BIOLOGY

NEET

CRASH COURSE

TRANSPORT IN PLANTS

SMART ACHIEVERS

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TRANSPORT IN PLANTS

1. Plants obtain a variety of inorganic elements (ions) and salts from their surroundings especially from water and soil.
2. Movement of these nutrients from environment into the plant as well as from one plant cell to another plant cell essentially involves movement across a cell membrane.
3. Transport across cell membrane can be through diffusion, facilitated transport or active transport.
4. Water and minerals absorbed by roots are transported by xylem and the organic material synthesised in the leaves is transported to other parts of plant through phloem.
5. Passive transport (diffusion, osmosis) and active transport are the two modes of nutrient transport across cell membranes in living organisms.
6. In passive transport, nutrients move across the membrane by diffusion, without any use of energy as it is always down the concentration gradient and hence entropy driven.
7. This diffusion of substances depends on-their size, solubility in water or organic solvents.
8. Osmosis is the special type of diffusion of water across a semi-permeable membrane which depends on pressure gradient and concentration gradient.
9. In active transport, energy in the form of ATP is utilised to pump molecules against a concentration gradient across membranes.
10. Water potential is the potential energy of water which helps in the movement of water. It is determined by solute potential and pressure potential.
11. The behaviour of the cells depends on the surrounding solution. If the surrounding solution of the cell is hypertonic, it gets plasmolysed.
12. The absorption of water by seeds and dry wood takes place by a special type of diffusion called imbibition.
13. In higher plants, there is a vascular system, xylem and phloem, responsible for translocation. Water minerals and food cannot be moved within the body of a plant by diffusion alone. They are therefore, transported by a mass flow system- movement of substance in bulk from one point to another as a result of pressure differences between the two points.
14. Water absorbed by root hairs moves deeper into the root by two distinct pathways, i.e., apoplast and symplast.
15. Various ions and water from soil can be transported upto a small height in stems by root pressure.
16. Transpiration pull model is the most acceptable to explain the transport of water.
17. Transpiration is the loss of water in the form of vapours from the plant parts through stomata. Temperature, light, humidity, wind speed and number of stomata affect the rate of transpiration.
18. Excess water is also removed through tips of leaves of plants by guttation.
19. Phloem is responsible for transport of food (primarily) sucrose from the source to the sink. The translocation in phloem is bi-directiorial; the source-sink relationship is variable.
20. The translocation in phloem is explained by the pressure flow hypothesis.

EXERCISE

Q.1 One molar solution of which substance will have maximum O.P. :-
(1) NaCl (2) Glucose (3) Fructose (4) Starch

Q.2 Pieces of beet root do not lose their colour in cold water, but do so in boiling water because :-
(1) The cell wall is killed in boiling water
(2) Hot water can enter the cells readily
(3) The plasma membrane gets killed in boiling water and becomes permeable
(4) The pigment is not soluble in cold water

Q.3 What statement can be cited for 10% sodium chloride solution and 10% sugar solution present ?
(1) Both have equal OP
(2) The concentration of sodium chloride solution will be less than concentration of sugar solution
(3) The OP of sugar solution will be higher than OP of sodium chloride solution
(4) DPD of sodium chloride solution will be higher than DPD of sugar solution

Q.4 If a cell is reduced in size (shrinks) of placing in a solution of sugar, the solution is :-
(1) Hypertonic (2) Hypotonic (3) Isotonic (4) None of the above

Q.5 A cell increases in volume if the external medium is
(1) Hypotonic
(2) Slightly hypertonic
(3) Isotonic
(4) Much more concentrated than the protoplasm of the cell

Q.6 Process of selective transmission of a liquid through semi permeable membrane is called :-
(1) Diffusion (2) Osmosis (3) Plasmolysis (4) Transmission

Q.7 Water enters into the root hair from the soil in its normal condition because the osmotic pressure of the soil solution :-
(1) Remains lesser than that of root hair sap (2) Remains equal to that of root hair sap
(3) Remains higher than that of root hair sap (4) And that of root hair sap remains zero

Q.8 Which helps in maintaining form and structure of cells & soft parts of plants ?
(1) Osmotic pressure (2) Turgor pressure
(3) Atmospheric pressure (4) DPD

Q.9 Which process occurs against a concentration gradient of solute ?
(1) Diffusion (2) Osmosis (3) Transpiration (4) Translocation

Q.10 If osmotic potential of a cell is – 10 bars and its pressure potential is 5 bars, its water potential would be
(1) – 5 bars (2) 5 bars (3) – 10 bars (4) 10 bars

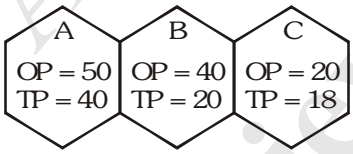
Q.11 The osmotic pressure of distilled water will be :-
(1) Minimum (2) Maximum
(3) Higher than any solution (4) Variable

Q.12 When a cell is fully turgid which of the following will be zero ?
(1) Turgor pressure (2) Wall pressure (3) Suction pressure (4) Osmotic pressure

Q.13 Water from the soil enters in to the root hairs on account of :-
(1) Turgor pressure (2) Suction pressure or DPD
(3) Barometric pressure (4) Osmotic pressure

Q.14 What is the direction of the movement of water if two cells have the same OP but differ in TP ?
(1) No net flow (2) From lower T.P to higher TP
(3) From higher TP to lower TP (4) Data insufficient

Q.15 The three cells A, B & C are joined in a linear manner. Demonstrate the movement of water & direction in these ?



(1) A → B → C (2) A ← B ← C (3) A → B ← C (4) A ← B → C

Q.16 When the solute has been added in the solution, then following observation can be made ?
(1) The DPD of the solution decreases
(2) The Ψ_w of the solution increases
(3) DPD of the solution decreases while its Ψ_w increases
(4) DPD of the solution increases while its Ψ_w decreases

Q.17 In a flaccid cell which condition does not occur-
(1) TP = 0 (2) SP = 0 (3) WP = 0 (4) SP = OP

Q.18 Select the correct statement -
(1) Pure water has minimum Ψ_w (2) Pure water has maximum Ψ_w
(3) Pure water has maximum D.P.D. (4) Pure water has variable Ψ_w & D.P.D.

Q.19 Plasmolysis can be used for :-
(1) Good growth of plants (2) Good growth of weeds
(3) Killing the weeds (4) None of the above

Q.20 If a plasmolysed cell is placed in distilled water then it returns to its original state & become turgid, this is called as :-
(1) Plasmolysis (2) Exosmosis (3) Endosmosis (4) Deplasmolysis

Q.21 Plant cells do not burst in distilled water because :-
(1) Cell wall is permeable (2) Cell wall is living
(3) Cell wall is elastic, rigid and get stretched (4) Cell wall is dead and impermeable

Q.22 Value of water potential for pure water is :-
(1) 1 (2) 2 (3) 3 (4) Zero

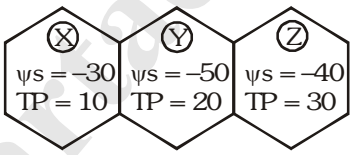
Q.23 When the solute has been added to the solution; it water potential will ?
(1) Increases (2) Decreases
(3) Remain unchanged (4) First increases then decreases

Q.24 Osmotic potential(ψS) of a solution is always :-
(1) Positive (2) Negative (3) Zero (4) Variable

Q.25 Water potential (ψ) of a solution is always :-
(1) + Ve (2) - Ve (3) Zero (4) Variable

Q.26 The accurate equation for presenting water potential is :-
(1) $\Psi\omega = \Psi s + \Psi p + \Psi m$ (2) $\Psi s = \Psi w + \Psi p + \Psi m$
(3) $\Psi w = \Psi s - \Psi p - \Psi m$ (4) $\Psi w = -\Psi s - \Psi p - \Psi m$

Q.27 The direction of the water flow in given cells X, Y & Z can be presented as :-



(1) $X \rightarrow Y \leftarrow Z$ (2) $X \rightarrow Y \rightarrow Z$ (3) $X \leftarrow Y \leftarrow Z$ (4) $X \leftarrow Y \rightarrow Z$

Q.28 Seeds swell when placed in water due to :-
(1) Osmosis (2) Imbibition (3) Hydrolysis (4) All of these

Q.29 The most powerful imbibant is :-
(1) Agar - agar (2) Proteins (3) Cellulose (4) Lignin

Q.30 First step of influx of water into a plant (or) a root hair cell (or) a seed is :-
(1) Osmosis (2) Imbibition (3) Absorption (4) Suction

Q.31 The right sequence for imbibition is :-
(1) Agar agar > cellulose > protein
(2) Protein > cellulose > agar agar
(3) Agar agar > protein > cellulose
(4) Agar agar < protein < cellulose

Q.32 The pathway of water from soil upto the secondary xylem :-
(1) Soil → root hair → cortex → endodermis → pericycle → protoxylem → Meta xylem
(2) Metaxylem → protoxylem → pericycle → cortex → endodermis → soil → root hair
(3) Cortex → root hair → endodermis → pericycle → protoxylem → metaxylem
(4) Pericycle → soil → root hair → cortex → endodermis → protoxylem → metaxylem

Q.33 Which plant hormone help in active absorption of water ?
(1) Auxin (2) GA (3) Cytokinin (4) ABA

Q.34 Absorption of water is increased when :-
(1) Transpiration is increased
(2) Photosynthesis is increased
(3) Respiration is increased
(4) Root pressure is increased

Q.35 Which of the following factors inhibit the absorption of water by roots ?
(1) Low soil temperature
(2) High concentration of soil solution
(3) Low soil aeration
(4) All of the above

Q.36 Water rises in the stem due to :-
(1) Cohesion and transpiration pull
(2) Turgor pressure
(3) Osmotic pressure
(4) None

Q.37 Sap ascends in woody stem because of :-
(1) Transpiration pull (2) Capillarity (3) Molecular adhesion (4) Photosynthesis

Q.38 Dixon and Jolly are associated with :-
(1) Light reaction and photosynthesis
(2) An aerobic respiration
(3) Cohesion and transpiration pull theory of ascent of sap
(4) Apical dominance

Q.39 The rate of transpiration will be high when there is?
(1) Rainy season (2) Winter season (3) Summer season (4) None of these

Q.40 The spray of PMA causes :-
(1) Decrease in transpiration
(2) Increase in transpiration
(3) Increase in absorption
(4) Increase in guttation

Q.41 When the stomata are opening ; we observe following changes in the guard cells ?
(1) OP increase, TP decreases (2) OP & TP increases
(3) OP decreases, TP increases (4) OP & TP decreases

Q.42 With increase in temperature the rate of transpiration becomes :-
(1) Low (2) High
(3) Low in herbs and high in tress (4) Immediately stopped

Q.43 Which pigment regulates opening and closing of stomata ?
(1) Chlorophylls (2) Carotenoids (3) Phytochrome (4) Flavines

Q.44 Which photoreceptor controls the opening & closing of stomata ?
(1) Chlorophyll-a (2) Chlorophyll-b (3) Phytochrome (4) Carotene

Q.45 Which of the following plant product act as an internal anti-transpirant ?
(1) Phenyl mercuric acetate (2) CO_2 and malic acid
(3) Abscisic acid (4) Ferulic acid

Q.46 Basis of stomatal opening is :-
(1) Exosmosis (2) Endosmosis
(3) Decrease in cell sap concentration (4) Plasmolysis of guard cells

Q.47 Shape of guard cells in gramineae family :-
(1) Kidney shaped (2) Oval (3) Round (4) Dumbel shaped

Q.48 Scotoactive stomata are occurs in :-
(1) Succulent xerophytes (2) Hydrophytes
(3) Mesophytes (4) None of the above

Q.49 Which of the following plants economises transpiration loss of water ?
(1) C_3-plants (2) C_4-plants (3) Both equally (4) C_2-plants

Q.50 Before opening of stomata accumulation of the following ion is seen in :-
(1) PO_4 (2) K^+ (3) Mg^{++} (4) Na^+

Q.51 The trunk of a tree shrinks in day due to :-
(1) Rapid translocation of food (2) Transpiration induced tension
(3) Rapid growth in day hours (4) Light induced elongation of plant

Q.52 Active $K^+ \rightleftharpoons H^+$ exchange theory explained –
(1) Ascent of sap (2) phloem conduction (3) Ion absorption (4) Stomatal movement

Q.53 The loss of water in the form of water drops is taking place through the :-
(1) Hydathodes (2) Lenticel (3) Stomata (4) All

Q.54 Guttation is dependent on :-
(1) Root pressure
(2) Active absorption
(3) Flaccidity of root cortical cells
(4) High rate of transpiration

Q.55 Guttation take place during night when :-
(1) Root pressure is positive
(2) Root pressure is negative
(3) Always take place
(4) It does not takes place at all

Q.56 Hydathodes open during :-
(1) Hight hours (2) Day hours (3) Noon hours (4) Always open

Q.57 Cells present on hydathodes is –
(1) Complementary cells
(2) Epithem cells
(3) Guard cells
(4) Kranz cells

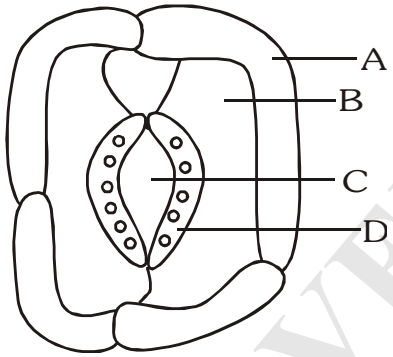
Q.58 The process involved in the formation of Toddy is:-
(1) Guttation (2) Transpiration (3) Bleeding (4) All

Q.59 The whitish powder around hydathode is due to :-
(1) Guttation
(2) Salt depositon from air
(3) Salt formation over surface
(4) Bleeding

Q.60 Stomata of CAM plants :-
(1) Are always open
(2) Open during the day & close at night
(3) Open during the night & close during the day
(4) Never open

Q.61 Potometer works on the principle of :
(1) Amount of water absorbed equals the amount transpired
(2) Osmotic pressure
(3) Root pressure
(4) Potential difference between the tip of the tube and that of the plant

Q.62 Given below is the diagram of a stomatal apparatus. In which of the following all the four parts labelled as A, B, C and D are correctly identified ?



	A	B	C	D
(1)	Guard Cell	Stomatal aperture	Subsidiary cell	Epidermal cell
(2)	Epidermal cell	Guard Cell	Stomatal aperture	Subsidiary cell
(3)	Epidermal cell	Subsidiary cell	Stomatal aperture	Guard Cell
(4)	Subsidiary cell	Epidermal cell	Guard Cell	Stomatal aperture

AIIMS Special

Instructions for following questions (Q.63 to Q.82).

(1) If both Assertion & Reason are true and the reason is the correct explanation of the assertion, then mark (1).

(2) If both Assertion & Reason are true but the reason is not the correct explanation of the assertion, then mark (2).

(3) If Assertion is true statement but Reason is false, then mark (3).

(4) If both Assertion and Reason are false statements, then mark (4).

Q.63 **Assertion :** Xerophytes have high water retaining capacity.
Reason : They have high OP.

Q.64 **Assertion :** There is indirect relationship between rate of respiration and water absorption.
Reason : Increased metabolism increases mineral uptake.

Q.65 **Assertion :** Root pressure is dynamic and is always a positive hydrostatic pressure.
Reason : It is a universal phenomenon and develops under absorption lag.

Q.66 **Assertion :** Stomata have delegated the task of providing food while preventing thirst.
Reason : They are made for gaseous exchange.

Q.67 **Assertion :** During stomatal opening there is relative change in TP of guard cell and subsidiary cell.
Reason : TP of subsidiary cell decreases during opening.

Q.68 **Assertion :** Most available form of water in plants is capillary water.
Reason : Ψ_w of capillary water is highly negative.

Q.69 **Assertion :** Osmotic pressure of solution is always higher than pure solvent.
Reason : O.P. is property of solvent molecules.

Q.70 **Assertion :** DPD in plasmolysed cell is higher than O.P.
Reason : T.P. is negative in plasmolysed cell.

Q.71 **Assertion :** Ascent of sap is function of Xylem parenchyma.
Reason : Xylem parenchyma is non living element.

Q.72 **Assertion :** O.P. of pure water is higher.
Reason : O.P. is property of solvent.

Q.73 **Assertion :** Guttation occurs during night & morning.
Reason : Hydathodes remain open during all time.

Q.74 **Assertion :** The movement of ions from soil to endodermis & Xylem elements is an active process.
Reason : It requires metabolic energy.

Q.75 **Assertion :** Ascent of sap occurs by xylem tissue.
Reason : Xylem is presents only in dicot plants.

Q.76 **Assertion :** Root hair cells absorb water from soil.
Reason : O.P. of soil is lower than root cells.

Q.77 **Assertion :** Ascent of sap is stopped by killing the xylem parenchyma.
Reason : Ascent of sap occurs by parenchyma.

Q.78 **Assertion :** Rate of transpiration decreases with increase in conc. of CO_2.
Reason : CO_2 reacts with ABA in subsidiary cells.

Q.79 **Assertion :** Potamogeton possesses non-functional stomata.
Reason : Potamogeton is submerged hydrophyte.

Q.80 **Assertion :** Transplanted plant can not grow easily.
Reason : Uptake of CO_2 is not possible at new places.

Q.81 **Assertion :** Orchids or epiphytes can absorb atm. humidity.
Reason : Orchids are photosynthetic plants.

Q.82 **Assertion :** Maximum transpiration takes place through the stomata.
Reason : Stomatal transpiration occurs through the leaves.

ANSWER KEY

Q.1	1	Q.2	3	Q.3	4	Q.4	1	Q.5	1	Q.6	2	Q.7	1
Q.8	2	Q.9	2	Q.10	1	Q.11	1	Q.12	3	Q.13	2	Q.14	3
Q.15	3	Q.16	4	Q.17	2	Q.18	2	Q.19	3	Q.20	4	Q.21	3
Q.22	4	Q.23	2	Q.24	2	Q.25	2	Q.26	1	Q.27	1	Q.28	2
Q.29	1	Q.30	2	Q.31	3	Q.32	1	Q.33	1	Q.34	1	Q.35	4
Q.36	1	Q.37	1	Q.38	3	Q.39	3	Q.40	1	Q.41	3	Q.42	2
Q.43	3	Q.44	3	Q.45	3	Q.46	2	Q.47	4	Q.48	1	Q.49	2
Q.50	2	Q.51	2	Q.52	4	Q.53	1	Q.54	1	Q.55	1	Q.56	4
Q.57	2	Q.58	3	Q.59	1	Q.60	3	Q.61	1	Q.62	3	Q.63	1
Q.64	1	Q.65	3	Q.66	2	Q.67	2	Q.68	3	Q.69	3	Q.70	1
Q.71	4	Q.72	4	Q.73	2	Q.74	1	Q.75	3	Q.76	1	Q.77	4
Q.78	3	Q.79	1	Q.80	3	Q.81	2	Q.82	2				