

## Transport in Plants

IGCSE Biology ■ Topic 8

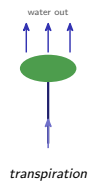
IGCSE Biology



Transport in Plants

### What we will cover

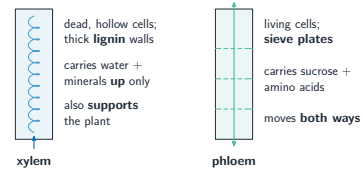
- 1 Xylem & phloem
- 2 Water uptake & pathway
- 3 Transpiration
- 4 How water rises
- 5 Translocation



# 1 Tissues and water

Transport in Plants  
└ Tissues and water

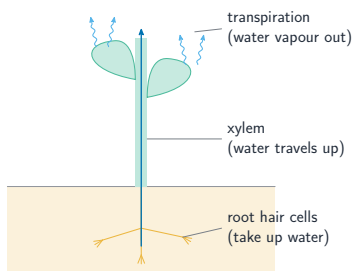
### Xylem and phloem



- **xylem** 木质部 – carries water and **mineral ions** 矿物质离子 up from the roots, and gives the plant **support** 支撑.
- **phloem** 韧皮部 – carries **sucrose** 蔗糖 and **amino acids** 氨基酸 to wherever they are needed.

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└ Tissues and water

### Water uptake and pathway



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

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

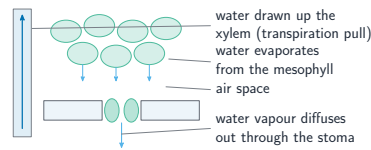
|                                 |                                                                                                                                            |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| <b>root hair cells</b> 根毛细胞     | long thin extensions giving an enormous <b>surface area</b> 表面积 for absorption                                                             |
| <b>the pathway</b>              | root hair → root cortex → xylem → stem → leaf → evaporation from the mesophyll                                                             |
| <b>showing it</b>               | stand a plant or a <b>white flower</b> in water containing a coloured <b>stain</b> 染色剂; the stain travels up the xylem and shows the route |
| <b>the xylem tube</b>           | cells joined end to end with <b>no walls across</b> , making one long continuous pipe                                                      |
| <b>forces of attraction</b> 吸引力 | between water molecules pull the whole column up as water evaporates at the top                                                            |
| <b>wilting</b> 萎蔫               | 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** 风速 and **light**, and falls with humidity. All four change how fast water leaves the leaf.

# 2 Transpiration

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└ Transpiration

## Transpiration



**Transpiration** 蒸腾作用 is water loss from leaves:

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

Faster when hotter, windier or drier.

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└ Transpiration

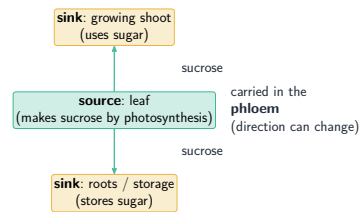
## How water rises

**transpiration pull** 蒸腾拉力  
water leaving the leaf  
pulls more up behind it

**one water column**  
molecules stick together; losing  
water too fast → **wilting** 萎蔫

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└ Transpiration

## Translocation



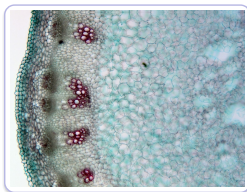
**Translocation** 转运 moves sucrose in the phloem from a **source** 源 to a **sink** 库.

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

The direction can change.

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└ Transpiration

## Xylem structure (Supplement)



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

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└ Transpiration

## Xylem and phloem, continued



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

## Exam tips

- Xylem: water and mineral ions, upward only, plus support – its cells are dead, with thick lignin walls. Phloem: sucrose and amino acids, in living cells.
- Learn the water pathway: root hair cell → cortex → xylem → mesophyll.
- Transpiration = evaporation from the mesophyll, then diffusion out of the stomata. It is faster when hotter, windier or drier.
- Water rises by the **transpiration pull**; the water molecules hold together as a column.
- Translocation goes from a **source** (where sugar is made or stored) to a **sink** (where it is used). The direction can change with the season.

# 3

## Recap

## Worked example – what changes transpiration?

A potometer bubble moves faster when a fan is switched on. Explain why.

- Transpiration is water **evaporating** from the leaves and diffusing out of the stomata.
- Still air lets water vapour **build up** just outside the leaf.
- The fan blows that vapour away, keeping the **concentration gradient steep**.
- Faster diffusion out ⇒ faster water uptake ⇒ **the bubble moves faster**.

Wind, heat and dry air all **speed up** transpiration; high humidity slows it. Each works by changing the **water-vapour gradient** outside the leaf.

## Topic 8 – key takeaways

### 1 Xylem

water & minerals up; dead, lignified

### 2 Phloem

sucrose to sources & sinks; living

### 3 Transpiration

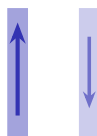
evaporate then diffuse out of stomata

### 4 Pull

transpiration pull draws up a water column

## Check yourself

- 1 Which tissue carries water up the plant?
- 2 Where does water evaporate in a leaf?
- 3 What drives water up the xylem?
- 4 What does translocation move?



**Answers** 1. xylem 2. the mesophyll cells 3. the transpiration pull 4. sucrose & amino acids