Plant tissues organs and systems

Q1.

(a) Balance the following equation for photosynthesis.

_____ CO_2 + _____ H_2O → $C_6H_{I2}O_6$ + _____ O_2

(1)

(b) Give **two** conditions necessary for photosynthesis apart from a suitable temperature range and the availability of water and carbon dioxide.

1. _____

2. _____

(2)

(a) Plants have leaves which contain guard cells and palisade cells. Explain how **each** of these kinds of cell assists photosynthesis.

Guard cells _____

_____

_____

_____

(2)

Palisade cells _____

_____

_____

_____

(2)

(d) Glucose is a product of photosynthesis. Give **three** uses which green plants make of glucose.

1. _____

2. _____

3. _____

(3)

(Total 10 marks)

Q2.

Plants transport water and mineral ions from the roots to the leaves.

(a) Plants move mineral ions:

- from a low concentration in the soil

- to a high concentration in the root cells.

What process do plants use to move these minerals ions into root cells?

Tick **one** box.

Active transport ☐

Diffusion ☐

Evaporation ☐

Osmosis ☐

(1)

(b) Describe how water moves from roots to the leaves.

_____

_____

_____

_____

(2)

(c) Plants lose water through the stomata in the leaves.

The epidermis can be peeled from a leaf.

The stomata can be seen using a light microscope.

The table below shows the data a student collected from five areas on one leaf.

Leaf area	**Number of stomata**	
	Upper surface	**Lower surface**
1	3	44
2	0	41
3	1	40
4	5	42
5	1	39
Mean	**2**	**X**

Describe how the student might have collected the data.

_____

_____

_____

_____

_____

_____

_____

_____

(3)

(d) What is the median number of stomata on the upper surface of the leaf?

_____

(1)

(e) Calculate the value of **X** in the table.

Give your answer to 2 significant figures.

_____

_____

Mean number of stomata on lower surface of leaf = _____

(2)

(f) The plant used in this investigation has very few stomata on the upper surface of the leaf.

Explain why this is an **advantage** to the plant.

_____

_____

_____

_____

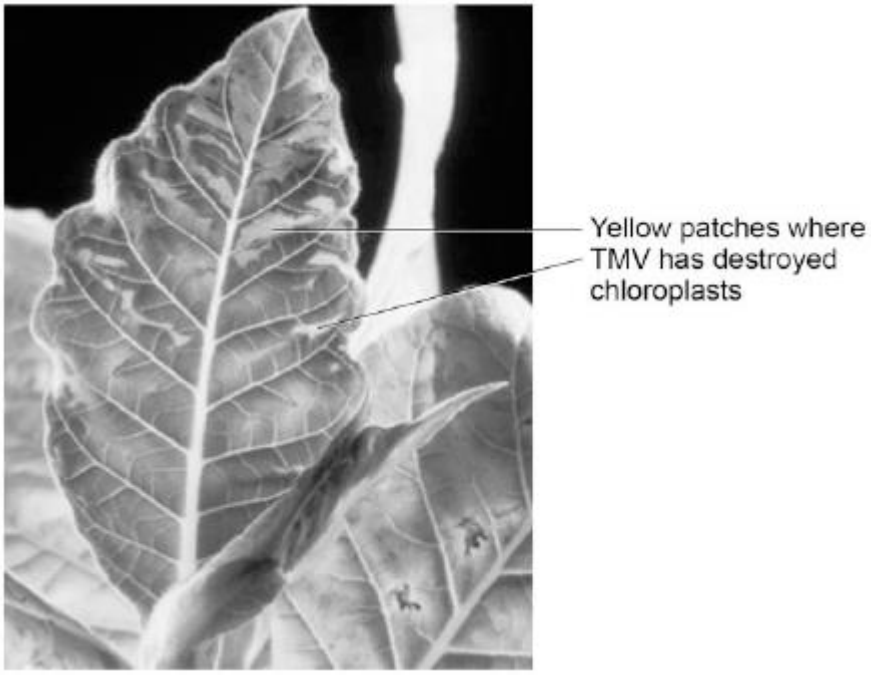
(2)

(Total 11 marks)

Q3.

Tobacco mosaic virus (TMV) is a disease affecting plants.

The diagram below shows a leaf infected with TMV.



(a) All tools should be washed in disinfectant after using them on plants infected with TMV.

Suggest why.

_____

_____

(1)

(b) Scientists produced a single plant that contained a TMV-resistant gene.

Suggest how scientists can use this plant to produce **many** plants with the TMV-resistant gene.

_____

_____

(1)

(c) Some plants produce fruits which contain glucose.

Describe how you would test for the presence of glucose in fruit.

_____

_____

_____

_____

(2)

(d) TMV can cause plants to produce less chlorophyll.

This causes leaf discoloration.

Explain why plants with TMV have stunted growth.

(4)

(Total 8 marks)

Q4.

Carbon dioxide enters a plant through stomata on the leaves.

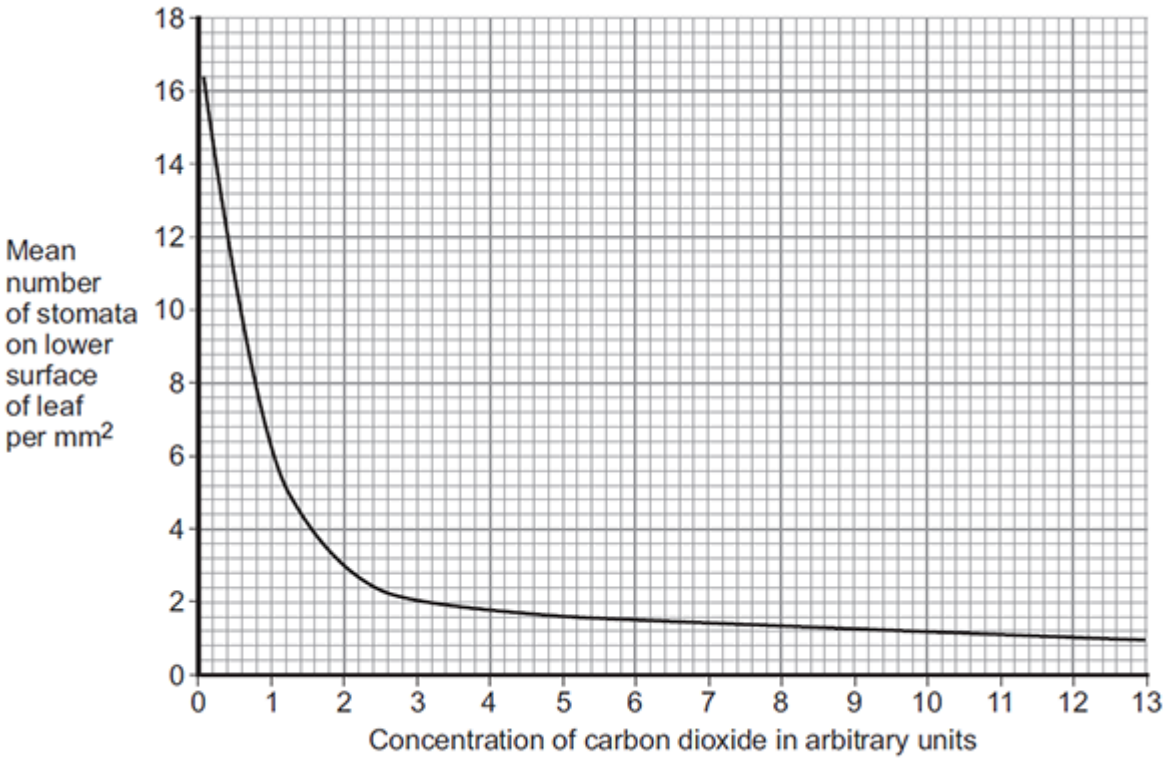
(a) Name the cells that control the size of the stomata.

(1)

(b) Scientists grew tomato plants in air containing different concentrations of carbon dioxide.

The scientists recorded the number of stomata found on the lower surface of the leaves of plants grown at each carbon dioxide concentration.

The graph below shows the results.



(i) Describe the relationship between the mean number of stomata per mm^2 and carbon dioxide concentration.

(2)

(ii) Suggest a reason for the relationship you described in part **(b)(i)**.

(1)

(c) (i) Suggest **one** disadvantage to a plant of having a large number of stomata per mm^2 on each leaf.

(1)

(ii) Suggest **one** environmental condition where a large number of stomata per mm^2 on each leaf would be a disadvantage.

(1)

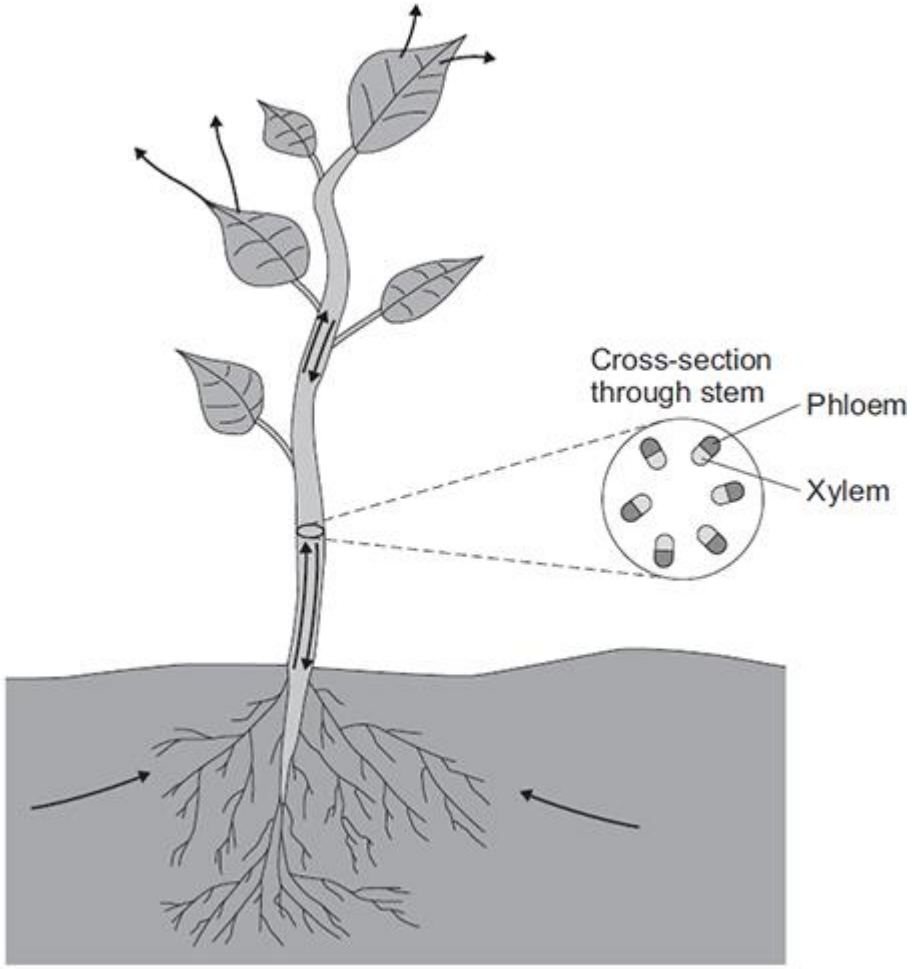
(Total 6 marks)

Q5.

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

Plants transport many substances between their leaves and roots.

The diagram below shows the direction of movement of substances through a plant.



Describe how **ions**, **water** and **sugar** are obtained and transported through plants.

In your answer you should refer to materials moving upwards in a plant and to materials moving downwards in a plant.

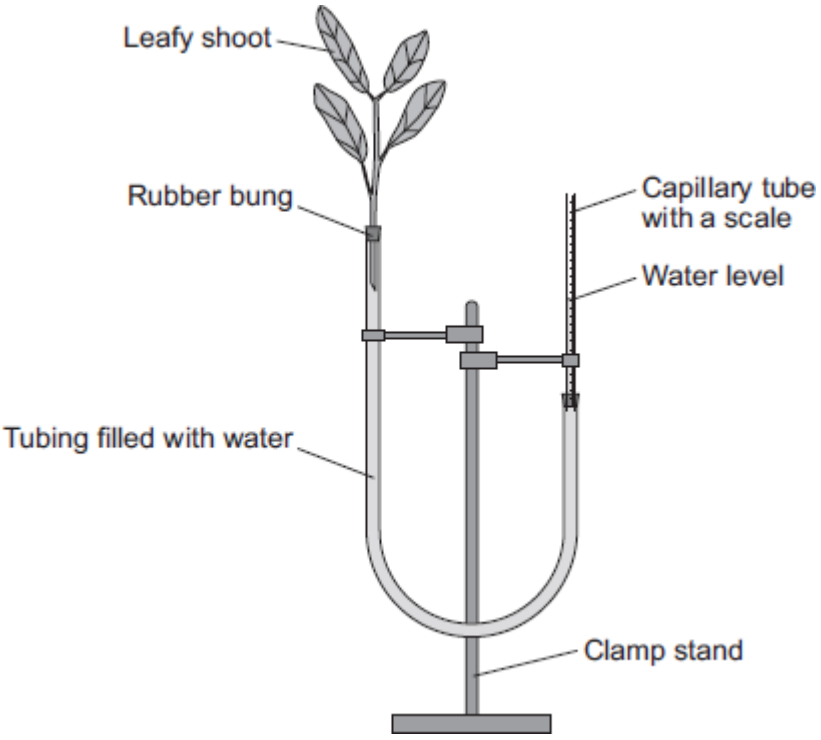
(Total 6 marks)

Q6.

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

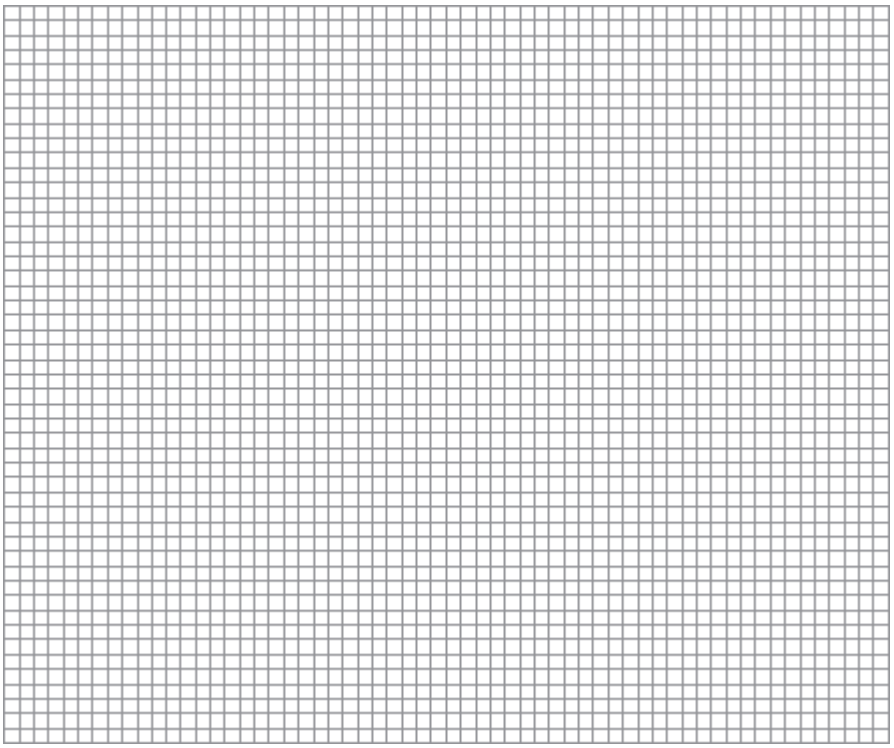
Temperature in °C	**Rate of water uptake in mm^3 per minute**
10	0
15	0.4
20	1.0
25	2.1
30	3.2

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)

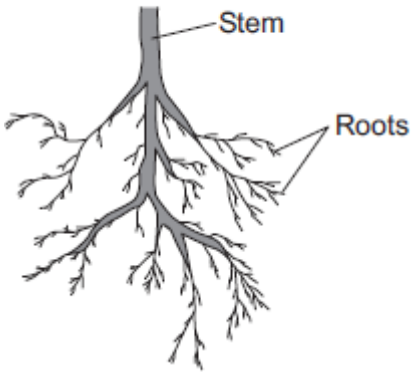
(Total 13 marks)

Q7.

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. ☐

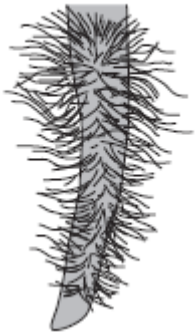
The absorption of mineral ions needs energy. ☐

(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?

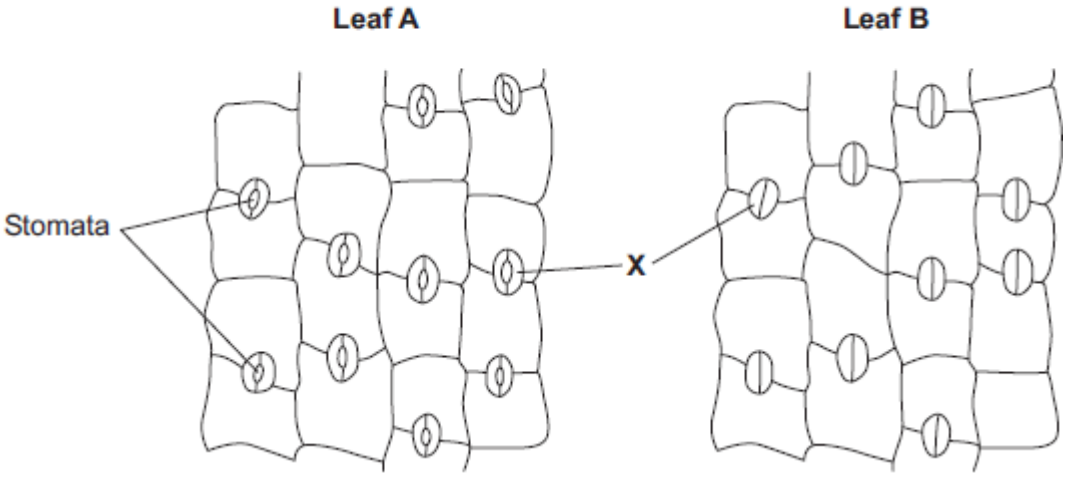
_____

_____

(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**?

_____

_____

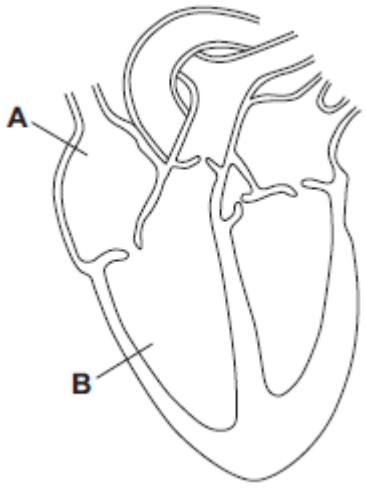
(1)

(Total 9 marks)

Q8.

Diagram 1 shows a section through the heart.

Diagram 1



(a) Use words from the box to name the structures labelled **A** and **B** on **Diagram 1**.

arota	**atrium**	**pulmonary artery**	**ventricle**

A _____

B _____

(2)

(b) The tissue in the wall of the heart contracts.

(i) What type of tissue is this?

Tick (✓) **one** box.

muscular ☐

glandular ☐

epithelial ☐

(1)

(ii) What does the heart do when this tissue contracts?

_____

_____

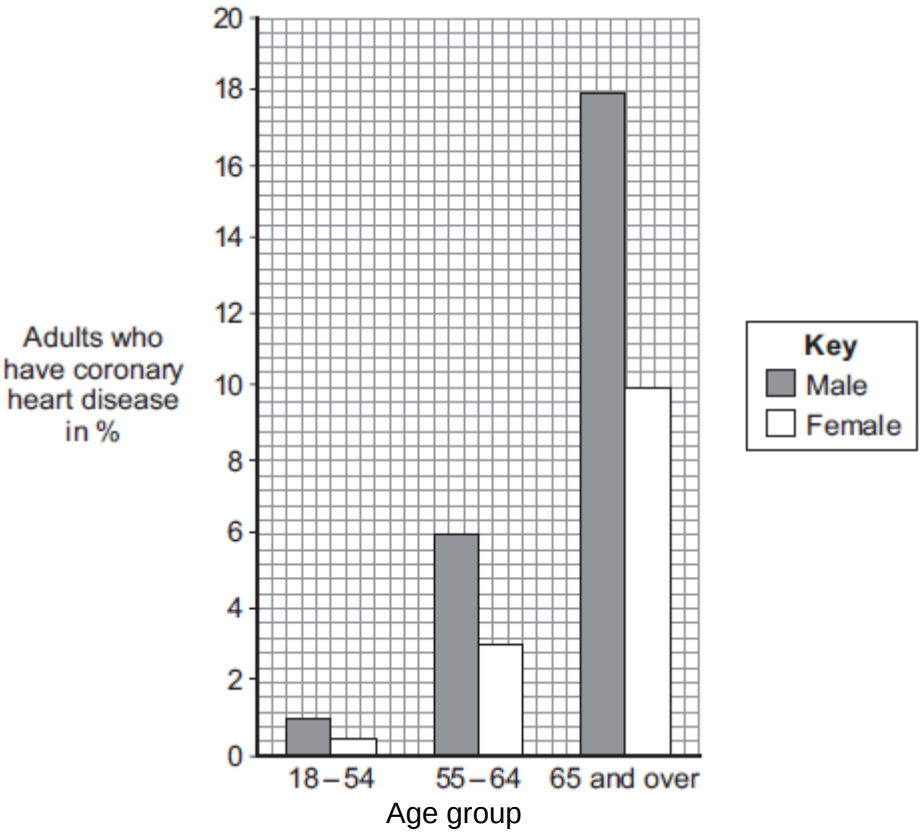
(1)

(c) Draw arrows on **Diagram 2** to complete the route taken by deoxygenated blood through the heart.

Diagram 2

(2)

(d) The graph shows the percentage (%) of adults in the UK who have coronary heart disease.



(i) Look at the graph.

Which group of people is **most** at risk of having coronary heart disease in the UK?

_____

(2)

(ii) Explain what happens to the heart in coronary heart disease.

_____

_____

_____

_____

_____

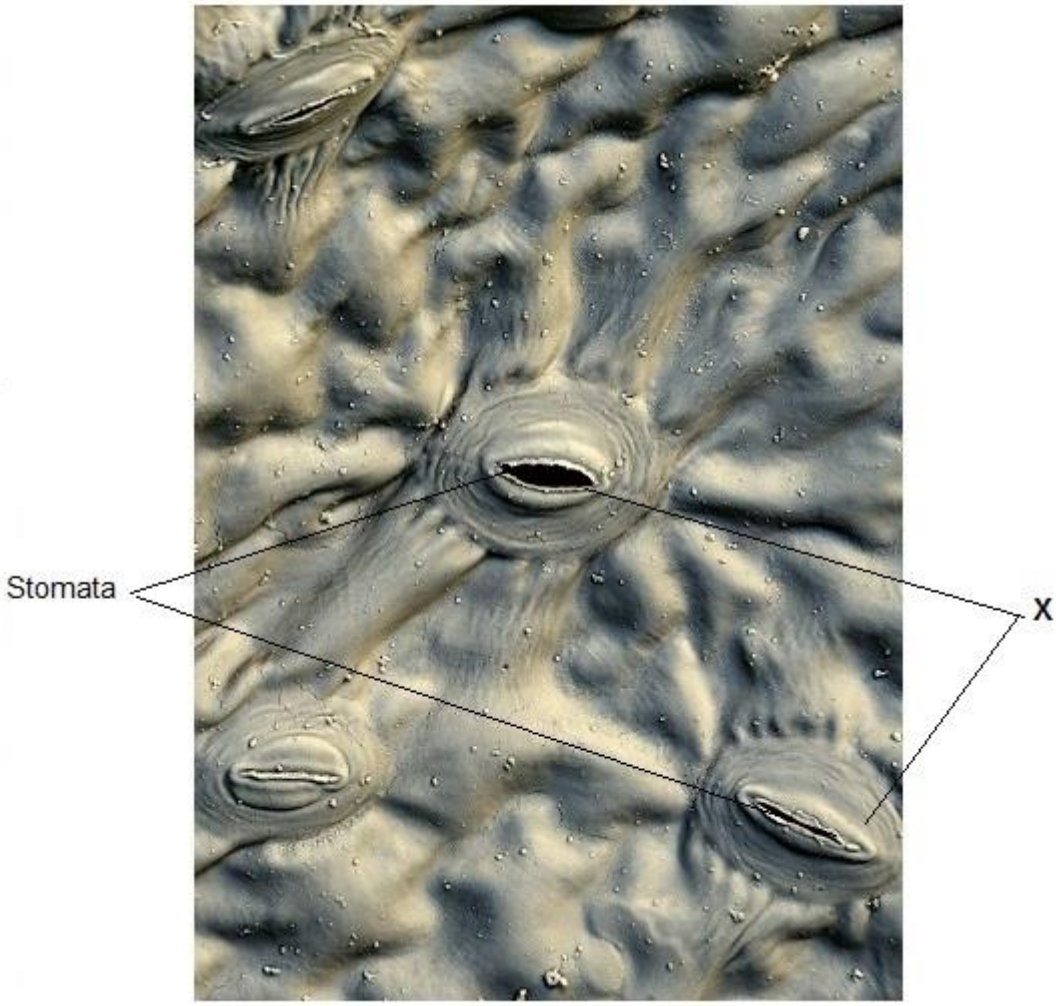
_____

(3)

(Total 11 marks)

Q9.

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



(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.

_____

_____

(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.

_____

_____

% decrease = _____

(2)

(c) Vaseline blocks the stomata.

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

_____

_____

_____

(1)

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

1. _____

2. _____

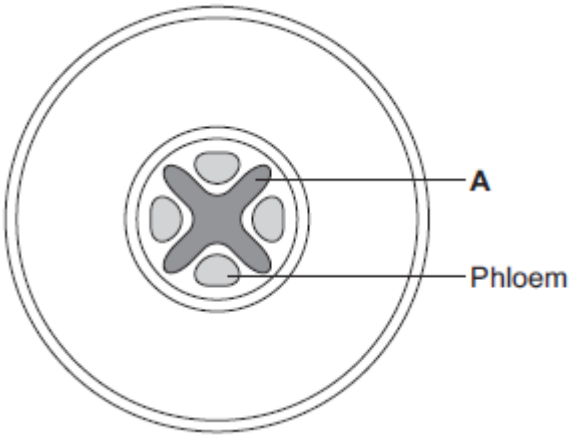
3 _____

(3)

(Total 8 marks)

Q10.

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)

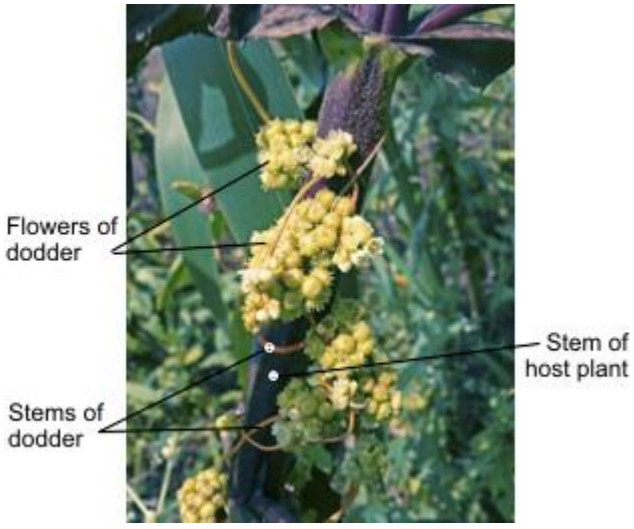
Q11.

(a) Dodder is an unusual flowering plant. It is a parasite.

The dodder plant:

- has no chlorophyll
- has no roots
- has no leaves
- grows attached to the stem of a host plant.

The image below shows dodder attached to its host plant.



© yogesh_more/iStock/Thinkstock

(i) Dodder has no chlorophyll. Most plants have leaves containing chlorophyll.

What is the function of chlorophyll in most plants?

_____

_____

_____

_____

(2)

(ii) Parts of the dodder stem grow into the host stem and attach to the host's phloem tissue.

Suggest why it is helpful to the dodder plant to be attached to the host's phloem tissue.

_____

_____

(1)

(iii) Suggest why the dodder will have a harmful effect on the host plant.

_____

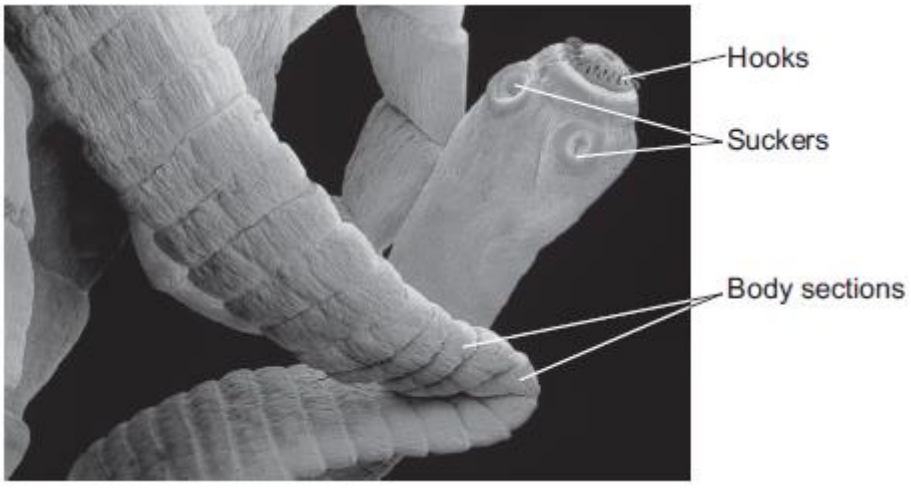
_____

(1)

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

The tapeworm is another parasite.

The image below shows part of a tapeworm.



© Science Photo Library

The tapeworm lives inside the small intestine of a mammal.

Describe and explain how the tapeworm is adapted for living inside the small

intestine of its host.

Extra space _____

(6)

(Total 10 marks)

Q12.

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

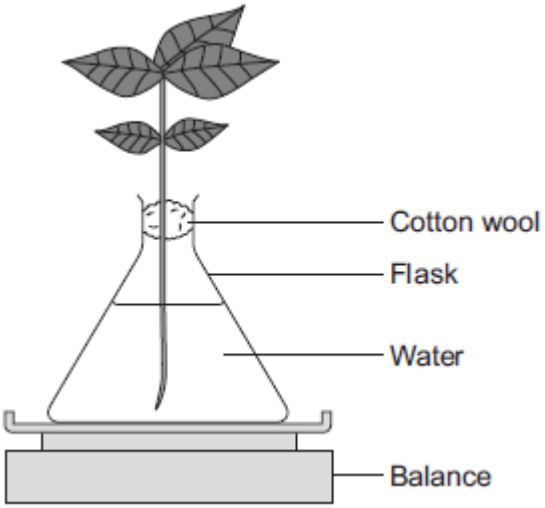
called _____ .

(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.

_____

_____

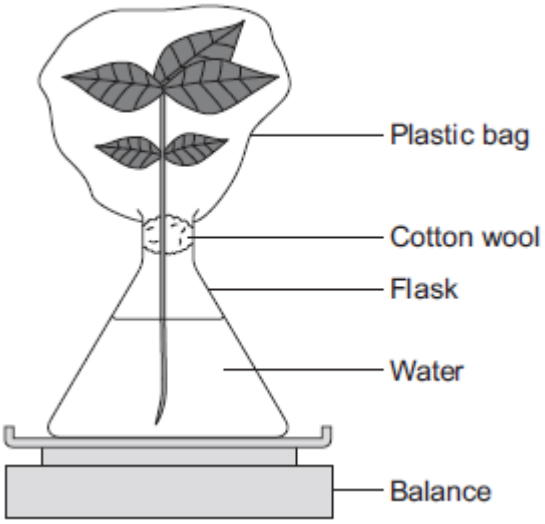
_____

(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)

Q13.

Plant roots absorb water from the soil by osmosis.

(a) What is osmosis?

_____

_____

_____

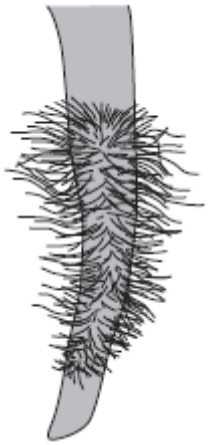
_____

_____

_____

(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.

_____

_____

_____

_____

_____

_____

(3)

(Total 6 marks)

Q14.

The leaves of most plants have stomata.

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

_____

(1)

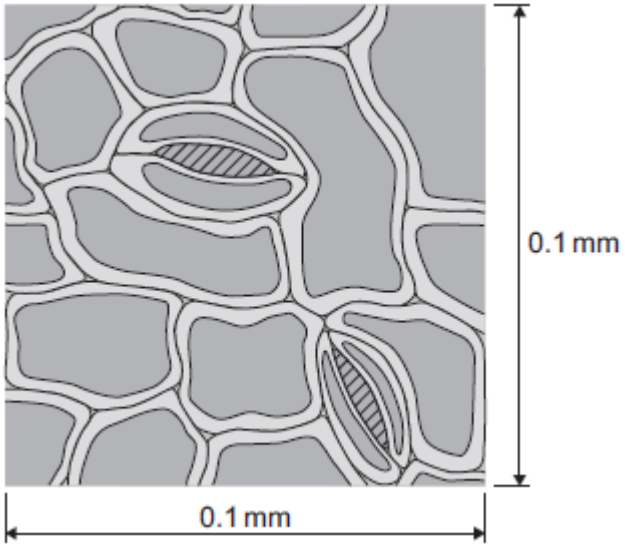
(ii) Give **one** function of stomata.

_____

_____

(1)

(b) The image below shows part of the surface of a leaf.



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

(i) Calculate the number of stomata per mm^2 of this leaf surface.

_____

_____

_____ per mm^2

(2)

(ii) A different plant species has 400 stomata per mm^2 of leaf surface.

Having a large number of stomata per mm^2 of leaf surface can be a disadvantage to a plant.

Give **one** disadvantage.

_____

_____

(1)

(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.

The table below 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

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

_____

_____

Mass = _____ g

(1)

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

Explain why.

_____

_____

_____

_____

_____

_____

_____

(3)

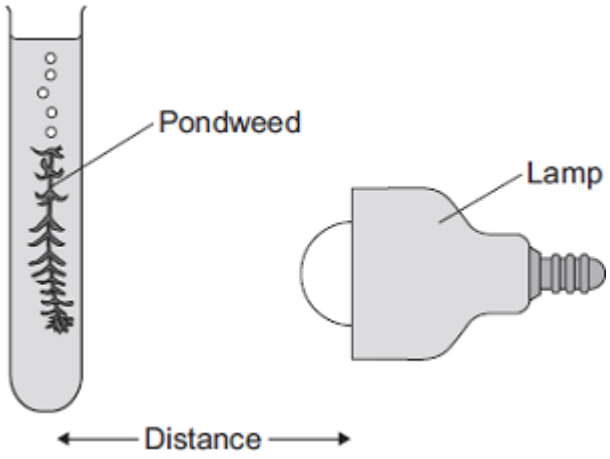
(Total 9 marks)

Q15.

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?

_____

_____

(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?

_____

_____

(1)

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

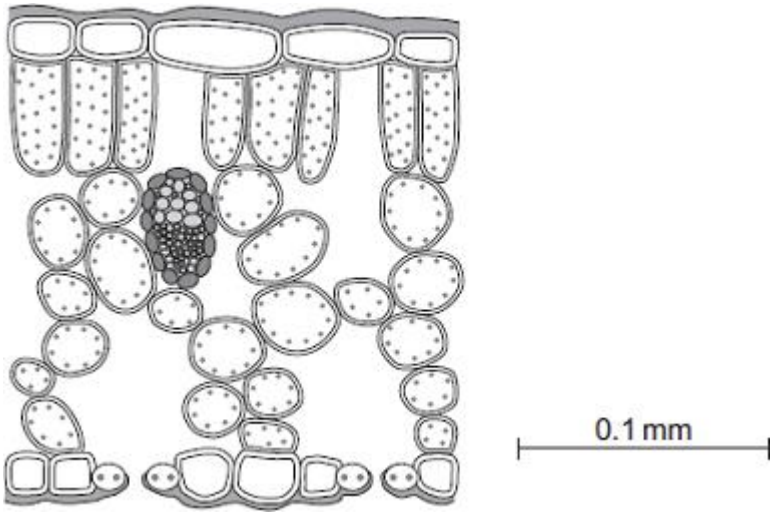
_____

(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.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

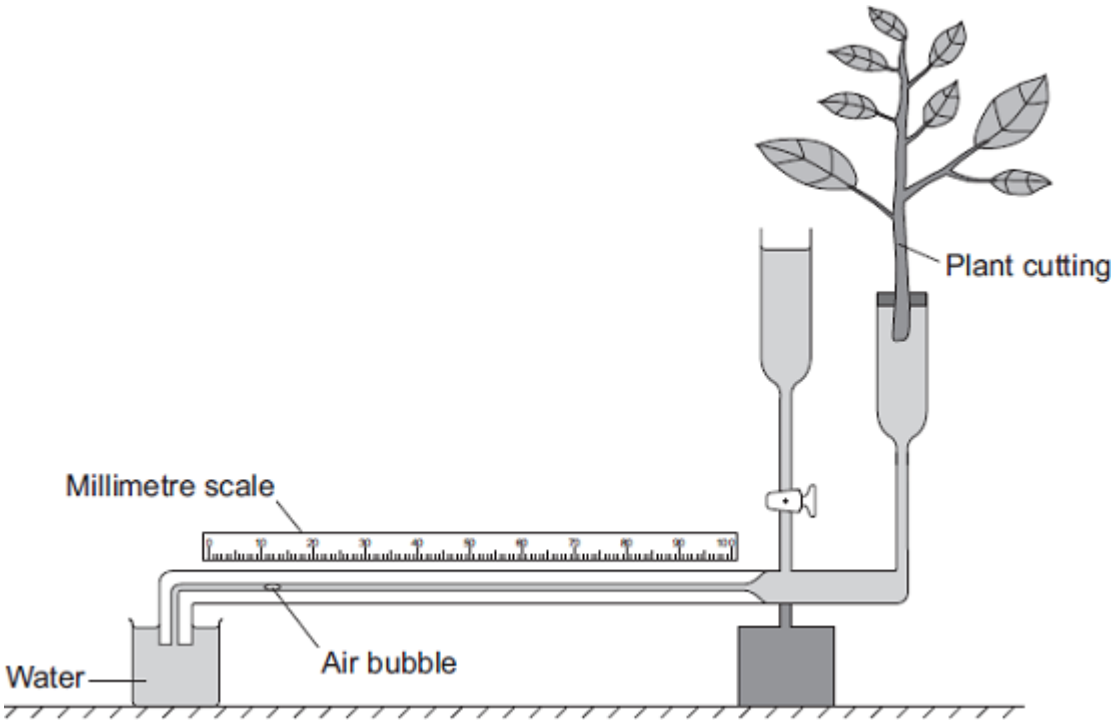
_____

(6)

(Total 9 marks)

Q16.

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.

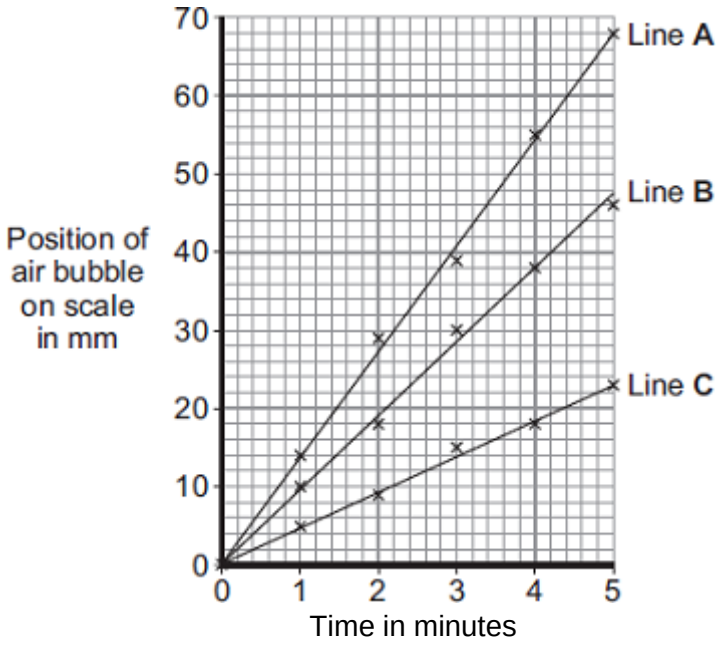
Explain why.

_____

_____

(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.

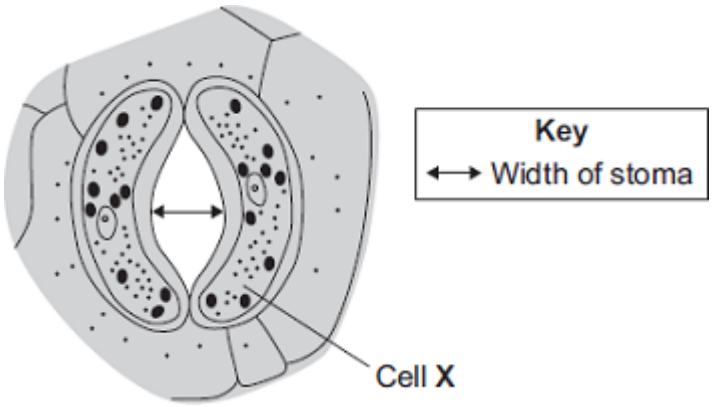
distillation **respiration** **transpiration**

(1)

(Total 6 marks)

Q17.

Plant leaves have many stomata.
The diagram shows a stoma.



(a) Name cell **X** _____

(1)

(b) The table shows the mean widths of the stomata at different times of the day for two different species of plant.
Species **A** grows in hot, dry deserts.
Species **B** grows in the UK.

	Time of day in hours	**Mean width of stomata as a percentage of their maximum width**	
		Species A	**Species B**
Dark	0	95	5
	2	86	5
	4	52	6
Light	6	6	40
	8	4	92
	10	2	98
	12	1	100
	14	0	100
	16	1	96
	18	5	54
Dark	20	86	6
	22	93	5
	24	95	5

The data in the table show that species **A** is better adapted than species **B** to living in hot, dry deserts.

Explain how.

_____

_____

_____

_____

_____

_____

_____

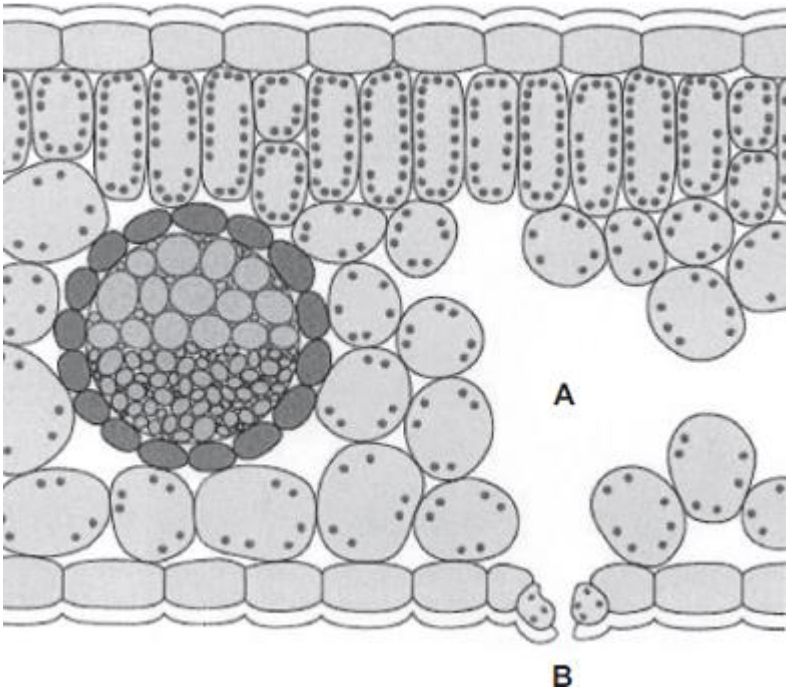
_____

(4)

(Total 5 marks)

Q18.

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)

Q19.

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)

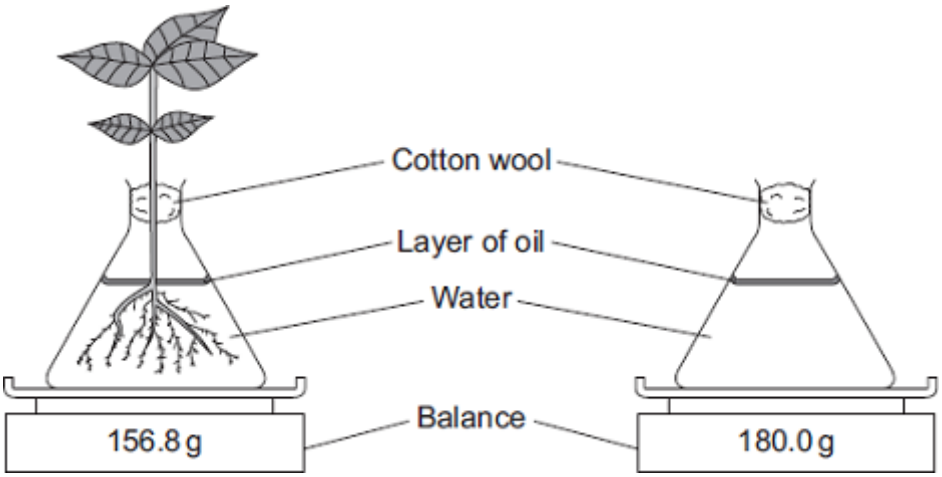
(iv) A leaf uses the carbon dioxide to produce sugars.

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)

Q20.

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)

(b) What is meant by the *transpiration stream*?

_____

_____

_____

_____

_____

_____

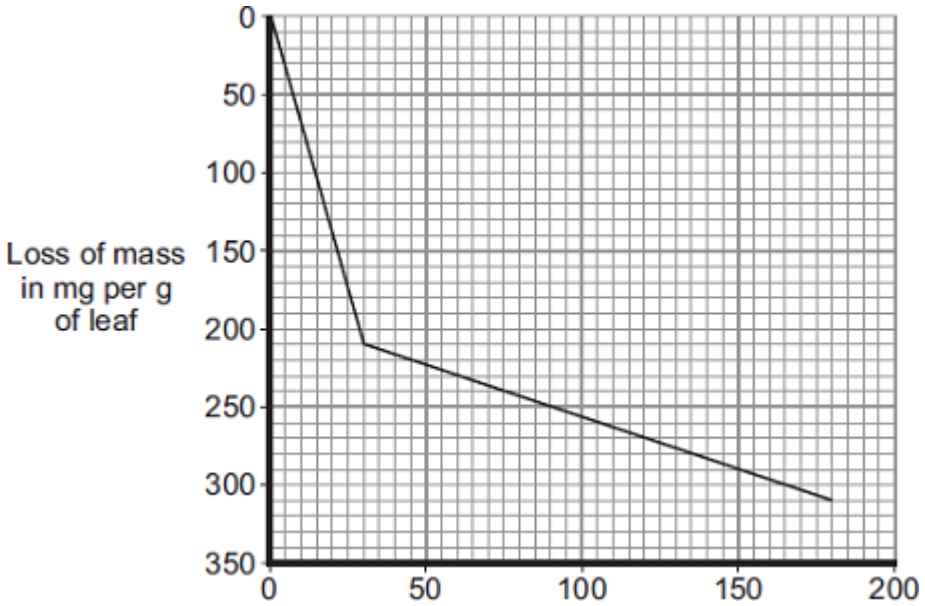
(3)

(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.



(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)

(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)

(Total 11 marks)

Q21.

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.

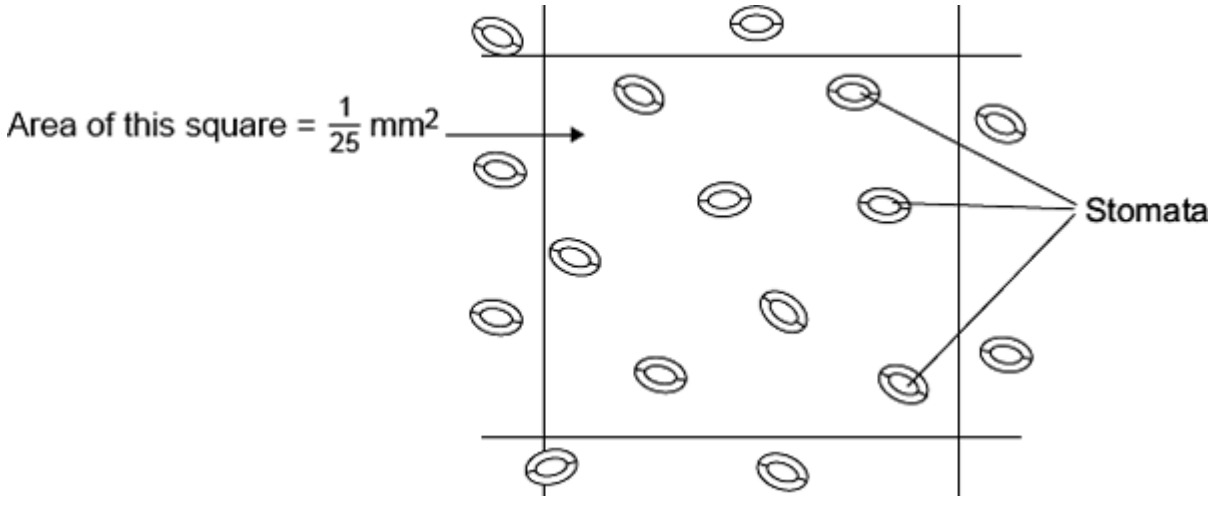
(1)

(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.

_____

_____

_____

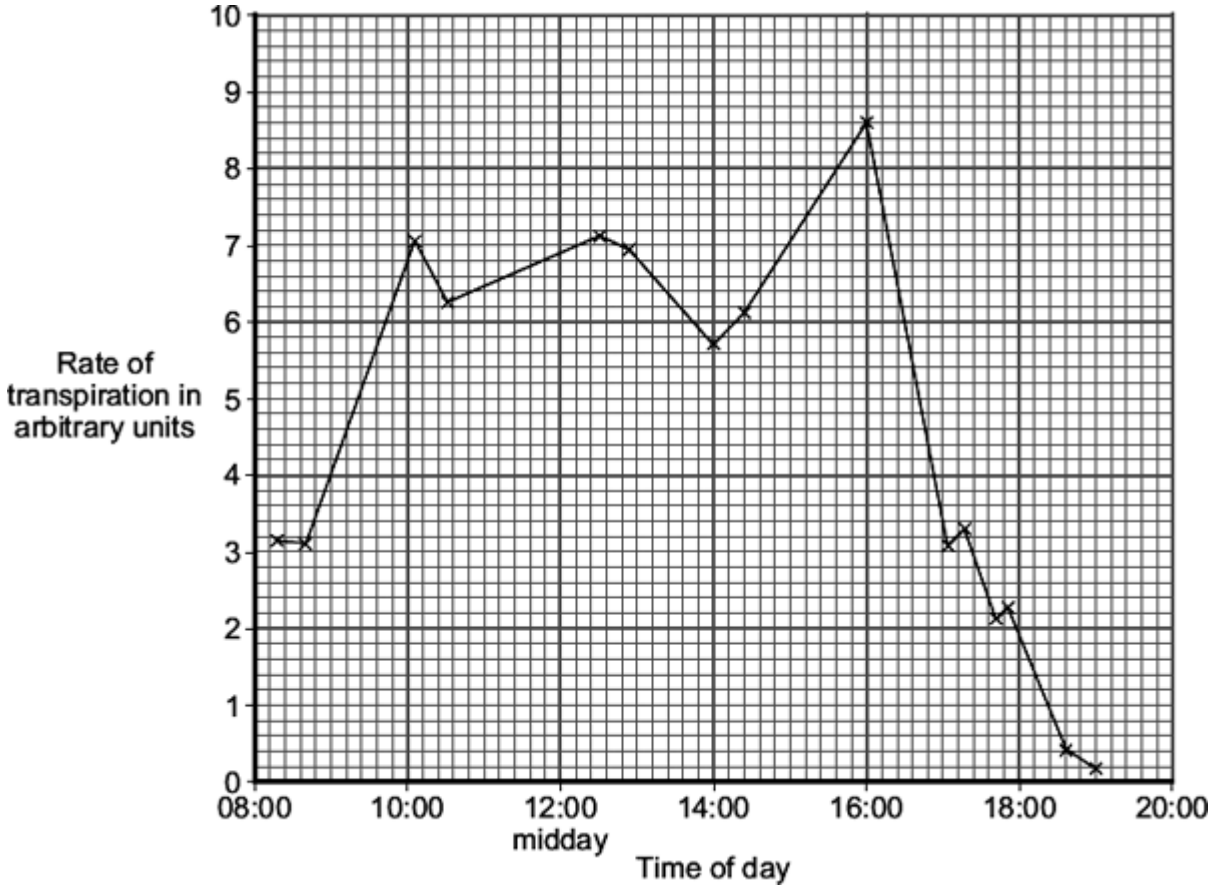
_____

(2)

(Total 6 marks)

Q22.

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*?

_____

_____

_____

_____

(2)

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

_____

(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.

_____

_____

_____

_____

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.

_____

_____

_____

_____

(2)

(Total 7 marks)

Q23.

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

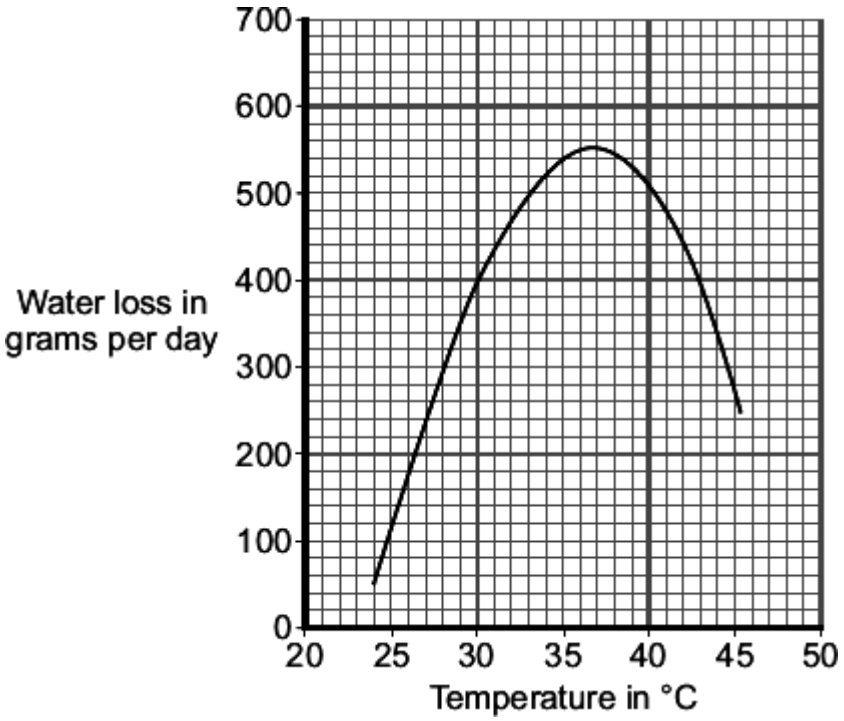
A plant loses water from its leaves by a process called

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.

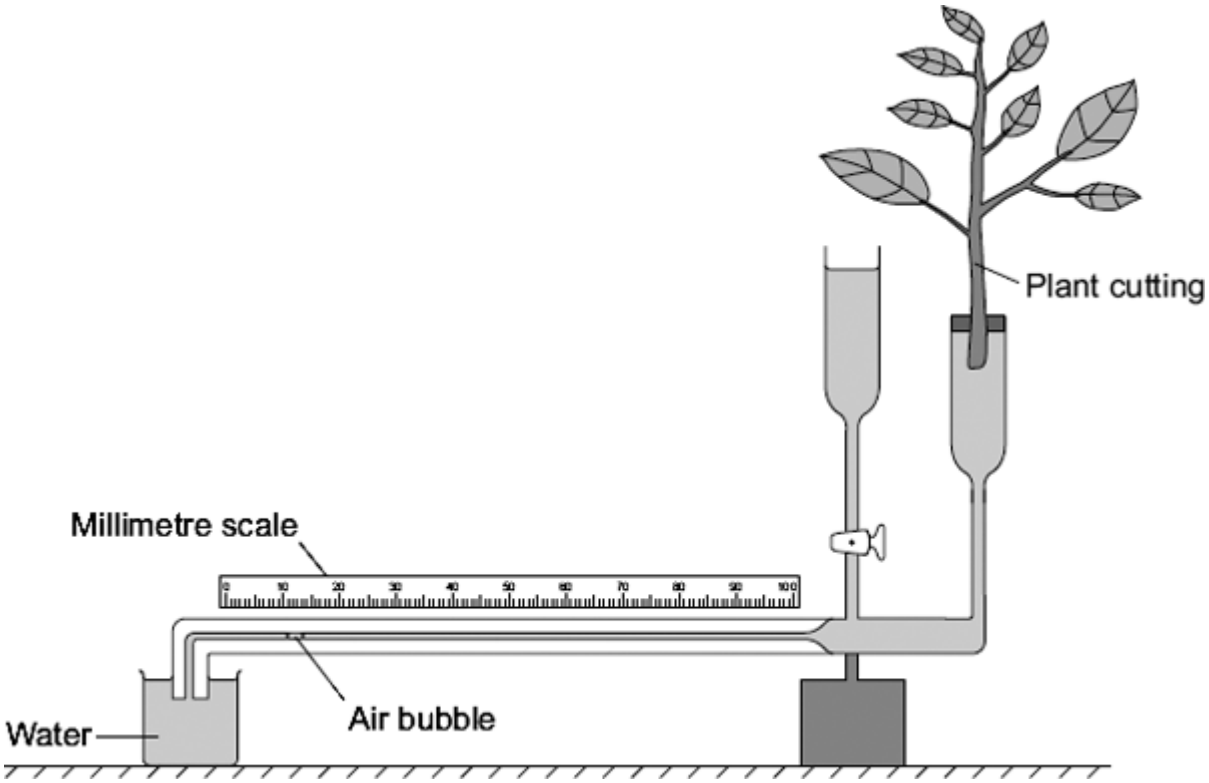
25 - 30 °C **30 - 35 °C** **40 - 45 °C**

(1)

(Total 5 marks)

Q24.

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)

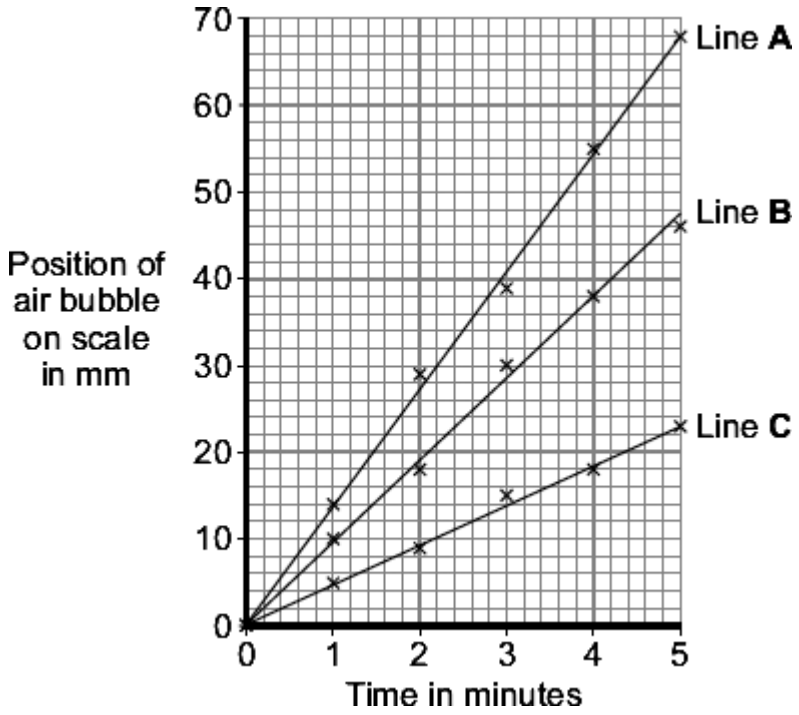
(ii) It was important to use the same plant cutting each time to make these experiments fair.

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**

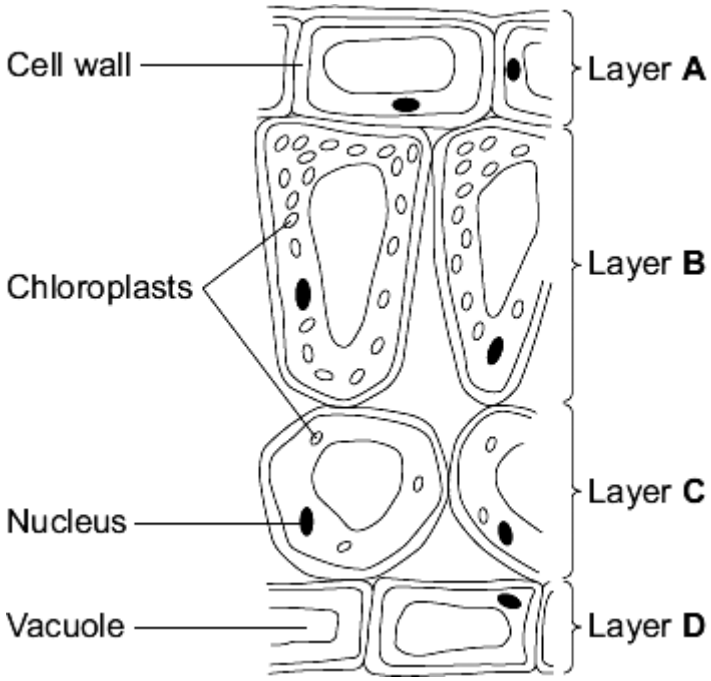
(1)

(Total 6 marks)

Q25.

Leaves are made from layers of cells.

The diagram shows a section through part of a leaf.



(a) (i) Which word in the table describes layer **A**?

Tick (✓) **one** box.

Layer A	**Tick (✓)**
Tissue	
Organ	
Cell	

(1)

(ii) Which word describes a whole leaf?

Draw a ring around **one** answer.

organ **tissue** **organism**

(1)

(b) (i) Which **two** layers of cells, **A**, **B**, **C** and **D**, can photosynthesise?

Use information from the diagram to help you.

Tick (✓) **two** boxes.

Layer **A** ☐

Layer **B** ☐

Layer **C** ☐

Layer **D** ☐

(2)

(ii) Give **one** reason for your answer.

_____

_____

(1)

(c) List **X** gives the names of two parts of a cell.
List **Y** gives information about parts of a cell.

Draw **one** line between each part of the cell in list **X** and information about it in list **Y**.

List X **Part of a cell**	**List Y** **Information**
	Controls the passage of substances into the cell
Vacuole	
	Contains the cell sap
Nucleus	

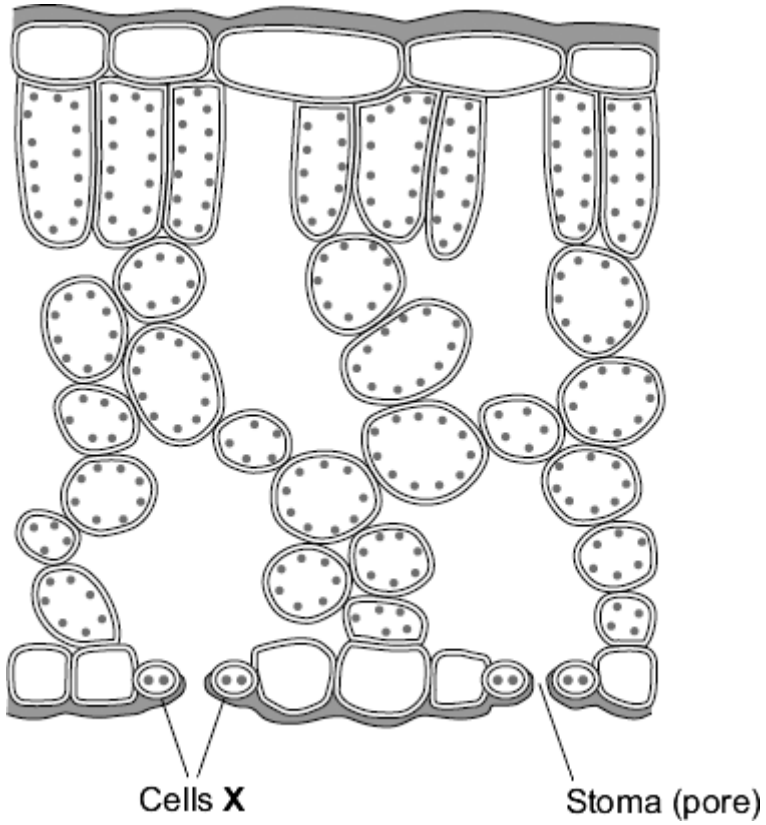
Controls the activities of the whole cell

(2)

(Total 7 marks)

Q26.

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.

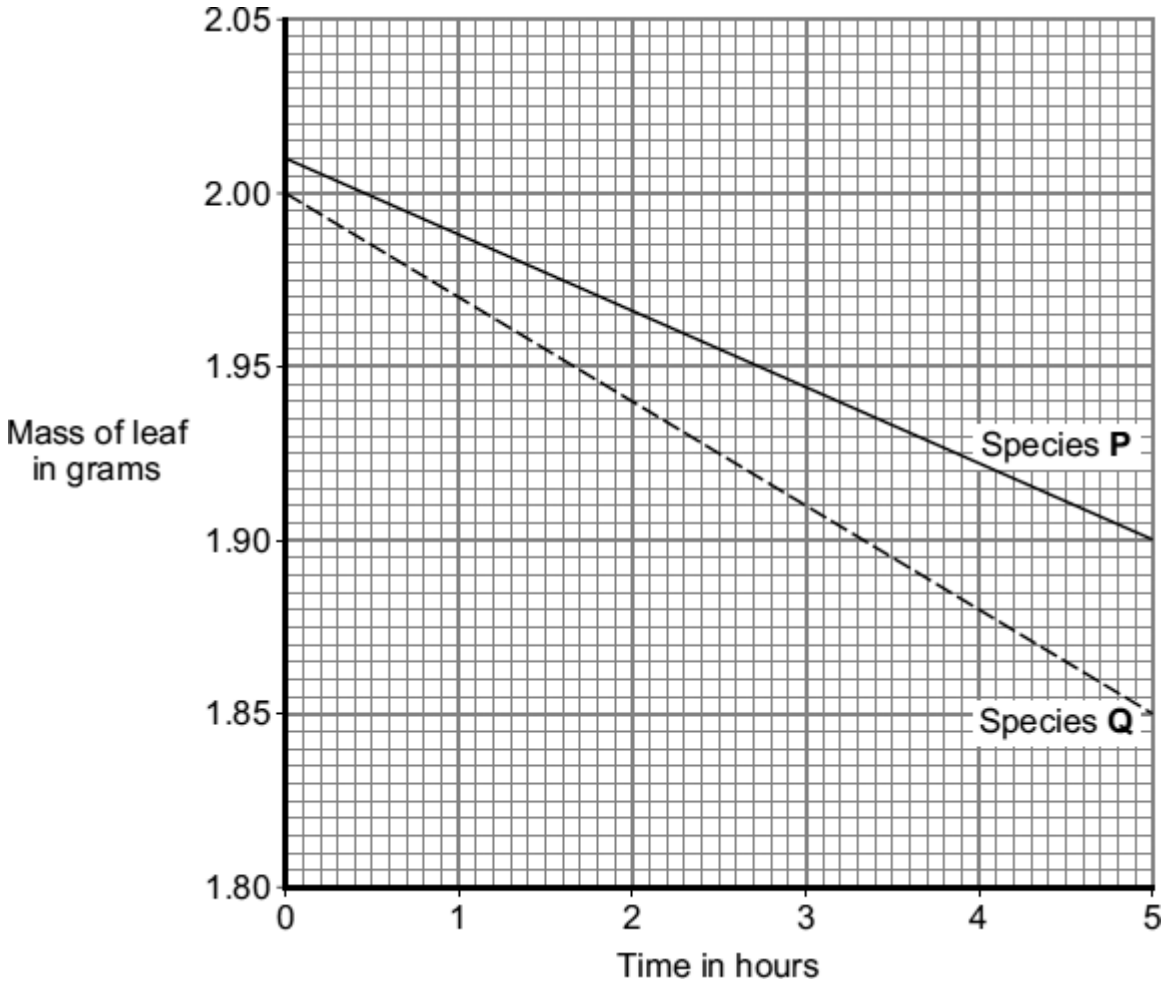
Cells **X** are called

alveoli.
guard cells.
villi.

(1)

(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.



(i) What was the mass of the leaf of species **Q** at 0 hours?

_____ grams

(1)

(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)

(iii) The leaf of species **Q** lost water at a faster rate than the leaf of species **P**.

Suggest **one** reason why.

_____

_____

(1)

(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)

(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)

(Total 6 marks)

Q27.

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.

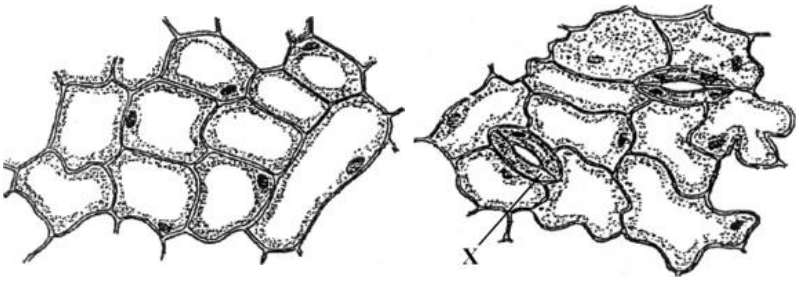
Time in hours	Mass of leaf + beaker in grams		
	Leaf A	Leaf B	Leaf C
0	50.00	55.01	51.99
0	49.99	54.95	51.90
3	49.97	54.90	51.85
5	49.95	54.86	51.80

(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.

_____

_____

_____

_____

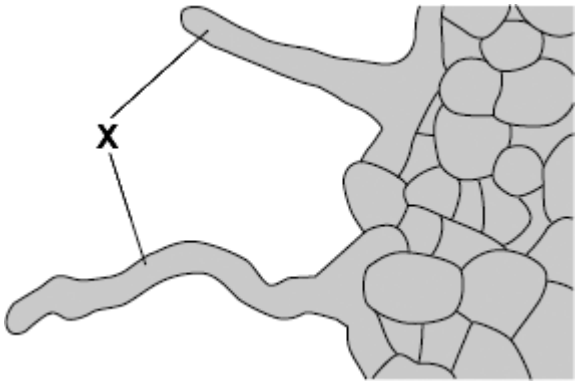
_____

(2)

(Total 4 marks)

Q28.

The diagram shows part of a plant root. A large number of structures like the ones labelled **X** grow out of the surface of the root.



(a) (i) What is the name of structure **X**?

Draw a ring around **one** answer.

root hair **stoma** **villus**

(1)

(ii) Name **two** substances which structure **X** absorbs from the soil.

1. _____

2. _____

(2)

(b) The substances in (a)(ii) are transported from the roots to the leaves. Carbon dioxide also enters the leaves.

Draw a ring round the correct answer to complete each sentence.

(i) Carbon dioxide enters leaves through

alveoli.
stomata.
villi.

(1)

(ii) Carbon dioxide enters leaf cells by

active transport.
diffusion.
reabsorption.

(1)

(Total 5 marks)

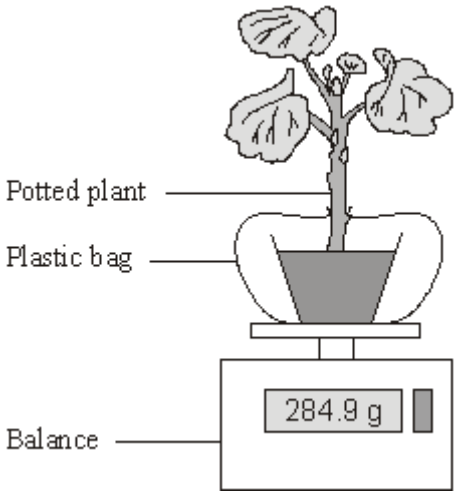
Q29.

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

_____

(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.

_____

_____

_____

_____

_____

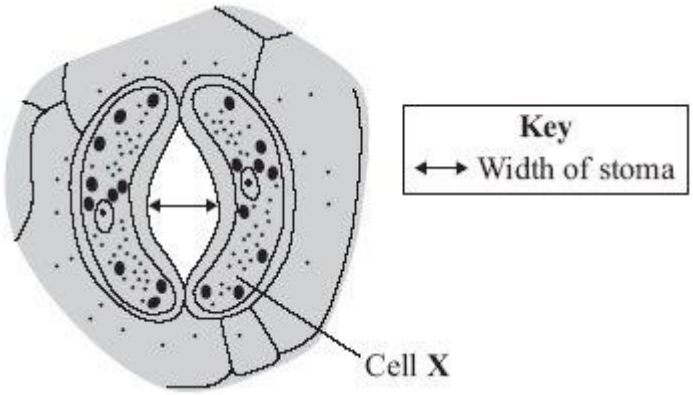
(2)

(Total 4 marks)

Q30.

Plant leaves have many stomata.

The diagram shows a stoma.



(a) Name cell **X** _____

(1)

(b) The table shows the mean widths of the stomata at different times of the day for two different species of plant.
Species **A** normally grows in hot, dry deserts.
Species **B** grows in the UK.

	Time of day	**Mean width of stomata as a percentage of their maximum width**	
	In hours	**Species A**	**Species B**
	0	95	5
Dark	2	86	5
	4	52	6
Light	6	6	40
	8	4	92
	10	2	98
	12	1	100
	14	0	100
	16	1	96
	18	5	54
Dark	20	86	6
	22	93	5
	24	95	5

The data in the table show that species **A** is better adapted than species **B** to living in hot, dry deserts.

Explain how.

_____

_____

_____

_____

_____

_____

_____

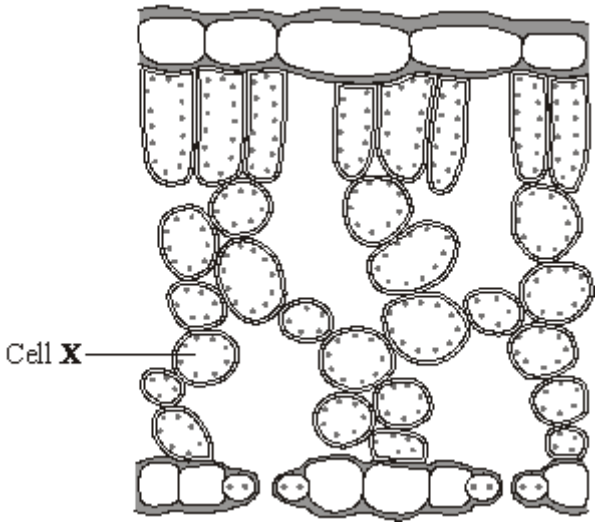
_____

(4)

(Total 5 marks)

Q31.

(a) The diagram shows a section through a plant leaf.
Water evaporates from cell **X**.



(i) **On the diagram**, draw an arrow to show how water vapour from cell **X** gets out of the leaf.

(1)

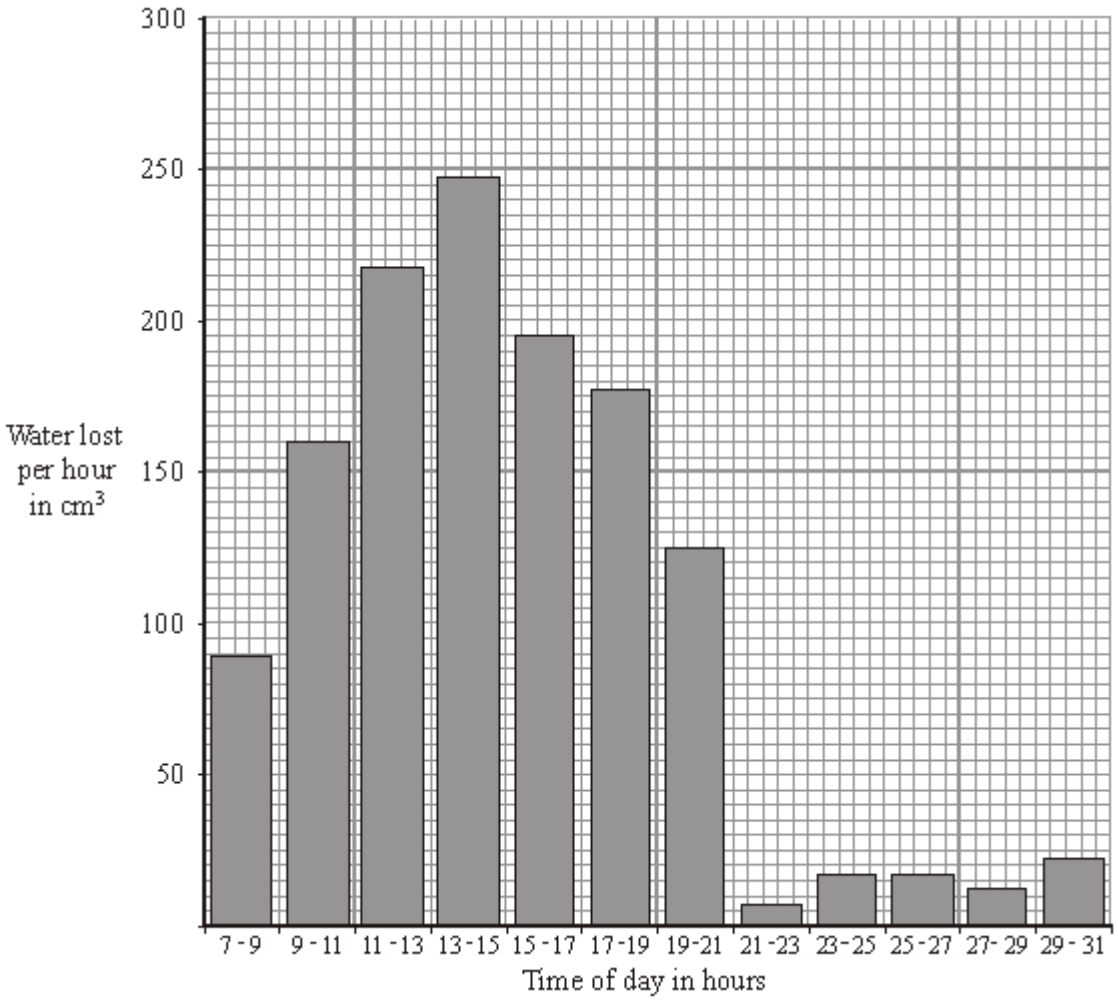
(ii) Name the process by which water vapour is lost from a leaf.

Draw a circle around **one** answer.

osmosis **transpiration** **wilting**

(1)

(b) The graph shows how much water was lost from a plant at different times of the day.



(i) During which 2-hour period was water lost most quickly?

_____

(1)

(ii) Give **one** possible explanation why water was lost most quickly at this time.

_____

_____

_____

_____

(2)

(Total 5 marks)

Q32.

A group of students looked at stomata on four different species of plants, **A, B, C** and **D**. They estimated the number of stomata per cm^2 on the upper and lower surfaces of the leaves of the four species.

Their results are shown in the table.

Plant	**Estimated number of stomata per cm^2 of leaf surface**

species	Upper surface of leaf	Lower surface of leaf
A	4000	28 000
B	0	800
C	8500	15 000
D	8000	26 000

(a) Which plant species probably lives in a dry region? ☐

Explain the reason for your answer.

_____

_____

_____

_____

_____

_____

(3)

(b) All four species have more stomata on the lower surface of their leaves than on the upper surface.

Suggest how this could help the plants to survive better.

_____

_____

_____

_____

(2)

(Total 5 marks)

Q33.

Four leaves were removed from the same plant. Petroleum jelly (a waterproofing agent) was spread onto some of the leaves, as follows:

Leaf **A**: on both surfaces
Leaf **B**: on the lower surface only
Leaf **C**: on the upper surface only
Leaf **D**: none applied

Each leaf was then placed in a separate beaker, as shown in diagram **1**.

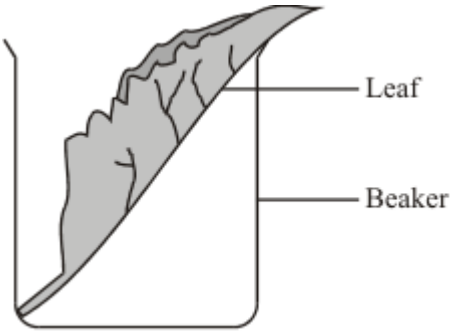
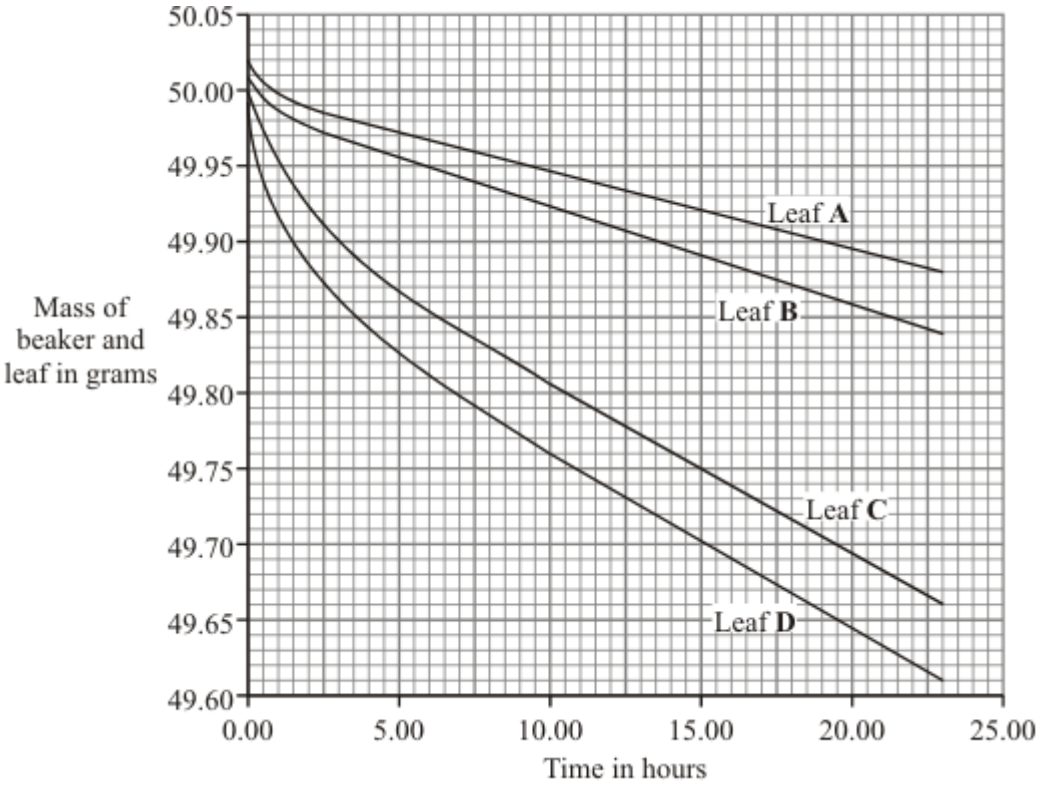


Diagram 1

Each beaker was weighed at intervals. The results are shown in the graph.



(a) Give evidence from the graph in answering the following questions.

(i) Which surface (upper or lower) loses water most rapidly? _____

Evidence _____

_____

(1)

(ii) Is water lost from both surfaces of the leaf? _____

Evidence _____

_____

(1)

(b) Diagram **2** shows the appearance of each surface of the leaf as seen through a microscope.

Upper Surface of Leaf **Lower Surface of Leaf**

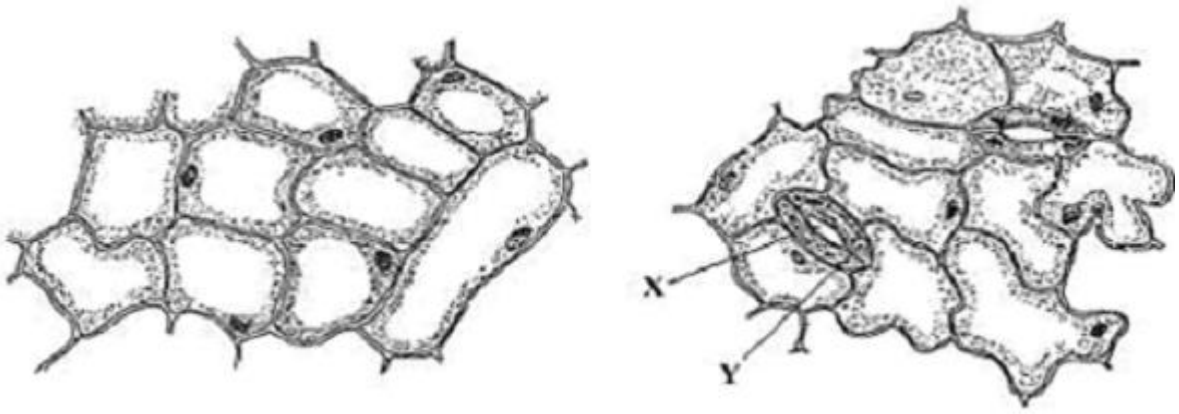


Diagram 2

(i) Name space **X** and cell **Y**.

X _____

Y _____

(2)

(ii) Use information in diagram **2** to explain why the results are different for leaves **B** and **C**.

_____

_____

_____

_____

(2)

(Total 6 marks)

Q34.

The table gives information about a geranium plant and a cactus plant.

The geranium grows in gardens in the UK. The cactus grows in hot deserts.

Feature	Geranium	Cactus
Thickness of waxy cuticle in micrometres	5	15
Total leaf surface area in cm^2	1800	150
Percentage of water storage tissue in stem	50	85
Number of stomata per mm^2	59	13
Time of day when stomata open	daylight	at night

Horizontal spread of roots in metres	0.2	5

Using only information in the table, explain how the cactus is better adapted for living in hot, dry conditions.

To gain full marks in this question you should write your ideas in good English. Put them into a sensible order and use the correct scientific words.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(Total 5 marks)

Q35.

(a) Complete the following sentences.

Green plants produce their own food by a process called photosynthesis. In this process the raw materials are _____ and carbon dioxide. Glucose and _____ are produced. _____ energy is absorbed by the green substance called _____ .

(4)

(b) Name **two** things that can happen in the plant to the glucose produced in photosynthesis.

1. _____

2. _____

(2)

(c) Plants need mineral salts.

(i) Through which part do mineral salts get into the plant?

_____

(1)

(ii) Explain why water is important in this process.

_____

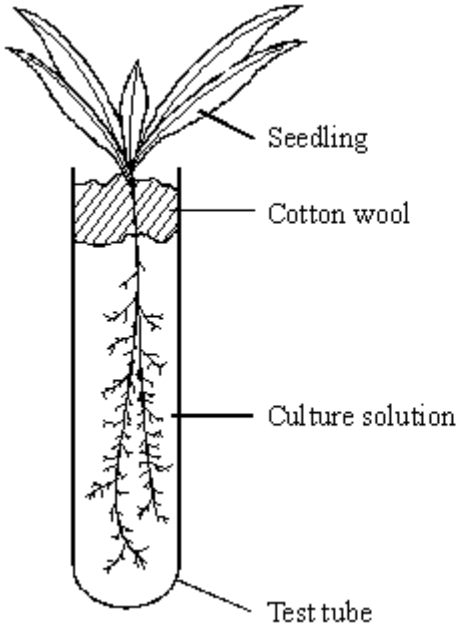
_____

_____

_____

(2)

Some students set up water cultures to find out how plants use nitrates.
They had two sets of nutrient solutions.
A full solution provided the plant with all the required nutrients.
The results table shows the average mass of the seedlings after 28 days of growth.



Culture solution	Average mass of seedling in g
distilled water	0.14
full solution with no nitrates	0.29
full solution	0.43

(d) (i) Give a conclusion you could make from these results.

_____

_____

(1)

(ii) Calculate the difference in average mass caused by the addition of nitrates to the culture solution.

_____

(1)

(iii) What are nitrates used for in the seedling?

_____

(1)

(iv) Some factors need to be controlled to keep this test fair. Name **two** of them.

1. _____

2. _____

(2)

(v) Suggest **one** way you could improve the experiment.

_____

(1)

(Total 15 marks)

Q36.

(a) What type of blood vessels join arteries to veins?

_____

(1)

(b) How are oxygen and carbon dioxide carried in the blood?

_____

_____

_____

_____

(2)

(c) List **three** things that are carried around the body in the blood plasma.

1. _____

2. _____

3. _____

(3)

(Total 6 marks)

Q37.

(a) Photosynthesis is a process that takes place in green plants.

(i) What type of energy is needed for this process?

_____

(1)

(ii) What substance in the plant absorbs this energy?

_____

(1)

(iii) In which part of the plant cell does photosynthesis take place?

_____

(1)

(iv) Write a balanced chemical equation for photosynthesis.

_____ → _____

(3)

(b) Describe **two** ways you could speed up photosynthesis.

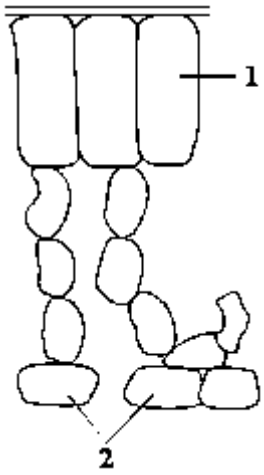
_____

_____

_____

(2)

(c) The diagram shows the outline of a cross-section of a leaf. Name cells **1** and **2** and describe how they are involved in photosynthesis.



_____

_____

_____

_____

_____

_____

_____

_____

(4)

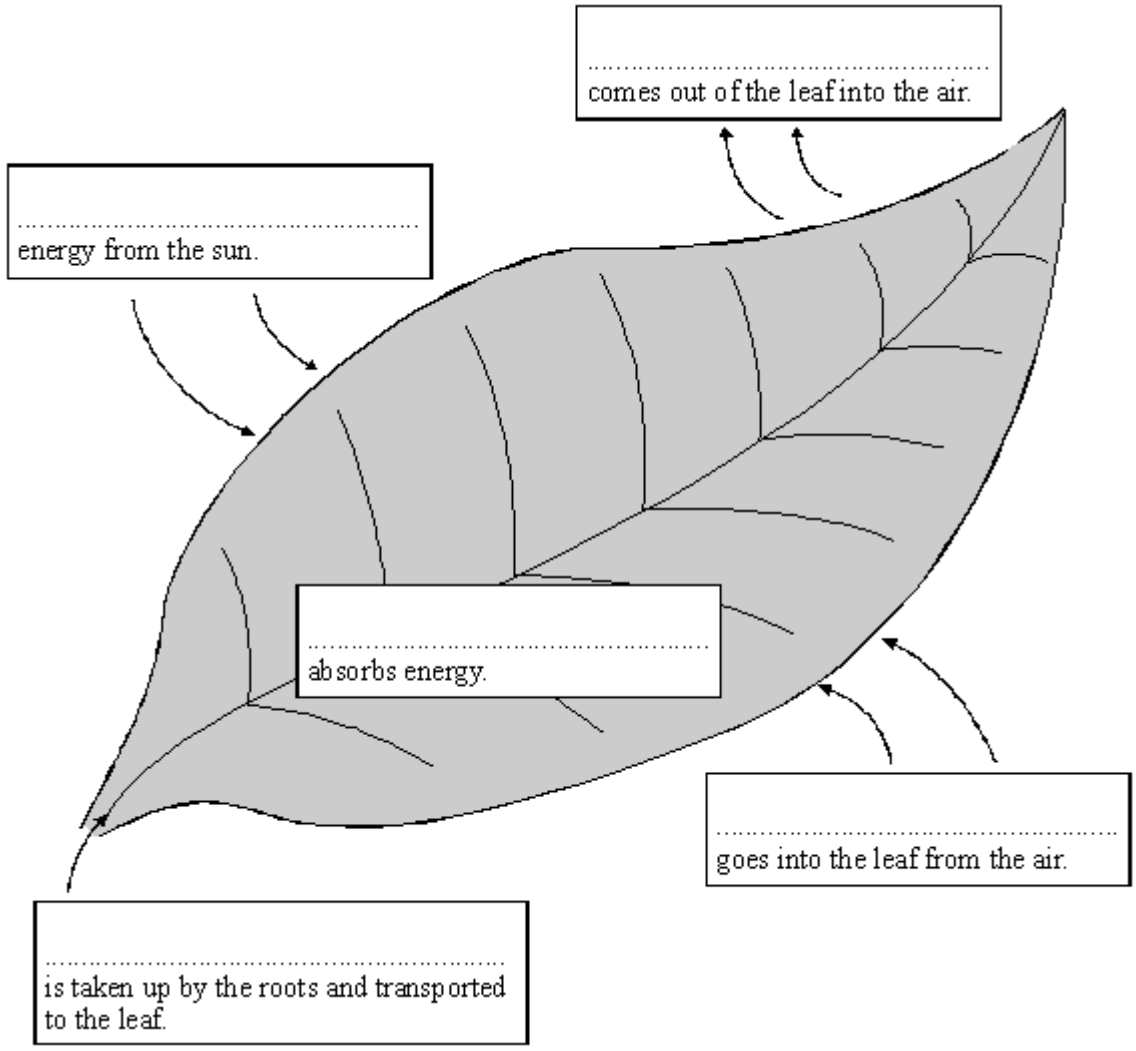
(Total 12 marks)

Q38.

The diagram shows how a leaf of a green plant makes glucose.

(a) Use words from the box to complete the labels on the diagram. You may use each word once or not at all.

carbon dioxide	chlorophyll	glucose	heat
light	oxygen	water	



(5)

(b) (i) Compete the following sentence.

Glucose in food is a type of _____ . When we eat it, it gives us energy.

(1)

(ii) The plant turns some of the glucose into starch. Why is starch useful to the plant?

_____

_____

(1)

(iii) What does the plant do with the rest of the glucose?

_____

(1)

(c) (i) What is the name of the process outlined in the diagram?

_____

(1)

(ii) Give **one** way that leaves are adapted to do this process.

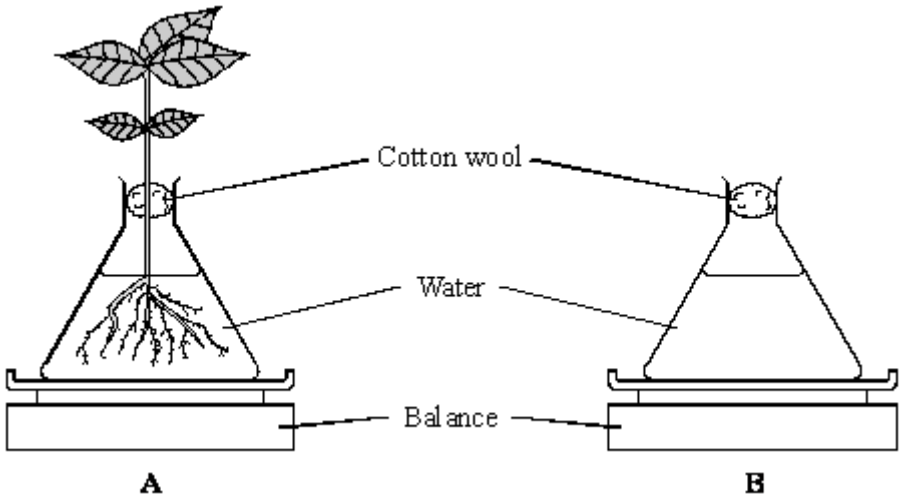
_____

(1)

(Total 10 marks)

Q39.

Some students set up the following apparatus.



The balances show the same mass at the start of the investigation.

After 24 hours the mass of flask **B** was the same but the mass of flask **A** had changed.

(i) Describe and explain the change to the mass of flask **A**.

_____

_____

_____

_____

_____

(3)

(ii) Why did the students need to set up flask **B**?

_____

_____

(1)

(Total 4 marks)

Q40.

(a) Put a tick (✓) in the correct boxes in the table below to show which of the parts given are present in the cells and organisms listed.

	CYTOPLASM	NUCLEUS	CELL WALL	GENES
Leaf mesophyll cell				

Sperm				

(2)

(b) (i) What is the main job of a leaf mesophyll cell?

_____

_____

(1)

(ii) Explain **one** way in which the structure of the leaf mesophyll cell helps it to carry out its job.

_____

_____

_____

_____

(2)

(Total 5 marks)

Q41.

A market gardener produces large numbers of attractive, large flowered geranium plants.

(a) Give two advantages to the gardener of producing geraniums from cuttings rather than from seeds.

1. _____

_____

2. _____

_____

(2)

(b) Gardeners often cover trays of cuttings with large polythene bags.

Suggest **one** advantage of this.

_____

_____

(1)

(Total 3 marks)

Q42.

Busy lizzie plants produce flowers with many different colours.

A gardener wants to produce busy lizzie plants to fill a flower bed in her garden.
She decides to grow them from cuttings rather than seeds.

(a) Give **one** condition that she should supply to the new cuttings so that they grow well.

_____

(1)

Busy Lizzie plants can produce flowers which are white, pink or red.
A gardener wants to grow a display containing all three colours of flowers.

(b) Give **one** advantage and **one** disadvantage to the gardener of growing Busy Lizzie plants from cuttings rather than seeds.

Advantage _____

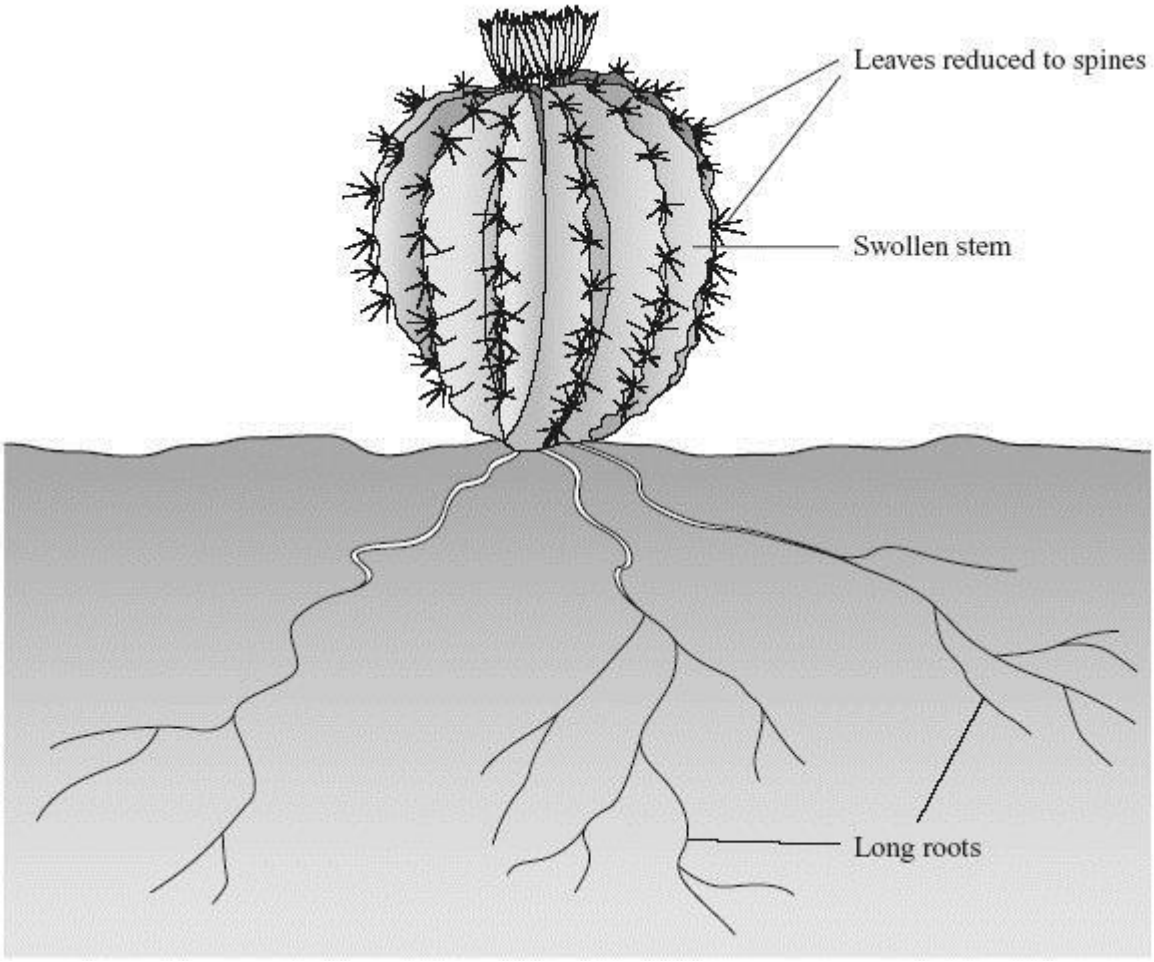
Disadvantage _____

(2)

(Total 3 marks)

Q43.

The drawing shows a plant that is adapted to life in a hot, dry desert.



(a) Which labelled part of the plant helps it to get the water it needs?

_____

_____

(1)

(b) The stem of the plant is covered by wax.
How does this help the plant to survive?

_____

_____

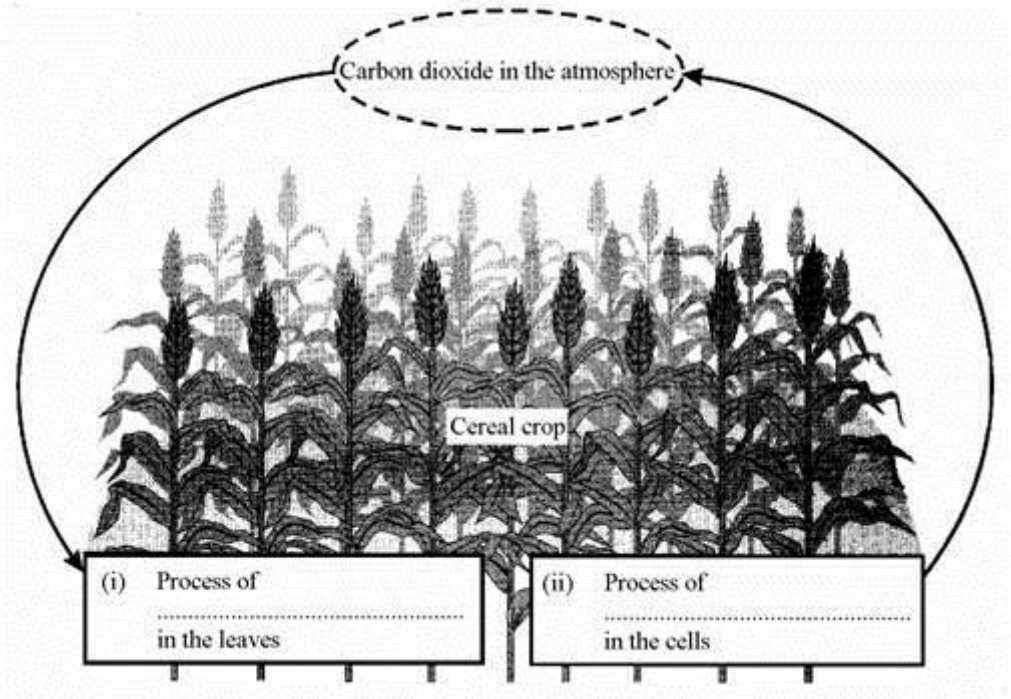
(1)

(Total 2 marks)

Q44.

(a) The diagram shows a cereal crop.

Complete spaces (i) and (ii).



(2)

(iii) What sort of weather may cause the cereal crop to wilt?

_____

(1)

(b) Describe the process of transpiration in plants.

_____

_____

_____

_____

_____

_____

(3)

(Total 6 marks)

[6]