Q1. The leaves of most plants have stomata.

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

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(1)

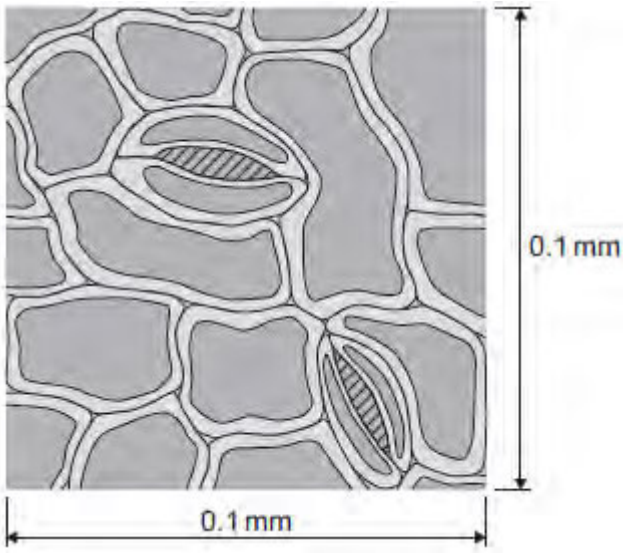
(ii) Give **one** function of stomata.

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(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.

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..... 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.

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(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?

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Mass = ... g

(1)

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

Explain why.

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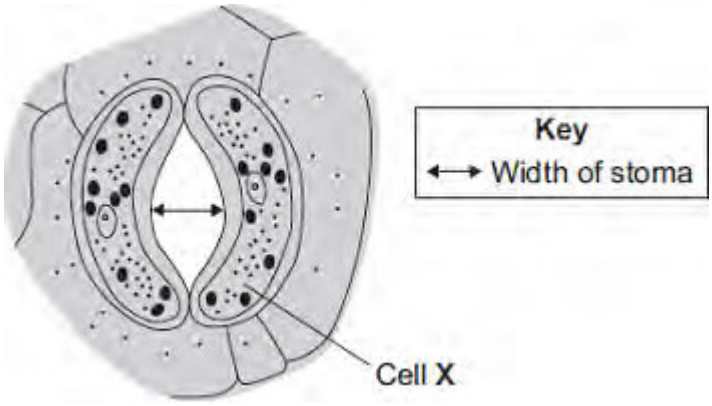
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(3)

(Total 9 marks)

Q2. 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.

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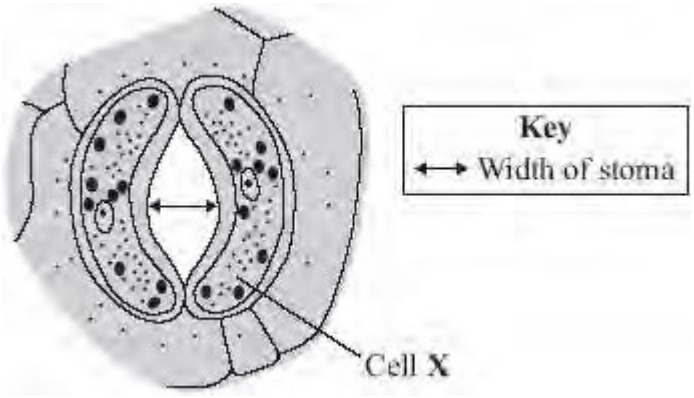
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(4)
(Total 5 marks)

Q3. 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
	6	6	40
	8	4	92
	10	2	98
Light	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.

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(4)
(Total 5 marks)

Q4. 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.

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(4)

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

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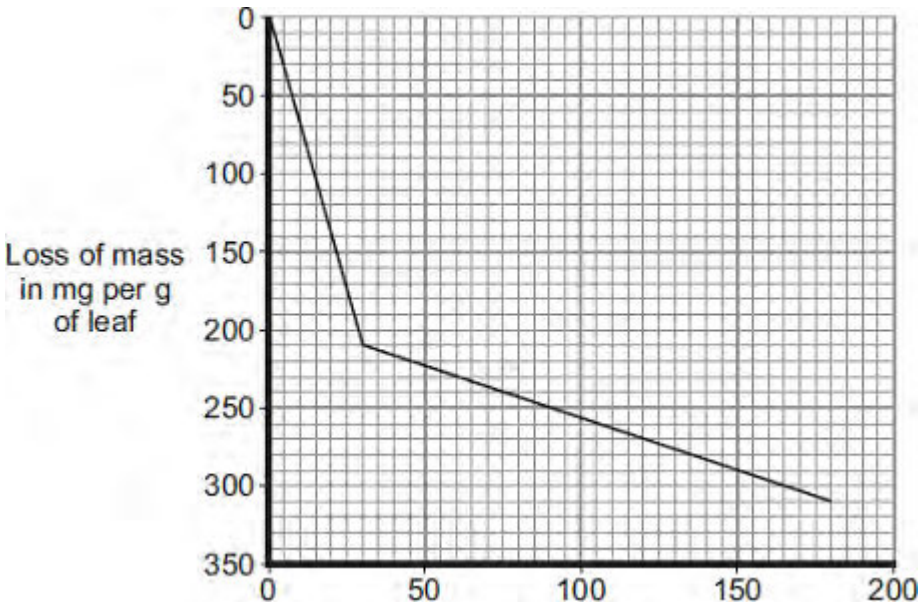
(3)

(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.

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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.

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(2)

(Total 11 marks)