

Multiple Choice Questions

1. **What is the primary function of root hairs?**
 - a) Photosynthesis
 - b) **Increasing surface area for absorption**
 - c) Storing starch
 - d) Anchoring the plant

2. **Which tissue layer regulates mineral entry into the vascular cylinder?**
 - a) Epidermis
 - b) Cortex
 - c) **Endodermis**
 - d) Pericycle

3. **Water moves into root hairs primarily via:**
 - a) Active transport
 - b) **Osmosis**
 - c) Diffusion
 - d) Transpiration

4. **The Casparian strip is composed of:**
 - a) Cellulose
 - b) **Suberin**
 - c) Lignin
 - d) Pectin

5. **Which pathway involves water moving through cell walls?**
 - a) Symplastic
 - b) **Apoplastic**
 - c) Transmembrane
 - d) Vascular

6. **Mineral uptake by roots often requires:**
 - a) **Active transport**
 - b) Osmosis
 - c) Transpiration pull
 - d) Diffusion

7. **The pericycle gives rise to:**
 - a) Root hairs
 - b) **Lateral roots**
 - c) Xylem
 - d) Phloem

8. **Root pressure is generated by:**
 - a) Transpiration
 - b) **Active transport of ions into the xylem**
 - c) Gravity
 - d) Photosynthesis

9. Which structure blocks the apoplastic pathway?

- a) Epidermis
- b) **Casparian strip**
- c) Cortex
- d) Root cap

10. The cohesion-tension theory explains:

- a) Mineral absorption
- b) **Water movement up the xylem**
- c) Root growth
- d) Sugar transport

11. Which factor directly drives transpiration?

- a) Root pressure
- b) **Evaporation from leaves**
- c) Active transport
- d) Mineral concentration

12. Ion-specific pumps are located in the:

- a) Root hairs
- b) **Plasma membrane of root cells**
- c) Xylem vessels
- d) Phloem sieve tubes

13. The cortex of roots primarily functions to:

- a) Absorb water
- b) **Store starch and facilitate diffusion**
- c) Produce lateral roots
- d) Protect the root tip

14. Which process requires ATP?

- a) Water absorption
- b) **Mineral ion uptake**
- c) Osmosis
- d) Transpiration

15. Root hairs are extensions of:

- a) Cortex cells
- b) **Epidermal cells**
- c) Endodermal cells
- d) Pericycle cells

16. The apoplastic pathway is blocked at the:

- a) Epidermis
- b) Cortex
- c) **Endodermis**
- d) Xylem

17. Which mechanism explains water movement from roots to leaves?
- a) Root pressure
 - b) **Cohesion-tension theory**
 - c) Active transport
 - d) Capillary action
18. Which ion is often a co-transporter in mineral uptake?
- a) Na^+
 - b) **H^+**
 - c) K^+
 - d) Ca^{2+}
19. The symplastic pathway involves movement through:
- a) Cell walls
 - b) **Cytoplasm and plasmodesmata**
 - c) Intercellular spaces
 - d) Xylem vessels
20. Guttation is caused by:
- a) Transpiration
 - b) **Root pressure**
 - c) Active transport
 - d) Photosynthesis

True/False Questions

1. **Root hairs are permanent structures.**
Answer: False (ephemeral, lasting days)
2. **The Casparian strip is part of the epidermis.**
Answer: False (endodermis)
3. **Water absorption requires energy.**
Answer: False (passive via osmosis)
4. **Minerals enter roots only through the symplastic pathway.**
Answer: False (apoplastic until endodermis)
5. **Transpiration pull is the only force moving water upward.**
Answer: False (root pressure contributes at night)
6. **The pericycle is part of the vascular cylinder.**
Answer: True
7. **Active transport of minerals lowers water potential in roots.**
Answer: True
8. **The cortex is a site of photosynthesis in roots.**
Answer: False
9. **Root pressure can cause guttation.**
Answer: True
10. **All minerals are absorbed passively.**
Answer: False (most require active transport)

11. The apoplastic pathway is faster than the symplastic pathway.

Answer: True

12. The endodermis has no role in mineral selectivity.

Answer: False (Casprian strip filters minerals)

13. Lateral roots originate from the pericycle.

Answer: True

14. Root cap protects the root tip during growth.

Answer: True

15. Sucrose is transported upward via xylem.

Answer: False (phloem transports sugars)

Short Answer Questions

1. Explain how the Casprian strip ensures selective mineral uptake.

Answer: The Casprian strip, a suberin barrier in the endodermis, forces water/minerals to cross cell membranes, allowing selective transport into the xylem.

2. Compare apoplastic and symplastic pathways.

Answer: Apoplastic—movement through cell walls; Symplastic—movement through cytoplasm/plasmodesmata.

3. Why is active transport critical for mineral absorption?

Answer: Minerals are often in lower soil concentrations; active transport uses ATP to move ions against gradients.

4. Describe how root pressure is generated.

Answer: Active ion transport into xylem lowers water potential, drawing water in by osmosis, creating pressure.

5. How does transpiration pull aid water movement?

Answer: Evaporation from leaves creates tension, pulling water upward via cohesive water molecules in xylem.

Fill-in-the-Blank Questions

1. The _____ pathway involves water movement through cell walls.

Answer: apoplastic

2. Root hairs are extensions of _____ cells.

Answer: epidermal

3. The _____ strip blocks apoplastic flow at the endodermis.

Answer: Casprian

4. Minerals enter root cells via _____ transport.

Answer: active

5. _____ pressure is responsible for guttation in plants.

Answer: Root