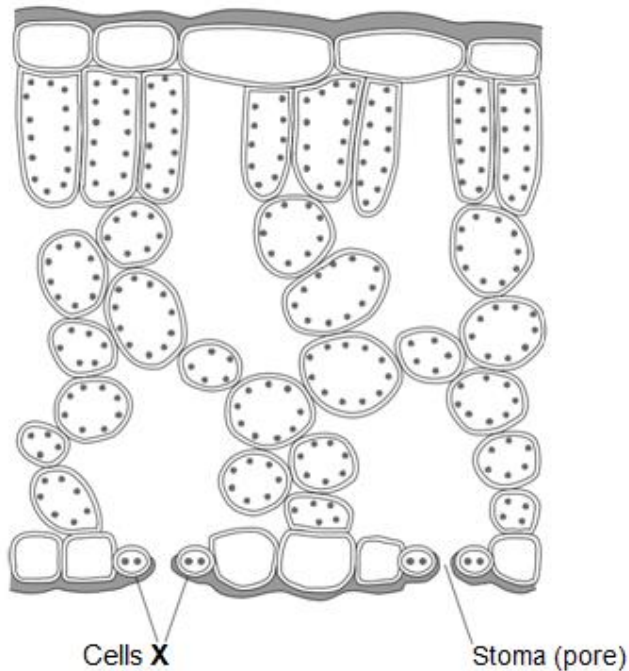


Transpiration 2

Q:1 The diagram shows a section through a plant leaf.



(a) The cells labelled X surround a stoma (pore).

Draw a ring around the correct answer to complete the sentence.

alveoli.

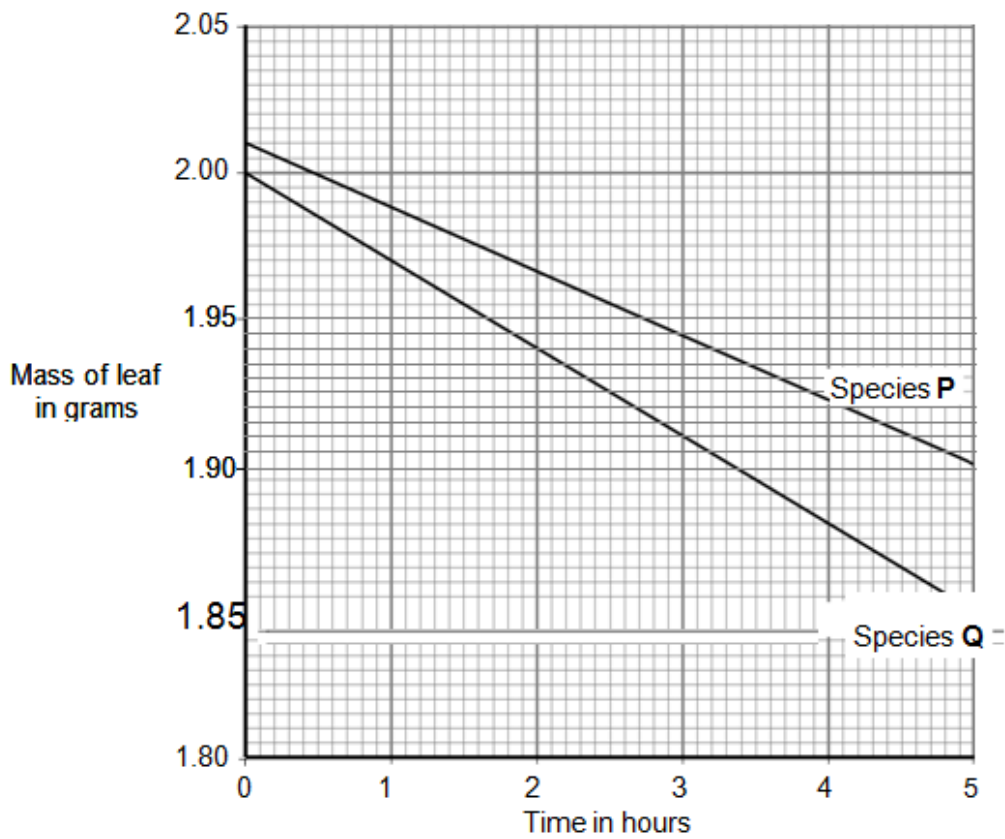
Cells X are called guard cells.

villi.

(1 mark)

(b) Water vapour is lost from leaves. Water loss causes a leaf to lose mass.

The graph shows how the masses of leaves from two plant species, P and Q, changed over several hours. Both leaves were kept in the same conditions.



(b) (i) What was the mass of the leaf of species Q at 0 hours? _____ grams

(1 mark)

(b) (ii) What was the difference between the mass of the leaf of species P and the mass of the leaf of species Q after 5 hours?

_____ grams

(1 mark)

(b) (iii) The leaf of species Q lost water at a faster rate than the leaf of species P. Suggest one reason why.

(1 mark)

(b) (iv) Which weather conditions would cause the greatest rate of loss of mass for both species P and species Q?

Tick (☑) one box in the table.

Weather conditions		Tick (✓)
Still air or wind	Temperature in °C	
Wind	30	
Still air	30	
Wind	20	

(1 mark)

(c) Draw a ring around the correct answer to complete the sentence.

In very hot, dry conditions, the stomata close.

This is to prevent

- anaerobic respiration.
- breathing.
- wilting.

(1 mark)

Q:2 Plants exchange substances with the environment.

(a) Plant roots absorb water mainly by osmosis.

Plant roots absorb ions mainly by active transport.

Explain why roots need to use the two different methods to absorb water and ions.

(4 marks)

(b) What is meant by the transpiration stream?

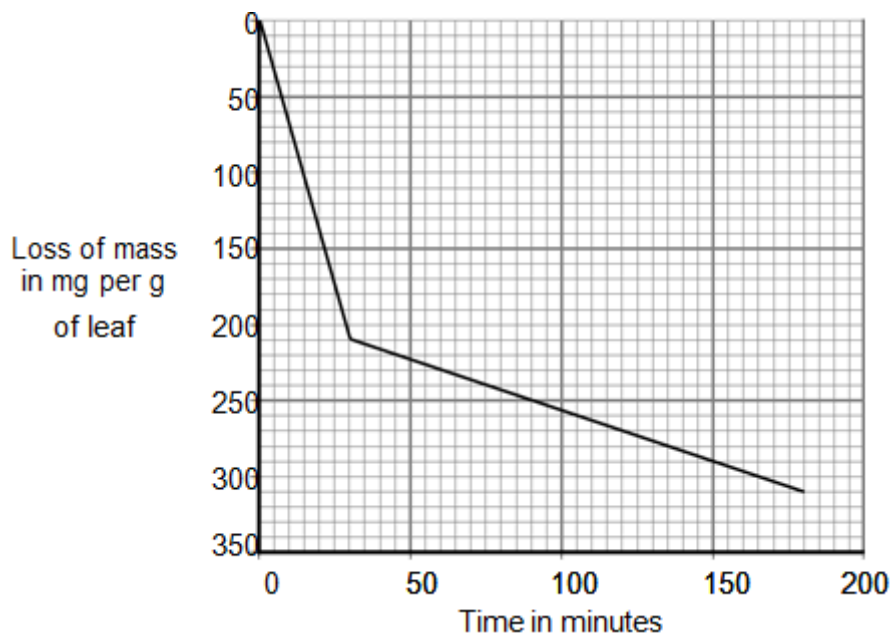
(3 marks)

(c) Students investigated the loss of water vapour from leaves.

The students:

- ☐ cut some leaves off a plant
- ☐ measured the mass of these leaves every 30 minutes for 180 minutes.

The graph shows the students' results.



(c) (i) The rate of mass loss in the first 30 minutes was 7 milligrams per gram of leaf per minute. Calculate the rate of mass loss between 30 minutes and 180 minutes.

Rate of mass loss = _____ milligrams per gram of leaf per minute

(2 marks)

(c) (ii) The rate of mass loss between 0 and 30 minutes was very different from the rate of mass loss between 30 and 180 minutes.

Suggest an explanation for the difference between the two rates.

(2 marks)

Q:3 Substances are transported through plants.

(a) Use the correct answer from the box to complete each sentence.

capillary guard cells phloem
stomata transpiration xylem

(a)(i) Water is transported from the roots to the stem of a plant in the _____

[1 mark]

(a) (ii) Dissolved sugars are transported through the plant in the _____

[1 mark]

(a)(iii) Movement of water through the plant is called the _____ stream.

[1 mark]

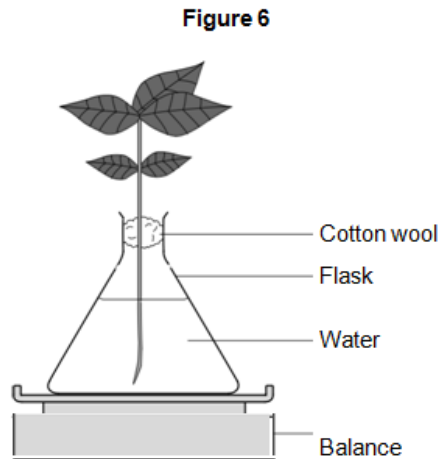
(a) (iv) Water vapour moves out of the plant through pores called _____

[1 mark]

(b) Students investigated the effect of different conditions on water loss from leaves.

The apparatus is shown in Figure 6.

Figure 6



The students set up four flasks, A, B, C and D.

The students:

- ☐ used the same size plant shoot in each flask
- ☐ recorded the mass of the flask and plant shoot at the start of each experiment
- ☐ left each flask and plant shoot in different conditions
- ☐ recorded the mass of each flask and plant shoot after 2 hours.

Table 2 shows the conditions that flasks A, B, C and D were left in for 2 hours.

Table 2

Flask	Temperature in °C	Fan or no fan
A	20	No fan
B	20	Fan
C	35	No fan
D	35	Fan

(b) (i) Suggest why the students used cotton wool in each flask.

[1 mark]

(b) (ii) The use of the same size of plant shoot made the investigation a fair test. Explain why.

[2 marks]

(b) (iii) Table 3 shows the students' results.

Table 3

Flask	Conditions		Mass at the start in grams	Mass after 2 hours in grams	Mass of water lost in 2 hours in grams
	Temperature in °C	Fan or no fan			
A	20	No fan	150.0	148.1	1.9
B	20	Fan	152.0	148.5	3.5
C	35	No fan	149.0	145.9	3.1
D	35	Fan	150.0	145.5	

What mass of water was lost by the plant shoot in flask D?

_____ grams

[1 mark]

(b) (iv) Suggest what conclusion can be made about the effect of temperature on water loss from the plant shoot.

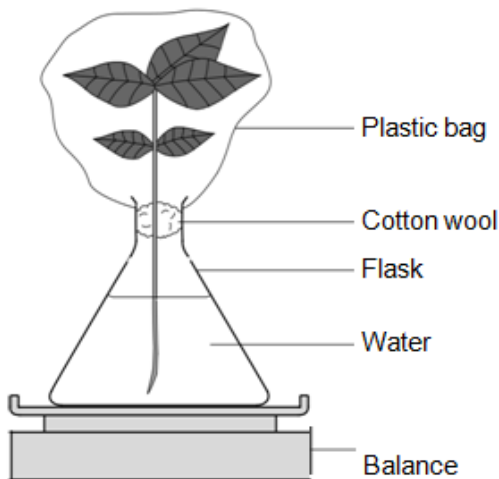
(b) (v) Suggest what conclusion can be made about the effect of the fan on water loss from the plant shoot.

[1 mark]

(c) The students carried out another experiment at 20 °C, with no fan.

The students used the apparatus in Figure 7.

Figure 7



In this experiment, the students:

- ☐ recorded the mass of the flask and plant shoot before tying the plastic bag around the plant shoot
- ☐ removed the bag after 2 hours and recorded the mass again.

(c) (i) What mass of water would be lost from the plant shoot in 2 hours?

Draw a ring around the correct answer.

0.3 g 1.9 g 3.9 g

[1 mark]

(c) (ii) Give a reason for your answer to part (c)(i).

[1 mark]

Q:4 The leaves of most plants have stomata.

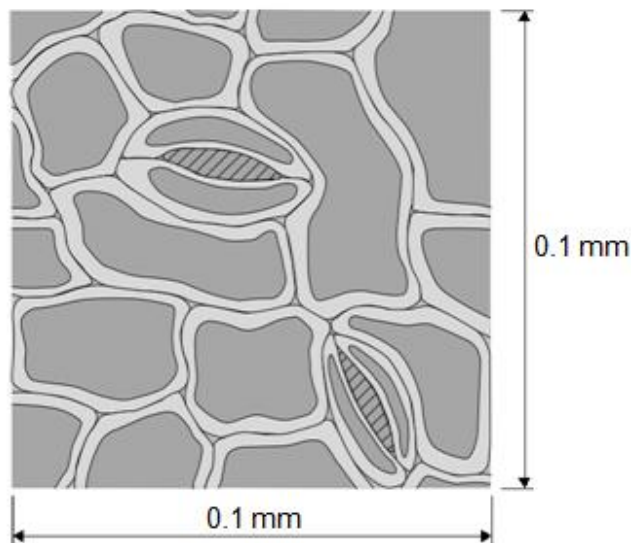
(a)(i) Name the cells which control the size of the stomata.

[1 mark]

(a) (ii) Give one function of stomata.

[1 mark]

Figure 5 shows part of the surface of a leaf.



The length and width of this piece of leaf surface are both 0.1 mm.

(b) (i) Calculate the number of stomata per mm² of this leaf surface.

_____ per mm²

[2 marks]

(b)(ii) A different plant species has 400 stomata per mm² of leaf surface.

Having a large number of stomata per mm² of leaf surface can be a disadvantage to a plant.

Give one disadvantage.

[1 mark]

(c) A student investigated the loss of water from plant leaves.

The student did the following:

- ☐ Step 1: took ten leaves from a plant
- ☐ Step 2: weighed all ten leaves
- ☐ Step 3: hung the leaves up in a classroom for 4 days
- ☐ Step 4: weighed all ten leaves again
- ☐ Step 5: calculated the mass of water lost by the leaves
- ☐ Step 6: repeated steps 1 to 5 with grease spread on the upper surfaces of the leaves
- ☐ Step 7: repeated steps 1 to 5 with grease spread on both the upper and lower surfaces of the leaves.

All the leaves were taken from the same type of plant.

Table 2 shows the student's results.

Treatment of leaves	Mass of water the leaves lost in g
No grease was used on the leaves	0.98
Grease on upper surfaces of the leaves	0.86
Grease on upper and lower surfaces of the leaves	0.01

(c) (i) What mass of water was lost in 4 days through the upper surfaces of the leaves?

Mass = _____ g

[1 mark]

(c) (ii) Very little water was lost when the lower surfaces of the leaves were covered in grease.

Explain why.

[3 marks]

TOTAL MARKS=27