DPP - Daily Practice Problems

Chapter-wise Sheets

Date : _____ **Start Time :** _____ **End Time :** _____

BIOLOGY CB11

SYLLABUS : Transport in Plants

Max. Marks : 180 **Marking Scheme :** + 4 for correct & (–1) for incorrect **Time : 60 min.**

INSTRUCTIONS : This Daily Practice Problem Sheet contains 45 MCQs. For each question only one option is correct. Darken the correct circle/ bubble in the Response Grid provided on each page.

1. Water potential is equal to
(a) Ψ_s + O.P. (b) Ψ_s + T.P.
(c) $\Psi_p + \Psi_w$ (d) $\Psi_s + \Psi_p$

2. The movement of mineral ions into plant root cells as a result of diffusion is called
(a) osmosis
(b) active absorption
(c) passive absorption
(d) endocytosis

3. In soil, the water available for root absorption is
(a) gravitational water (b) capillary water
(c) hygroscopic water (d) combined water

4. Plasmolysis occurs when the cell is placed in
(a) isotonic solution (b) hypotonic solution
(c) hypertonic solution (d) None of the above

5. The rate of transpiration in plants is dependent upon
(a) temperature and soil
(b) light and temperature
(c) wind, temperature and light
(d) light, temperature, atmospheric humidity and wind

6. The water potential and osmotic potential of pure water are
(a) zero and zero (b) 100 and 100
(c) zero and 100 (d) 100 and zero

7. Stomata open and close due to
(a) circadian rhythm
(b) genetic clock
(c) pressure of gases inside the leaves
(d) turgor pressure of guard cells

8. Movement of ions or molecules in a direction opposite to that of prevailing electrochemical gradient is known as
(a) diffusion (b) active transport
(c) pinocytosis (d) brownian movement

9. Osmosis means movement of
(a) solute from lower concentration to higher concentration.
(b) solute from higher concentration to lower concentration.
(c) solvent from low concentration of solution to higher concentration of solution.
(d) solvent from higher concentration of solution to low concentration of solution.

RESPONSE GRID					
1. ⓐⓑⓒⓓ	**2.** ⓐⓑⓒⓓ	**3.** ⓐⓑⓒⓓ	**4.** ⓐⓑⓒⓓ	**5.** ⓐⓑⓒⓓ
6. ⓐⓑⓒⓓ	**7.** ⓐⓑⓒⓓ	**8.** ⓐⓑⓒⓓ	**9.** ⓐⓑⓒⓓ	

Space for Rough Work

10. Solution outside a cell has higher concentration than cytoplasm, then the solution is
(a) isotonic (b) acidic
(c) hypotonic (d) hypertonic

11. Which of the following is used as antitranspirant?
(a) Calcium carbonate
(b) Phenyl mercuric acetate
(c) Cobalt chloride
(d) Naphthol acetic acid

12. During $Na^+ - K^+$ pump
(a) $3Na^+$ and $2K^+$ are transported
(b) $1Na^+$ and $2K^+$ are transported
(c) $3Na^+$ and $3K^+$ are transported
(d) Depends on requirement of cell

13. In rainy season, door gets swelled due to
(a) imbibition (b) diffusion
(c) transpiration (d) respiration

14. Turgor pressure become equal to the wall pressure when
(a) water leaves the cell
(b) water enter the cell
(c) no exchange of water takes place
(d) solute goes from cell into water

15. Addition of a solute to pure water causes
(a) negative water potential.
(b) more negative water potential.
(c) positive water potential.
(d) more positive water potential.

16. Which one of the following process help the water- soluble inorganic nutrients go down into the soil horizon and get precipitated as unavailable salts?
(a) Fragmentation (b) Leaching
(c) Catabolism (d) Humification

17. Water logging of soil makes it physiologically dry because:
(a) this condition does not allow the capillary force to work
(b) this condition does not allow oxygen to enter the soil
(c) Both (a) and (b)
(d) None of the above

18. The productivity of a crop declines when leaves begin to wilt mainly because
(a) the chlorophyll of wilting leaves decomposes.
(b) flaccid mesophyll cells are incapable of photosynthesis.
(c) stomata close, preventing CO_2 from entering the leaf.
(d) photolysis, the water-splitting step of photosynthesis, cannot occur when there is a water deficiency.

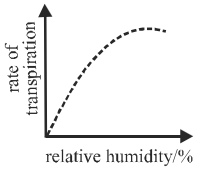
19. The phenomenon of plasmolysis is evident when cells are kept in
(a) hypotonic solution
(b) hypertonic solution
(c) isotonic solution
(d) None of the above

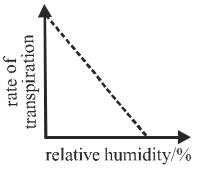
20. What mechanism explains the movement of sucrose from source to sink ?
(a) Evaporation of water and active transport of sucrose from sink.
(b) Osmotic movement of water into the sucrose loaded sieve tube cells creating a higher hydrostatic pressure into the source than in the sink.
(c) Tension created by differences in hydrostatic pressure in the source and sink.
(d) Active transport of sucrose through the sieve tube membranes driven by proton pump.

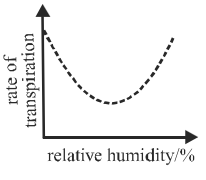
21. Water will be absorbed by root hairs when
(a) concentration of salt in the soil is high.
(b) concentration of solutes in the cell sap is high.
(c) plant is rapidly respiring.
(d) they are separated from soil by a permeable membrane.

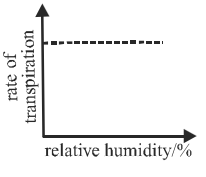
22. Proton pumps in the plasma membranes of plant cells may
(a) generate a membrane potential that helps drive cations into the cell through their specific carriers.
(b) be coupled to the movement of K^+ into guard cells.
(c) drive the accumulation of sucrose in sieve-tube members.
(d) be involved in all of the above

23. Which one of the following graphs most closely represents the relationship between the rate of transpiration of a mesophytic leaf and the atmospheric humidity ?

(a) 

(b) 

(c) 

(d) 

RESPONSE GRID					
	10. ⓐⓑⓒⓓ	**11.** ⓐⓑⓒⓓ	**12.** ⓐⓑⓒⓓ	**13.** ⓐⓑⓒⓓ	**14.** ⓐⓑⓒⓓ
	15. ⓐⓑⓒⓓ	**16.** ⓐⓑⓒⓓ	**17.** ⓐⓑⓒⓓ	**18.** ⓐⓑⓒⓓ	**19.** ⓐⓑⓒⓓ
	20. ⓐⓑⓒⓓ	**21.** ⓐⓑⓒⓓ	**22.** ⓐⓑⓒⓓ	**23.** ⓐⓑⓒⓓ	

Space for Rough Work

24. A plant cell placed in pure water will
(a) expand until the osmotic potential or solute potential reaches that of water.
(b) becomes more turgid until the pressure potential of cell reaches its osmotic potential.
(c) become more turgid until the osmotic potential reaches that of pure water.
(d) becomes less turgid until the osmotic potential reaches that of pure water.

25. The casparian strip prevents water and minerals from entering the stele through the
(a) plasmodesmata (b) apoplast
(c) symplast (d) xylem vessel

26. If a soft stemmed plant, is cut horizontally near the base of its stem with a sharp blade on early morning of a humid day, drops of solution ooze through cut stem. This is due to
(a) guttation (b) bleeding
(c) transpiration pull (d) root pressure

27. Which of the following statements is incorrect?
(a) Endodermis is impervious to water due to the presence of suberized Casparian stips.
(b) Xylem vessels and tracheids, being non-living, are parts of the apoplast
(c) Ascent of sap is best explained by root pressure theory.
(d) None of these

28. In part A of a plant, sugars are actively transported into the phloem tissue. In part B, sugars are actively transported out of the phloem. Which way will the phloem sap move under these conditions?
(a) From A to B
(b) From B to A
(c) First from A to B; then, once the pressure builds up, from B to A
(d) First from B to A; then, once the pressure builds up, from A to B

29. If the pressure potential is +0.16 megapascals (mPa) and the osmotic potential is –0.24 megapascals, then the water potential would be
(a) + 0.4 mPa (b) +0.08 mPa
(c) – 0.08 mPa (d) + 0.16 mPa.

30. The movement of water up the stems of tall plants is least dependent on which of the following factors ?
(a) Guttation
(b) Transpiration
(c) Cohesiveness of water molecules
(d) Tension within column of water molecules

31. As a leaf loses water, a series of events typically occurs leading to the closing of stomata. Which of the following shows the correct sequence of these events ?
(a) Potassium ions enter guard cells, water passively enters guard cells, abscisic acid is released by leaf cells, pressure potential in guard cells decreases
(b) Potassium ions enter guard cells, water passively leaves guard cells, pressure potential in guard cells decreases
(c) Water passively leaves guard cells, pressure potential in guard cells decreases, abscisic acid is released by leaf cells, potassium ions leave guard cells
(d) Abscisic acid is released by leaf cells, potassium ions leave guard cells, water passively leaves guard cells, pressure potential in guard cells decreases

32. Which of the following explains why the leaf cells of plants within the family Crassulaceae have a lower pH at night than during the day ?
(a) These plants keep their stomata open at night but clossed during the day.
(b) Carbon dioxide in these plants is chemically fixed in orgnanic acids during the night, but these acids are metabolized during the day.
(c) These plants have a buildup of abscisic acid at night.
(d) Because their stomata are closed during the day, excess carbon dioxide within the leaf forms carbonic acid.

33. Which of the following characteristics applies to both xylem and phloem transport ?
(a) Follows a water potential gradient
(b) Involves only living cells
(c) Can occur in both directions
(d) Involves active transport of solute with passive movement of water

34. Which of the following cell types would be the third cell type a sugar molecule is likely to encounter on its route from its site of production in a chloroplast to its site of storage in the root ?
(a) Mesophyll cell
(b) Companion cell
(c) Sieve tube element
(d) Parenchyma

35. The primary difference between the apoplast and the symplast is that the
(a) apoplast is nonliving spaces and cell walls.
(b) apoplast relies on active transport.
(c) symplast is nonliving spaces and cell walls.
(d) apoplast prevents passive diffusion.

RESPONSE GRID					
	24. ⓐⓑⓒⓓ	**25.** ⓐⓑⓒⓓ	**26.** ⓐⓑⓒⓓ	**27.** ⓐⓑⓒⓓ	**28.** ⓐⓑⓒⓓ
	29. ⓐⓑⓒⓓ	**30.** ⓐⓑⓒⓓ	**31.** ⓐⓑⓒⓓ	**32.** ⓐⓑⓒⓓ	**33.** ⓐⓑⓒⓓ
	34. ⓐⓑⓒⓓ	**35.** ⓐⓑⓒⓓ			

Space for Rough Work

36. Tension is a result of which of the following?
(a) Transpiration at the leaf surface
(b) The cohesive nature of water
(c) The narrowness of the xylem tube
(d) All of the above

37. Which of the following regulates stomatal opening and closing ?
(a) Abscisic acid levels
(b) Light levels
(c) Carbon dioxide concentrations
(d) All of the above

38. Regulators of stomatal opening and closing work by activating the
(a) proton pump in guard cells.
(b) proton pump in stomata
(c) sodium-potassium pump
(d) all of the above

39. Which of the following would not contribute to water uptake by a plant cell ?
(a) an increase in the water potential (ψ) of the surrounding solution
(b) a decrease in pressure on the cell exerted by the wall
(c) the uptake of solutes by the cell
(d) an increase in tension on the surrounding solution.

40. Which of the following does not appear to involve active transport across membranes?
(a) the movement of mineral nutrients from the apoplast to the symplast
(b) the movement of sugar from mesophyll cells into sieve-tube members in corn
(c) the movement of sugar from one sieve-tube member to the next
(d) K^+ uptake by guard cells during stomatal opening.

41. The productivity of a crop declines when leaves begin to wilt mainly because
(a) the chlorophyll of wilting leaves decomposes.
(b) flaccid mesophyll cells are incapable of photosynthesis
(c) stomata close, preventing CO_2 from entering the leaf.
(d) photolysis, the water-splitting step of photosynthesis, cannot occur when there is a water deficiency

42. Imagine cutting a live twig from a tree and examining the cut surface of the twig with a magnifying glass. You locate the vascular tissue and observe a growing droplet of fluid exuding from the cut surface. This fluid is probably
(a) phloem sap
(b) xylem sap
(c) guttation fluid
(d) fluid of the transpiration stream

43. Xylem moves its materials
(a) from the leaves to the roots.
(b) from the roots to the leaves.
(c) when the plant is actively photosynthesizing.
(d) if the proper pressure is maintained.

44. Primary and secondary active transport both
(a) Generate ATP
(b) Use ATP directly
(c) Can move solutes against their concentration gradient
(d) Include the passive movement of glucose molecule

45. Aquaporins are
(a) cytoplasmic connections between cortex cells.
(b) openings in the lower epidermis of leaves through which water vapour escapes.
(c) openings into root hairs through which water enters.
(d) water specific channels in membranes that may regulate the rate of osmosis.

RESPONSE GRID					
	36. ⓐⓑⓒⓓ	**37.** ⓐⓑⓒⓓ	**38.** ⓐⓑⓒⓓ	**39.** ⓐⓑⓒⓓ	**40.** ⓐⓑⓒⓓ
	41. ⓐⓑⓒⓓ	**42.** ⓐⓑⓒⓓ	**43.** ⓐⓑⓒⓓ	**44.** ⓐⓑⓒⓓ	**45.** ⓐⓑⓒⓓ

Space for Rough Work

DAILY PRACTICE PROBLEM DPP CHAPTERWISE 11 - BIOLOGY			
Total Questions	45	Total Marks	180
Attempted		Correct	
Incorrect		Net Score	
Cut-off Score	40	Qualifying Score	55
Success Gap = Net Score – Qualifying Score			
Net Score = (Correct × 4) – (Incorrect × 1)			

HINTS & SOLUTIONS

DPP/CB11

1. (d)

2. (c) Osmosis is the movement of solvent particles from a region of low solute concentration to a region of high solute concentration through a selectively permeable membrane.

3. (b) **4. (c)**

5. (d) The factors which affect the rate of transpiration are light – stomatal opening, temperature – increases rate of transpiration, humidity – low humidity increases the rate of transpiration whereas high humidity exerts an opposite effect *i.e.* decreases the rate, wind – high wind causes stomatal closure, thereby, reducing the rate of transpiration in plants.

6. (a) Osmotic potential is the potential of a solution to cause water movement into it across a semi- permeable membrane. Water potential is the tendency of water to leave a system.

7. (d) Turgor pressure is the pressure that develops in a cell due to osmotic diffusion of water inside it and is responsible for pushing the membrane against cell wall. Stomata open under conditions of increased turgor pressure of guard cells and stomata gets closed under conditions of decreased turgor pressure of guard cells. When turgid, they swell and bend outward. As a result, the stomatal aperture opens. When they are flaccid, the tension from the wall is released and stomatal aperture closes.

8. (b) Active transport involves movement of ions against concentration gradient involves the expenditure of energy. Diffusion involves the movement of solute particles from region of higher concentration to a region of lower concentration. Pinocytosis is cell drinking. Brownian movement is the random to and fro movement of atoms and molecules.

9. (c)

10. (d) A solution having more solutes as compared to solution having less number of solutes : former is known as hypertonic and latter hypotonic. Hence, solution outside the cytoplasm has more solutes (higher concentration) and are hypertonic. If two solutions have same solute concentration then they are isotonic.

11. (b)

12. (a) During sodium-potassium pump, the concentration of sodium ions will be about 14 times more in extra cellular fluid (outside) and concentration of potassium ions will be about 28-30 times more in axoplasm (inside). Thus, $3Na^+$ and $2K^+$ are transported during the process.

13. (a) In rainy season, door gets swelled due to the phenomenon of imbibition. It is the process of absorption of water without forming a solution.

14. (c) Cell placed in a hypotonic solution becomes turgid due to endosmosis. Water exerts a pressure on the walls of the cell called turgor pressure. Cell wall being a rigid and hard structure also exerts a pressure on Cytoplasm in response to Turgor pressure when TP = WP, DPD = 0 (No net exchange of water).

15. (a) The pure water, at atmospheric pressure has zero water potential. The addition of any solute particles reduces the free energy of water. Thus, the water potential will be negative.

16. (b)

17. (b) Water logging of soil makes it physiologically dry because this condition does not allow oxygen to enter the soil.

18. (c) **19. (b)** **20. (b)**

21. (b) The absorption of water still occurs when concentration of outer soil water is more than root hair cell sap.

22. (d)

23. (b) With increasing humidity, the rate of transpiration decreases linearly, because the high saturation of water vapour in the atmosphere prevents the evaporation of more water from the leaf interior to the exterior.

24. (b) **25. (b)**

26. (d) If we cut a small soft-stemmed plant on a day, when there is plenty of atmospheric moisture, early in the morning we will soon see drops of solution ooze out of the cut stem; this comes out due to the positive root pressure. If we fix a rubber tube to the cut stem as a sleeve we can actually collect and measure the rate of exudation, and also determine the composition of the exudates. Root pressure is a positive pressure that develops in the xylem sap of the root of some plants. It is a manifestation of active water absorption. Root pressure is observed in certain seasons which favours optimum metabolic activity and reduce transpiration. It is more during rainy season in the tropical countries and during spring in temperate habitats.

27. (c) Cohesion tension theory (Cohesion-tension and transpiration pull theory) explains the ascent of sap best. It was put forward by Dixon and Jolly in 1894. It was further improved by Dixon in 1914. Therefore, the theory is also named after him as Dixon's theory of ascent of sap. Today most of the workers believe in this theory.

28. (a) Sap will flow from high to low pressure areas in the plant. Adding sugars to the sap causes water to enter the phloem, thus increasing pressure. Removing sugars causes water to leave the phloem, thereby reducing pressure.

29. (c) The water potential is the sum of the osmotic potential (usually negative) and the pressure potential (usually positive), so WP = –0.24 + 0.16 = –0.08 mPa.

30. (a) Guttation is caused by root pressure. It is only important to the movement of water in quite small plants.

31. (d) As leaf cells lose water, they release abscisic acid, which causes potassium ions to leave guard cells, decreasing their pressure potential and closing stomata.

32. (b) As carbon dioxide is fixed into organic acids at night the pH decreases; metabolism of these acids during the day (with the carbon dioxide going into the citric acid cycle) causes the pH to increase.

33. (a) Choices b, c, and d are true for phloem transport only.

34. (c) Sugar molecules diffuse through the symplast of mesophyll cells, are pumped into the apoplast near a vein, re-enter the symplast of a companion cell, and then move into a sieve tube element.

35. (a) The intercellular spaces and cell walls of the plant constitute the apoplast.

36. (a) Transpiration causes tension.

37. (d) Abscisic acid, light, and carbon dioxide levels all regulate stomatal opening and closing.

38. (a) Stomatal regulators work by activating and deactivating the proton pump in guard cells.

39. (d) **40. (c)** **41. (c)** **42. (a)**

43. (b) The tension created by the evaporation of water from leaf surfaces generates a pull on the water column that moves water and nutrients up the xylem from the roots to the leaves.

44. (c) **45. (d)**