UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

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| CANDIDATE NAME | | | | | | | | | |
| CENTRE NUMBER | | | | | | CANDIDATE NUMBER | | | |

*8272753014*

**BIOLOGY** **0610/33**

Paper 3 Extended **October/November 2013**

**1 hour 15 minutes**

Candidates answer on the Question Paper.

No Additional Materials are required.

**READ THESE INSTRUCTIONS FIRST**

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This document consists of **19** printed pages and **1** blank page.


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**1** Crabs are classified, along with prawns, shrimps and lobsters, as crustaceans. Most crabs live in the sea, although some live in freshwater and there are a few land-dwelling crabs.

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Fig. 1.1 shows the structure of a typical crab.

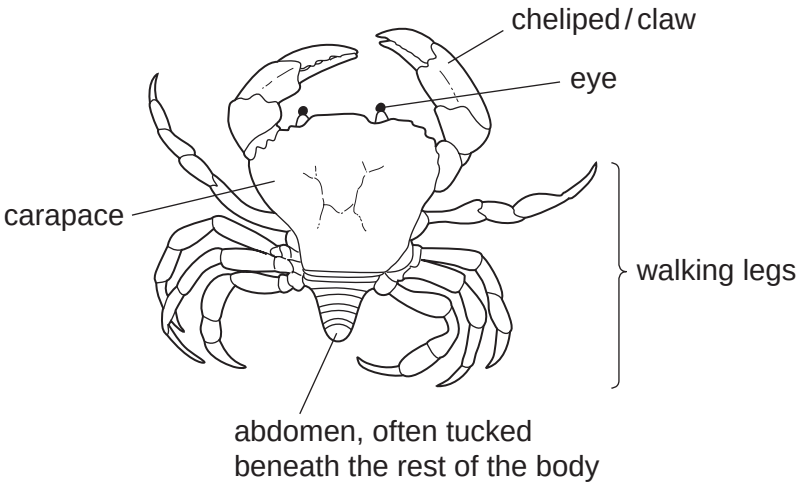


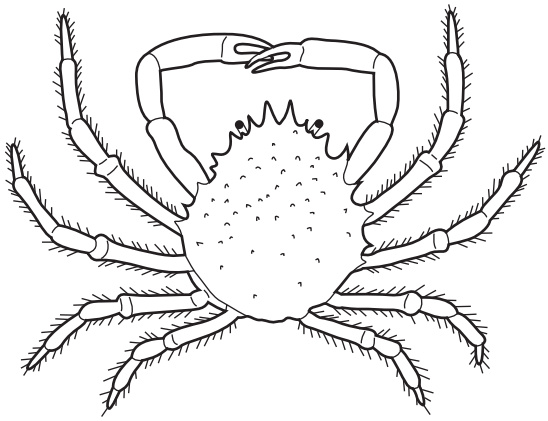

**Fig. 1.1**

**(a)** State the group of animals that includes crustaceans, insects, arachnids and myriapods.

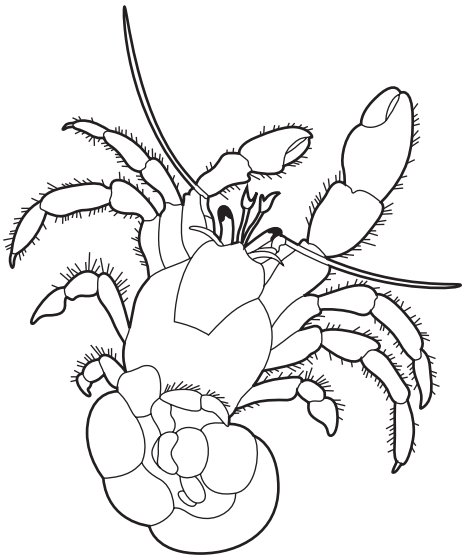
.....  [1]

Fig. 1.2 shows four different species of crab.

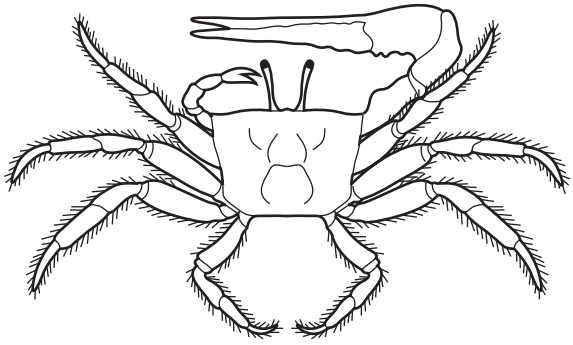
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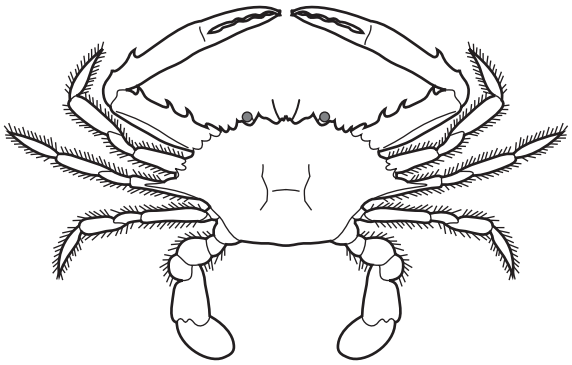
**A** spiny spider crab
*Maia squinado*



**B** hairy hermit crab
*Pagurus hirsutiusculus*



**C** West African fiddler crab
*Uca tangeri*



**D** sand crab
*Portunus pelagicus*

**Fig. 1.2**

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**(b)** Biologists use dichotomous keys to identify different species.

Use Fig. 1.1 and Fig. 1.2 to state **one visible** feature of each species of crab **A**, **B**, **C** and **D**, that could be used in a dichotomous key to identify crabs.

**A** .....

.....

**B** .....

.....

**C** .....

.....

**D** .....

..... [4]

**(c)** Crabs show variation in many features.

**(i)** State **one** feature of crabs that shows **continuous variation**.

..... [1]

**(ii)** Describe how you would measure variation in the feature you have given in **(i)**.

.....

..... [1]

For Examiner's Use

**(d)** Crabs produce huge numbers of offspring, but their populations remain fairly constant from year to year.

Explain why.

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..... [3]

**(e)** Emergency medical packs contain bandages made from chitosan.

Chitosan comes from the exoskeleton of crustaceans and has a positive charge to attract red blood cells. It helps blood clot quickly and also has antibacterial properties.

Explain the benefits of using bandages made from chitosan.

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..... [3]

**[Total: 13]**

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**2** Bovine somatotropin (BST) is a protein hormone that stimulates growth in cows.

**(a) (i)** Name the small molecules that are joined together to make proteins.

.....[1]

**(ii)** Define the term *growth*.

.....

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.....[2]

**(b)** Genetic engineering techniques similar to those used for producing human insulin were used to make bacteria produce BST.

Outline the way in which genetic engineering was used to produce BST.

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.....[3]

**(c)** The effects of BST on milk production and the food energy intake of cows were investigated.
The milk yield and food energy intake were recorded each day for each cow in two groups, **A** and **B**.

- Group **A** received BST treatment at week 10.
- Group **B** did not receive any BST.

The results are shown in Fig. 2.1.

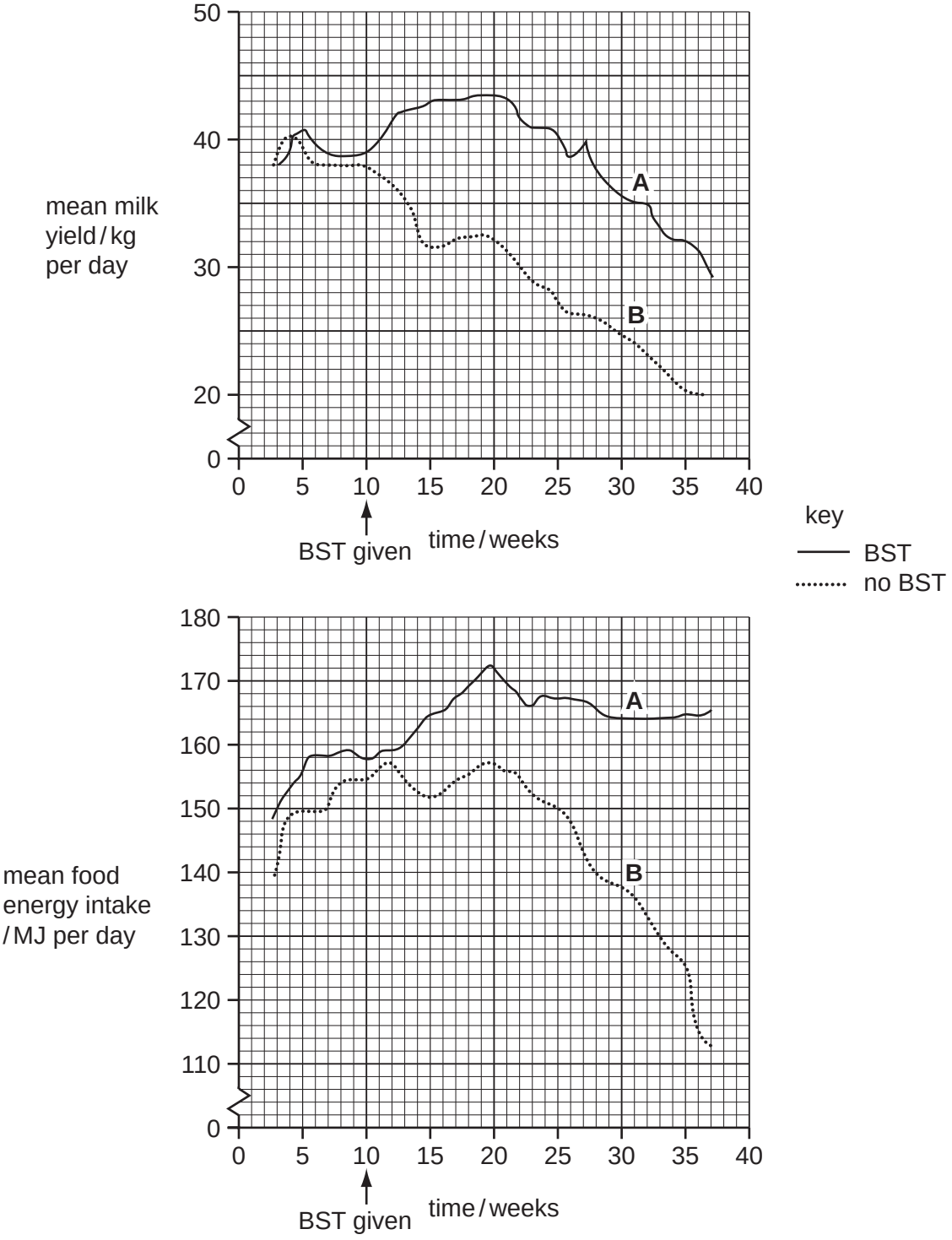



**Fig. 2.1**

*For Examiner's Use*

*For Examiner's Use*

**(i)** Use Fig. 2.1 to describe the effect of BST treatment on mean milk yield and mean food energy intake. You will gain credit if you use data from Fig. 2.1 in your answer.

mean milk yield .....

.....

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.....

mean food energy intake .....

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..... [6]

**(ii)** Various studies have shown that there is little economic benefit from using BST.

Use the results from Fig. 2.1 to explain why this might be so.

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..... [3]

*For Examiner's Use*

**(d)** The US Food and Drug Administration certifies that milk from cows treated with BST is as safe as milk from cows not treated with the hormone.

It is impossible to test milk to detect the use of BST, but some milk producers in the US label their milk to indicate that it is BST-free.

Discuss the reasons for labelling milk to show whether it has come from cattle treated with BST or not.

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..... [3]

**[Total: 18]**

**3** Fig. 3.1 shows a vertical section of a kidney.

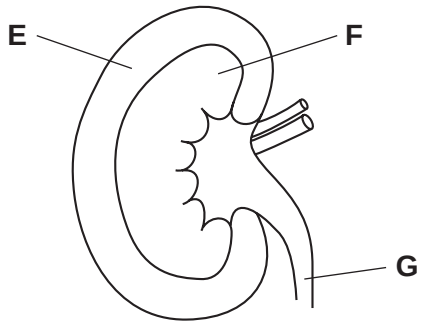



**Fig. 3.1**

**(a)** Name the parts **E**, **F** and **G**.

**E** .....

**F** .....

**G** ..... [3]

For Examiner's Use

**(b)** Substances move into and out of cells in kidney tubules.

Fig. 3.2 shows four processes, **H**, **J**, **K** and **L**, that occur in cells lining the kidney tubule.

The net movement of substance is shown by an arrow, in each case.

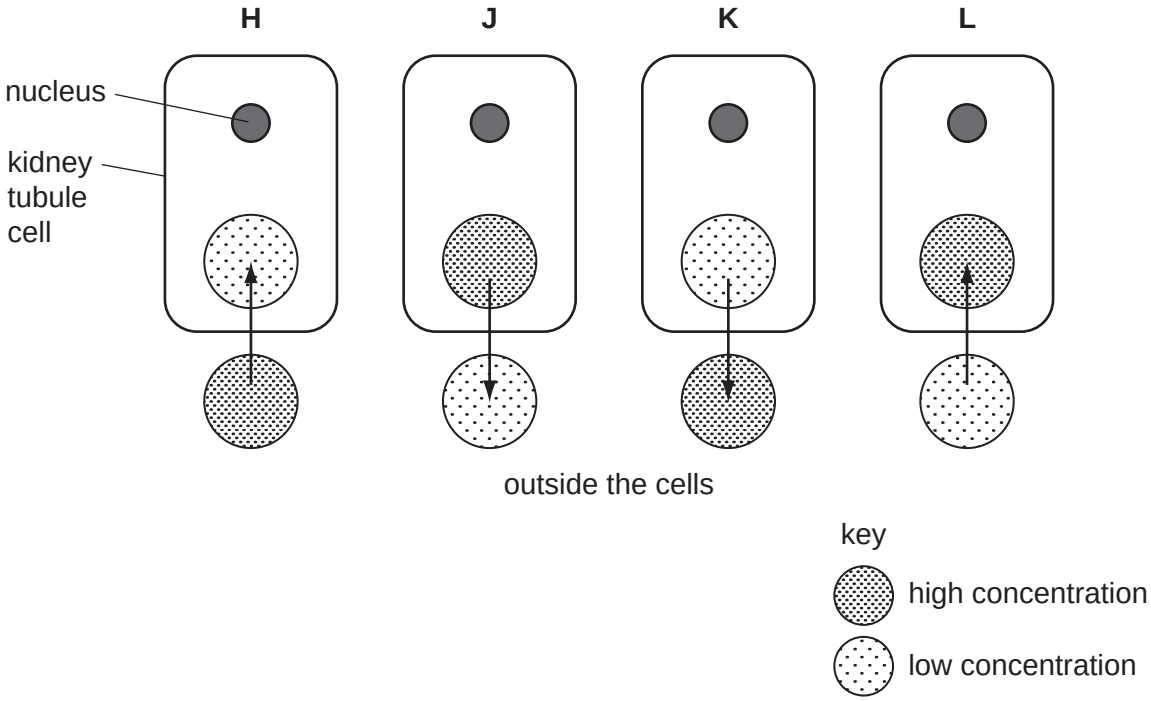



**Fig. 3.2**

**(i)** Complete Table 3.1 by stating the letter, **H**, **J**, **K** or **L**, which identifies each of the processes. Give a reason for each answer.

**Table 3.1**

| process | letter | reason |
|---|---|---|
| diffusion of oxygen | | |
| active uptake of sodium ions | | |

[4]

For Examiner's Use

**(ii)** Glucose is filtered from the blood. Usually all of it is reabsorbed by the kidney tubules so that there is none present in the urine.

Name the part of the kidney where filtration occurs.

..... [1]

**(iii)** Use Fig. 3.2 to describe how kidney tubules reabsorb glucose from the filtrate.

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..... [2]

**(c)** When plants are grown in a solution that includes a poison that prevents respiration, the roots continue to absorb water, but do **not** absorb many ions.

Explain this result.

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..... [3]

**[Total: 13]**

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**Question 4 begins on page 14.**

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**4** **(a)** Yeast cells and human muscle cells can carry out both aerobic and anaerobic respiration.

Complete Table 4.1 by writing the end products of aerobic and anaerobic respiration in these two types of cell.

**Table 4.1**

| cell | end products of respiration | |
|---|---|---|
| | aerobic | anaerobic |
| yeast | ……..... + ……..... | ……..... + ……..... |
| human muscle cell | ……..... + ……..... | …….. |

[4]

**(b)** During exercise there are changes to:

- breathing rate;
- ventilation rate;
- oxygen absorption;
- heart rate;
- blood pressure.

The effect of strenuous exercise is shown in Table 4.2.

**Table 4.2**

| | before exercise | immediately after exercise |
|---|---|---|
| breathing rate / breaths per minute | 11 | 22 |
| ventilation rate (volume of air taken into the lungs per minute) / $dm^3$ per minute | 6 | 90 |
| oxygen absorption / $cm^3$ per minute | 250 | 2500 |
| heart rate / beats per minute | 65 | 170 |
| blood pressure / kPa | 15 | 25 |

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Explain why the changes shown in Table 4.2 occur during exercise.

*For Examiner's Use*

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..... [5]

**[Total: 9]**

*For Examiner's Use*

**5** **(a)** In 2005, the World Health Organization estimated that there were 2.3 million children infected with HIV.

Most children become infected from their mothers at birth or during breast feeding. Very few become infected by movement of HIV across the placenta.

Without any treatment, 25-40% of babies of mothers who are HIV positive (HIV+) will be infected. However, there are very effective treatments that have reduced transmission rates to 1%.

This has been achieved by:

- encouraging mothers to be tested for HIV;
- treating mothers and new-born babies with drugs that prevent HIV spreading within the body and reduce the chances of infection at birth;
- advising mothers not to breast feed if they are HIV+.

Explain the meaning of the following terms as used in the passage above:

transmission; .....

.....

drug. .....

..... [2]

**(b)** In many countries, there are dangers in using milk powder because it cannot be prepared under sterile conditions.

Explain the dangers of feeding non-sterile milk to children who may be HIV+.

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..... [4]

**(c)** Even though there is a risk of HIV infection, it is sometimes advised that women breast feed their babies.

*For Examiner's Use*

Explain the advantages of breast feeding.

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..... [4]

**(d)** State **two** ways in which an adult may become infected with HIV.

1 .....

2 ..... [2]

**[Total: 12]**

**6** Chemical fertilisers are used to improve crop productivity.

**(a)** Outline how chemical fertilisers improve the productivity of crops.

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..... [3]

For Examiner's Use

Some students investigated the effect of acid on the germination and growth of seedlings. Seeds were placed onto paper that had been soaked in different concentrations of sulfuric acid.

Ten seeds were placed into each dish.

The students measured the lengths of roots and shoots. Their results are shown in Fig. 6.1.

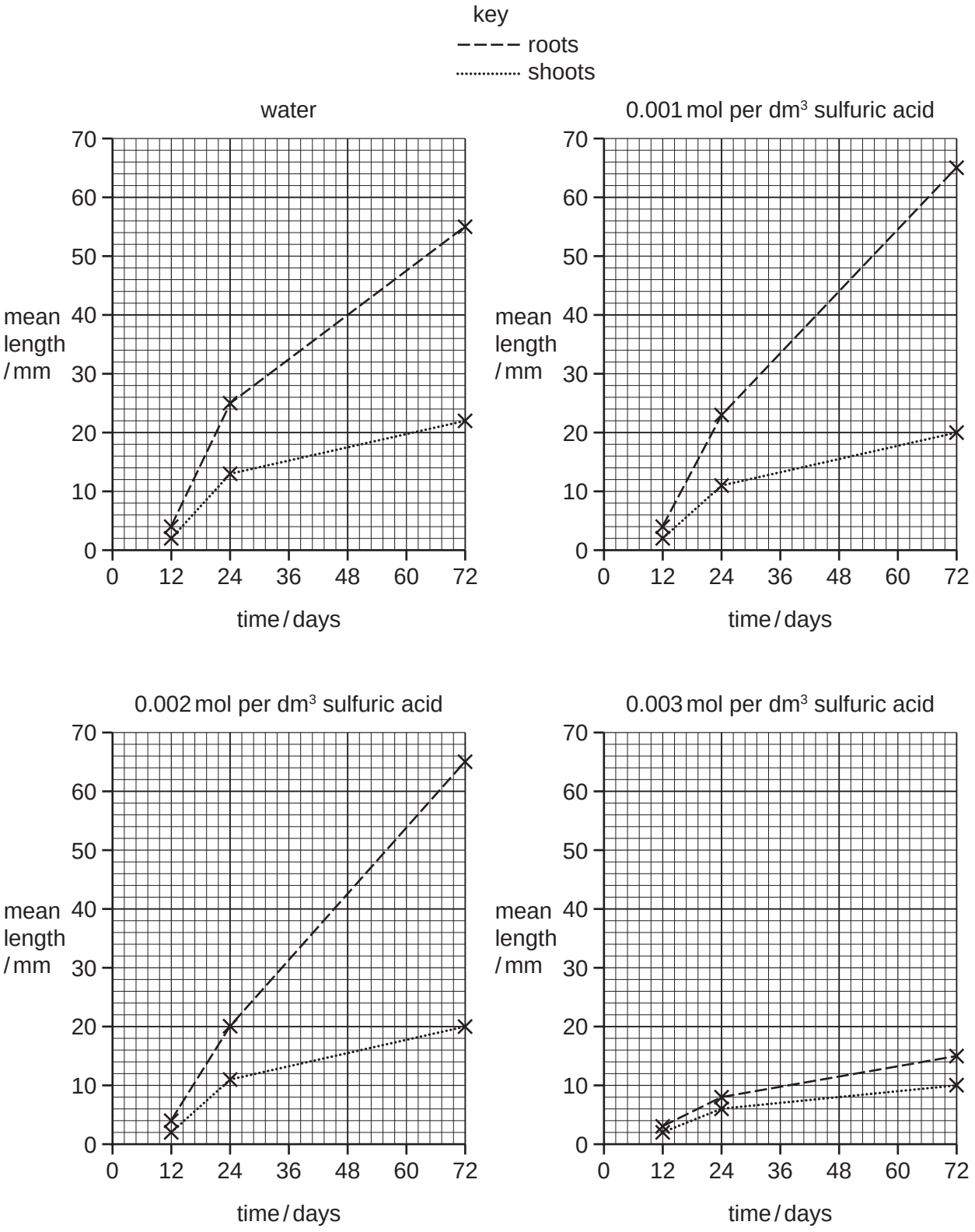



**Fig. 6.1**

**(b)** State the conditions necessary for seeds to germinate.

*For Examiner's Use*

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..... [3]

**(c)** Describe the effects of increasing the concentration of sulfuric acid on the growth of roots and shoots of the seedlings.

You will gain credit if you use data from Fig. 6.1 in your answer.

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..... [4]

**(d)** Acid rain is formed when sulfur dioxide ($SO_2$) and oxides of nitrogen ($NO_x$) dissolve in rain water.

Explain why concentrations of sulfur dioxide in the atmosphere have increased over the last 150 years.

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..... [2]

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**[Turn over**

**(e)** Describe **three** effects of acid rain on organisms and their environment.

*For Examiner's Use*

1 .....

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2 .....

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3 .....

..... [3]

**[Total: 15]**

Figure 2.1 © T D Etherton & D E Bauman; *Biology of Somatotropin in Growth and Lactation of Domestic Animals*; Physiological Reviews; Vol.78, No.3; July 1998; http://physrev.physiology.org/content/78/3/745.html.
Figure 6.1 © G Fleet et al; *Acid rain in the classroom: a student research project*; Journal of Biological Education; 1987.

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