

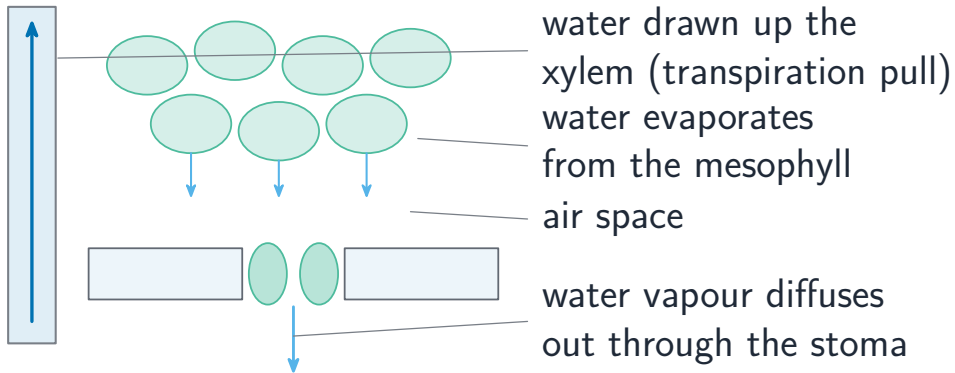
Exercise walk-through

8.3

Transpiration

IGCSE Biology

Transpiration



Transpiration is water loss from leaves:

- water **evaporates** from the mesophyll
- vapour **diffuses** out of the **stomata**

Faster when hotter, windier or drier.

How water rises

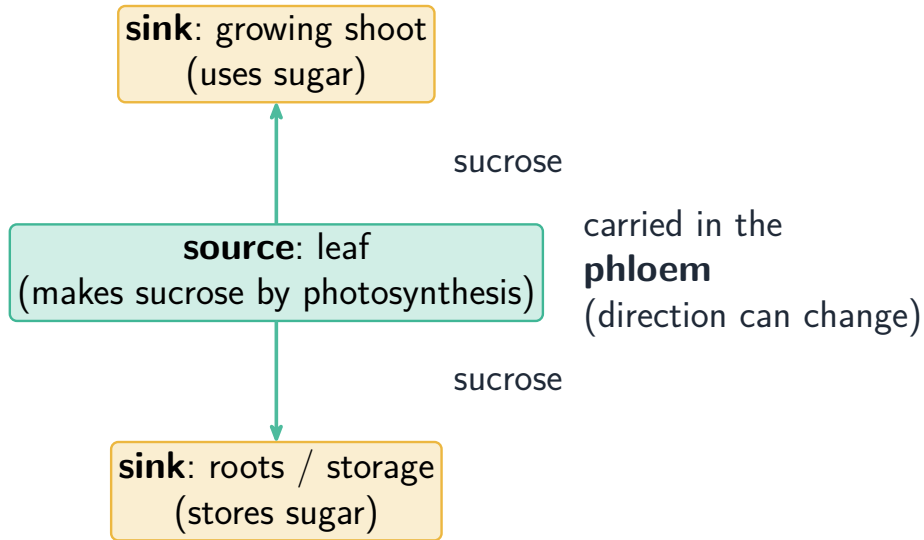
transpiration pull

water leaving the leaf
pulls more up behind it

one water column

molecules stick together; losing
water too fast → **wilting**

Translocation

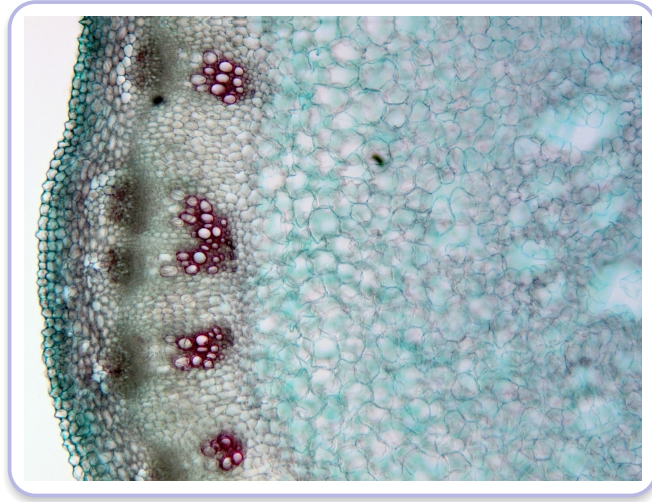


Translocation moves sucrose in the phloem from a **source** to a **sink**.

- source – makes/stores sugar (leaves)
- sink – uses/stores it (roots)

The direction can change.

Xylem structure (Supplement)



A stem in cross-section: the red-stained xylem sits in vascular bundles near the edge

Xylem and phloem, continued



A tree moves water up from its roots through xylem vessels.

Exercises 2.1·2.2

2.1 Define transpiration.

[1]

2.2 State the effect of higher wind speed on transpiration rate.

[1]

Exercises 2.1·2.2

2.1 Define transpiration.

[1]

2.1

- transpiration is the **loss of water vapour from the leaves**

2.2 State the effect of higher wind speed on transpiration rate.

[1]

2.2

- higher wind speed **increases** the transpiration rate

Exercise 3.1

3.1 Transpiration is fastest in conditions that are:

[1]

☐

A cold, still and humid

B hot, windy and dry

C cold and dark

D warm and very humid

Exercise 3.1

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[1]

☐

A cold, still and humid

B hot, windy and dry

C cold and dark

D warm and very humid

3.1 B

- transpiration is fastest when it is **hot, windy and dry**
- A, C and D all slow it

Exercise 3.2 (a)

3.2 Water vapour is lost from the leaves.

(a) Describe the two steps by which water leaves the leaf.

[2]

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(a) Describe the two steps by which water leaves the leaf.

[2]

(a)

- water **evaporates** from wet mesophyll cells into the air spaces
- water vapour **diffuses out through the stomata**

Exercise 3.2 (b)

3.2 Water vapour is lost from the leaves.

(b) Explain why a higher temperature increases the rate of transpiration.

[2]

Exercise 3.2 (b)

3.2 Water vapour is lost from the leaves.

(b) Explain why a higher temperature increases the rate of transpiration.

[2]

(b)

- higher temperature makes water **evaporate faster**
- so more **diffuses out**

Exercise 3.3

3.3 Explain how the transpiration pull moves water up the xylem.

[2]

Exercise 3.3

3.3 Explain how the transpiration pull moves water up the xylem.

[2]

3.3

- as water leaves the leaf it **pulls more water up** behind it
- water molecules stick together and are drawn up the xylem as a **column**

Exercise 3.4 (a)

3.4 A student measured the mass lost by a leafy shoot in four conditions, each for one hour.

Condition	Mass lost / g
A still air, 20 °C	1.2
B moving air (fan), 20 °C	2.8
C still air, 30 °C	2.1
D still air, 20 °C, in a plastic bag	0.3

(a) Explain the result for each of **B**, **C** and **D** compared with **A**.

[6]

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(a) Explain the result for each of **B**, **C** and **D** compared with **A**.

[6]

(a)

- **B**: moving air blows vapour away, keeping the gradient **steep**
- **C**: higher temperature gives more energy, so evaporation and diffusion are **faster**
- **D**: the bag traps vapour, so the gradient is almost gone and **almost no water leaves**

Exercise 3.4 (b)

3.4 A student measured the mass lost by a leafy shoot in four conditions, each for one hour.

Condition	Mass lost / g
A still air, 20 °C	1.2
B moving air (fan), 20 °C	2.8
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(b) State why measuring mass loss is a fair way to measure the rate of transpiration. [2]

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(b)

- almost all the mass lost is **water leaving through stomata**
- so mass lost per hour measures **transpiration**

Exercise 3.4 (c)

3.4 A student measured the mass lost by a leafy shoot in four conditions, each for one hour.

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(c) Describe how water moves from the soil, through the plant, to the air.

[3]

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[3]

(c)

- absorbed by root hairs by **osmosis**
- travels up the stem in the **xylem**
- evaporates from mesophyll and **diffuses out through stomata**

Exercise 3.4 (d)

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(d) State **two** variables the student had to keep the same for the comparison to be fair.[2]

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(d)

- same shoot / same leaf area
- same time and **light intensity** (stomata)