

PREVIOUS YEAR QUESTIONS

(Chapterwise)

CHAPTER NAME: ABSORPTION BY ROOTS - THE PROCESSES INVOLVED

SUMMARY POINTS

Key Concepts:

- **Absorption by Roots:** Process by which roots absorb water and minerals from the soil.
 - **Key Mechanisms Involved:**
 - **Osmosis:** Movement of water from a region of higher water concentration (soil) to a region of lower water concentration (root cells) through a selectively permeable membrane.
 - **Diffusion:** Movement of molecules from higher to lower concentration directly.
 - **Active Transport:** Uptake of mineral ions against the concentration gradient using energy (ATP).
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Main Topics Covered:

1. Adaptations for Absorption:

- **Root Hairs:** Unicellular, thin-walled outgrowths that increase surface area for absorption.
- **Cell Sap:** Root hair cells contain a hypertonic solution (cell sap) compared to soil water, aiding water absorption.

2. Pathways of Water Absorption:

- **Apoplast Pathway:** Movement through cell walls and intercellular spaces.
 - **Symplast Pathway:** Movement through cytoplasm and plasmodesmata.
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3. Water Movement Sequence (from Soil to Xylem):

- Soil Water → Root Hair → Epidermis → Cortex → Endodermis → Pericycle → Xylem
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4. Key Processes Explained:

- **Plasmolysis:** Shrinking of cytoplasm when a cell is placed in a hypertonic solution.
- **Deplasmolysis:** Recovery of plasmolyzed cells when placed in a hypotonic solution.
- **Root Pressure:** Pressure developed due to the continuous inward movement of water into root cells by osmosis.
- **Guttation:** Loss of water in liquid form from leaf margins due to root pressure.

	Common PYQ Trends: • Definitions: Osmosis, Diffusion, Active Transport, Plasmolysis, Guttation. • Diagram-Based: Labeling parts of a root hair cell and explaining water absorption pathways. • Biological Reasoning: Why excess fertilizer causes root hair cells to become flaccid. • Correcting Statements: e.g., "Cell sap of root hair is hypotonic" (should be hypertonic).
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Q.NO.: 1	The process in which water is lost from the margins of strawberry leaves is: A) Osmosis B) Imbibition C) Diffusion D) Guttation	YEAR [2024]
ANS.:	D) Guttation, because the water is released in drop form.	
TOPIC:	Page No.:	Ref. Link

Q.NO.: 2	Osmosis takes place when there is: A) a freely permeable membrane B) a cell wall C) a selectively permeable membrane D) an impermeable membrane	YEAR [2024]
ANS.:	C) a selectively permeable membrane. Osmosis requires a plasma membrane, or cell membrane, which is a selectively permeable membrane.	
TOPIC:	Page No.:	Ref. Link

Q.NO.: 3	Name the following: Unicellular outgrowths from the epidermis of roots.	YEAR [2024]
ANS.:	Root hairs	
TOPIC:	Page No.:	Ref. Link

Q.NO.: 4	Arrange and rewrite the terms in the group in the correct order to be in a logical sequence beginning with the term that is underlined: Soil water, Ascent of sap, Leaves, Transpiration	YEAR [2024]
ANS.:	1) Soil water, 2) Ascent of sap, 3) Leaves, 4) Transpiration (of water vapour).	
TOPIC:	Page No.:	Ref. Link

Q.NO.: 5	Mention two adaptations in roots for absorption of water from the soil.	YEAR [2024]
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ANS.:	1) Root hairs have a large surface area. The greater the surface area, the greater the absorption. 2) Root hairs contain cell sap, which is a less dilute solution than the surrounding soil water, which has more water, or a more dilute solution.	
TOPIC:	Page No.:	Ref. Link

Q.NO.: 6	Plasmolysis occurs when a plasmolyzed cell is placed in: A) Concentrated salt solution B) Tap water C) Concentrated sugar solution D) Hypertonic solution	YEAR [2023]
ANS.:	B) Tap water, because tap water is a hypotonic solution (it contains more water). The water will move from the area of higher concentration (the tap water) to the area of lower concentration (the plasmolyzed cell), causing deplasmolysis.	
TOPIC:	Page No.:	Ref. Link

Q.NO.: 7	Arrange the terms in the group in the correct order to be in a logical sequence beginning with the term that is underlined: Soil water, Root hair, Cortical cell, Xylem	YEAR [2023]
ANS.:	1) Soil water, 2) Root hair, 3) Cortical cell, 4) Xylem	
TOPIC:	Page No.:	Ref. Link

Q.NO.: 8	What is a semi-permeable membrane? Name the semi-permeable membrane present in a plant cell.	YEAR [2023]
ANS.:	A semipermeable membrane is a membrane that allows the passage of molecules selectively. It allows a solvent, such as water molecules, to pass through it freely but prevents the passage of solutes (like sugar or salt). The semi-permeable membrane in a plant cell is the cell membrane, or plasma membrane.	
TOPIC:	Page No.:	Ref. Link

Q.NO.: 9	The pressure developed in the roots due to continuous inward movement of water by cell to cell osmosis: A) Root pressure B) Wall pressure C) Turgor pressure D) Air pressure	YEAR [2021]
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ANS.:	A) Root pressure	
TOPIC:	Page No.:	Ref. Link

Q.NO.: 10	When a cell is placed in a ____ solution, it becomes plasmolyzed. A) Distilled water B) Hypertonic solution C) Isotonic solution D) Hypotonic solution	YEAR [2021]
ANS.:	B) Hypertonic solution (meaning that it has a higher concentration of solutes). Placing a cell in a hypertonic solution will cause water to leave the cell and the cell will become plasmolyzed. Placing it in a hypotonic solution will cause it to become plasmolysed.	
TOPIC:	Page No.:	Ref. Link

Q.NO.: 11	The shoot from a balsam plant is kept in a beaker containing Eosin solution. The pink color will be distinctly seen in the: A) Xylem B) Phloem C) Epidermis D) Cortex	YEAR [2021]
ANS.:	A) Xylem, because the xylem is responsible for carrying water and minerals up the plant through the stem (shoot).	
TOPIC:	Page No.:	Ref. Link

Q.NO.: 12	Mention the exact location of the following: Xylem tissue A) Conducts water and minerals in leaves B) Does not conduct water and minerals in leaves C) Conducts food and nutrition to roots D) Conducts food and nutrition to all parts of the plant	YEAR [2021]
ANS.:	A) Conducts water and minerals in leaves	
TOPIC:	Page No.:	Ref. Link

Q.NO.: 13	State the function of the following: Cell wall A) Regulates entry of solutes in plant cells B) Regulates entry of solutes in animal cells C) Gives rigidity and shape to plant cells D) Gives rigidity and shape to animal cells	YEAR [2021]
ANS.:	C) Gives rigidity and shape to plant cells. Note that animal cells do not have cell walls.	
TOPIC:	Page No.:	Ref. Link

Q.NO.: 14	Explain the following term: Diffusion	YEAR [2020]
ANS.:	Diffusion is the free movement of molecules of a substance from the region of their higher concentration to the region of their lower concentration when the two are in direct contact.	
TOPIC:	Page No.:	Ref. Link

Q.NO.: 15	Given below is a set of five terms. Rearrange the terms in correct order in a logical sequence beginning with the first word that is underlined: Root hair, Endodermis, Epidermis, Xylem, Cortex	YEAR [2020]
ANS.:	1) Root hair, 2) Epidermis, 3) Cortex, 4) Endodermis, 5) Xylem	
TOPIC:	Page No.:	Ref. Link

Q.NO.: 16	Differentiate between the following on the basis of what is mentioned in the brackets: Osmosis and Active transport (substances undergoing movement)	YEAR [2020]
ANS.:	In osmosis, there is movement of the solvent, or water. In active transport, there is movement of ions or salt particles.	
TOPIC:	Page No.:	Ref. Link

Q.NO.: 17	Give a suitable biological reason for the following statement: Root hairs become flaccid and droop when excess fertilizers are added to the moist soil around them.	YEAR [2019]
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ANS.:	Adding excess fertilizer to moist soil causes the concentration of solutes in the soil to increase and the concentration of water to decrease. Because osmosis occurs from an area of higher water concentration to an area of lower water concentration, water will leave the root hairs and enter the soil. This causes the root hairs to become flaccid. The plasma membrane withdraws itself from the cell wall in this process of plasmolysis.	
TOPIC:	Page No.:	Ref. Link

Q.NO.: 18	Correct the following statements by changing the underlined word: The cell sap of root hair is hypotonic.	YEAR [2018]
ANS.:	The cell sap of root hair is hypertonic . A hypertonic solution has a lower concentration of water.	
TOPIC:	Page No.:	Ref. Link

Q.NO.: 19	Correct the following statements by changing the underlined word: Xylem transports starch from the leaves to all parts of the plant body.	YEAR [2018]
ANS.:	Phloem transports starch from the leaves to all parts of the plant body.	
TOPIC:	Page No.:	Ref. Link

Q.NO.: 20	Give an appropriate term for the following: The free movement of any substance from a region of higher concentration to lower concentration when they are in direct contact.	YEAR [2018]
ANS.:	Diffusion	
TOPIC:	Page No.:	Ref. Link

Q.NO.: 21	Differentiate between the following pairs on the basis of what is indicated in the bracket: Hypertonic solution and Hypotonic solution (condition of a plant cell when placed in them)	YEAR [2018]
ANS.:	If a plant cell is placed in a hypertonic solution, it will become flaccid . If a plant cell is placed in a hypotonic solution, it will become turgid .	
TOPIC:	Page No.:	Ref. Link

Q.NO.: 22	Give a biological explanation for the following: Plants growing in fertilized soil are often found to wilt if the soil is not adequately watered.	YEAR [2018]
ANS.:	Fertilizer causes soil to become hypertonic, leading to exosmosis (water leaving the plant) and the cells losing their water content. As a result, the cells become flaccid and the plant wilts.	
TOPIC:	Page No.:	Ref. Link

Q.NO.: 23	A marine fish when placed in tap water bursts because of: A) Endosmosis B) Exosmosis C) Diffusion D) Plasmolysis	YEAR [2018]
ANS.:	A) Endosmosis The marine fish is in a hypertonic solution, while the tap water is hypotonic. Water will therefore move from the tap water into the fish, causing the fish to swell and burst.	
TOPIC:	Page No.:	Ref. Link

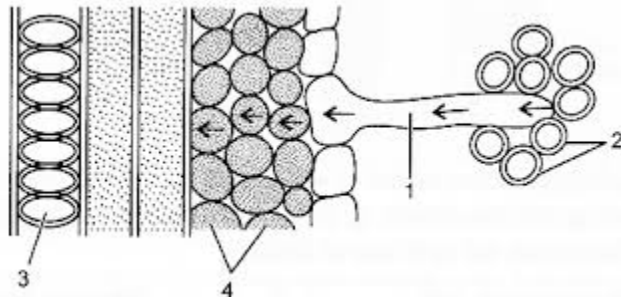
Q.NO.: 24	The statement given below is incorrect. Rewrite the correct statement by changing the underlined word of the statement: The free movement of solutes in and out of the cell takes place across the cell membrane.	YEAR [2018]
ANS.:	The free movement of solutes in and out of the cell takes place across the cell wall.	
TOPIC:	Page No.:	Ref. Link

Q.NO.: 25	Differentiate between the following pairs on the basis of what is mentioned in the bracket: Active transport and Diffusion (Significance in plants)	YEAR [2018]
ANS.:	Active transport is significant in plants because it allows for the uptake of nutrients, such as ions of nitrates, sulfates, potassium, zinc, and manganese, from the soil into the roots, even though the concentration of these nutrients is lower in the soil than in the plant. This requires the use of energy by the cell, in the form of ATP. Diffusion is significant for the intake of carbon dioxide through the stomata of leaves, which is needed for photosynthesis.	
TOPIC:	Page No.:	Ref. Link

Q.NO.: 26	A diagram is given that represents a plant cell after being placed in a strong sugar solution.	YEAR [2018]
	Q1: What is the state of the cell shown in the diagram? Q2: Name the structure that acts as a selectively permeable membrane. Q3: Label the parts numbered 1, 2, 3 and 4 Q4: How can the above cell be brought back to its original condition? Mention the scientific term for the recovery of the cell. Q5: State any two features of the above plant cell which is not present in an animal cell.	
ANS.:	1. Plasmolyzed 2. Cell membrane, or plasma membrane 3. 1) Cell wall, 2) Hypertonic solution (or strong sugar solution), 3) Cell membrane, 4) Nucleus 4. By placing the cell in a hypotonic solution, such as water. The scientific term for the recovery of the cell is deplasmolysis. 5. 1) Cell wall, 2) Large prominent vacuole	
TOPIC:	Page No.:	Ref. Link

Q.NO.: 27	Choose the correct answer from each of the four options given below: A plant cell may burst when: A) Turgor pressure equals wall pressure B) Turgor pressure exceeds wall pressure C) Wall pressure exceeds turgor pressure D) None of the above	YEAR [2016]
ANS.:	B) Turgor pressure exceeds wall pressure	

TOPIC:	Page No.:	Ref. Link
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Q.NO.: 28	A diagram is given representing part of the cross-section of a root in the root hair zone.  Q1: Name the parts indicated by the guidelines 1, 2, 3, and 4. Q2: Which is the process that enables the passage of water from the soil into the root hair? Q3: Name the pressure that is responsible for the movement of water in the direction indicated by the arrows (upward). Define it. Q4: Due to an excess of this pressure (root pressure), sometimes drops of water are found along the leaf margins of some plants, especially in the early mornings. What is this phenomenon called? Q5: Draw a well-labeled diagram of the root hair cell as it would appear if an excess of fertilizer is added to the soil close to it.	YEAR [2016]
ANS.:	1. 1) Root hair cell, 2) Soil water, 3) Xylem, 4) Cortex (or cortex cell). 2. Osmosis 3. Root pressure. It is built up due to cell-to-cell osmosis in the root tissue. As one cell becomes turgid, it presses on the next cell. The force of the flow of water increases inwards. 4. Guttation 5. The image should show a plasmolyzed cell where the cell contents have shrunk away from the cell wall.	
TOPIC:	Page No.:	Ref. Link

Q.NO.: 29	Name the following: The process of uptake of mineral ions against the concentration gradient using energy from the cell.	YEAR
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		[2015]
ANS.:	Active transport	
TOPIC:	Page No.:	Ref. Link

Q.NO.: 30	Given below is an example of a certain structure and its special functional activity. On a similar pattern, fill in the blanks with a suitable function. Example: Chloroplast: Photosynthesis, Xylem: _____	YEAR [2015]
ANS.:	Xylem: Ascent of sap	
TOPIC:	Page No.:	Ref. Link

Q.NO.: 31	Differentiate between the following pair on the basis of what is mentioned within the bracket: Diffusion and Osmosis (Definition)	YEAR [2015]
ANS.:	Diffusion is the free movement of molecules of a substance from the region of their higher concentration to the region of their lower concentration when the two are in direct contact. Osmosis is the movement of water molecules from a region of higher concentration to a region of lower concentration (or from a more dilute solution to a less dilute solution) through a semipermeable membrane.	
TOPIC:	Page No.:	Ref. Link

Q.NO.: 32	Explain the following term: Turgor pressure	YEAR [2015]
ANS.:	The pressure of the cell contents on the cell wall is called turgor pressure.	
TOPIC:	Page No.:	Ref. Link