

# SOLUTIONS

## Unit 7: Transport in plants

### 7.1: Structure of transport tissues

- A**  
Cell 1 is a companion cell, which supports the phloem sieve tube element (Cell 2) in transporting sugars and other nutrients. These structures are part of the phloem tissue, involved in translocation in plants.
- C**  
The structure labeled "X" in the image is a phloem sieve tube element, identifiable by its perforated sieve plates, which allow the flow of nutrients between cells.
- D**  
Lignin in xylem makes the vessels impermeable to water and, along with cellulose, strengthens the walls to prevent collapse under pressure.
- C**  
In a sieve tube element, the cell wall and sieve plate are visible, but cytoplasm is minimal, and no mitochondria are present. This matches the structure shown in option C, which correctly labels the key features.
- B**  
Both xylem and phloem use mass flow for transport: xylem for water and minerals, phloem for nutrients.
- A**  
Lignin stains xylem, which supports the identification of Z as xylem and W as phloem. Xylem is typically located toward the center of the stem, while phloem is found toward the periphery.
- B**  
Pits in xylem vessel elements allow lateral movement of water into adjacent vessels. Options A, C, and D describe incorrect features for xylem vessels.
- B**  
Phloem sieve tube elements and companion cells are connected by plasmodesmata, allowing for the exchange of nutrients, signaling molecules, and other substances. This is essential for the transport of organic compounds, like sugars produced during photosynthesis, throughout the plant. In contrast, xylem vessel elements are dead, lignified cells that are stacked end-to-end, forming a continuous tube for efficient water transport. They don't require plasmodesmata because they're specialized for water transport and don't need cellular connections.
- D**  
In xylem vessel elements, adhesion plays a crucial role during transpiration, which is the process of water movement through a plant and its evaporation from aerial parts, such as leaves. Adhesion refers to the ability of water molecules to stick to the walls of the xylem vessels, which is facilitated by the surface tension of water and the narrowness of the tubes. When the vessel elements form a narrow tube (D), it enhances the adhesion of water molecules to the walls of the vessels, aiding in the upward movement of water against gravity.