What is Xylem and Phloem Transport?

Worksheet

Xylem transports water and dissolved minerals upward from roots to leaves in one direction, while phloem transports sugars (food) made in leaves to all parts of the plant in either direction.

Questions

1. Which tissue transports water and minerals from roots to leaves?

A) Phloem
B) Xylem
C) Cambium
D) Epidermis

2. Phloem transport mainly carries

A) Water
B) Oxygen
C) Sugars made by photosynthesis
D) Minerals from soil

3. What is the driving force behind xylem water movement?

A) Active pumping by roots only
B) Transpiration pull (cohesion-tension)
C) Gravity alone
D) Muscle contraction

4. Which statement about phloem is true?

A) It consists of dead cells
B) It always transports downward
C) It can transport in either direction depending on source/sink
D) It only carries water

5. A tree loses a ring of bark (girdling) around its trunk. Predict what happens to the roots over time and explain why.

6. On a hot, sunny day, water evaporates rapidly from a plant's leaves. Explain how this affects xylem transport.

7. A plant is given radioactive-labeled sugar at a leaf (source). Where will the label appear over time, and through which tissue?

8. Define: What does xylem transport?

9. Define: What does phloem transport?

10. Define: Are xylem cells alive at maturity?

Answer Key

1. B) Xylem - Xylem carries water and minerals upward in one direction.

2. C) Sugars made by photosynthesis - Phloem transports the sugars produced in photosynthesis to where they're needed.

3. B) Transpiration pull (cohesion-tension) - Evaporation from leaves creates tension that pulls water up the xylem column.

4. C) It can transport in either direction depending on source/sink - Phloem flow direction depends on where sugar is produced (source) vs used/stored (sink).

5. Girdling removes the phloem (located just under the bark). Without phloem, sugars made in leaves cannot reach the roots. Roots slowly starve and die, even though water still moves up through the xylem.

6. Evaporation from leaf stomata is called transpiration. This creates negative pressure (tension) pulling water upward through the xylem. More transpiration means faster xylem water flow - this is the transpiration-cohesion-tension mechanism.

7. The leaf is a 'source' producing excess sugar. Sugar loads into phloem sieve tubes and moves via pressure flow to a 'sink' (e.g., growing root or fruit). The radioactive label will appear in sinks, transported through phloem, not xylem.

8. Water and dissolved minerals, one-way from roots to leaves.

9. Sugars (organic food) from source to sink, in either direction.

10. No - mature xylem vessels are dead, hollow tubes.