

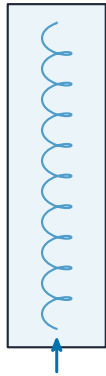
Exercise walk-through

8.1

Xylem and phloem

IGCSE Biology

Xylem and phloem



xylem

dead, hollow cells;
thick **lignin** walls

carries water +
minerals **up** only

also **supports**
the plant



phloem

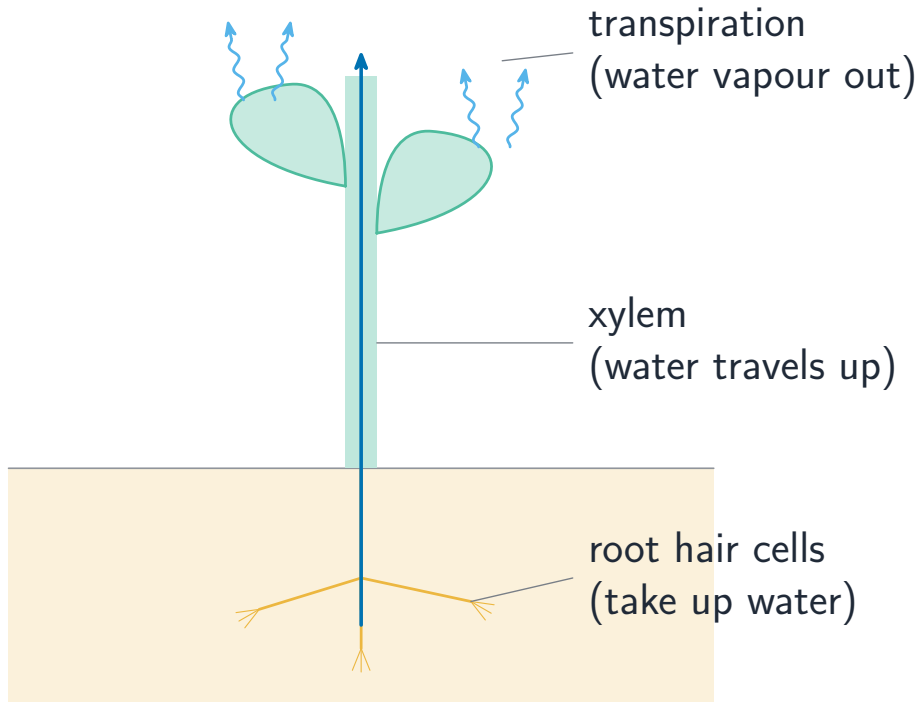
living cells;
sieve plates

carries sucrose +
amino acids

moves **both ways**

- **xylem** – carries water and **mineral ions** up from the roots, and gives the plant **support**.
- **phloem** – carries **sucrose** and **amino acids** to wherever they are needed.

Water uptake and pathway



- Water **evaporates** from the wet surfaces of the mesophyll cells into the **air spaces** inside the leaf.
- The water vapour then **diffuses** out of the leaf through the **stomata**.

How water gets in, and what happens when it runs out

root hair cells	long thin extensions giving an enormous surface area for ab-sorption
the pathway	root hair → root cortex → xylem → stem → leaf → evaporation from the mesophyll
showing it	stand a plant or a white flower in water containing a coloured stain ; the stain travels up the xylem and shows the route
the xylem tube	cells joined end to end with no walls across , making one long continuous pipe
forces of attraction	between water molecules pull the whole column up as water evaporates at the top
wilting	when water is lost faster than it is taken up, cells go soft and leaves and stems droop

Transpiration rate rises with **temperature**, **wind speed** and **light**, and falls with humidity. All four change how fast water leaves the leaf.

Exercises 2.1-2.3

2.1 State what the xylem transports.

[1]

2.2 State what the phloem transports.

[1]

2.3 State one substance carried by xylem and one carried by phloem.

[2]

Exercises 2.1-2.3

2.1 State what the xylem transports.

[1]

2.1

- xylem transports **water and mineral ions** (upward)

2.2 State what the phloem transports.

[1]

2.2

- phloem transports **sucrose and amino acids**

2.3 State one substance carried by xylem and one carried by phloem.

[2]

2.3

- xylem: **water** or mineral ions
- phloem: **sucrose** or amino acids

Exercises 2.4-2.5

2.4 Explain why xylem cells are dead and lignified.

[2]

2.5 State what is meant by a source and a sink in translocation.

[2]

Exercises 2.4-2.5

2.4 Explain why xylem cells are dead and lignified.

[2]

2.4

- dead and hollow with no end walls: a continuous tube with little resistance
- **lignin** strengthens the wall so the vessel does not collapse

2.5 State what is meant by a source and a sink in translocation.

[2]

2.5

- a **source** is where sucrose is made or released, e.g. a leaf
- a **sink** is where it is used or stored, e.g. a growing root tip

Exercise 3.1

3.1 Xylem vessels are well adapted to carry water because they are:

[1]

☐

A living cells full of cytoplasm

B dead, hollow tubes with lignin walls

C thin-walled and branched

D packed with chloroplasts

Exercise 3.1

3.1 Xylem vessels are well adapted to carry water because they are:

[1]

☐

A living cells full of cytoplasm

B dead, hollow tubes with lignin walls

C thin-walled and branched

D packed with chloroplasts

3.1 B

- xylem vessels are **dead, hollow tubes with lignin walls**
- A would block flow; C is phloem-like; D is mesophyll

Exercise 3.2 (a)

3.2 Xylem and phloem run through the plant.

(a) State the additional role of xylem (besides transport).

[1]

Exercise 3.2 (a)

3.2 Xylem and phloem run through the plant.

(a) State the additional role of xylem (besides transport).

[1]

(a)

- extra role of xylem: it **supports the plant**

Exercise 3.2 (b)

3.2 Xylem and phloem run through the plant.

(b) Explain how the structure of xylem suits carrying water.

[2]

Exercise 3.2 (b)

3.2 Xylem and phloem run through the plant.

(b) Explain how the structure of xylem suits carrying water.

[2]

(b)

- cells are **dead and hollow**, so water flows freely
- they join end to end into one continuous **lignified pipe**

Exercise 3.3 (a)

3.3 The diagram shows a transverse section through a plant stem, with the vascular bundles labelled.

(a) State where the xylem and the phloem are found in a stem, relative to each other.[2]

Exercise 3.3 (a)

3.3 The diagram shows a transverse section through a plant stem, with the vascular bundles labelled.

(a) State where the xylem and the phloem are found in a stem, relative to each other.[2]

(a)

- vascular bundles form a **ring**
- **xylem inside, phloem outside** each bundle

Exercise 3.3 (b)

3.3 The diagram shows a transverse section through a plant stem, with the vascular bundles labelled.

(b) Complete the table comparing xylem and phloem.

[4]

Feature	Xylem	Phloem
substances carried		
direction of transport		
living or dead cells		
end walls		

Exercise 3.3 (b)

3.3 The diagram shows a transverse section through a plant stem, with the vascular bundles labelled.

(b) Complete the table comparing xylem and phloem.

[4]

Feature	Xylem	Phloem
substances carried		
direction of transport		
living or dead cells		
end walls		

(b)

- carried: water and mineral ions / sucrose and amino acids
- direction: **upwards only** / **both directions**
- cells: **dead** / **living**
- end walls: **absent** / **sieve plates**

Exercise 3.3 (c)

3.3 The diagram shows a transverse section through a plant stem, with the vascular bundles labelled.

(c) Explain why translocation in the phloem can occur in two directions but transport in the xylem cannot. [3]

Exercise 3.3 (c)

3.3 The diagram shows a transverse section through a plant stem, with the vascular bundles labelled.

(c) Explain why translocation in the phloem can occur in two directions but transport in the xylem cannot. [3]

(c)

- phloem goes from **source to sink**
- which organ is source or sink **changes**, so direction changes
- xylem is pulled **up** by transpiration only

Exercise 3.3 (d)

3.3 The diagram shows a transverse section through a plant stem, with the vascular bundles labelled.

(d) A complete ring of bark is removed from around a tree trunk. Explain why sugars build up above the ring, and why the roots eventually die. [4]

Exercise 3.3 (d)

3.3 The diagram shows a transverse section through a plant stem, with the vascular bundles labelled.

(d) A complete ring of bark is removed from around a tree trunk. Explain why sugars build up above the ring, and why the roots eventually die. [4]

(d)

- the bark contains **phloem**; the ring cuts it, leaving xylem intact
- sucrose **accumulates above** the cut
- **no sucrose** reaches the roots
- root cells have no glucose for respiration and **die**

Exercise 3.3 (e)

3.3 The diagram shows a transverse section through a plant stem, with the vascular bundles labelled.

(e) Explain why the leaves do not wilt immediately after the bark is removed. [2]

Exercise 3.3 (e)

3.3 The diagram shows a transverse section through a plant stem, with the vascular bundles labelled.

(e) Explain why the leaves do not wilt immediately after the bark is removed. [2]

(e)

- **xylem** is deeper and has not been cut
- so **water still reaches the leaves**