

transport in plants

Why do plants require a transport system?

To ensure all cells receive a strong supply of the nutrients they require
Plants must be able to transport substances up their stem (against gravity)

Relate the structure of the xylem to its function

Long, continuous columns made of dead tissue allow transport of water
Contain pits, allowing water to move sideways between vessels
Thickened with a tough substance, providing structural support

Relate the structure of the phloem to its function

Sieve tube elements transport sugars around the plant
Companion cells designed for active transport of sugars into tubes
Plasmodesmata allow flow of substances between cytoplasm of different cells

Describe the structure & function of the vascular system in the roots

Consists of xylem & phloem
Xylem arranged in X shape to provide resistance against force
Surrounded by endodermis (water supply)

Describe the structure & function of the vascular system in the stem

Consists of xylem & phloem
Xylem on the inside of the bundle to provide support & flexibility, phloem on the outside
Layer of meristems cells that produce new xylem & phloem tissue when required

Describe the structure & function of the vascular system in the leaves

Consists of xylem & phloem
Forms the midrib & veins
Involved in transport & support

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Define transpiration

Evaporation of water from the leaves of a plant

Consequence of gas exchange; occurs when the plant opens the stomata to exchange oxygen & carbon dioxide

Factors that affect the rate of transpiration

Increased light, temperature & air movement increases rate

Increased humidity decreases rate

Waxy cuticle prevents it

How can we measure transpiration rate?

Potometer

Plant is based in a water-filled tube that contains air bubbles

Rate of transpiration is calculated by measuring movement of air bubbles over time

Define water potential as a mechanism of movement in plants

The tendency of water to move by osmosis from an area of high to low water potential

Pure distilled water has the highest water potential of zero

The basis by which water moves to the areas it is needed in plants

Explain what is meant by the apoplastic pathway

Method of osmosis through root hair cells

Water moves through the cell walls & intercellular spaces

Can only be used until water reaches the casparian strip

Explain what is meant by the simplastic pathway

Method of osmosis through root hair cells

Water moves through cytoplasm via plasmodesmata

Water must be actively transported into cells to begin this pathway

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Explain the cohesion - tension theory

Water molecules form hydrogen bonds with each other so stick together
Surface tension of water create sticking effect
As water is lost through transpiration, more can be drawn up the stem from the roots

5 adaptations of xerophytes that allow them to live in dry conditions

Small / rolled leaves, densely packed mesophyll, thick waxy cuticle, stomata often closed, hairs to trap moist air

4 adaptations of hydrophytes that allow them to live in wet conditions

Thin or absent waxy cuticle, stomata often open, wide & flat leaves, air spaces for buoyancy

Summarise the mechanism of translocation

Sucrose produced in leaves is loaded into sieve tube via active transport
Lowers water potential so water moves in from xylem
Assimilate move along sieve tubes to areas of lower hydrostatic pressure
Sucrose diffuses into surrounding cells where it's needed