

# Plant Tissues, Organs and Organ Systems

## Question Paper 1

<b>Level</b>	GCSE (9-1)
<b>Subject</b>	Combined Science: Trilogy - Biology
<b>Exam Board</b>	AQA
<b>Topic</b>	4.2 Organisation
<b>Sub-Topic</b>	Plant Tissues, Organs and Organ Systems
<b>Difficulty Level</b>	Silver Level
<b>Booklet</b>	Question Paper 1

**Time Allowed:** 60 minutes

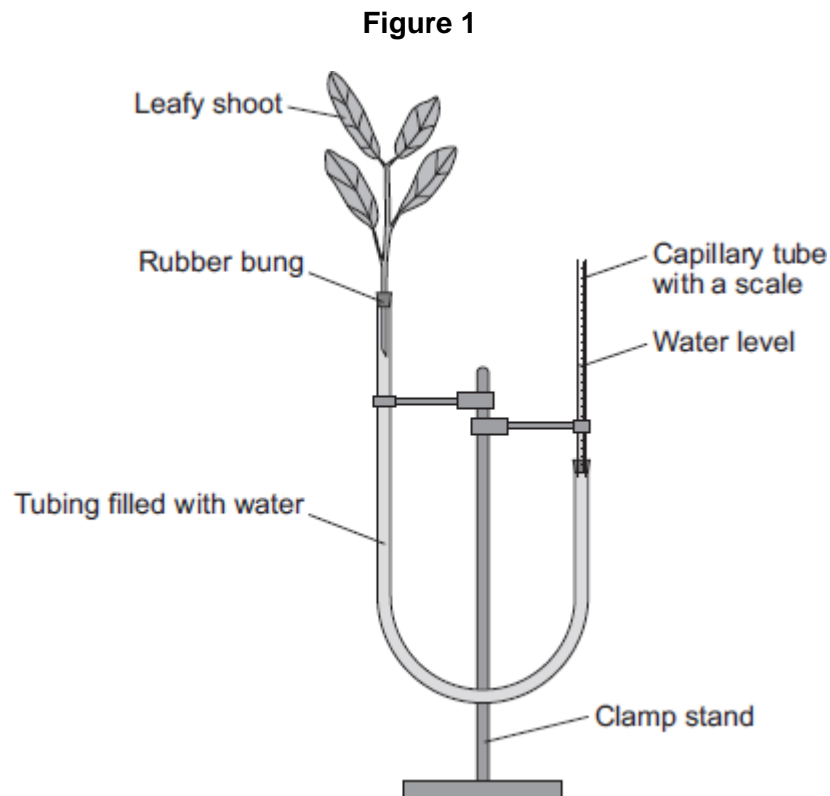
**Score:** /60

**Percentage:** /100

**Grade Boundaries:**

**Q1.** A potometer is a piece of apparatus that can be used to measure water uptake by a leafy shoot.

**Figure 1** shows a potometer.



Some students used a potometer like the one shown in **Figure 1**.

- They measured the water taken up by a shoot in normal conditions in a classroom.
- As the water was taken up by the shoot, the level of water in the capillary tube went down.
- The students recorded the level of the water in the capillary tube at 2-minute intervals for 10 minutes.

**Table 1** shows the students' results.

**Table 1**

Time in minutes	0	2	4	6	8	10
Level of water (on scale) in capillary tube in mm	2.5	3.6	4.4	5.4	6.5	7.5

The area of the cross section of the capillary tube was  $0.8 \text{ mm}^2$ .

- (a) (i) Complete the following calculation to find the volume of water taken up by the shoot in  $\text{mm}^3$  per minute.

Distance water moved along the scale in 10 minutes = .....mm

Volume of water taken up by the shoot in 10 minutes = ..... $\text{mm}^3$

Therefore, volume of water taken up by the shoot in 1 minute = ..... $\text{mm}^3$

(3)

- (ii) The students repeated the investigation but this time placed the potometer next to a fan blowing air over the leafy shoot.

Suggest how the results would be different. Give a reason for your answer.

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(2)

- (b) The students repeated the investigation at different temperatures.

The results are shown in **Table 2**.

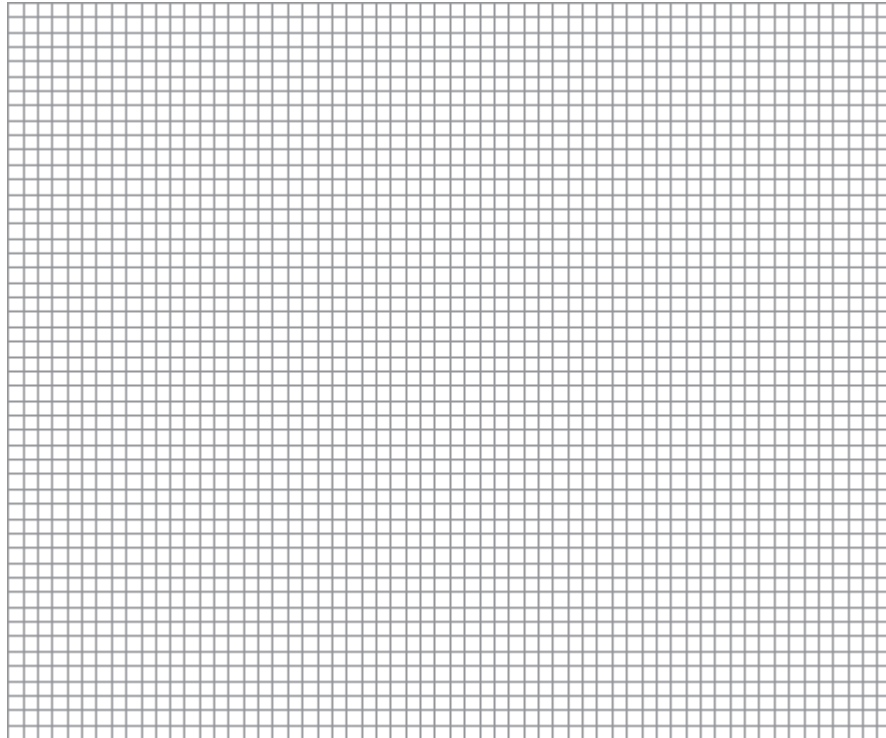
**Table 2**

Temperature in $^{\circ}\text{C}$	Rate of water uptake in $\text{mm}^3$ per minute
10	0
15	0.4
20	1.0
25	2.1
30	3.2
35	4.0
40	4.4

Plot the data from **Table 2** on the graph paper in **Figure 2**.

Choose suitable scales, label both axes and draw a line of best fit.

**Figure 2**



**(5)**

- (c) What would happen to the leaves if the potometer was left for a longer time at 40 °C?

Explain your answer.

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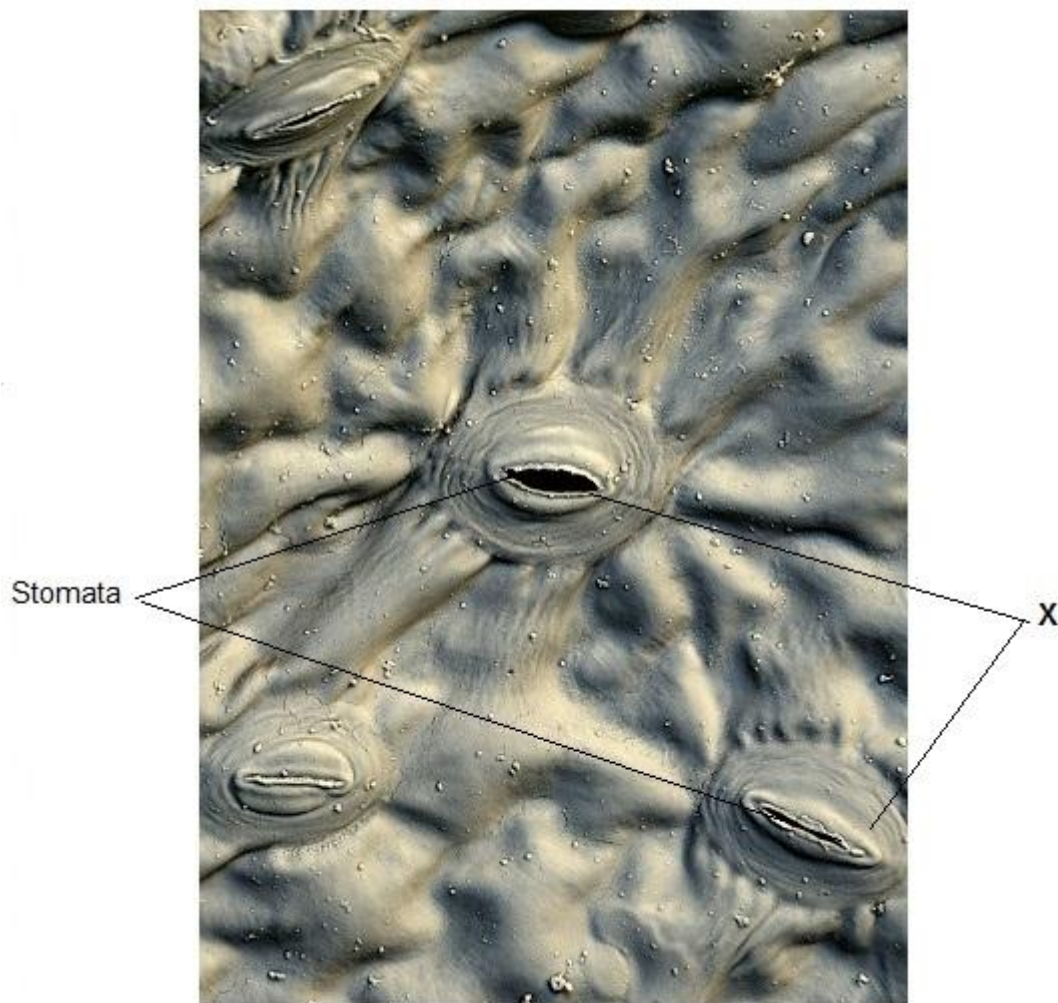
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**(3)**

**(Total 13 marks)**

**Q2.**The image below shows some cells on the lower surface of a leaf.



© Stefan Diller/Science Photo Library

- (a) What are the cells labelled **X** called?

Draw a ring around the correct answer.

**guard cells**

**palisade cells**

**mesophyll cells**

(1)

- (b) Water loss by evaporation from leaves is called **transpiration**.

A student set up an experiment to investigate water loss from leaves.

The student:

- took two leaves, **A** and **B**, from a plant
- put Vaseline (grease) on both sides of **Leaf B**; did nothing to **Leaf A**
- wrote down the mass of each leaf

- attached the leaves onto a string as shown in the diagram below.



**Leaf A**  
(no treatment)

**Leaf B**  
(both surfaces  
covered in Vaseline)

- left the leaves for 48 hours
- wrote down the mass of each leaf again
- calculated the percentage (%) change in mass for each leaf.

- (i) Give **one** variable that the student controlled in this investigation.

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(1)

- (ii) The mass of **Leaf A** was 1.60 g at the start of the investigation. After 48 hours it was 1.28 g.

Calculate the % decrease in mass over 48 hours.

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% decrease = .....

(2)

- (c) Vaseline blocks the stomata.

The % change in mass of **Leaf B** was less than **Leaf A** after 48 hours.  
Explain why.

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(1)

- (d) Give **three** environmental conditions that would increase transpiration.

1 .....

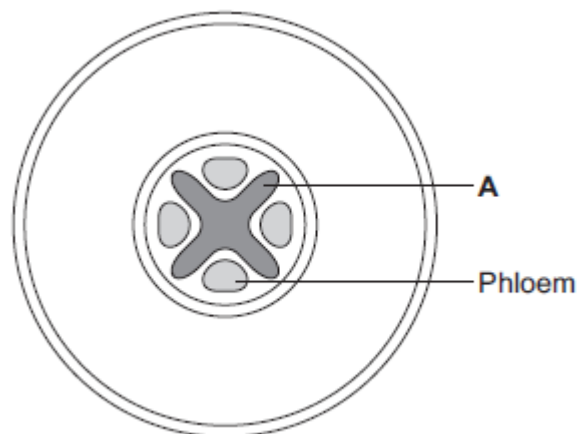
2 .....

3 .....

(3)

(Total 8 marks)

**Q3.** The diagram below shows a cross-section of a plant root. The transport tissues are labelled.



- (a) (i) What is tissue **A**?

Draw a ring around the correct answer.

cuticle

epidermis

xylem

(1)

(ii) Name **two** substances transported by tissue **A**.

1 .....

2 .....

(2)

(b) Phloem is involved in a process called translocation.

(i) What is translocation?

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.....

(1)

(ii) Explain why translocation is important to plants.

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(2)

(c) Plants must use active transport to move some substances from the soil into root hair cells.

(i) Active transport needs energy.

Which part of the cell releases most of this energy?

Tick (✓) **one** box.

mitochondria

☐



nucleus

ribosome

(1)

(ii) Explain why active transport is necessary in root hair cells.

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(2)

(Total 9 marks)

**Q4.** Plant roots absorb water from the soil by osmosis.

(a) What is osmosis?

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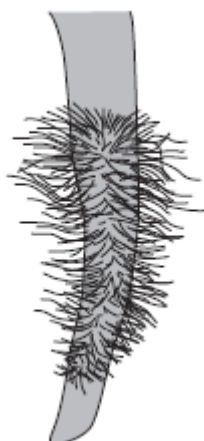
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(3)

(b) The image below shows part of a plant root.



The plant root is adapted for absorbing water from the soil.

Use information from the diagram to explain how this plant root is adapted for absorbing water.

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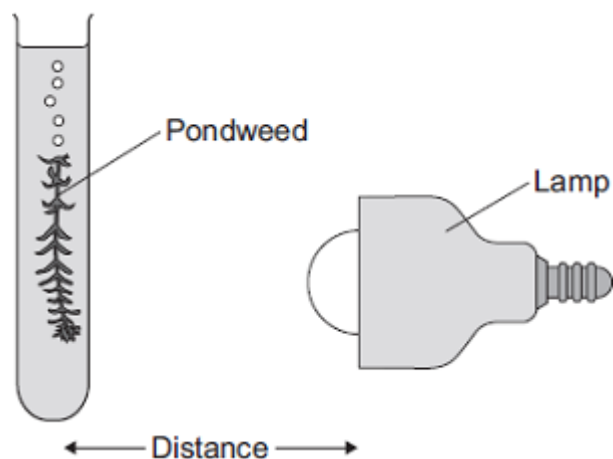
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(3)  
(Total 6 marks)

**Q5.** Some students investigated the effect of light intensity on the rate of photosynthesis.

They used the apparatus shown in **Diagram 1**.

**Diagram 1**



The students:

- placed the lamp 10 cm from the pondweed
- counted the number of bubbles of gas released from the pondweed in 1 minute
- repeated this for different distances between the lamp and the pondweed.

(a) The lamp gives out heat as well as light.

What could the students do to make sure that heat from the lamp did **not** affect the rate of photosynthesis?

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 .....

(1)

(b) The table shows the students' results.

Distance in cm	Number of bubbles per minute
10	84
15	84
20	76
40	52
50	26

(i) At distances between 15 cm and 50 cm, light was a limiting factor for

photosynthesis.

What evidence is there for this in the table?

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(1)

- (ii) Give **one** factor that could have limited the rate of photosynthesis when the distance was between 10 cm and 15 cm.

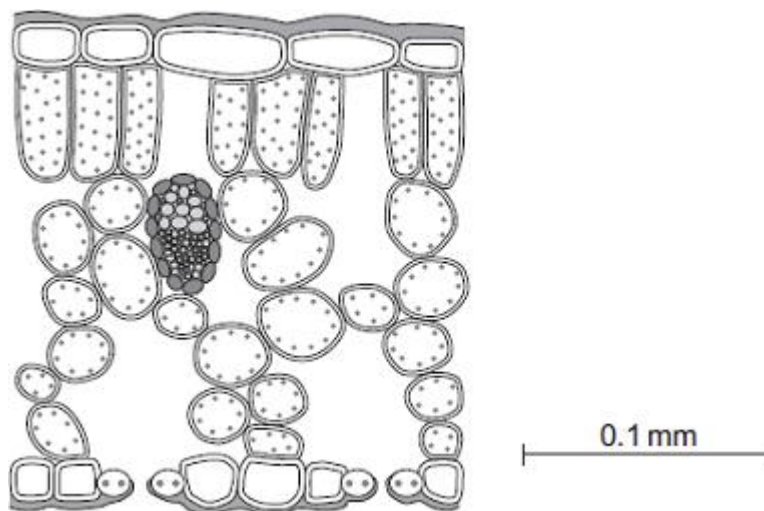
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(1)

- (c) *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

**Diagram 2** shows a section through a plant leaf.

**Diagram 2**



Describe the structure of the leaf and the functions of the tissues in the leaf.

You should use the names of the tissues in your answer.

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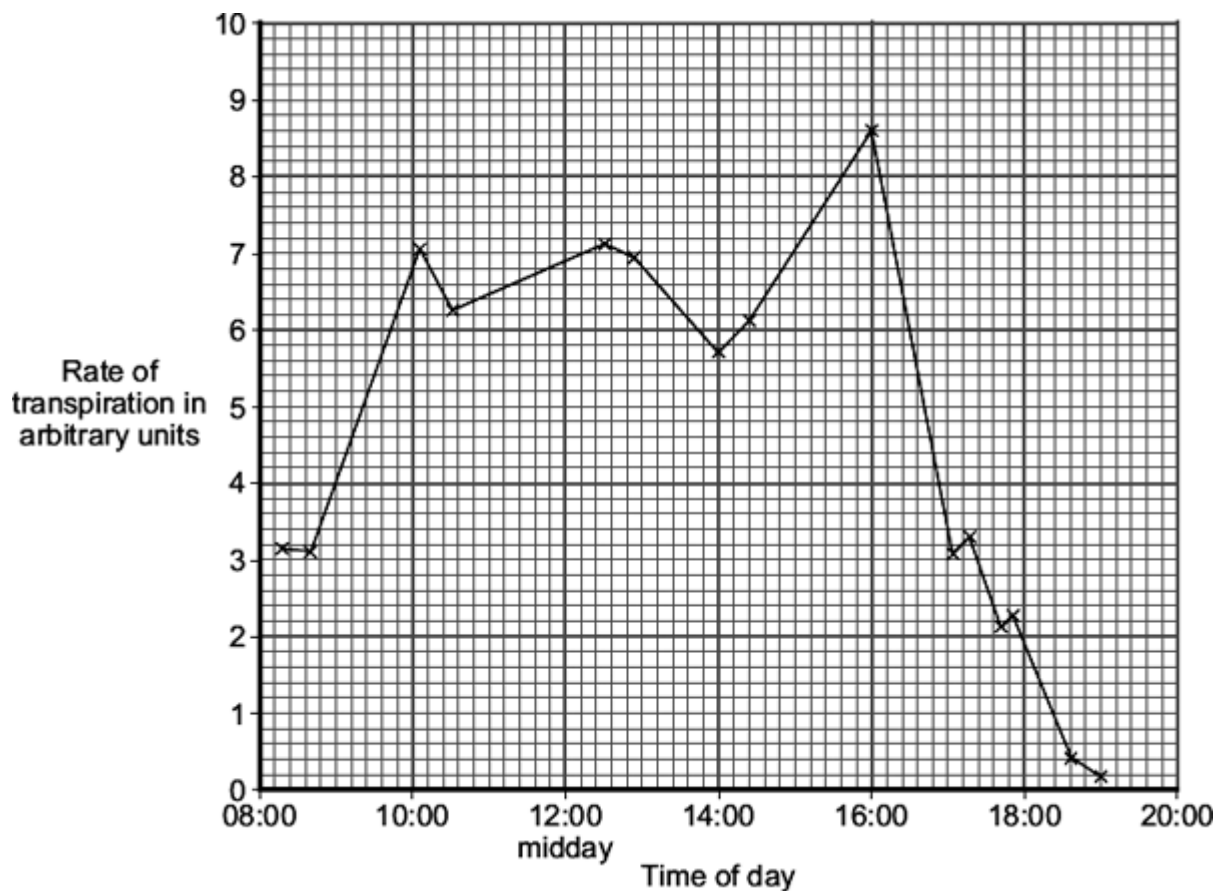
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(6)  
(Total 9 marks)

**Q6.** The graph shows the rate of transpiration from a plant at different times of the day.



*Transpiration* occurs mainly in the leaves of a plant.

(a) (i) What is *transpiration*?

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(2)

- (ii) Through which part of a leaf does most transpiration occur?

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(1)

- (b) In this investigation, the rate of transpiration decreases between 16:00 hours and 19:00 hours.

- (i) Calculate the average rate of decrease per hour in the rate of transpiration over this time.

Show clearly how you work out your answer.

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Rate = ..... arbitrary units per hour

(2)

- (ii) Suggest **one** explanation for the decrease in the rate of transpiration between 16:00 hours and 19:00 hours.

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(2)

(Total 7 marks)

**Q7.** A student removed three similar leaves from a plant. The student spread petroleum jelly (a waterproofing substance) on some of the leaves, as follows:

**Leaf A:** on the lower surface

**Leaf B:** on the upper surface

**Leaf C:** none.

The student placed each leaf in a separate beaker. He weighed each beaker at intervals. The results are shown in the table.

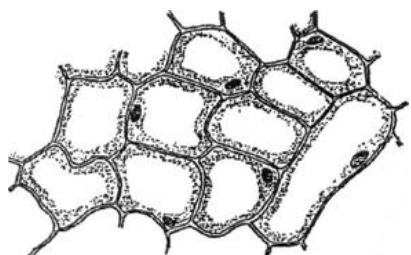
Time in hours	Mass of leaf + beaker in grams		
	Leaf A	Leaf B	Leaf C
0	50.00	55.01	51.99
0	49.99	54.95	51.90
3	49.97	54.90	51.85
5	49.95	54.86	51.80

(a) Which leaf, **A**, **B** or **C**, lost most water?

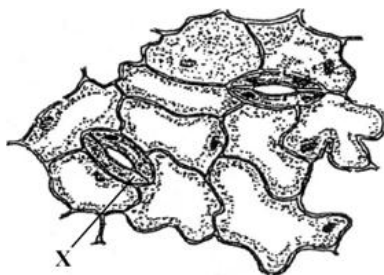
(1)

(b) The diagram shows the appearance of the upper and lower surfaces of one of the leaves under a microscope.

**Upper surface of leaf**



**Lower surface of leaf**



(i) Name cell X. ....

(1)

(ii) The petroleum jelly had a greater effect when it was spread on the lower surface than when it was spread on the upper surface.

Use information from the diagram to explain why.

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(2)

(Total 4 marks)

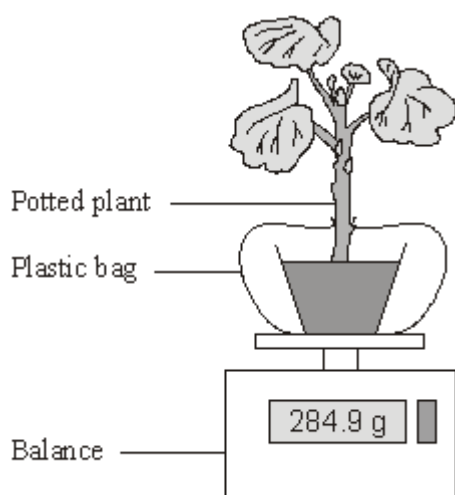
**Q8.** (a) Name the process by which water is lost from plant leaves.

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(1)

(b) Some students set up the apparatus shown in the diagram to measure the water loss from a potted plant.





The apparatus was placed in different environmental conditions:

- A** in still air at 20 °C.
- B** in still air at 25 °C.
- C** in a wind at 20 °C.
- D** in a wind at 25 °C.

Readings from the balance were recorded by a datalogger at 10-minute intervals.

The results are given in the table.

Time in minutes	Balance reading in grams			
	A	B	C	D
0	285.6	284.6	282.9	280.9
10	285.3	284.2	282.4	280.2
20	284.9	283.8	281.9	279.4
30	284.7	283.4	281.4	278.8

- (i) Under which conditions, **A**, **B**, **C** or **D**, was water lost most rapidly?

(1)

- (ii) Explain, as fully as you can, why water was lost most rapidly under these conditions.

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(2)  
(Total 4 marks)