

7 Transport in plants

1 All of the following statements are true but which one is the most precise?

Water is conducted through plant stems in

- (a) the xylem, (b) vascular bundles, (c) vessels, (d) veins.

2 Which of the following statements is the most accurate?

- (a) Food can travel up the stem in the phloem.
(b) Food can travel down the stem in the phloem.
(c) Food can travel up or down the stem in the phloem.
(d) Food can travel up or down the stem in the xylem.

3 Roots have no chlorophyll and grow in darkness. So how do roots obtain their food?

4 Which of the following conditions is least likely to increase the rate of transpiration in a plant?

- (a) a rise in temperature (c) increased air movement
(b) an increase in humidity (d) increased sunlight

5 Which of the following statements are true of transpiration

- (a) it draws water up the stem
(b) it draws dissolved salts up the stem
(c) it draws food up the stem
(d) it has a cooling effect on the leaves
(e) it speeds up photosynthesis?

6 Osmosis and transpiration both play a part in the movement of water through a plant. Which of these two processes makes the greater contribution to the movement of water up the trunk of a tree?

7 Which of the following statements are true?

A potometer is an apparatus which can be used to:

- (a) measure the rate of water uptake in a shoot
(b) measure the rate of transpiration in a shoot
(c) measure the rate of photosynthesis in a shoot
(d) compare rates of transpiration in different conditions

8 Most of the water taken up by a plant passes through it and is evaporated to the atmosphere. What use is made of the tiny fraction of this water which is retained by the plant?

9 A student set up a potometer in the laboratory and measured the rate of movement of water in the capillary. An average of four readings gave a rate of 50mm per minute. The apparatus was then taken outside, where there was a light breeze. Four more readings were taken without delay. The average of these readings was 130 mm per minute. The student concluded that exposure of the shoot to rapid air movement had increased the rate of transpiration.

Criticise the design of the experiment and the student's conclusions.

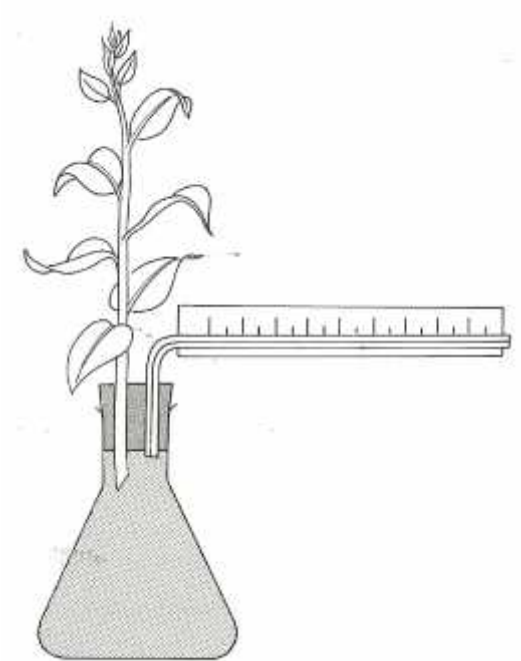
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10 The drawing on the right represents a design for a potometer.

Criticise the design and practicability of the apparatus.

11 A pot plant was watered and the pot enclosed in a plastic bag tied securely round the base of the stem. The plant was weighed at 9 a.m. and 4 p.m. During this time it lost 32g in weight.

- From these results, what was the plant's rate of transpiration?
- Why might this calculated rate be slightly inaccurate (i) in daylight, (ii) in darkness?
- What was the point of (i) watering the plant, (ii) enclosing the pot in a plastic bag?



7 Transport in plants - answers

1 The most precise statement is (c).

2 The most accurate statement is (c). Statements (a) and (b) are correct but incomplete. Statement (d) is wrong.

3 Food made in the leaves is transported to the roots in the phloem of the vascular bundles

4 (b) An increase in humidity is likely to slow down the rate of transpiration.

5 Transpiration (a) draws water and (b) dissolved salts up the stem, and also (d) has a cooling effect on the leaves.

6 In a mature tree (in full leaf) transpiration makes by far the greater contribution to water movement through the trunk.

7 Statements (a), (b) and (d) are correct.

8 The water retained by a plant is used for photosynthesis and other chemical reactions. It is also used for maintaining cell turgor.

9 By taking the second set of readings 'without delay', the student did not allow time for a new rate to become established. The student should either have waited for 5 minutes or, better, kept taking readings until four of them were nearly the same.

When the apparatus was taken outside, several variables were changed, e.g. light intensity, temperature, humidity and air movement. There is no way of knowing which of these was contributing to the increased transpiration rate. It would have been better to vary just one condition while remaining in the laboratory, e.g. moving the apparatus from shade to sunlight.

10 The large volume of water in the conical flask, connected to a narrow capillary will behave like a giant thermometer. Small changes in temperature will produce large movements in the water column.

There is no way of re-setting the water column.

The cork will have to be removed and the apparatus set up again each time a new reading is wanted.

11 (a) The plant lost 32g in 7 hours, so its rate of transpiration was 4.6g per hour.

(b) (i) In daylight, the weight loss due to transpiration will be reduced by a gain in weight resulting from photosynthesis.

(ii) In darkness some of the decrease in weight will be due to the loss of water and carbon dioxide produced by respiration.

(c) (i) If the plant had been short of water, this might have restricted the rate of transpiration.

(ii) The plastic bag prevented evaporation taking place from the pot or the soil. Had this evaporation not been prevented, the weight loss could not have been attributed solely to transpiration.