



GCSE Biology

Plant Organ Systems

Question Paper

Time available: 50 minutes

Marks available: 45 marks

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1. A student carried out an investigation using leaf epidermis.

This is the method used.

1. Peel the lower epidermis from the underside of a leaf.
2. Cut the epidermis into six equal sized pieces.
3. Place each piece of lower epidermis into a different Petri dish.
4. Add 5 cm³ of salt solution to the six Petri dishes. Each Petri dish should have a different concentration of salt solution.
5. After 1 hour, view each piece of epidermis under a microscope at ×400 magnification.
6. Count and record the total number of stomata present and the number of open stomata that can be seen in one field of view.

The student's results are shown in the table.

Concentration of salt solution in mol / dm ³	Number of stomata in field of view	Number of open stomata in field of view	Percentage (%) of open stomata in field of view
0.0	7	7	100
0.1	8	8	100
0.2	7	6	X
0.3	9	6	67
0.4	10	4	40
0.5	9	2	22

(a) Calculate value **X** in the table above.

X = _____ %

(1)

(b) Give **one** conclusion from the results in the table above.

(1)

(c) How could the student find out what concentration of salt solution would result in half of the stomata being open?

(1)

(d) The student measured the real diameter of the field of view to be 0.375 mm.

Calculate the number of open stomata per mm^2 of leaf for the epidermis placed in 0.4 mol / dm^3 salt solution.

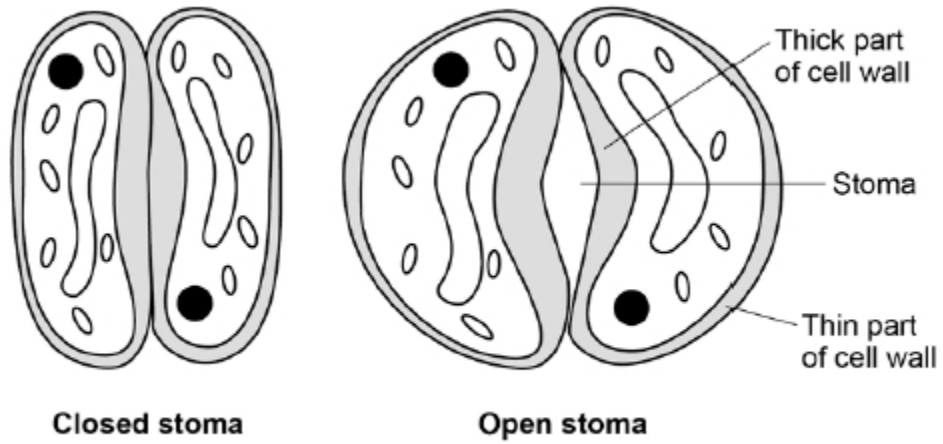
Use information from the table above.

Take π to be 3.14

Number of open stomata = _____ per mm^2

(3)

(e) The diagram below shows two guard cells surrounding a closed stoma and two guard cells surrounding an open stoma.



When light intensity is high potassium ions are moved into the guard cells.

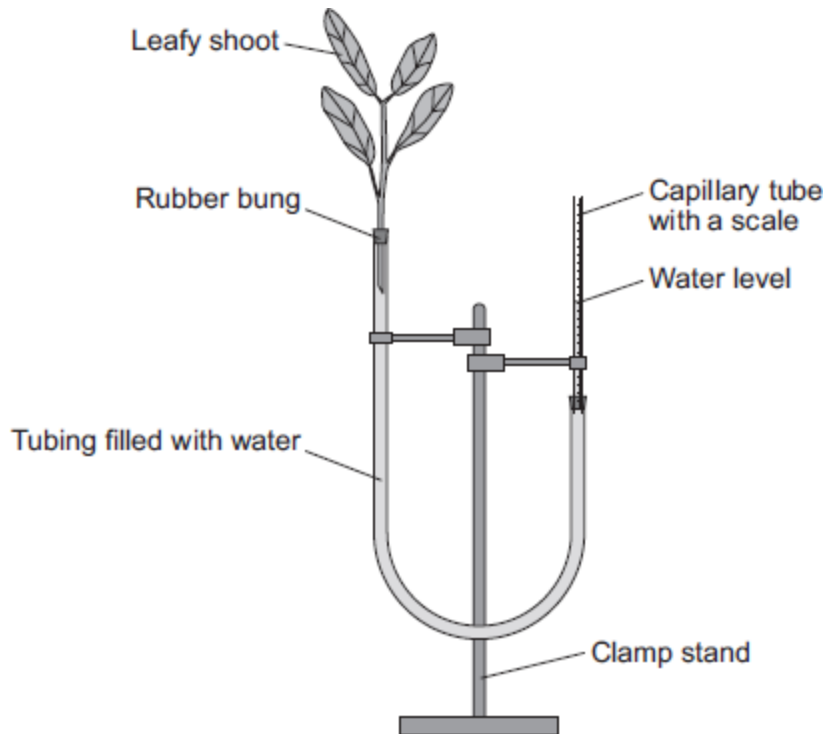
Describe how the movement of potassium ions into the guard cells causes the stoma to open.

(4)
(Total 10 marks)

2.

A potometer is a piece of apparatus that can be used to measure water uptake by a leafy shoot. **Figure 1** shows a potometer.

Figure 1



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 mm^2 .

(a) (i) Complete the following calculation to find the volume of water taken up by the shoot in 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 = _____ mm^3

Therefore, volume of water taken up by the shoot in 1 minute = _____ 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.

(2)

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

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

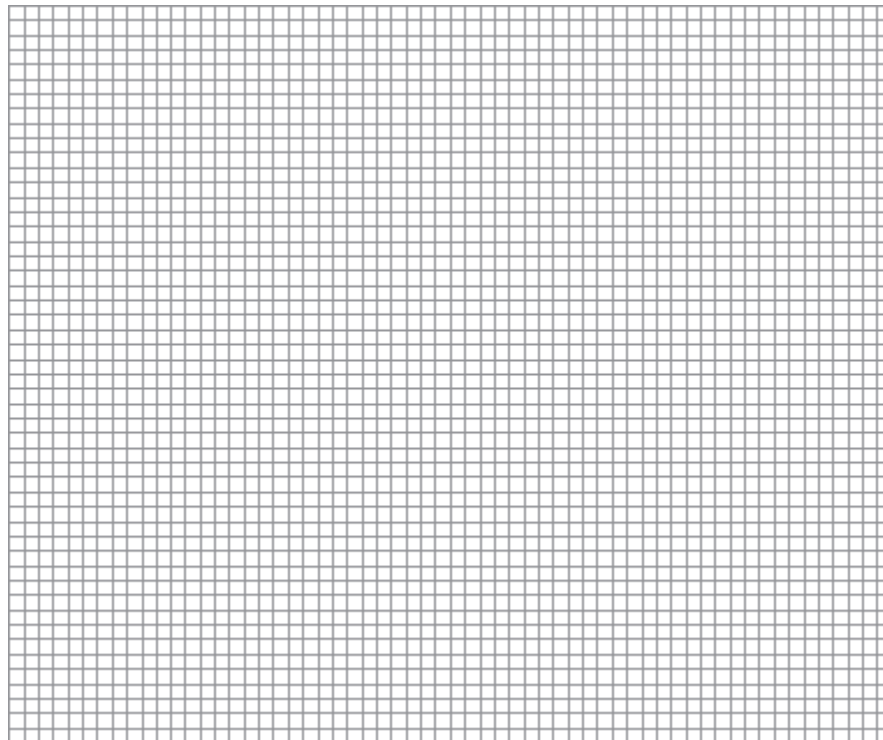
Table 2

Temperature in °C	Rate of water uptake in 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)

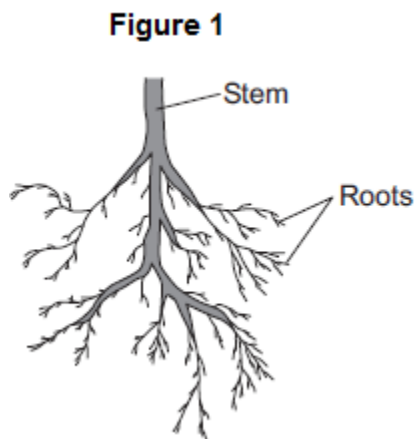
(c) What would happen to the leaves if the potometer was left for a longer time at 40 °C?

Explain your answer.

(3)
(Total 13 marks)

3. Plants need different substances to survive.

Figure 1 shows the roots of a plant.



(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.

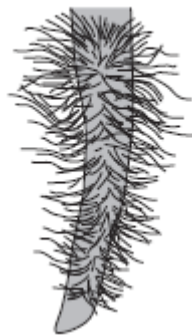
The absorption of mineral ions needs energy.

(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.

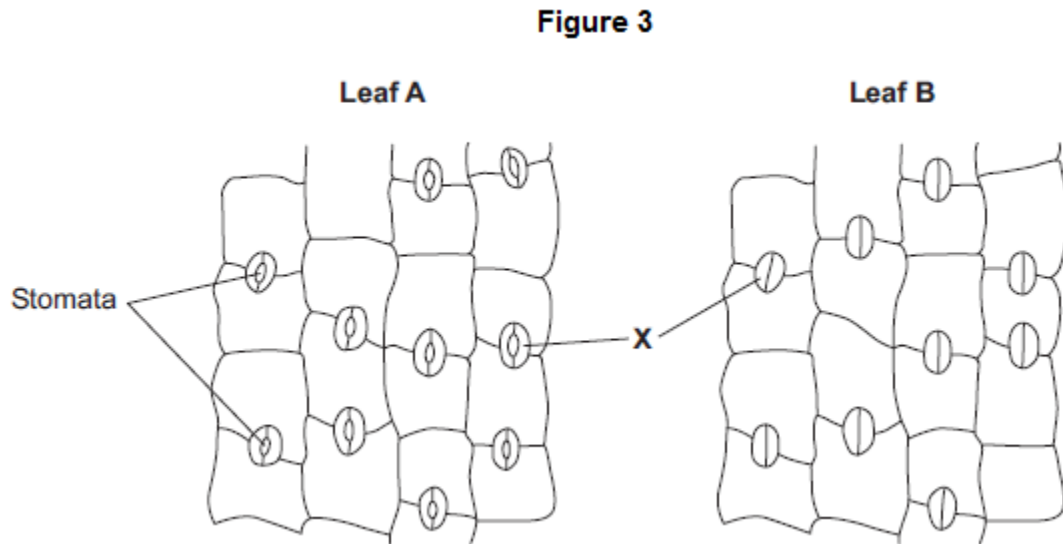
(2)

(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.



(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.

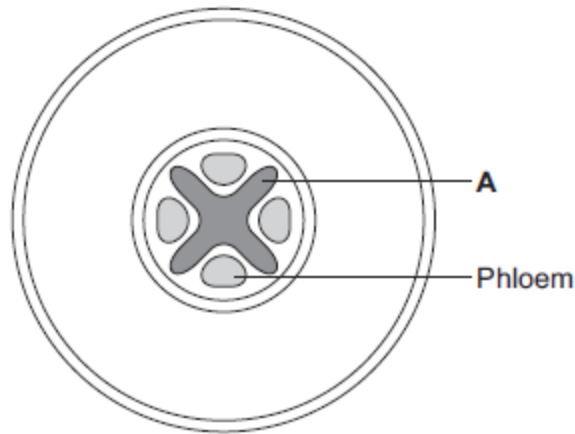
What might happen to the plant in the next few days if the stomata stay the same as shown in leaf **A** in **Figure 3**?

(1)

(Total 9 marks)

4.

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?

(1)

(ii) Explain why translocation is important to plants.

(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)

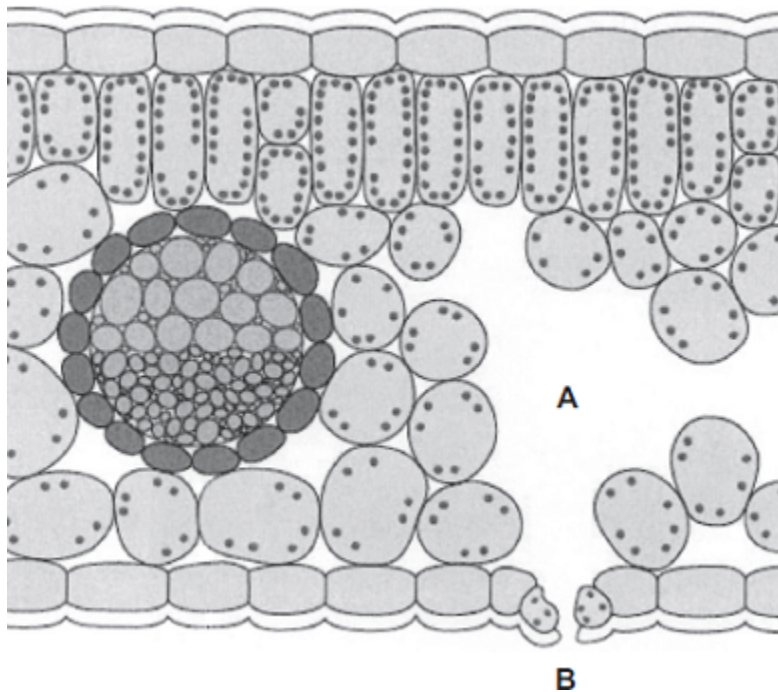
(ii) Explain why active transport is necessary in root hair cells.

(2)

(Total 9 marks)

5.

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
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_____ 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)