



The National Orthodox School / Shmaisani

Subject: Biology

worksheet : Transpiration

Name: *Answer key*

Date: **Grade 9 IB**

Ecologists study plants and animals in their natural environment. Some ecologists inserted probes into the water-conducting tissue in trees, as shown in Fig. 4.1. The ecologists measured the time taken for water to move up from probe 1 to probe 2.

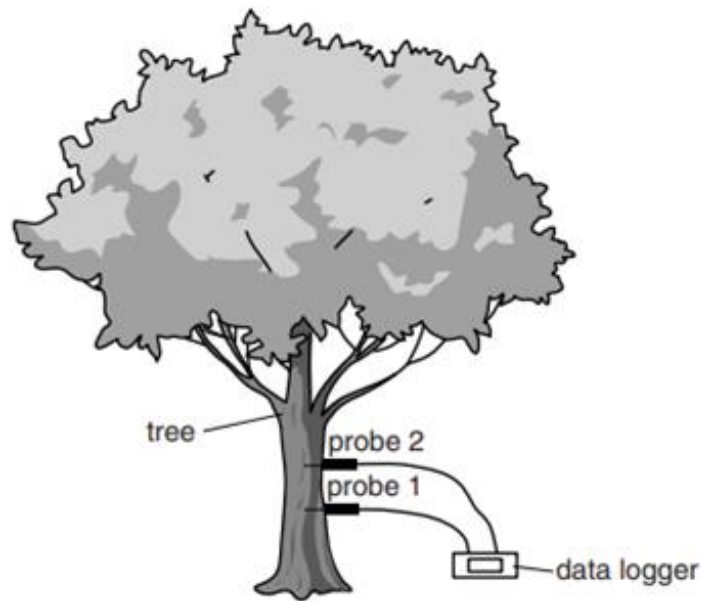


Fig. 4.1

(a) (i) Name the water-conducting tissue into which the two probes were inserted.

xylem

(ii) Describe how the structure of this water-conducting tissue is adapted to its function.

cell walls are waterproof / no water leaks out;
long / hollow / no cytoplasm / no organelles / no end walls; water passes through easily /



(b) Explain the mechanism of water movement from the roots up the tree to the leaves.

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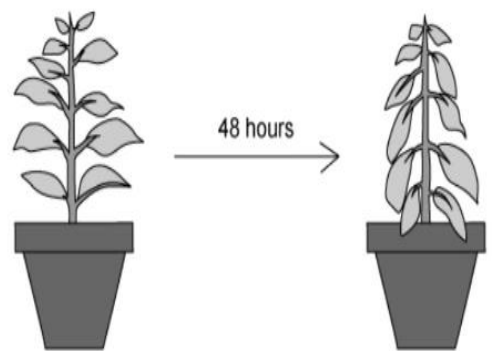
osmosis into leaf cells;
continuous column of water;
cohesion of water molecules / described;
adhesion of water to, cell wall / xylem;
water evaporates, into airspaces (in mesophyll);
water (vapour), diffuses / passes, out through
stomata;

Question 2 :

What has caused the plant's appearance to change?

Which process causes this change?

- A Water loss by translocation is greater than water uptake
- B Water evaporating from the leaves by translocation
- C Water loss by transpiration is greater than water uptake
- D Water loss from the leaves by osmosis



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Which order below is correct in describing the pathway of water as it travels from the roots through a plant?

- A** Root hair cell → xylem → mesophyll cells → air space → stomata
- B** Root hair cell → xylem → air spaces → mesophyll cells → stomata
- C** Root hair cell → mesophyll cells → phloem → stomata
- D** Root hair cell → cortex cells → mesophyll cells → xylem → stomata

Which of the following is a correct explanation of the process of translocation?

- A** The movement of mineral ions through the xylem of a plant
- B** The movement of sucrose and amino acids through the phloem from a source to a sink
- C** The unidirectional movement of sucrose and amino acids through the phloem.
- D** The movement of sucrose and amino acids through the phloem from a sink to a source

The xylem has specific adaptations to allow it to transport water and mineral ions from the roots of a plant to the leaves as a result of transpiration.

Which processes produce the adaptations in xylem vessels to allow the continuous flow of water?

	Cells walls break down between adjacent cells	Cytoplasm and organelles removed from each cell
A	X	X
B	✓	✓
C	X	✓
D	✓	X

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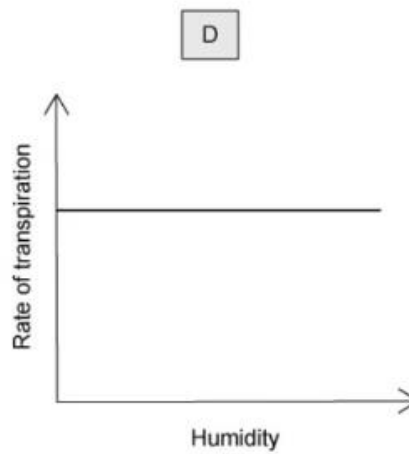
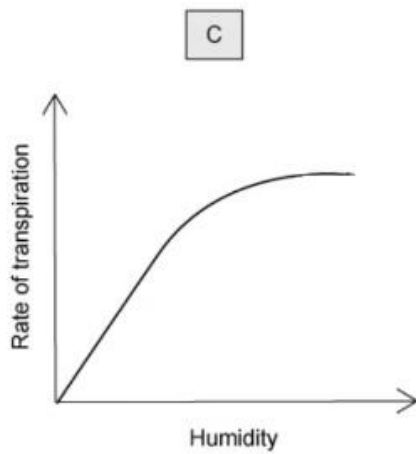
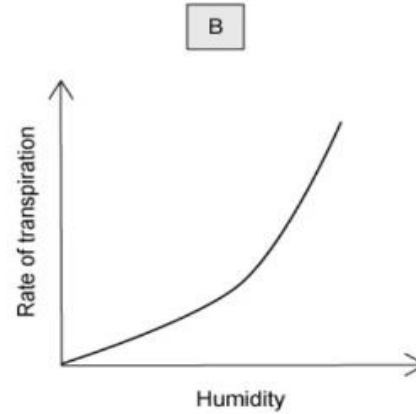
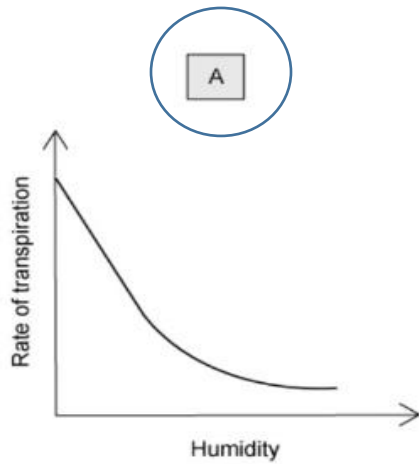


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Which of the following graphs shows most clearly what would happen to the rate of transpiration as humidity decreases?



Which of the following processes are involved in the loss of water from the leaves of plants?

- 1 diffusion
- 2 osmosis
- 3 condensation
- 4 evaporation

A 1 and 3

B 1 only

C 4 only

D 1 and 4

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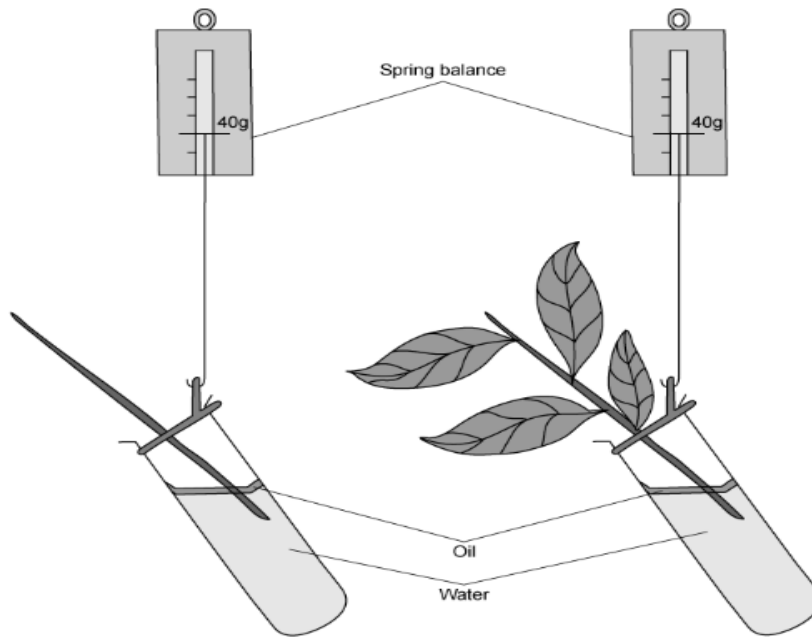


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The diagram below shows two shoots at the start of an experiment set up by a group of students.



What are the most likely readings on the spring balances after four days?

	Spring balance readings / g	
	shoot A	shoot B
A	40	40
B	40	34
C	34	40
D	34	34

Question 2 :

- a) Fig. 3.1 shows a photomicrograph of a section of a root.

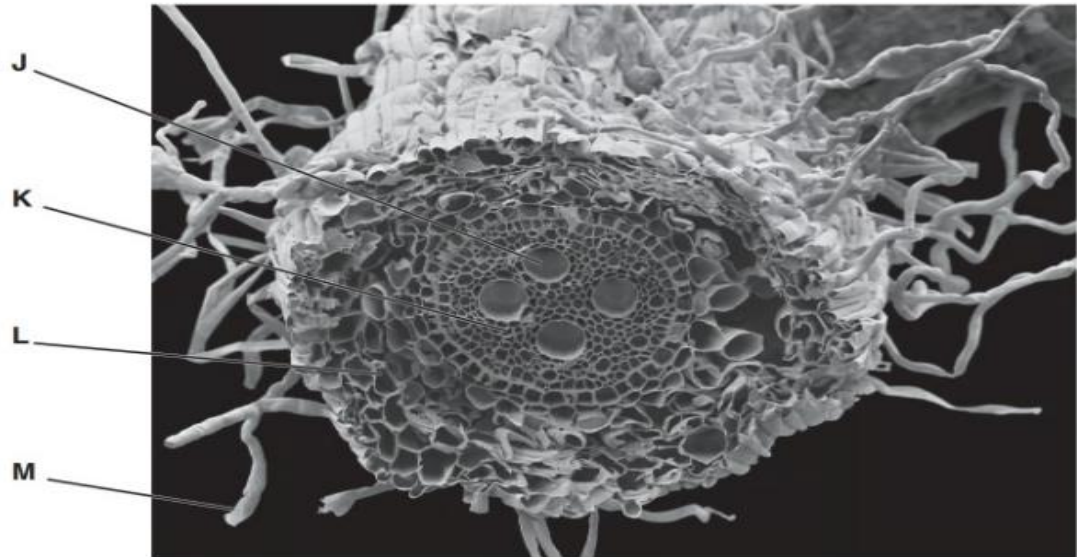


Fig. 3.1

Structure **J** is a xylem vessel.

The xylem vessels conduct water from the roots to the stems.

State the features of xylem vessels that enable them to conduct water.

cell walls are waterproof (lignin) / no water leaks out;
long / hollow / no cytoplasm / no organelles / no end walls; water passes through easily /

b) Complete table 7.1 by

- stating **two** environmental conditions that affect the rate of transpiration
- stating how a **decrease** in each environmental condition affects the rate of transpiration

Table 7.1

Environmental condition	Effect of a decrease on the rate of transpiration
temperature	decrease in transpiration rate
light	decrease in transpiration rate

Question 3 :

Describe **and** explain how a reduced concentration of water vapour in the air would increase the movement of water through crop plants.

- Increased rate of transpiration;

This is because...

- The concentration of water vapour is greater inside the leaf than outside;
- More water vapour diffuses out of the leaf / the rate of diffusion of water vapour out of the leaf increases;
- (Diffusion occurs) through the stomata;
- More water moves up the xylem / due to transpiration pull (to replace the water lost at the stomata by transpiration);

Question 4 :

A student investigated the effect of temperature on water uptake in celery stalks.

Water is transported in the xylem tissue in plant stems.

Step 1 One celery stalk was placed into a beaker containing **warm** red stain.
Another celery stalk was placed into a beaker containing **cool** red stain.

This is shown in Fig 1.1.

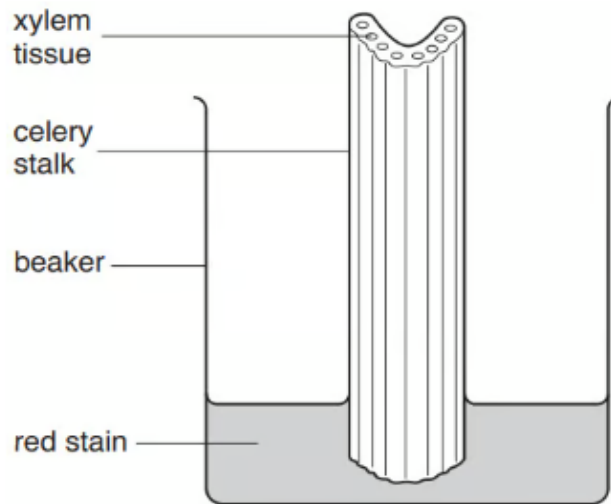


Fig. 1.1

Step 2 Both celery stalks were left in the red stain for 10 minutes.

Step 3 After 10 minutes the celery stalks were removed from the red stain.

Step 4 A 5 mm section was cut from the end of the celery stalk which had been in the warm red stain, as shown in Fig. 1.2.

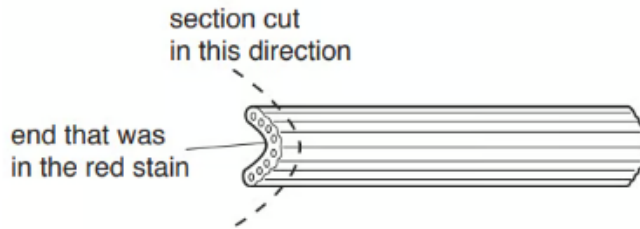
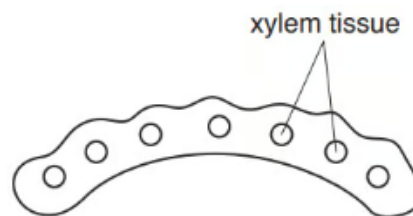


Fig. 1.2

Step 5 The section was inspected for the presence of the red stain in the xylem tissue in the celery stalk, as shown in Fig. 1.3.



Step 6 If the red stain was visible in the cut section, another 5 mm section was cut and the process repeated until no red stain was visible in the cut section. This allowed the student to estimate how far the red stain had moved up the celery stalk.

Step 7 Steps 4 to 6 were repeated for the celery stalk which had been in the **cool** red stain.

(a) (i) State **one** safety precaution that should be taken while carrying out this method.

[1]

(ii) The student's results are shown in Fig. 1.4.

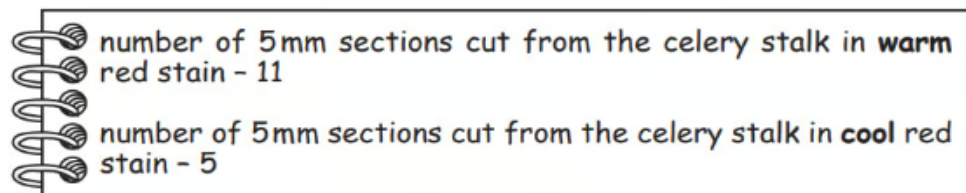


Fig. 1.4

Prepare a table and record your results in your table, in the space provided.
Your table should include:

- the temperature (cool or warm) of the red stain
- the number of sections that were stained in 10 minutes
- the total distance moved by the red stain in 10 minutes.

Temperature	Number of sections stained in 10 minutes	Total distance moved by the stain/mm
Warm	10	45 – 50
Cool	4	15 – 20

State a conclusion for these results.

The higher the temperature the faster the stain / water moves

(b) State **two** variables which were kept constant in this experiment.

length / concentration of stain / time / size of pieces

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