

TRANSPORT IN PLANTS

1. Who is called the father of plant physiology?
(A) K.V. Thimann (B) Stephan Hales
(C) M. Calvin (D) E. Rabinowitch
2. During germination, seeds absorb water by
(A) Endosmosis (B) Exosmosis
(C) Plasmolysis (D) Imbibition
3. Which of the following is not concerned with movement of materials in and out of cells?
(A) Osmosis (B) Diffusion
(C) Active transport (D) Surface tension
4. The hydrostatic pressure developed in solution when it is separated from pure water by a semipermeable membrane in a rigid vessel is called
(A) Wall pressure (B) Imbibition pressure
(C) Osmotic pressure (D) Diffusion pressure
5. A cell is plasmolysed after being kept in a hypertonic solution what will be present between cell wall and plasmalemma
(A) Isotonic solution (B) Hypertonic solution
(C) Air (D) Hypotonic solution

6. If turgor pressure become equal to wall pressure, then
(A) Water leaves the cell
(B) Water enters the cell
(C) No exchange of water takes place
(D) Solute goes from the cell into water
7. The difference in the chemical potential of water in a system with that of a pure water under standard conditions is called as
(A) Matric potential (ψ_m) (B) Solute potential (ψ_s)
(C) Pressure potential (ψ_p) (D) Water potential (ψ_w)
8. Cell A has water potential -3 bars and cell B has water potential -8 bars, the movement of water will be from
(A) Cell A to B (B) Cell B to A
(C) No movement of H₂O (D) None of these
9. A soil is said to be physiologically dry when it has no
(A) Capillary water (B) Hygroscopic water
(C) Combined water (D) All of these
10. Water uptake at the expense of energy the cell against the concentration gradient is known as
(A) Imbibition (B) Osmosis
(C) Active absorption (D) Passive absorption

11. Most widely explanation for the ascent of sap is
- (A) Capillarity
 - (B) Pulsatory activity of living cells
 - (C) Role of atmospheric pressure
 - (D) Transpiration pull cohesion theory
12. Stomata in angiosperms open and close due to
- (A) Their genetic constitution
 - (B) Effect of hormones
 - (C) Change of turgor pressure in guard cells
 - (D) Pressure of gases inside the leaves
13. Transpiration ratio is the ratio of moles of H₂O transpired/moles of CO₂ fixed. The ratio is a measure of
- (A) Stomatal pore size of the leaves.
 - (B) The efficiency of guard cells on stomatal movement.
 - (C) Effectiveness of stomata in maximizing photosynthesis, while minimizing waters loss.
 - (D) Distinguishing a xerophyte from a glycophyte.
14. Stomata of plant open due to
- (A) Influx of hydrogen ions
 - (B) Influx of calcium ions
 - (C) Influx of potassium ions
 - (D) Influx of zinc ions

15. In guttation plants can
- (A) excrete salts
 - (B) compensate for loss of water
 - (C) manufacture organic substances
 - (D) get rid of excess of water
16. Osmotic pressure in a vacuolated plant cell is usually
- (A) Less than DPD
 - (B) More than DPD
 - (C) Equal to TP
 - (D) Equal to WP
17. 0.1M solution of a given solute has water potential = $- 2.3$ bars. Its DPD is equal to
- (A) $- 2.3$ bars
 - (B) $+ 2.3$ bars
 - (C) $- 4.6$ bars
 - (D) $+ 4.6$ bars
18. Meaningful girdling (Ringing) experiments cannot be done on sugarcane because
- (A) Phloem is present inside the xylem
 - (B) It cannot tolerate the injury
 - (C) Vascular bundles are scattered
 - (D) Plants are very delicate

19. The sugarcane plant has
- (A) Dumb-bell shaped guard cells
 - (B) Pentamerous flowers
 - (C) Reticulate venation
 - (D) Capsular fruits
20. The cell wall is permeable and not a semipermeable structure can be best deduced from the passage of water and mineral salts from
- (A) Soil into periplasmic space of root hairs
 - (B) Root hairs to cortical cells
 - (C) Cortical cells to pericycle
 - (D) Pericycle to trachea
21. Selective permeability identifies the process of transmission through semipermeable membrane is called
- (A) Diffusion
 - (B) Osmosis
 - (C) Plasmolysis
 - (D) Imbibition

22. Water moves across a selectively permeable membrane

	FROM	TO
	Region of higher water-potential	Region of lower water potential
	Lower water concentration	Higher water concentration
	Higher solute concentration	Lower solute concentration
	Region of higher osimotic potential	Region of lower osmotic potential

23. During osmosis, water moves through a membrane

FROM	TO
Low water potential	High water potential
High solute concen	Low solute concen.
High osmotic potential	Low osmotic potential
A hypotonic solution (less solute)	A hypertonic solution (more solute)

24. If cell A with OP = 5 and TP = 4 is surrounded by cells with OP = 3 and TP = 1, what will be the direction of water movement

- (A) From cell A to other cells
- (B) From other cells to cell A
- (C) Water will not move
- (D) Water will move up

25. DPD is equal to

- (A) $OP \times TP$
- (B) $OP + TP$
- (C) $OP - TP$
- (D) $TP - OP$

26. In a fully turgid cells, the values of DPD, OP and TP will show the tendency

- (A) DPD = 10 atm, OP = 15 atm, TP = 5 atm
- (B) DPD = 5 atm, OP = 12 atm, TP = 7 atm
- (C) DPD = 2 atm, OP = 7 atm, TP = 5 atm

(D) $DPD = 0 \text{ atm}$, $OP = 15 \text{ atm}$, $TP = 15 \text{ atm}$

27. The cell is fully turgid when

- (A) $DPD = TP$
- (B) $OP = DPD$
- (C) $DPD = SP$
- (D) $DPD = \text{zero}$

28. You are given three cells, a root hair, a cell of the inner cortical layer and a cell of the mesophyll

Arrange them in the ascending order of DPD

- (A) Root hair < Cortical cell < Mesophyll
- (B) Cortical cell < Mesophyll < Root hair
- (C) Mesophyll < Root hair < Cortical cell
- (D) Root hair < Mesophyll < Cortical cell

29. Most widely accepted explanation for the ascent of sap in tree is

- (A) Capillarity
- (B) Roll of atmospheric pressure
- (C) Pulsating action of living cells
- (D) Transpiration cohesion theory of Dixon

30. The path of water from soil upto secondary xylem is
- (A) Soil → Root hair cell wall → Cortex → Endodermis → Pericycle → Protoxylem → Metaxylem
 - (B) Metaxylem → Protoxylem → Cortex → Soil → Root hair
 - (C) Cortex → Root hair → Endodermis → Pericycle → Protoxylem → Metaxylem
 - (D) Pericycle → Soil → Root hair → Cortex → Endodermis → Protoxylem → Metaxylem

31. Na^+ , K^+ dependent ATPase activity helps in transport of
- (A) K^+ inward, Na^+ outward
 - (B) K^+ inward only
 - (C) Na^+ inward only
 - (D) K^+ outward, Na^+ inward

32. Suitable temperature for active absorption of water by root is
- (A) $40-45^\circ \text{C}$
 - (B) $10-15^\circ \text{C}$
 - (C) $20-35^\circ \text{C}$
 - (D) Can take at any temperature

33. Stomata open at night and close during day in
- (A) Xerophytes
 - (B) Gametophytes
 - (C) Mesophytes
 - (D) Hydrophytes

34. Identify the instrument used for measuring both relative humidity and transpiration.

- (A) Porometer
- (B) Potometer
- (C) Atmometer
- (D) Psychrometer

35. It r_c and r_s respectively represents cuticular and stomatal resistances, the total resistance (R) could be expressed as

- (A) $R = r_c + r_s$
- (B) $R = r - r_s$
- (C) $\frac{1}{R} = \frac{1}{r_c} + \frac{1}{r_s}$
- (D) $\frac{1}{R} = \frac{1}{r_c} - \frac{1}{r_s}$

36. The conditions under which transpiration would be most rapid

- (A) High humidity
- (B) Excess of water in soil
- (C) Low humidity, high temperature, guard cells are turgid (open) and moist soil
- (D) Low velocity of wind

37. The metal ion involved in the stomatal regulation is or
Stomata will open, if there is accumulation of the following element in the guard cells

- (A) Iron
- (B) Magnesium
- (C) Zinc
- (D) Potassium

38. Which among the following would be the best hypothesis to explain the mechanism of stomatal action in night in succulent plants when the stomata remains open?

(A) CO_2 accumulates, reduces pH , stimulate enzymes resulting in accumulation of sugars

(B) Increase in CO_2 concentration, conversion of organic acids into starch resulting in the increased conversions into sugars resulting in K^+ transport

(C) Low CO_2 concentration accumulates organic acids resulting in the increased concentration of cell sap

(D) CO_2 used up, increase pH results in accumulation of sugars

39. Which one of the following describes a possible reason for the opening and closing of the guard cells

(A) Stomata open in daylight because photosynthesis occurs in the guard cells producing sugar resulting in higher osmotic pressure.

(B) Stomata open in daylight because guard cells have chloroplasts and the epidermal cells do not, and so a differential osmotic pressure arises.

(C) Stomata open in daylight because starch is changed to osmotically active substances which increase the turgidity of the guard cells.

(D) Stomata close in darkness because the starch produced in daylight by photosynthesis, it is changed into sugars and translocated from the guard cells.

40. Guttation is the process of elimination of water from plants through or Guttation occurs from or the pores in leaves through which water comes out in the form of droplets are called or A specialized multicellular structure in leaves which excretes water droplets is called as

- (A) Stomata (B) Hydathodes
(C) Lenticels (D) Wounds

41. Which of the following is used to determine the rate of transpiration in plants

- (A) Porometer (B) Potometer
(C) Auxanometer (D) Tensiometer

42. Match the theories given in column I with the names of scientists listed in column II. Choose the answer which gives the correct combination of the alphabets

Column – I (Names of theories)	Column – II (Names of scientists)
A Relay pump theory	p Stocking
B Transpiration cohesion theory	q Sir J.C. Bose

C Mass flow	r Godlewski
DPulsation theory	s Dixon and Joly
	t Ernst Munch

- (A) A = r; B = s; C = t; D = q
- (B) A = s; B = r; c = p; d = q
- (C) A = r; B = q; C = t; D = q
- (D) A = q; B = p; C = t; D = r

43. Food is transported to various parts of the plant through

- (A) Root hairs
- (B) Phloem
- (C) Xylem
- (D) Stomata

44. Starch is insoluble in water yet it is accumulated in large quantities in potato because

- (A) It is synthesized in potato tuber itself.
- (B) It is translocated from the leaves to the potato tuber in the form of sugar.
- (C) Soil micro-organism deposit starch in tuber.
- (D) It is useful consumption.

45. Which of the following conditions is CORRECT for a plant cell placed in a solution which is hypotonic to the cell sap?

- (A) The water potential of the cell sap will rise.
- (B) The suction pressure of the cell sap will fall.
- (C) The cell will become turgid.
- (D) The cell will become flaccid.

ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
B	D	D	C	B	C	D	A	A	C	D	C	C	C	C	D
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
B	B	C	A	A	B	A	D	A	C	D	D	A	D	A	
31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	
A	C	A	D	C	C	D	B	C	B	B	A	B	B	C	

SOLUTIONS

18. In monocot like sugarcane, maize, etc. due to absence of cambium secondary growth is not found. So removal of bark (phloem) is not possible so that ringing experiment is not possible.
19. The guard cells of monocots (family - Gramineae) are dumbel shaped or elliptical, *e.g.*, Sugarcane.
21. Osmosis is a special type of diffusion or diffusion through semipermeable membrane.
23. It is the migration of solvent through a semipermeable membrane to keep the concentration equal.
24. D.P.D. (S.P.) of cell A = O.P. – T.P. = 5 – 4 = 1 atm.
D.P.D. (S.P.) of cell B = 3 – 1 = 2 atm.
So, movement of water is from cell A to cell B, *i.e.*,
direction of movement of water is from lower D.P.D. (S.P.)
to higher D.P.D. (S.P.).
25. Osmotic Pressure – Turgor Pressure = Diffusion Pressure Deficit (DPD).
26. In a fully turgid cell, O.P. is equal to T.P. and thus D.P.D. is zero.
27. In a fully turgid cell, D.P.D. = 0
As, T.P. = O.P.
31. ATPase may itself catalyze a direct transport of K^+ , or a Na^+/K^+ exchange pump.

33. Such stomata are known as scotoactive stomata. This is a mechanism to reduce water loss due to transpiration. These are found in plants like *Opuntia*, *Aloe*, *Bryophyllum* etc.
34. Psychrometer is an instrument used for measuring both relative humidity and transpiration.
36. Increase in the temperature of the air decreases the humidity of the air and therefore more water is vapourised and lost from the transpiring surface. When soil is moist means availability of water are sufficient, stomata will open thus rate of transpiration increases.
37. When K^+ ions into the guard cells, stomata open and when K^+ ions out, stomata close.
38. In succulents (CAM) plants, stomata remains open during night and closed during the day. In these plants, organic acids such as malic acid, accumulates without CO_2 release and incomplete oxidation of carbohydrates occurs which results in the increase of CO_2 . During day time rapid breakdown of organic acids occur resulting in the release of excess CO_2 for the process of photosynthesis and also to keep stomata closed.
39. During day starch is converted to sugars because of increase in pH , it results in increase in the concentration of cell sap and consequently endosmosis of water into guard cells would occur resulting in opening of stomata.
40. Hydathodes are usually found on the margins and tips of the leaves. Each hydathode consists of a group of loosely

arranged achlorophyllous or colourless and parenchymatous cells called epithem.

43. Food moves in downward direction in phloem from leaves to roots.
45. When a cell is placed in hypotonic solution, it becomes turgid due to the inward movement of water into the cell by the process of endosmosis and the cell becomes swollen and hard.