in the size of the potato cubes when placed in water.

(b) Sugar solution is hypertonic to the potato cells, due to which exosmosis occurs and water flows out of the potato cells. The potato cell loses its distended appearance, the cytoplasm shrinks and the plasma membrane withdraws from the cell wall. The cells become limp or flaccid. This causes the softness and decrease in size of the potato cubes when placed in sugar solution.

(c) The process being investigated is osmosis. Osmosis is the diffusion of water molecules across a semi-permeable membrane from a more dilute solution (with a lower solute concentration) to a less dilute solution (with a higher solute concentration).

Question 6:

Given below is the diagrammatic representation of the transverse section of a part of a plant. Study it and answer the questions that follow:



(a) Name the part of the plant that is shown
(b) Label the parts 1 to 6
(c) Write the functions of parts 3 and 5

Solution 6:

(a) It is the diagrammatic cross-section of a part of a root.

(b)

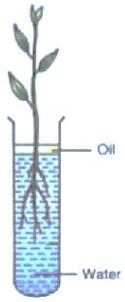
1 - Root hair
2 - Epidermis
3 - Cortex
4 - Endodermis
5 - Phloem
6 – Xylem

(c) Cortex (label 3) is the ground tissue and is active in the uptake of water and minerals. It also helps in storage of photosynthetic products.

Phloem (label 5) helps in transporting the prepared food from leaves to different parts of the plant.

Question 7:

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



(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?

Solution 7:

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

(b) A root-hair contains cell sap which contains higher concentration of salts as compared to outside soil water. This difference sets off osmosis and outside water diffuses into the root-hair. From the cell bearing root-hair, water passes into adjoining cells one after another to finally the xylem vessels.

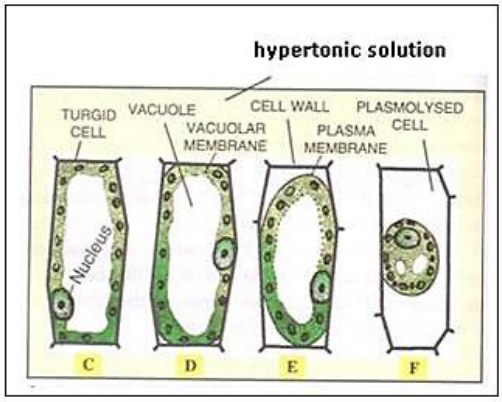
The surface of water was covered with oil to prevent any loss of water by evaporation.

Question 8:

Show by a series of diagrams, the change which a plant cell will undergo when placed in
(a) Hypertonic salt solution and
(b) Hypotonic salt solution

Solution 8:

(a)



(b)