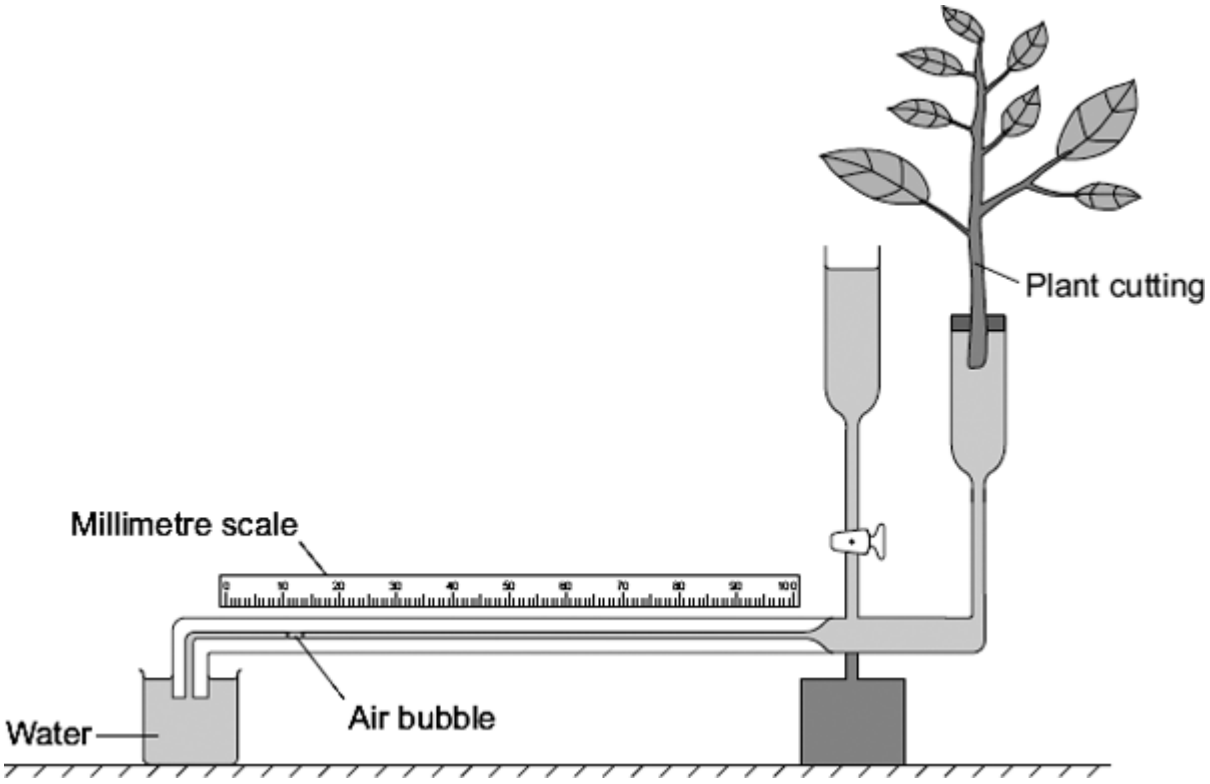
Q1. Some students used the apparatus shown in the diagram to measure the rate of water uptake by a plant cutting.



The students set up the apparatus in three different conditions:

- no wind at 15 °C
- no wind at 25 °C
- wind at 25 °C

For each experiment, the students recorded the movement of the air bubble along the scale.

(a) (i) Name the **two** variables that the students chose to change in these experiments.

1 .....

2 .....

(2)

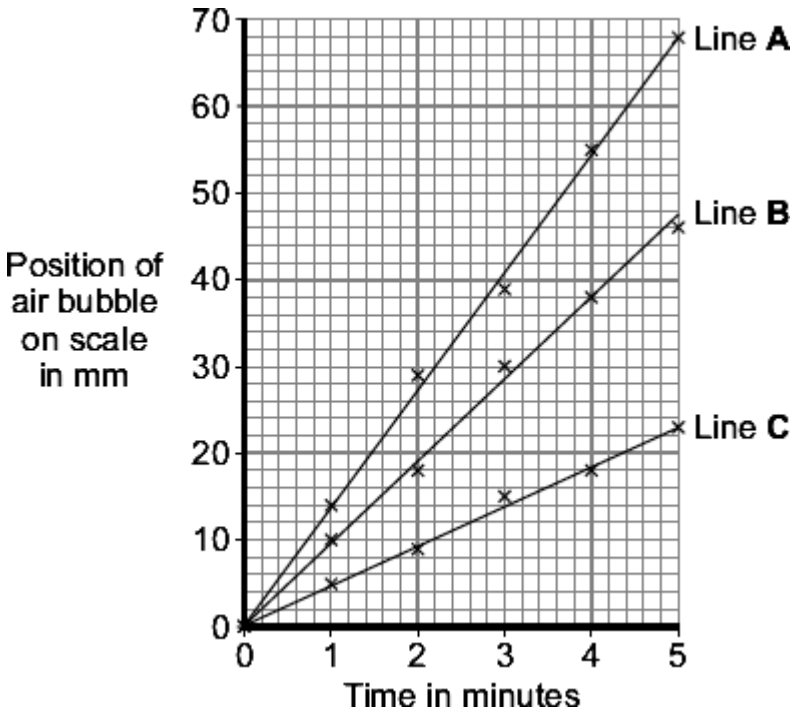
(ii) It was important to use the same plant cutting each time to make these experiments fair.

Explain why.

.....

(1)

(b) The graph shows the students' results.



Which line on the graph, **A**, **B** or **C**, shows the results for each of the three different experiments?

Write each of the letters **A**, **B** or **C** in the correct boxes in the table.

Condition	Letter
No wind at 15 °C	
No wind at 25 °C	
Wind at 25 °C	

(2)

(c) Water is lost from the leaves of the plant cutting.

Name this process.

Draw a ring around **one** answer.

distillation **respiration** **transpiration**

(1)
(Total 6 marks)

Q2 . Plants exchange substances with the environment.

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

alveoli phloem root hairs stomata
storage organs villi xylem

(i) Most water enters a plant through
.....

(1)

(ii) The water is transported up the stem to the leaves in the
.....

(1)

(iii) Carbon dioxide enters leaves through
.....

(1)

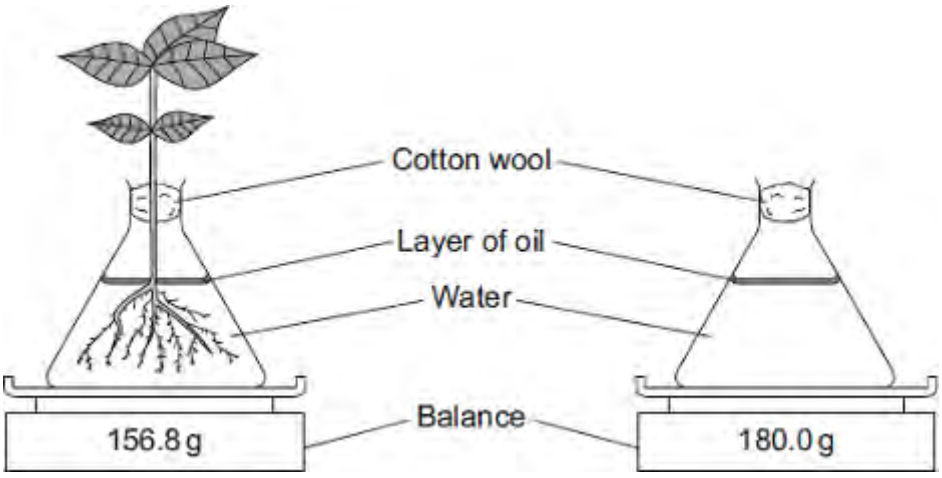
(iv) A leaf uses the carbon dioxide to produce sugars.

Sugars are transported to ..... through the ..... .

(2)

(b) A student set up the apparatus shown in the diagram.

At the start of the experiment both balances showed a mass of 180.0 g.



The diagram shows the reading on each balance 24 hours later.

(i) Look at the mass shown on each balance.

Calculate the difference between the two masses.

.....

.....

Difference in mass = ... g

(1)

(ii) Suggest an explanation for the difference between the two masses.

.....

.....

.....

.....

(2)

(Total 8 marks)

Q3. (a) Draw a ring around the correct answer to complete the sentence.

A plant loses water from its leaves by a process called

distillation.

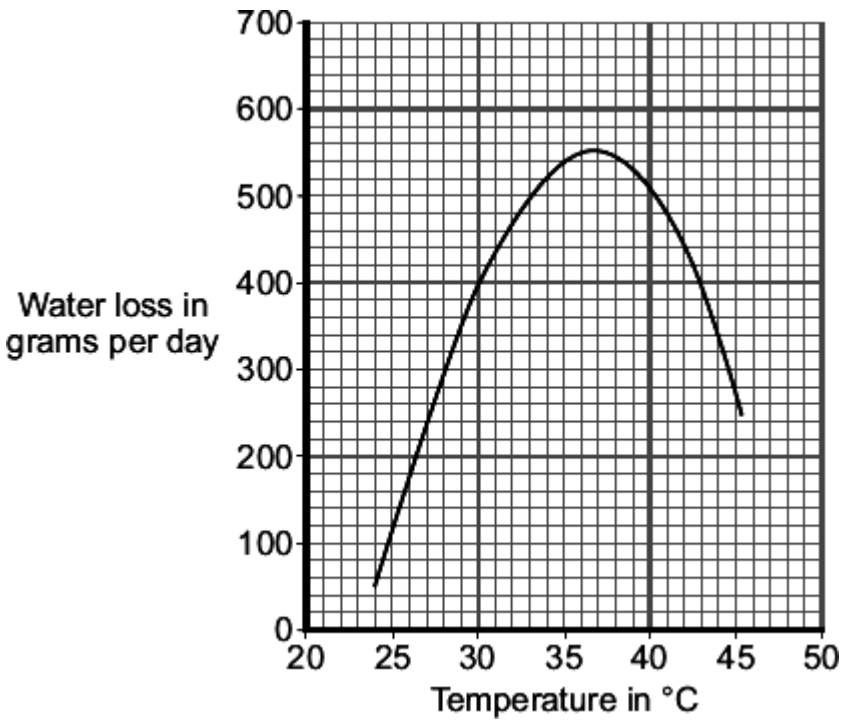
respiration.

transpiration.

(1)

(b) Some scientists investigated the effect of temperature on water loss from a plant.

The graph shows the results.



Describe the effect of increasing the temperature on water loss from the plant.

.....

.....

.....

.....

(2)

(c) Under different conditions, plants open or close their stomata.

(i) How does closing its stomata help a plant?

.....

.....

(1)

(ii) In the investigation described in part (b), which temperature range would cause most of the stomata to close?

Draw a ring around **one** answer.

25 - 30 °C **30 - 35 °C** **40 - 45 °C**

(1)
(Total 5 marks)

Q4. Plants lose water vapour from their leaves. Most of this water vapour is lost through the stomata.

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

Plants lose water vapour by

distillation.
filtration.
transpiration.

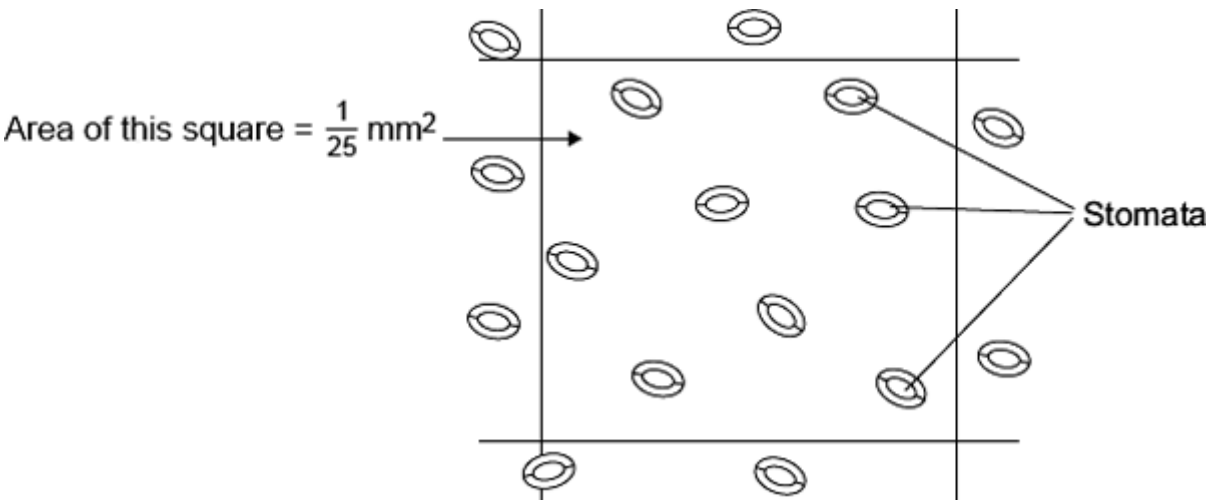
(1)

(b) A class of students investigated the number of stomata per mm^2 on the upper surface and on the lower surface of the leaves of three species of plant, **P**, **Q** and **R**.

The students placed samples of the surface cells onto a grid on a microscope.

Student **X** counted the stomata on the lower surface of a leaf from one of the plant species.

The diagram shows part of the grid that student **X** saw under the microscope.



(i) Complete the calculation to estimate the number of stomata per mm^2 on the lower surface of this leaf.

Number of stomata in $\frac{1}{25}$ mm^2 = ...

Number of stomata in 1 mm^2 = ...

(2)

The table shows the mean results for the class.

Plant species	Mean number of stomata per mm^2 of leaf	
	Upper surface of leaf	Lower surface of leaf
P	40	304
Q	0	11
R	85	195

(ii) Student **X** had counted the stomata on the lower surface of a leaf from one of the plant species.

Use your answer to part **(b)(i)**, and information in the table, to help you to answer this question.

From which plant species, **P**, **Q** or **R**, was student **X**'s leaf most likely to have been taken? ☐

(1)

(iii) Species **Q** is normally found growing in hot, dry conditions.

Explain **one** way in which species **Q** is adapted for living in hot, dry conditions.

Use information from the table.

.....

.....

.....

.....

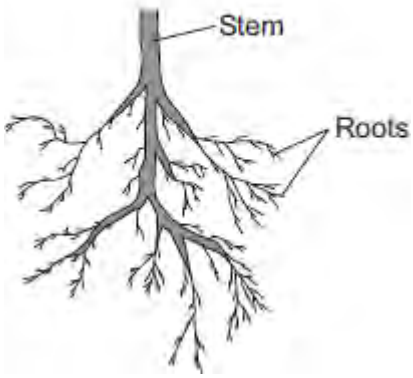
(2)

(Total 6 marks)

Q5. Plants need different substances to survive.

Figure 1 shows the roots of a plant.

Figure 1



(a) (i) Mineral ions are absorbed through the roots.

Name **one** other substance absorbed through the roots.

.....

(1)

(ii) The plant in **Figure 1** has a higher concentration of mineral ions in the cells of its roots than the concentration of mineral ions in the soil.

Which **two** statements correctly describe the absorption of mineral ions into the plant's roots?

Tick (✓) **two** boxes.

The mineral ions are absorbed by active transport. ☐

The mineral ions are absorbed by diffusion. ☐

The mineral ions are absorbed down the concentration gradient. ☐

The absorption of mineral ions needs energy. ☐

(2)

(iii) The plant in **Figure 1** has roots adapted for absorption.

Figure 2 shows a magnified part of a root from **Figure 1.**

Figure 2

Describe how the root in **Figure 2** is adapted for absorption.

.....

.....

.....

.....

(2)

(b) The leaves of plants have stomata.

What is the function of the stomata?

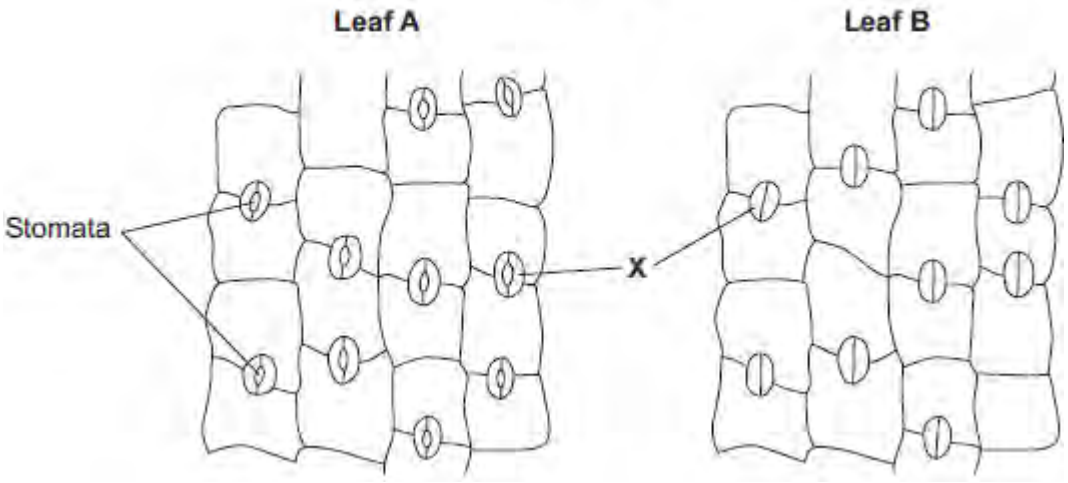
.....

.....

(1)

(c) **Figure 3** shows the underside of two leaves, **A** and **B**, taken from a plant in a man's house.

Figure 3



(i) In **Figure 3**, the cells labelled **X** control the size of the stomata.

What is the name of the cells labelled **X**?

Tick (✓) **one** box.

Guard cells ☐

Phloem cells ☐

Xylem cells ☐

(1)

(ii) Describe how the appearance of the stomata in leaf **B** is different from the appearance of the stomata in leaf **A**.

.....

.....

(1)

(iii) The man forgets to water the plant.

What might happen to the plant in the next few days if the stomata stay the

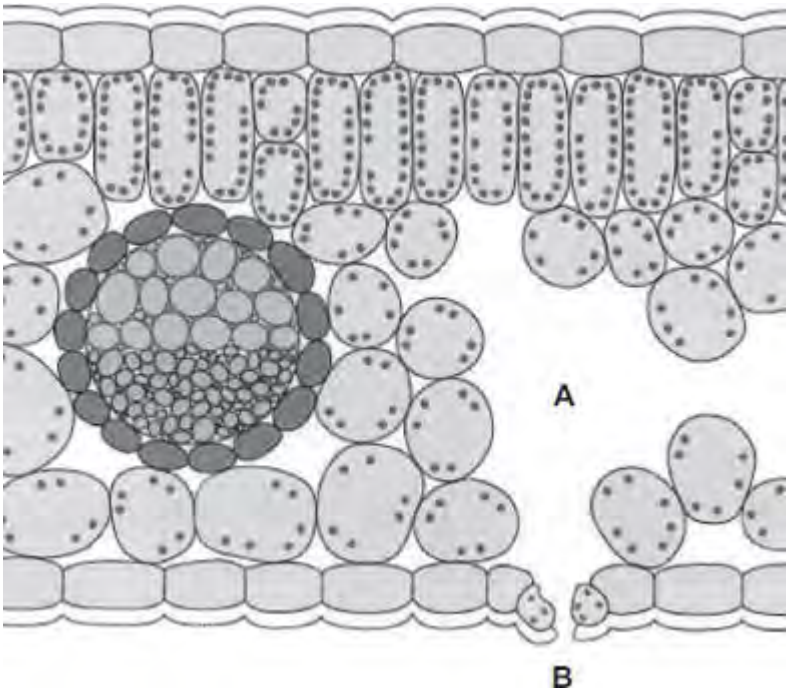
same as shown in leaf **A** in **Figure 3**?

.....

.....

(1)
(Total 9 marks)

Q6. The diagram shows a section through a plant leaf.



(a) Use words from the box to name **two** tissues in the leaf that transport substances around the plant.

epidermis	**mesophyll**	**phloem**	**xylem**

..... and
.....

(1)

(b) Gases *diffuse* between the leaf and the surrounding air.

(i) What is *diffusion*?

.....

.....

.....

.....

(2)

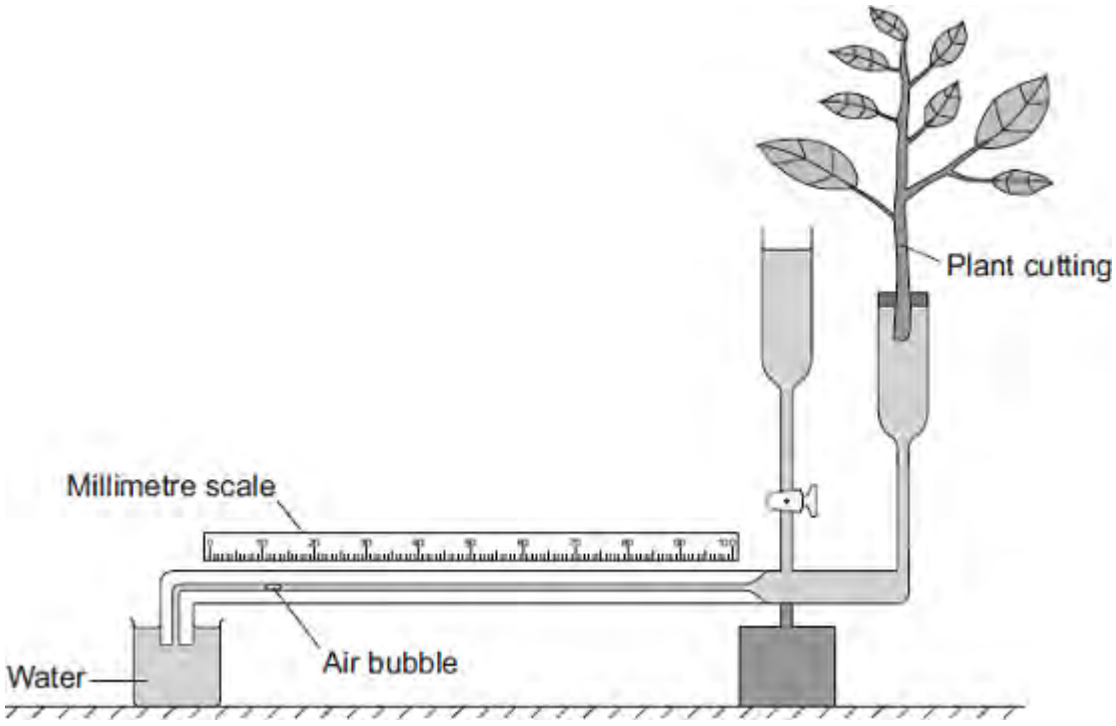
(ii) Name **one** gas that will diffuse from point **A** to point **B** on the diagram on a sunny day.

.....

(1)

(Total 4 marks)

Q7. Some students used the apparatus shown in the diagram to measure the rate of water uptake by a plant cutting.



The students set up the apparatus in three different conditions:

- no wind at 15°C
- no wind at 25°C
- wind at 25°C

For each experiment, the students recorded the movement of the air bubble along the scale.

(a) (i) Name the **two** variables the students chose to change in these experiments.

1 .....

2 .....

(2)

(ii) It was important to use the same plant cutting each time to make these experiments fair.

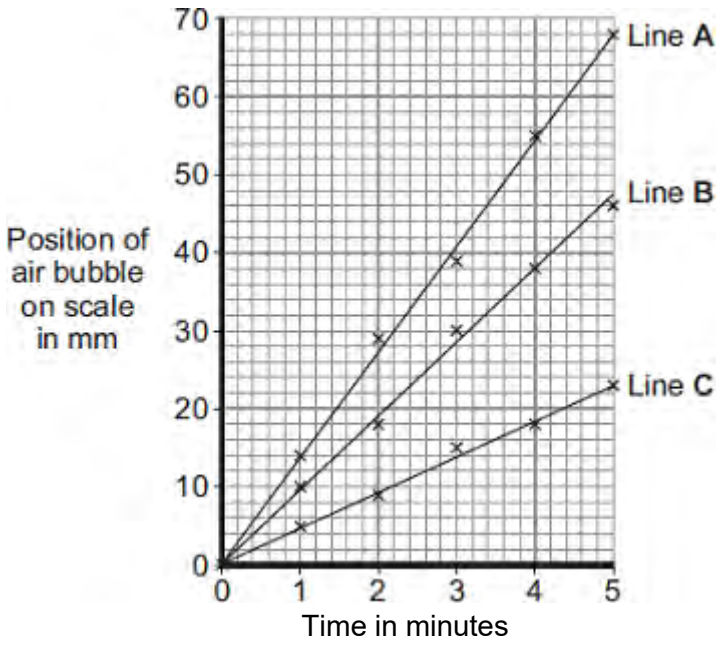
Explain why.

.....

.....

(1)

(b) The graph shows the students' results.



Which line on the graph, **A**, **B** or **C**, shows the results for each of the three different experiments?

Write each of the letters, **A**, **B** and **C**, in the correct boxes in the table.

Conditions	Letter
No wind at 15°C	
No wind at 25°C	
Wind at 25°C	

(2)

(c) Water is lost from the leaves of the plant cutting.

Name this process.

Draw a ring around **one** answer.

distillation **respiration** **transpiration**

(1)
(Total 6 marks)

Q8. Substances are transported through plants.

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

capillary	**guard cells**	**phloem**
stomata	**transpiration**	**xylem**

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

(1)

(ii) Dissolved sugars are transported through the plant in the ..... .

(1)

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

(1)

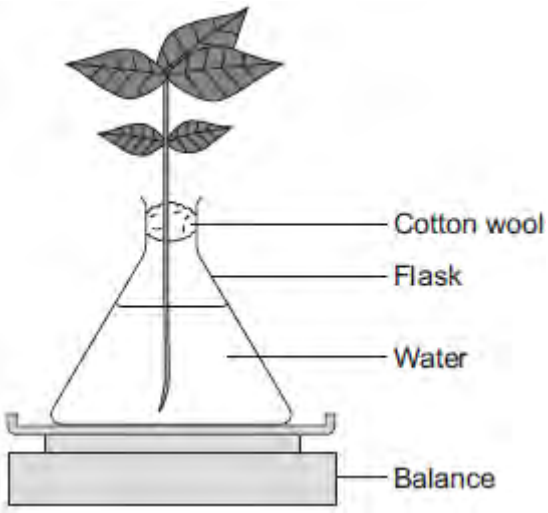
(iv) Water vapour moves out of the plant through pores called ..... .

(1)

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

The apparatus is shown in **Figure 1**.

Figure 1



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

Table 1

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

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

.....

.....

(1)

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

Explain why.

.....

.....

.....

.....

.....

(2)

(iii) **Table 2** shows the students' results.

Table 2

	Conditions		Mass at the start in grams	Mass after 2 hours in grams	Mass of water lost in 2 hours in grams
Flask	**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)

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

.....

.....

.....

(1)

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

.....

.....

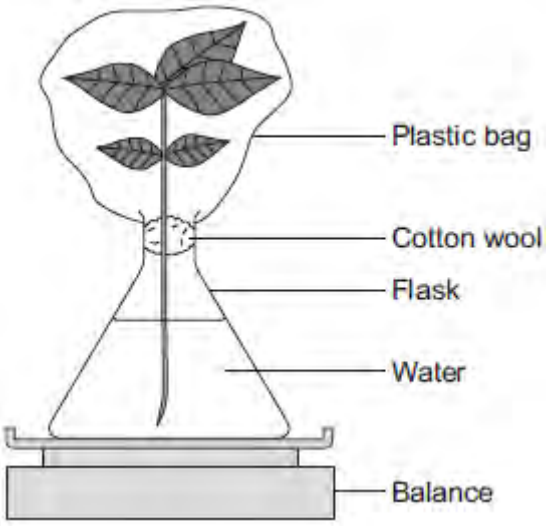
.....

(1)

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

The students used the apparatus in **Figure 2**.

Figure 2



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.

(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)

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

.....

.....

.....

(1)

(Total 12 marks)