Surname	Centre Number	Candidate Number
Other Names		0

GCSE

4461/01

SCIENCE A/BIOLOGY

BIOLOGY 1
FOUNDATION TIER

P.M. TUESDAY, 10 June 2014

1 hour

Suitable for Modified Language Candidates

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**4**	
2.	**5**	
3.	**6**	
4.	**4**	
5.	**7**	
6.	**5**	
7.	**5**	
8.	**6**	
9.	**6**	
10.	**6**	
11.	**6**	
Total	**60**	

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ADDITIONAL MATERIALS

In addition to this paper you may require a calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded that assessment will take into account the quality of written communication used in your answer to question **11**.

Examiner only

Answer **all** *questions*

1. The photograph below shows an insect called a water boatman *(Notonecta sp.)*.

(a) Water boatmen are invertebrates.
State what is meant by the term invertebrate. [1]

.....

(b) Read the following statements about water boatmen.

Water boatmen:

A live at the surface of ponds

B have long, flat back legs to help them swim

C have large eyes

D can dive below the surface of the water

E lay eggs on plants in the water

F have hairs sensitive to movement in water

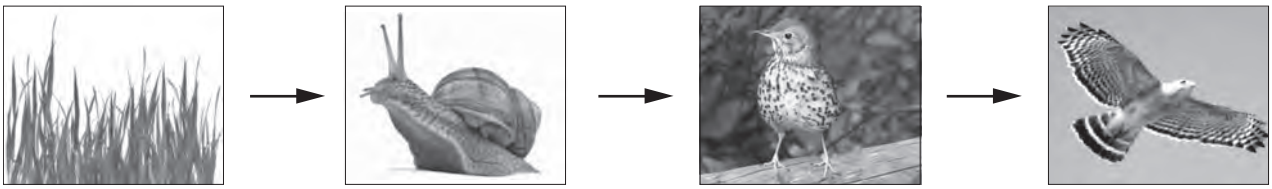
Water boatmen feed on small fish in the water.
Which **four** statements (**A** to **F**) are adaptations to help water boatmen **find** their food? [3]

....

4

Examiner only

2. The photographs below show a food chain.



grass → snail → thrush → hawk

(a) State the source of the energy used by the grass. [1]

.....

(b) Complete the following sentence:

Arrows in the food chain show the flow of ..... [1]

(c) The table below shows how much energy enters each organism in the food chain in one day.

organism in food chain	energy entering each organism (kJ)	percentage energy in grass passed on (%)
grass	2500	
snail	500	.....
thrush	25	1
hawk	0.5	0.02

(i) Use data in the table. Calculate the percentage of the energy **entering the grass** that is passed on to the **snail**. Show your working below. Write your answer in the table. [2]

(ii) State the process which happens in cells that releases energy. [1]

.....

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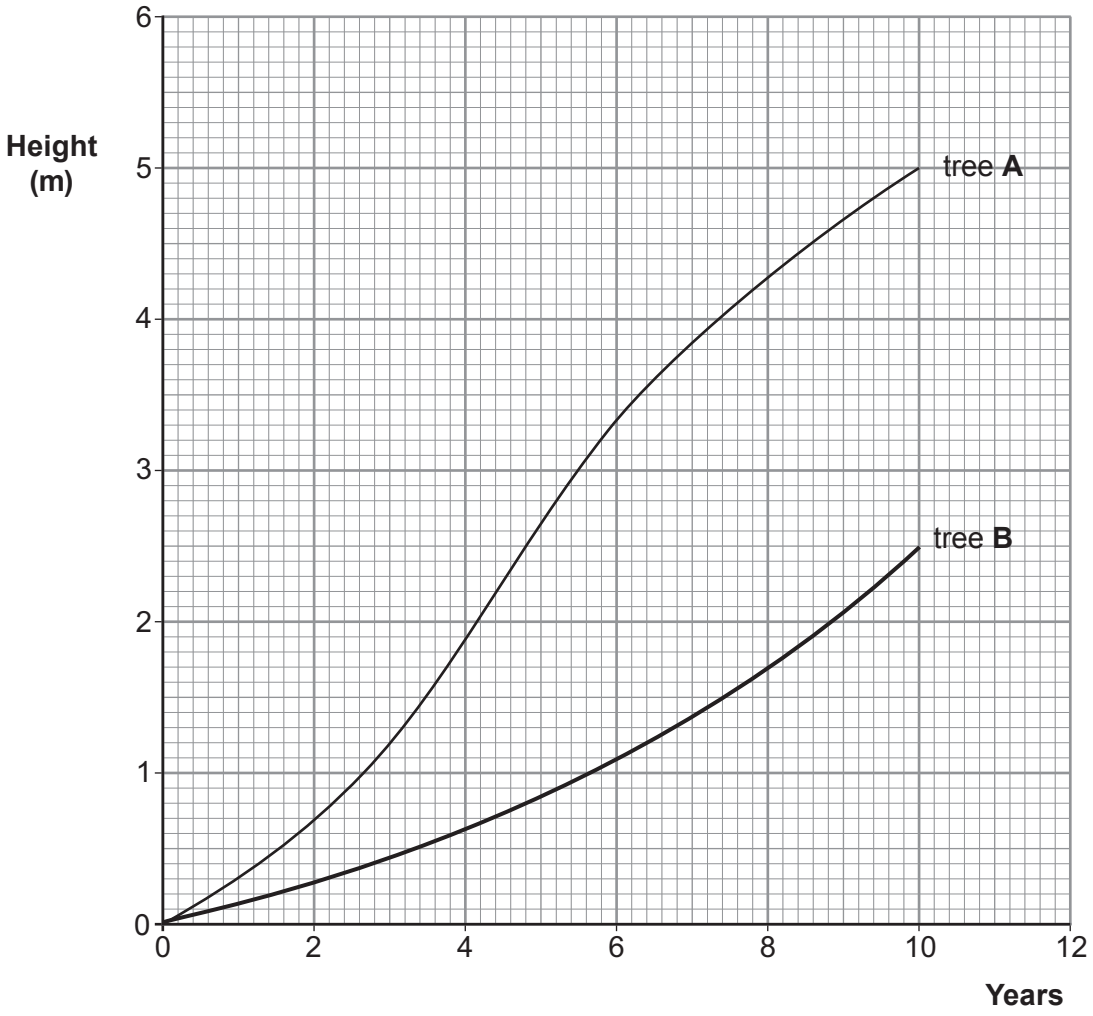
Turn over.

Examiner only

3. The graph below shows the growth of two trees (**A** and **B**) during a period of 10 years.



(a) What is the difference in height between trees **A** and **B** at 10 years? [1]

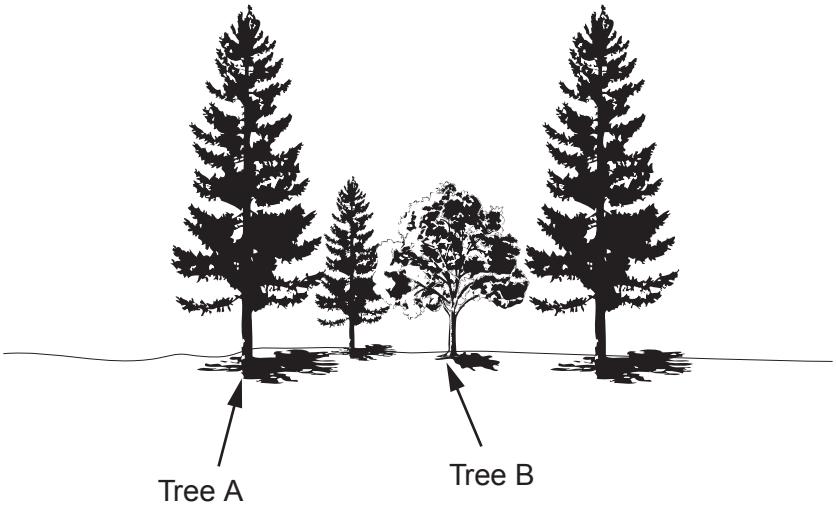
..... m

(b) The mean (average) growth rate for tree **A** over 10 years was 0.5 m per year. Calculate the mean growth rate for tree **B**. [1]

..... m per year

Examiner only

(c) Look at the diagram below. The trees were growing in a wood.



Trees fight for the same resources.
Use the diagram above. Also use your own knowledge to name **three** resources which the trees are fighting for. [3]

1 .....

2 .....

3 .....

(d) Suggest **one** reason, for the difference in mean growth rate between the two trees. Do not use fighting for resources. [1]

.....

.....

6

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Turn over.

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4. The photograph below shows maggots. Maggots are the larvae (young) of flies.

Read the following information.

- In the First World War, many soldiers died from infection of their wounds by bacteria.
- Sometimes, maggots would hatch in the wounds from eggs laid by flies.
- An army doctor called William Baer observed that soldiers whose wounds had maggots were more likely to survive than soldiers who did not have maggots.
- The maggots seemed to clean the wound.
- He reasoned that maggots ate bacteria and dead flesh around the wound.
- Baer published his ideas in 1931. Since then, using maggots to treat wounds has become common.

(a) Using the above information, answer the following questions:

(i) What was Baer's observation? [1]

.....

.....

(ii) What was Baer's hypothesis? [1]

.....

.....

(iii) Why was it important for Baer to publish his ideas? [1]

.....

.....

(b) Suggest **one** reason why using maggots to treat wounds may be better than using antibiotics on patients. Do **not** give cost as a reason. [1]

.....

.....

4

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5. *(a)* Use words from the list below to complete the following sentences about chromosomes. [3]

nucleus cytoplasm circle gene protein membrane

Chromosomes are found in the ..... of a cell. Sections of DNA form units of inheritance. Each unit is called a ..... . Each unit is a code for the production of one ..... .

(b) The table below gives the number of chromosomes in the **body** cells of some animals.

animal	number of chromosomes in body cells
human	46
meerkat	36
kangaroo	16
fruit fly	8
mosquito	6

The diagram below shows the chromosomes from an **egg cell**. They belong to one of the animals in the table above.

(i) I How many chromosomes are shown in the diagram above? ..... [1]

II State the animal from which this egg cell was taken. Give a reason for your answer. [2]

.....

.....

.....

(ii) State the chromosome number in a **fertilised** egg cell of a meerkat. [1]

.....

Examiner only

6. Some rats have evolved (developed) a resistance to the rat poison warfarin.

(a) The information below shows some stages in the development of this resistance **but not in the correct order**.

1 so the useful mutation is passed on to offspring

2 a mutation occurred in a gene

3 the mutation is useful

4 rats with the mutation survive to reproduce

5 as a result, there is an increase in the population of rats with the mutation

Complete the sequence below to show the stages in the correct order. *One has been done for you*.

2 → ..... → ..... → ..... → ..... [4]

(b) What may happen to **species** that do not adapt to new environmental conditions? [1]

.....

5

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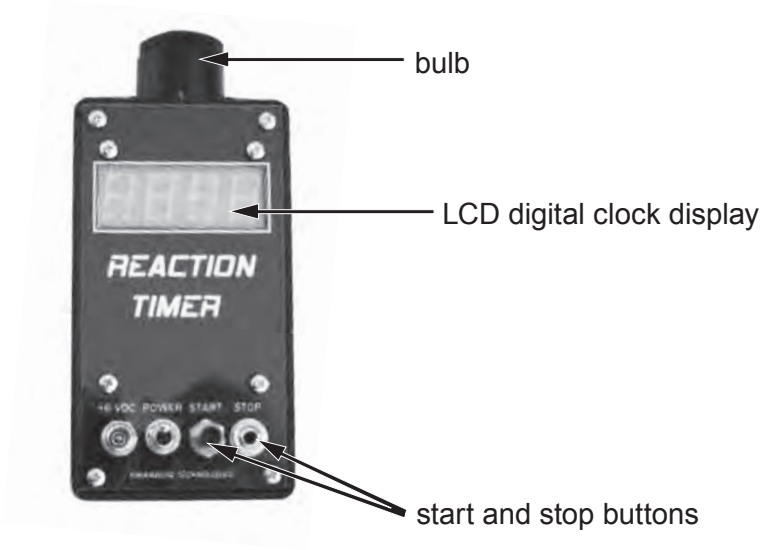
Turn over.

7. Megan wanted to know if playing music affected Bob's reaction time.

She used a reaction timer as shown in the photograph below.



Method

- The clock started timing as soon as the bulb lit up.
- When Bob saw the bulb light up, he pressed the stop button as fast as he could.
- Bob's reaction time was recorded. First with no music playing and then with music playing.

The results for five trials are shown below.

trial number	reaction time with no music playing (s)	reaction time with music playing (s)
1	0.20	0.53
2	0.20	0.44
3	0.20	0.40
4	0.20	0.38
5	0.20	0.25

Examiner only

(a) What conclusions can be made from the results of the experiment? [2]

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.....

(b) (i) State the name of the sense organ that detects light. [1]

.....

(ii) Describe how information gets from sense organs to the brain. [2]

.....

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5

Turn over.

Examiner only

8. The diagram below shows some organisms living in a large lake and their total biomass in kg.

They are **not** drawn to scale.

Snails
4 500 kg

Pike
250 kg

Aquatic plants
45 000 kg

Minnows
500 kg

Beetles
800 kg

(a) (i) Choose from the organisms above. Which are likely to have the least numbers in the lake? [1]

.....

(ii) The organisms above all form part of the same food chain.
Use the space below. Draw a **labelled** diagram to show a pyramid of biomass containing **all** of these organisms. [2]

Examiner only

(iii) The pike in the lake are affected by a parasite. It is called a fish louse, and lives on their skin. There would be many of these parasites on each pike but their biomass would be less than the biomass of the pike.

How would you add this information to the pyramid you drew in *(a)*(ii)?

Tick (✓) the correct answer. [1]

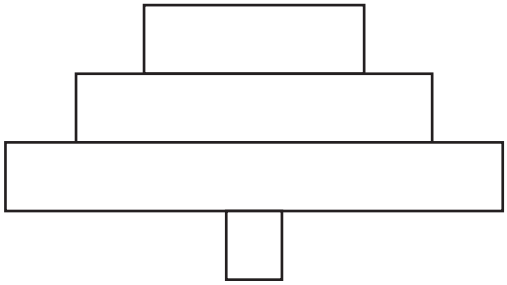
Place them at the tier above the pike ☐

Place them at the bottom of the pyramid ☐

Place them below the minnows ☐

Place them in the tier below the pike ☐

(b) Explain how a pyramid of **numbers**, for some organisms living on land, could look like the one shown below. [2]



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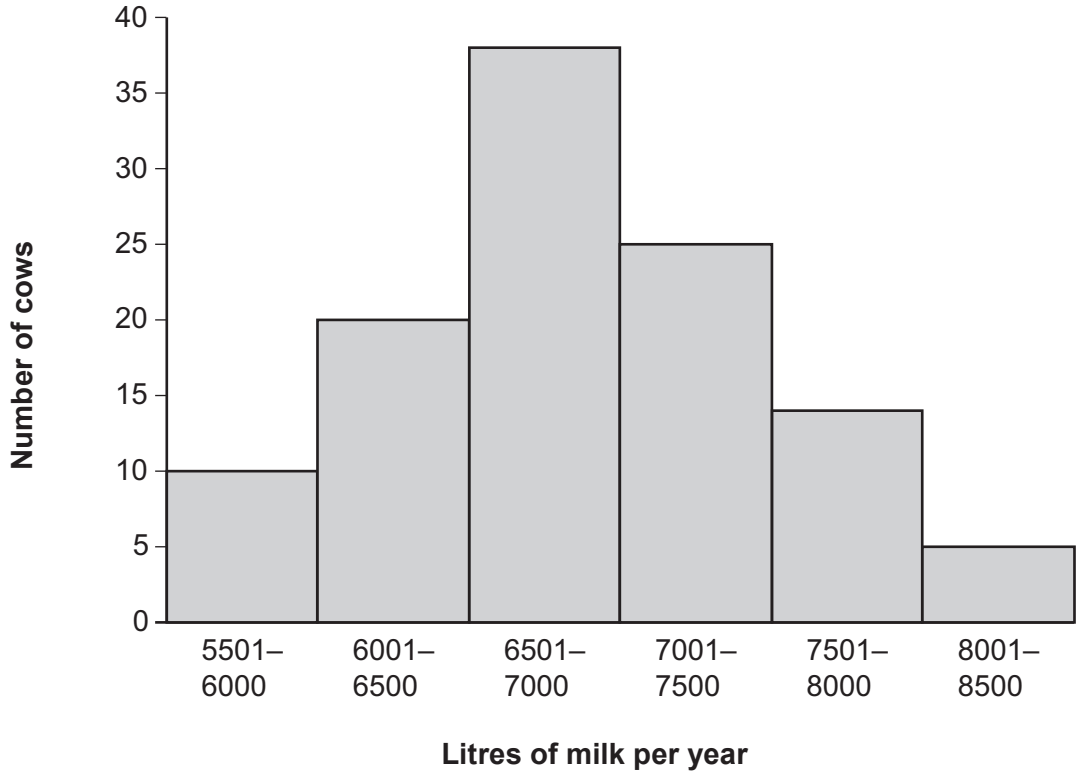
Examiner only

9. *(a)* Look at the graph below. It shows the variation (difference) in the volume of milk produced by a herd of cows in one year. All the cows were the same breed.



(i) During the winter months, the herd is kept indoors in large barns. All the cows in the herd are fed exactly the same quality and quantity of food. Why could the volumes of milk produced by the cows change during the winter months? [1]

.....

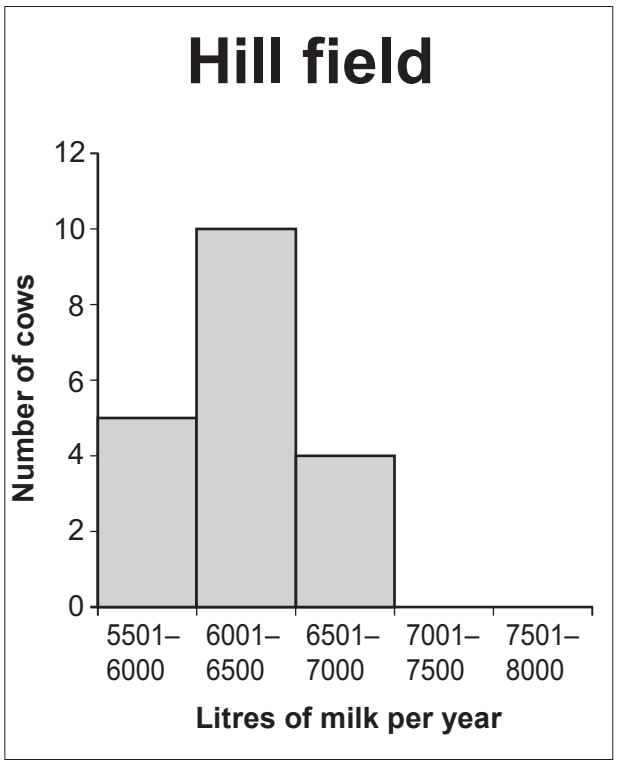
.....

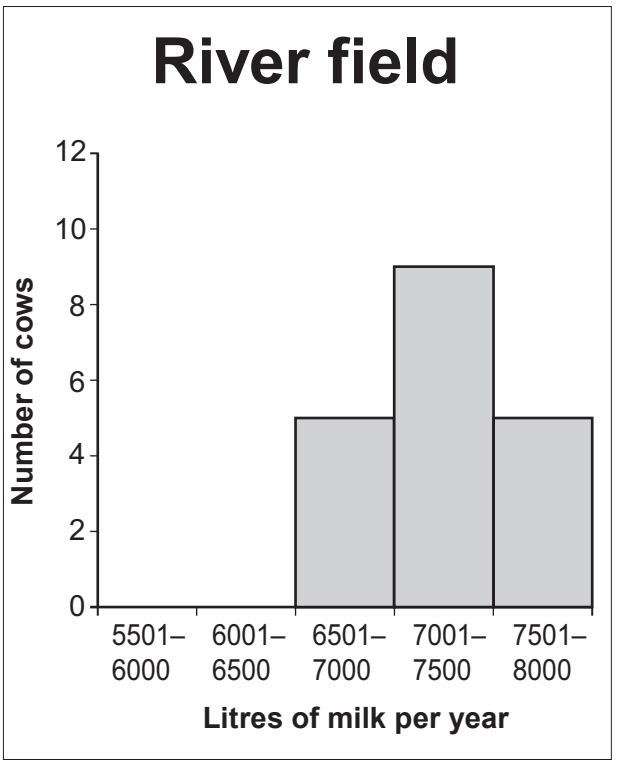
Examiner only

During the summer months, the farmer noticed that the volume of milk produced by the cows changed. It depended on which fields on the farm the cows were grazing on.

He divided the cows that produced 6501 – 7000 litres of milk per year into two groups. One of these groups grazed on a field by the river and the other on a field on the hill.

The graphs below show the results.





(ii) Explain the differences in the results shown in the graphs. [2]

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.....

(iii) A farmer wants to breed from his cows. He uses a method called artificial insemination (AI). The sperm are put into the cows mechanically (using a machine) rather than by using a bull directly.
How does this information suggest that AI is a method of sexual reproduction? [1]

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.....

Examiner only

(b) The table below shows the make up of milk of five breeds (types) of dairy cattle.

	make up of milk (g/l)		
breed	fat	protein	milk sugar
Ayrshire	3.97	3.26	4.63
Brown Swiss	3.80	3.18	4.80
Guernsey	4.58	3.49	4.78
Holstein	3.56	3.02	4.61
Jersey	4.97	3.03	4.70

A person is suffering from heart disease. Milk from which breed (type) of cattle do you think they should drink? Give a reason for your answer. [2]

.....

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.....

.....

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10. The diagram below shows the hairs on the surface of the skin of a cat at different air temperatures.

Diagram A

Mean air temperature 6.4°C

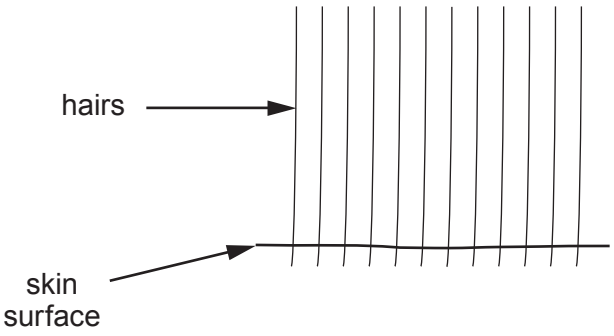
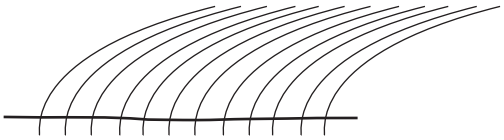


Diagram B

Mean air temperature 22.7°C



(a) Name the structures in the skin that raise each hair to the position shown in **Diagram A**. [1]

.....

(b) Explain why the skin in **Diagram A** loses less heat to the air than the skin in **Diagram B**. [3]

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.....

(c) State **two** *other* ways in which the skin reduces heat loss from the body. [2]

I .....

II .....

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11. How would you set up an experiment to investigate the positive growth response (phototropism) of plant shoots to light coming from one side?
In your account you must explain the use of a control in your investigation. [6 QWC]

6

END OF PAPER

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