# Shiksha Classes, Bhandara
## Biology
## Transport in plants

**(1.)** The lower surface of leaf will havemore number of stomata in a

(a.) dorsiventral leaf      (b.) isobilateral leaf

(c.) both(a) and (b)      (d.) none of these

**(2.)** In soil, water available for root (to plants) is

(a.) capillary water      (b.) hygroscopic water

(c.) gravitational water      (d.) chemically bond water

**(3.)** The physical phenomenon of diffusion is responsible for which of the following function of the plant body.
(I) Exchange of gases during photosynthesis
(II) Stomatal transpiration
(III) Spread of aroma of flower
(IV) Turgidity to plant cells

(a.) I, II and III      (b.) I and II

(c.) III and IV      (d.) Only II

**(4.)** Stomata in grass leaf are

(a.) rectangular      (b.) kidney-shaped

(c.) dumb-bell-shaped      (d.) barrel-shaped

**(5.)** The movement of water from one cell of the cortex to the adjacent one in roots is due to

(a.) accumulation of inorganic salts in the cells.      (b.) accumulation of organic compounds in the cells.

(c.) chemical potential gradient.      (d.) water potential gradient.

**(6.)** A special type of diffusion in which water is absorbed by solids is called

(a.) osmosis      (b.) plasmolysis

(c.) both(a) and (b)      (d.) imbibition

**(7.)** The water potential of pure water is

(a.) zero      (b.) less than zero

(c.) more than zero, but less than one      (d.) more than one

**(8.)** Water entering root due to diffusion is part of

(a.) endosmosis      (b.) osmosis

(c.) passive absorption      (d.) active absorption

**(9.)** Stomatal movement is not affected by

(a.) $O_2$ concentration      (b.) Light

(c.) Temperature      (d.) $CO_2$ concentration

**(10.)** The modified equation for water potential is

(a.) $\psi_w = \psi_s + \psi_p$      (b.) $\psi_w = \psi_s - \psi_p$

(c.) $\psi_w = \psi_s$      (d.) $\psi_w = \psi_p - \psi_s$

**(11.)** Following is the flow of water moving in root tissue. Identify the tissues involved in blank space.

$\boxed{\text{Soil}} \rightarrow \boxed{\text{Root hair}} \rightarrow \boxed{\text{Cortex}} \rightarrow \boxed{A} \rightarrow \boxed{B} \rightarrow \boxed{\text{Protoxylem}} \rightarrow \boxed{C}$

(a.) A-Pericycle B-Endodermis C-Metaxylem      (b.) A-Metaxylem B-Pericycle C-Endodermis

(c.) A-Endodermis B-Pericycle C-Metaxylem      (d.) A-Endodermis B-Metaxylem C-Pericycle

**(12.)** Stomata of a plant open due to

(a.) influx of hydrogen ions      (b.) influx of calcium ions

(c.) influx of potassium ions      (d.) efflux of potassium ions

**(13.)** IdentifyA, B and C in the figure given below and select the correct option.
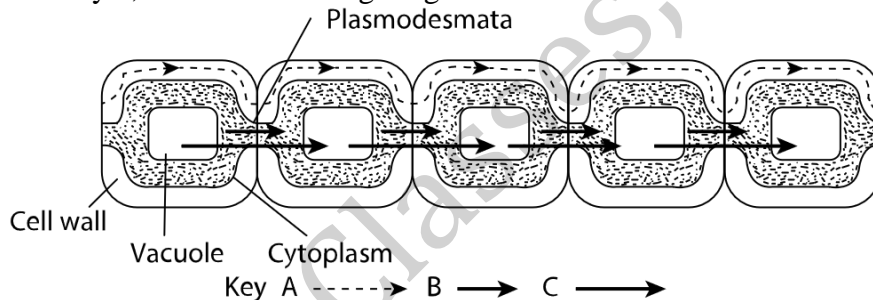


(a.) A-Apoplast, B-Symplast, C-Vacuolar      (b.) A-Symplast, B-Apoplast, C-Vacuolar

(c.) A-Symplast, B-Vacuolar, C-Apoplast      (d.) A-Apoplast, B-Vacuolar, C-Symplast

**(14.)** Stomata of CAM plants

(a.) open during the night and close during the day      (b.) never open

(c.) are always open      (d.) open during the day and close at night

**(15.)** The water potential and osmotic potential of pure water are

(a.) 100 and zero      (b.) Zero and zero

(c.) 100 and 200      (d.) Zero and 100

**(16.)** Mainly conduction of water in an angiosperm occurs through

(a.) tracheids      (b.) xylem vessels

(c.) sieve tubes      (d.) all of these

**(17.)** If turgidity of a cell surrounded by water increases, the wall pressure will

  (a.) increase

  (b.) decrease

  (c.) fluctuate

  (d.) remain unchanged

**(18.)** Root system in a plant is well developed

  (a.) due to deficiency of auxin

  (b.) due to deficiency of cytokinin

  (c.) due to deficiency of mineral

  (d.) for increased absorption of water

**(19.)** Suction pressure is also known as

  (a.) diffusion pressure deficit

  (b.) osmotic pressure

  (c.) wall pressure

  (d.) turgor pressure

**(20.)** Choose the right option exhibiting correct relationship between diffusion pressure deficit, osmotic pressure and turgor pressure?

  (a.) $DPD = OP + TP$

  (b.) $DPD = OP - TP$

  (c.) $DPD = OP$

  (d.) $DPD = OP = TP$

**(21.)** Root pressure develops due to

  (a.) active absorption

  (b.) low osmotic potential in soil

  (c.) passive absorption

  (d.) increase in transpiration

**(22.)** Read the following statements regarding the movement of water in plant system
(A) In symplast water molecules moves through cell membrane and plasmodesmata.
(B) It does not provide any resistance in water movement.
(C) It is a rapid process of water absorption.
(D) Symplast is influenced by metabolic status of roots.

  (a.) A and C

  (b.) A, B and D

  (c.) A and D

  (d.) B and D

**(23.)** Which of the following cells in the given figure show wall pressure equivalent to zero?**[Page: 179]**
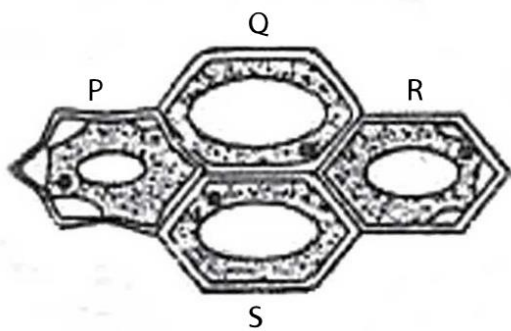


  (a.) P and Q

  (b.) Q and S

  (c.) P and R

  (d.) R and S

**(24.)** Water enters a cell due to

   (a.)   OP                             (b.)   SP

   (c.)   TP                             (d.)   WP

**(25.)** Passive absorption of water by the root system results from which of the mechanisms occurring in the root issues?

   (a.)   Forces created in the cells of root         (b.)   Increased respiratory activity in root cells

   (c.)   Tension on the cell sap due to transpiration         (d.)   Osmotic force in the shoot system

**(26.)** Which of the following statements does not apply to reverse osmosis

   (a.)   It is used for water purification.         (b.)   In this technique, pressure greater than osmotic pressure is applied to the system.

   (c.)   It is a passive process.         (d.)   It is an active process.

**(27.)** The rupture and friction do not usually occur in the water column in vesseltracheids during the ascent of sap because of

   (a.)   lignified thick walls         (b.)   cohesion and adhesion

   (c.)   weak gravitational pull         (d.)   transpiration pull

**(28.)** Identify the direction and rate of osmosis which depend on two forces

   (a.)   Diffusion pressure and pressure gradient.         (b.)   Pressure gradient and concentration gradient.

   (c.)   Concentration gradient and diffusion pressure gradient.         (d.)   None of these

**(29.)** Two cellsA and B are contiguous. Cell A has osmotic pressure 10 atm, turzor pressure 7 atm and diffusion pressure deficit 3 atm, cell B has osmotic pressure 8 atm, turgor pressure 3 atm and diffusion pressure deficit 5 atm. The result will be

   (a.)   movement of water from cell is B–A         (b.)   no movement of water

   (c.)   equilibrium between the two         (d.)   movement of water from cellA–B

**(30.)** Two living cells viz., RBC and a plant cell are kept in distilled water. The solute concentration is same in both the cells. What kind of changes can be observed in both the cells

   (a.)   Both plant cell and RBC would not undergo any changes.         (b.)   The RBC would increase in size and burst, while the plant cell would remain about the same size.

   (c.)   The plant cell would increase in size and burst, while the RBC would remain about the same size.         (d.)   Both plant cell and RBC would decrease in size and collapse.

**(31.)** Meaningful girdling (ringing) experiment cannot be performed within sugarcane because

(a.) its phloem is situated interior to xylem.

(b.) its stem surface is covered with waxy coating.

(c.) its vascular bundles are not present in a ring.

(d.) its stem is thin.

**(32.)** A cell dipped in 0.5 M sucrose solution has no effect, but when the same cell is dipped in 0.5 M NaCl solution, the cell will

(a.) increase in size

(b.) decrease in size

(c.) will be turgid

(d.) will getdeplasmolysed

**(33.)** Which of the following is a rapid method of absorption?

(a.) Active absorption

(b.) Passive absorption

(c.) Continuous absorption

(d.) Pulsating absorption

**(34.)** Path of water movement from soil to xylem is

(a.) soil → root hair → cortex → pericycle → endodermis → metaxylem → protoxylem

(b.) soil → root hair → cortex → endodermis → pericycle → protoxylem → metaxylem

(c.) soil → root hair → epidermis → endodermis →phoelm → xylem

(d.) soil → root hair → epidermis → cortex → phloem → xylem

(e.) soil → root hair → cortex → protoxylem → phloem → metaxylem

**(35.)** Which one of the following elements is responsible for maintaining turgor in cells?

(a.) Potassium

(b.) Sodium

(c.) Magnesium

(d.) Calcium

**(36.)** Which of the following is responsible for movement in sensitive plants like Mimosapudica?

(a.) Turgor pressure

(b.) Imbibition

(c.) Plasmolysis

(d.) Osmosis

**(37.)** Which of the following statement is/are true?
(A) The apoplastic movement of water occurs exclusively through the cell wall without crossing any membrane.
(B) Solutes present in a cell (or in any solution) increase the free energy of water or water potential.
(C) The symplastic movement occurs from cell to cell through the plasmodesmata.
(D) Membrane permeability depends on the membrane composition, as well the chemical nature of the solute.

(a.) A and B only

(b.) B and D only

(c.) A, C and D only

(d.) A, B and D only

(e.) C only

**(38.)** Match **Column-I** with **Column-II** and choose the correct option from the codes given below.

| Column-I | Column-II |
|---|---|
| (a.) Symplast | (1) System of adjacent cell walls, which is continuous throughout the plant |
| (b.) Apoplast | (2) System of interconnected protoplast in the plant |
| (c.) Protoplast | (3) Main difference between animal and plant cell |
| (d.) Cell wall | (4) Cell minus cell wall |

| Codes | A | B | C | D |
|---|---|---|---|---|
| (a.) | 2 | 1 | 4 | 3 |
| (b.) | 3 | 2 | 1 | 4 |
| (c.) | 4 | 1 | 2 | 3 |
| (d.) | 1 | 2 | 3 | 4 |

**(39.)** Which of the following pressure brings about stretching of cell wall in plant cell?

(a.) Osmotic pressure     (b.) Turgor pressure

(c.) Diffusion pressure     (d.) Water potential

**(40.)** Guttation is caused by

(a.) transpiration     (b.) osmosis/DPD

(c.) root pressure     (d.) osmotic pressure

**(41.)** Study the following statements and find the one which is incorrect regarding imbibition?
(A) Imbibition is the phenomenon of adsorption of water or any other liquid without forming solution.
(B) The liquid which is imbibed is called imbibant.
(C) There is a decrease in volume during imbibition.
(D) Water is absorbed by germinating seed through imbibition.

(a.) A and B     (b.) B and C

(c.) A and C     (d.) A, C and D

**(42.)** The main difference between active and passive transport across cell membrane is

(a.) passive transport is non-selective whereas active transport is selective

(b.) passive transport requires a concentration gradient across a biological membrane whereas active transport requires energy to move solutes

(c.) passive transport is confined to anionic carrier proteins whereas active transport is confined to cationic channel proteins

(d.) active transport occurs more rapidly than passive transport

**(43.)** A column of water within xylem vessels of tall trees does not break under its weight because of

(a.) dissolved sugars in water

(b.) tensile strength of water

(c.) lignification of xylem vessels

(d.) positive root pressure

**(44.)** Which of the following criteria does not pertain to facilitated transport?

(a.) Requirement of special membrane proteins

(b.) High selectivity

(c.) Transport saturation

(d.) Uphill transport

**(45.)** Which of the following is not a feature of active transport of solutes in plants?

(a.) Occurs against concentration gradient

(b.) Non-selective

(c.) Occurs throughmemberanes

(d.) RequiresATP

**(46.)** Study the following statements and select the option with reference to the correct statements given below regarding mechanisms of facilitated diffusions
(A) Facilitated diffusion cannot cause net transport.
(B) Transport rate in case of facilitated diffusion never reaches to a maximum level.
(C) Facilitated transport is selective to inhibition proteins.
(D) Concentration gradient is not required in case of facilitated diffusion.

(a.) B and D

(b.) A, B, C and D

(c.) A and C

(d.) None of these

**(47.)** What will be the direction of flow of water when a plant cell is placed in a hypotonic solution?

(a.) Water will flow in both directions

(b.) Water will flow out of the cell

(c.) Water will flow into the cell

(d.) No flow of water in any direction

**(48.)** Xylemtranslocates

(a.) water and mineral salts only

(b.) water, mineral salts and some organic nitrogen only

(c.) water, mineral salts, some organic nitrogen and hormones

(d.) water only

**(49.)** Study the following statements and choose the correct option of statements.
(A) Carrier proteins are needed by both facilitated diffusion and active transport and are sensitive to inhibitors that react with protein side chain.
(B) Different types of proteins present in the membrane play a major role in both active as well as passive transport.
(C) The carrier proteins needed by facilitated and active transport are specific.
(D) There is no need of energy to pump molecule against a concentration in active transport. (E) Transport rate reaches to saturation point, when all the active proteins are used.

(a.) A, B, C, D and E

(b.) A, B and C

(c.) E, D andA

(d.) A, B, C and E

**(50.)** Match **Column-I** with **Column-II** and choose the correct option from the codes given below.

| Column-I | Column-II |
|---|---|
| (A) Isotonic | (1) Cells flaccid |
| (B) Hypotonic | (2) No net flow of water |
| (C) Hypertonic | (3) Cells turgid |
| (D) Plasmolysis | (4) Water moves into the cell |
| (E) Deplasmolysis | (5) Water moves out of the cell |

| Codes | A | B | C | D | E |
|---|---|---|---|---|---|
| (a.) | 1 | 3 | 4 | 2 | 5 |
| (b.) | 2 | 4 | 5 | 1 | 3 |
| (c.) | 2 | 4 | 1 | 3 | 5 |
| (d.) | 3 | 2 | 5 | 1 | 4 |

# **ANSWER**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **(1.)** | a | **(2.)** | a | **(3.)** | a | **(4.)** | c | **(5.)** | d |
| **(6.)** | d | **(7.)** | a | **(8.)** | c | **(9.)** | a | **(10.)** | a |
| **(11.)** | c | **(12.)** | c | **(13.)** | a | **(14.)** | b | **(15.)** | b |
| **(16.)** | b | **(17.)** | a | **(18.)** | d | **(19.)** | a | **(20.)** | b |
| **(21.)** | a | **(22.)** | a | **(23.)** | c | **(24.)** | b | **(25.)** | c |
| **(26.)** | c | **(27.)** | a | **(28.)** | a | **(29.)** | a | **(30.)** | b |
| **(31.)** | c | **(32.)** | b | **(33.)** | a | **(34.)** | b | **(35.)** | a |
| **(36.)** | a | **(37.)** | c | **(38.)** | a | **(39.)** | b | **(40.)** | c |
| **(41.)** | b | **(42.)** | b | **(43.)** | b | **(44.)** | d | **(45.)** | b |
| **(46.)** | c | **(47.)** | c | **(48.)** | c | **(49.)** | d | **(50.)** | b |

# EXPLANATION

**(1.)** (a) The lower number of leaf will have more number of stomata in a dorsiventral leaf. The isobilateral leaf has the same number of stomata on both the surfaces.

**(2.)** (a) Water is present in the space between the soil particles. A large proportion of water is retained between the soil particles against the gravitational force. This is called capillary water. It is readily available to plants for absorption by roots.

**(3.)** (a) The physical phenomenon diffusion is responsible for exchange of gases during photosynthesis, stomatal transpiration and spread of fragrance of from a flower.

**(4.)** (c) Epidermis is present on all green aerial parts of plants. It contains minute opening called stomata. It is surrounded by guard cells and neighboring subsidiary cells collectively termed as stomatal apparatus. Kidney-shaped or bean-shaped guard cells are present in dicotyledonous plants only, while in monocots like grasses, these cells are dumb-bell shaped. Guard cells differ from rest of the cells in shape, size and thickenings on their cell walls.

Epidermal cells Subsidiary cells Chloroplast Guard cells Stomatal aperture Nucleus

(A) Bean-shaped guard cells Stomatal apparatus

(B) Dumb-bell guard cells



Stomatal apparatus
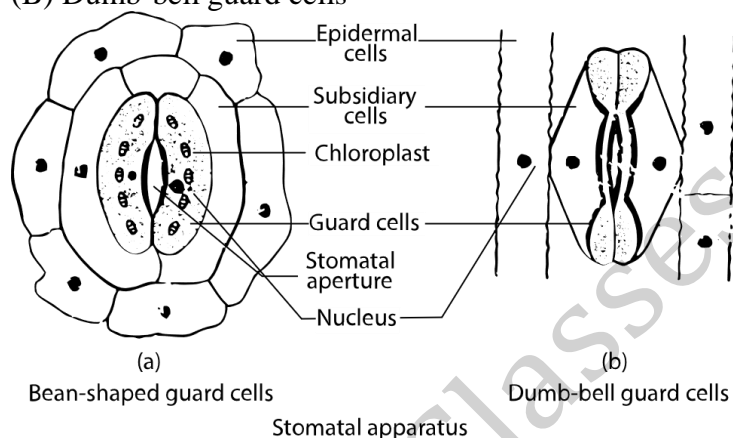
**(5.)** (d) Water potential is the difference in the free energy of water in solution and that of pure water at the same temperature and pressure. Water always moves from the area of high water potential to the area of low water potential.

**(6.)** (d) Imbibition is a special type of diffusion which occurs when a solid substance (such as seed) placed in water. It adsorbs the water molecules and swells up substantially and causes seed to germinate. It always results in release of heat as well as high metric potential pressure or imbibition pressure.

**(7.)** (a) The value of water potential of pure water is always highest and it is zero. Water molecules possess high kinetic energy. Greater the concentration of water in a system, greater is its kinetic energy or its water potential. It is always negative value, highest being zero. If we add solute in water, the solution has less free water molecule and concentration of water decreases thus reducing its water potential.

**(8.)** (c) Water entering in the root from soil is a part of passive absorption initially till the plant cell sap is hypotonic.

**(9.)** (a) Stomatal movements is not affected by oxygen concentration. Stomatal aperture are tiny pore complexes found in the epidermis of leaves and other soft aerial parts. They are mainly used for the gaseous exchange but are also the main source of transpiration. Stomatal movements are affected by many factors like light, temperature and $CO_2$ concentration. In majority of plants, the stomata remain open in light and close in darkness at night time. Normally, high temperature above 30°C reduces stomatal opening in many species.

**(10.)** (a) The modified equation of water potential is:

$$\psi_w = \psi_s + \psi_p$$

Where $\psi_w$ = Water potential

$\psi_s$ = Solute potential

$\psi_p$ = Pressure potential

**(11.)** (c) In the given flow chart, A is endodermis, B is pericycle and C is metaxylem. The water absorbed from soil through root hair reaches to cortex. From cortex, it moves towards endodermis, then pericycle and finally xylem (protoxylem and later to metaxylem). This is the correct pathway for movement of water from soil to the xylem.

**(12.)** (c) Accumulation of $K^+$ ions in the guard cells during the day time is responsible for migration of water molecules from subsidiary cells to guard cells. This increases the turgidity of guard cells and thus stomata opens up.

**(13.)** (a) In the given diagram:

A. Represents apoplast movement because movement is shown via non-living part of cell.

B. Represents symplast movement because movement is shown via protoplasm.

C. Represents vacuolar movement because movement is shown via vacuoles present in cytoplasm.

**(14.)** (b) CAM (Crassulacean Acid Metabolism) plants open stomata only at night (when temperature is low and humidity is high) to cause lesser loss of water (eg., Agave). So, CAM photosynthesis is a carbon fixation pathway that evolved in some plants as an adaptation to arid condition.

**(15.)** (b) The term water potential indicates the net tendency of any system to donate water to its surroundings. The water potential of pure water at atmospheric pressure is zero. Any addition of solute to this water reduces its water potential value and makes its value negative. The osmotic potential of pure water also would be zero.

**(16.)** (b) Mainly, conduction of water in an angiosperm occurs through xylem vessels.

**(17.)** (a) If a plant cell is placed in a hypotonic solution or pure water, water starts moving in by endosmosis. As the volume of the protoplast increases, it begins to exert pressure against the cell wall (turgor pressure). The cell wall exerts equal and opposite pressure (wall pressure) on the protoplast.

**(18.)** (d) The root system in xylem vessels is well developed for absorption of water for plant.

**(19.)** (a) Diffusion pressure deficit (DPD) is also known as suction pressure of the cell systems. It is the reduction in the diffusion pressure of water in a system than in its pure state. DPD determines the direction of net movement of water in the cellular systems. It is always from the area of lower DPD to higher DPD. DPD of pure solvent is maximum.

**(20.)** (b) DPD = OP − TP. Value of DPD in a system is equal to its osmotic pressure minus any force that opposes the osmotic entry of water (i.e. turgor pressure or wall pressure) into it. DPD determines the flow of water in the cellular systems.

**(21.)** (a) Root pressure is the main positive pressure that develops in the tissues of roots of plants by the active absorption of nutrients from the soil at the expense of energy. When the nutrients are actively absorbed by root hairs, water (along with minerals) increases the pressure in the xylem of roots. This pressure pushes water upto small heights upto stem near ground level.

**(22.)** (a) Statements I and III are correct.

**(23.)** (c) In the given figure, cell P and R do not show any wall pressure. Wall pressure is the counter pressure exerted by the wall over the swelling protoplast. Plasmolysed cell do not exert any counter pressure in the cell. Since cell P and cell R are plasmolysed and protoplast leaves the cell wall, it does not show any wall pressure.

**(24.)** (b) Suction pressure (or DPD) is believed to suck water (cause movement of water molecule) from pure solvent/hypotonic solution. It is a measure of the ability of the cells to absorb water.

**(25.)** (c) Passive absorption of water by root system results tension on the cell sap due to transpiration pull. It involves the movement of water from the soil into the plants due to more negative water potential in the xylem than present in the soil water. It is the common method of water absorption which does not require energy and water reaches to great heights of plants by this method.

**(26.)** (c) Reverse osmosis is not an active process. A process (in organisms) is considered active when its completion requires energy in the form of ATP. And as reverse osmosis does not consume ATP, it is a passive process, though external pressure is applied in order to carry out osmosis in a reverse direction (lower to higher). Rest of the options are true for reverse osmosis.

**(27.)** (a) The rupture and fractionation do not usually occur in the water column in vessels/tracheids during the ascent of sap because of lignified thick walls.

**(28.)** (a) The direction and rate of osmosis depend on two forces, i.e., pressure gradient and concentration gradient.

**(29.)** (a) The movement of water will occur from cell B to A.

**(30.)** (b) When RBC and a plant cell are placed in distilled water, endosmosis takes place, as a result of which RBC would increase in size and burst, while the plant cell would remain about the same size because of the presence of rigid cell wall.

**(31.)** (c) The meaningful girdling experiment cannot be performed within sugarcane because its vascular bundles are not present in ring.

**(32.)** (b) The cell will decrease in size due to exosmosis because NaCl solution has high osmotic potential. So, water will move from cell into NaCl solution.

**(33.)** (a) Active absorption of minerals and salts is a rapid method of absorption. It utilises energy (in the form of ATP) for absorption of solutes or ions across the membrane. It occurs against the concentration gradient.

**(34.)** (b) The path of water movement from soil to xylem is Soil → Root hair → Cortex → Endodermis → Pericycle → Protoxylem → Metaxylem.

**(35.)** (a) Among the given elements, potassium($K^+$) is responsible for maintaining turgor pressure in cell because it regulates the proton pumps involved in opening and closing of stomata. Magnesium ($Mg^{2+}$) is a constituent of chlorophyll pigment which helps in photosynthesis in green plants. Calcium ($Ca^{2+}$) provides selective permeability to the cell membrane. All of these, i.e. $K^+$, $Ca^{2+}$ and $Mg^{2+}$ are essential elements. Sodium (Na+) is involved in membrane permeability. It is a nonessential element.

**(36.)** (a) Turgor pressure causes movements in sensitive plants like Mimosa pudica and Desmodium gyrans. These are the plants which are touch sensitive and show phenomenon of thigmotropism.

**(37.)** (c) In apoplast pathway of water movement water passes from root hair to xylem through the walls of intervening cells without crossing any membrane or cytoplasm. It mainly occurs through the cell wall. In symplast pathway, water passes from the cell to cell through their protoplasm and it is trans membrane transport of water. It does not enter cell vacuoles. The cytoplasm of the adjacent cells are connected through bridges called plasmodesmata.

**(38.)** (a) A-2, B-1, C-4, D-3

**(39.)** (b) Turgor pressure, also known as pressure potential or hydrostatic pressure is exerted by the protoplasm against the cell wall due to osmotic diffusion of water molecules into cell. Turgor pressure causes stretching of cell wall and gives proper shape to the cell. It helps the stomata to open.

**(40.)** (c) The difference between the diffusion pressure of the solution and its solvents at a particular temperature and atmospheric condition is called DPD. The direction and rate of water movement from cell to cell is based on DPD (Diffusion Pressure Deficit).

**(41.)** (b) Statements II and III are incorrect. It is because the liquid which is imbibed is called imbibate, while the molecule which absorbs water is called imbibant. There is no decrease in volume in imbibition. It results in increase in volume. It causes the material to swell and increase in volume significantly.

**(42.)** (b) The main difference between active and passive transport across the cell membrane is that passive transport requires the presence of a concentration gradient across biological membrane whereas during active transport, the movement of molecules is from low concentration to high concentration that means they move against the concentration gradient by using ATP.

**(43.)** (b) High tensile strength of water in a column of water within xylem vessels of tall trees does not allow to break. i.e, an ability to resist a pulling force. This high tensile property of water depends on cohesion, adhesion and surface tension property of water. Due to these forces only transpiration driven ascent of xylem sap occurs in plant system.

**(44.)** (d) Uphill transport is a process of diffusion of a component from a less concentrated stream to a more concentrated permeable stream. Facilitated transport is a form of passive transport in which materials are moved across the plasma membrane by a transport protein down their concentration gradient. It requires integral membrane proteins and highly selective biological membrane to cross. Saturation occurs in facilitated diffusion because not enough carriers may be available to handle all the free solute.

**(45.)** (b) Option (b.) is not a feature of active transport of solutes in plants. Active transport of solutes in plants is carried out by specialised membrane proteins. Like enzymes, the carrier proteins are very specific (i.e. selective) in what they carry across the membranes. Active transport uses energy (ATP) to pump molecules against a concentration gradient.

**(46.)** (c) Statements I and III are correct whereas II and IV are incorrect because concentration gradient must be present for molecules to diffuse even if facilitated by proteins. Transport rate in facilitated diffusion reaches a maximum when all of the protein transporters are being used (saturation).

**(47.)** (c) The behaviour the plant cells with regard to water movement depends on the surrounding solution. When a plant cell is placed in hypotonic solution (where the concentration of solution is lower than the cell sap) then the water will flow into the cell and the cell will swell and become turgid.

**(48.)** (c) Xylem in plants helps in the translocation of water, mineral salts, some organic nitrogen and hormones to the aerial parts of the plant. This process is known as the ascent of sap and it involves four major forces namely, root pressure, capillarity, transpirational pull and cohesion and adhesion of water molecule and cell wall.

**(49.)** (d) All the given statements are correct except statement IV, because energy is required to pump a molecule against concentration gradient in active transport.

**(50.)** (b) **Isotonic solution:** When there is no net movement of water, solution is isotonic.

**Hypotonic solution:** The solution having an osmotic concentration lower than that of another solution. Water moves inside the cell.

**Hypertonic solution:** The solution having osmotic concentration higher than that of other solution. Water moves out from cell.

**Plasmolysis:** When plasmalemma leaves the cell wall leading to shrinkage due to exosmosis, resulting in flaccid cell.

**Deplasmolysis:** When shrunken protoplast gets swelled up due to endosmosis, the cell becomes turgid.