

7 Transport in plants – Part 2

Name: _____ Class: _____ Date: _____

Vocabulary 词汇

Write each word three times. 把每个单词抄写三遍。

English	中文	Write it 3 times (English)		
xylem	木质部	_____	_____	_____
phloem	韧皮部	_____	_____	_____
Transpiration	蒸腾作用	_____	_____	_____
evaporates	蒸发	_____	_____	_____
diffuses	扩散	_____	_____	_____
stomata	气孔	_____	_____	_____
hydrogen bonds	氢键	_____	_____	_____
cohesion	内聚力	_____	_____	_____
tension	张力	_____	_____	_____
xerophyte	旱生植物	_____	_____	_____
adapted	适应	_____	_____	_____
cuticle	角质层	_____	_____	_____
Translocation	运输	_____	_____	_____
sucrose	蔗糖	_____	_____	_____
source	源	_____	_____	_____

English	中文	Write it 3 times (English)		
sink	库	_____	_____	_____
active transport	主动运输	_____	_____	_____
water potential	水势	_____	_____	_____
pressure	压力	_____	_____	_____
mass flow	集流	_____	_____	_____

Recall

From Part 1 you know **xylem** 木质部 carries water up and **phloem** 韧皮部 carries food. Here we see what pulls the water up and how the food is moved.

- Leaves lose water vapour — you saw this at IGCSE.
- Water molecules stick together, which turns out to be very important.

New ideas

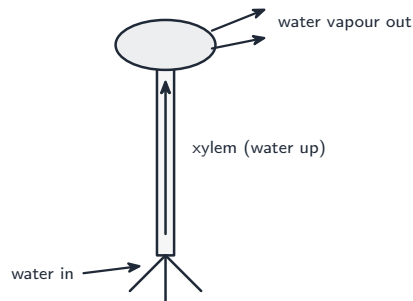
Read these first, then do the Practice.

■ 1 Transpiration

Transpiration 蒸腾作用 is the loss of water vapour from a plant. Water **evapo-rates** 蒸发 from wet cell surfaces inside the leaf, then **diffuses** 扩散 out through the **stomata** 气孔.

This loss at the top pulls a continuous column of water **up** the xylem:

- water molecules attract each other by **hydrogen bonds** 氢键, so they stick to-gether — this is **cohesion** 内聚力.
- the whole column is pulled up under **tension** 张力 (the cohesion–tension idea).



■ 2 Xerophytes

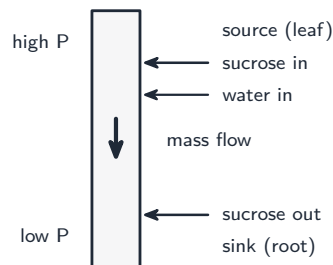
A **xerophyte** 旱生植物 is a plant **adapted** 适应 to dry places. Its leaves cut water loss with a thick waxy **cuticle** 角质层, **stomata** sunk in pits, hairs that trap moist air, and leaves that can roll up.

■ 3 Translocation (moving sugars)

Translocation 运输 carries sugars (**sucrose** 蔗糖) in the phloem from a **source** 源 to a **sink** 库:

- a **source** is where sugar is made or released (e.g. a leaf).
- a **sink** is where it is used or stored (e.g. a growing root).

Companion cells load sucrose into the sieve tube by **active transport** 主动运输. This lowers the **water potential** 水势, so water enters and raises the **pressure** 压力. Sap then flows from high pressure (source) to low pressure (sink) — this is **mass flow** 集流.



Watch out: transpiration *pulls* water up the xylem by cohesion–tension (no energy used). Translocation in the phloem *actively* loads sugars and moves them source → sink by mass flow (this *does* use energy).

Practice

Try these in order.

7.1 Define transpiration.

[1]

7.2 Describe how water vapour leaves a leaf, using the words *evaporate*, *stomata* and *diffuse*.

[2]

7.3 Water molecules stick together as they move up the xylem. (a) Name this sticking together. (b) Name the force that holds the molecules together.

[2]

7.4 State two ways a xerophyte leaf reduces water loss.

[2]

7.5 In translocation, explain the difference between a *source* and a *sink*.

[2]

7.6 Loading sucrose into a sieve tube causes water to enter it. Explain why.

[2]

7.7 Challenge. Water rises to the top of a tall tree with no pump. Explain how transpiration and cohesion make this possible. [2]
