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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

3495392383

BIOLOGY **0610/31**

Paper 3 Extended **October/November 2011**

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.
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.

For Examiner's Use	
1	
2	
3	
4	
5	
6	
Total	

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

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1 Fig. 1.1 shows a flowering shoot of tiger lily, *Lilium tigrinum*.

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Fig. 1.1

(a) State the name of the genus of the tiger lily.

.....[1]

(b) Name the parts labelled **A** to **D**.

A .....

B .....

C .....

D .....[4]

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(c) The tiger lily plant is a monocotyledon.

List two features, **visible in Fig. 1.1**, that show it is a monocotyledon.

1 .....

2 ..... [2]

(d) The tiger lily in Fig. 1.1 reproduces sexually.

Plants reproduce sexually and asexually.

Complete Table 1.1 to show the advantages and disadvantages of asexual and sexual reproduction to a flowering plant species.

Table 1.1

type of reproduction in flowering plants	advantages	disadvantages
asexual		
sexual		

[4]

[Total: 11]

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2 **(a)** Define the term *sensitivity*.

.....

.....

.....

..... [2]

Fig. 2.1 shows the reflex arc involved in a simple reflex action.

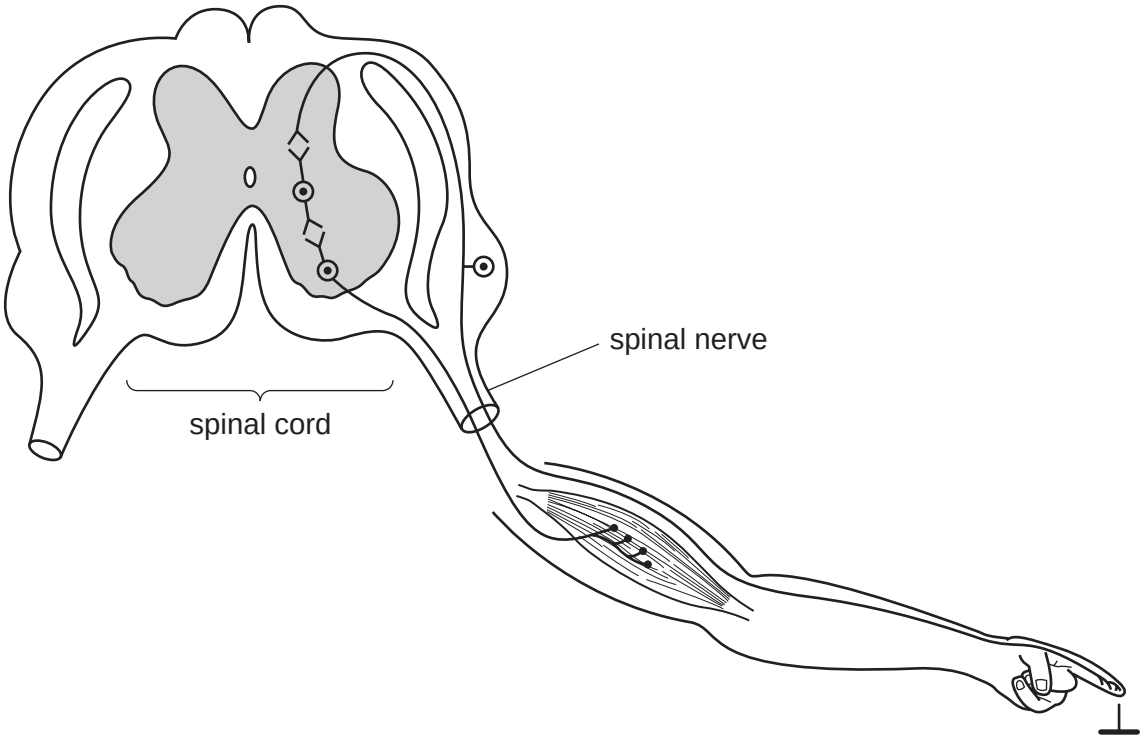

Fig. 2.1

(b) On Fig. 2.1 use label lines and the following letters to show

F a receptor in the skin

G the neurone that transmits impulses to the spinal cord

H the effector in this reflex arc. [3]

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(c) A reflex is an involuntary action.

Explain what is meant by the term *involuntary* action.

.....

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..... [2]

(d) Suggest the advantages of having reflexes.

You may refer to an example to illustrate your answer.

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..... [3]

(e) In dangerous situations there is an increase in the secretion of adrenaline from the adrenal glands.

Describe three ways in which this increase in adrenaline prepares the body for action.

1 .....

.....

2 .....

.....

3 .....

..... [3]

[Total: 13]

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3 **(a)** State, using chemical symbols, the equation for aerobic respiration.

..... [3]

A student compared the respiration of germinating mung bean seeds with pea seeds using the apparatus shown in Fig. 3.1.

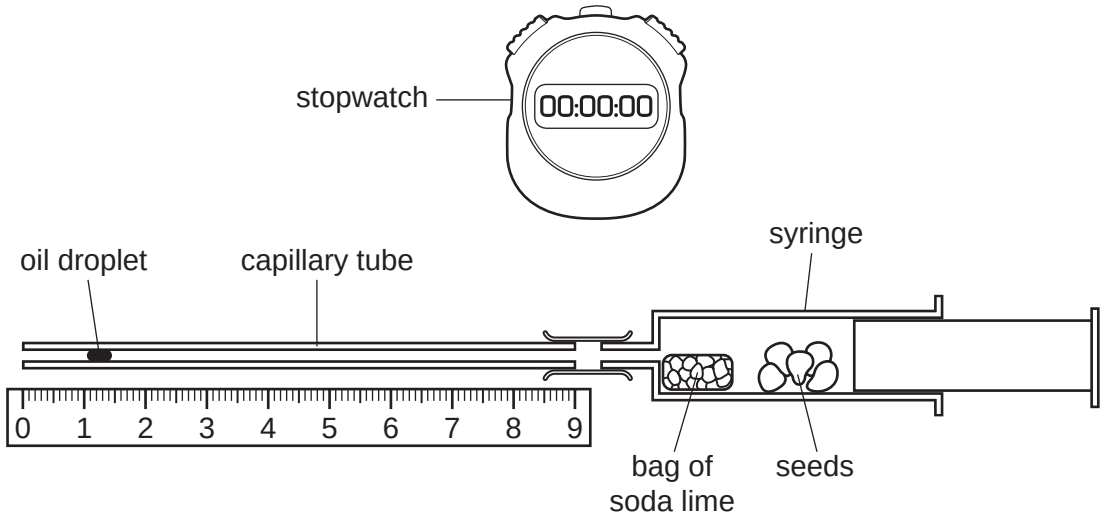

Fig. 3.1

The soda lime absorbs any carbon dioxide released by the germinating seeds. The student recorded the position of the oil droplet every minute over a period of six minutes.

(b) State three variables that should be kept constant in this investigation.

1 .....

2 .....

3 ..... [3]

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(c) Table 3.1 shows the student's results.

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Table 3.1

time / minute	germinating mung bean seeds		germinating pea seeds	
	position of droplet / mm	distance moved / mm per minute	position of droplet / mm	distance moved / mm per minute
0	0	0	0	0
1	12	12	10	10
2	23	11	19	9
3	36	13	28	9
4	45	9	33	5
5	48	3	36	3
6	48	0	36	0

(i) State which way the droplet moves **and** explain your answer.

.....

.....

.....

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.....

..... [3]

(ii) State what happens to the movement of the droplet after three minutes **and** suggest an explanation.

.....

.....

.....

..... [2]

[Total: 11]

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4 Penicillin is an antibiotic produced by the fungus *Penicillium chrysogenum*.

Fig. 4.1 shows the process used to produce penicillin.

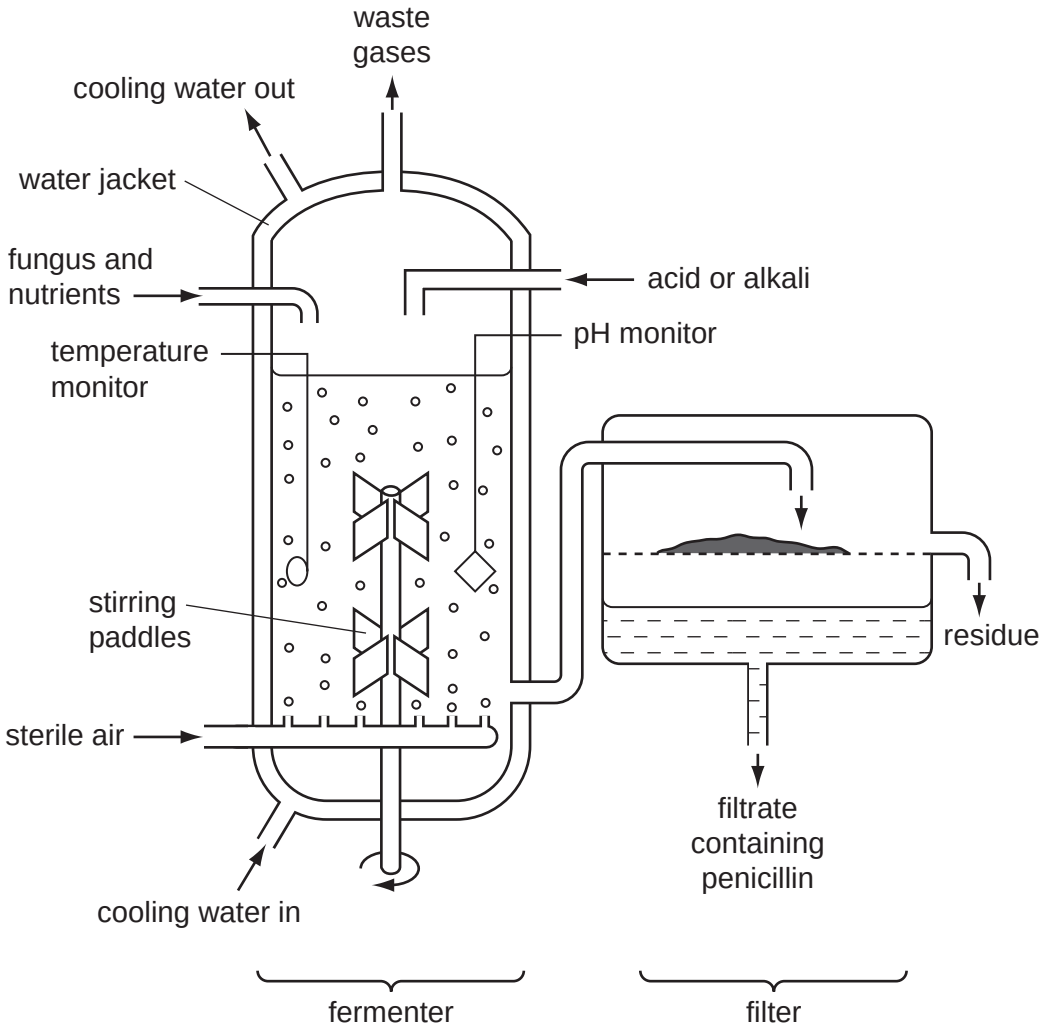

Fig. 4.1

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(a) Enzymes in the fungus are used to make penicillin.

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Explain why there is a water jacket around the fermenter **and** why acids or alkalis are added to the fermenter.

water jacket

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addition of acids or alkalis

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..... [6]

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Fig. 4.2 shows the mass of fungus and the yield of penicillin during the fermentation process.

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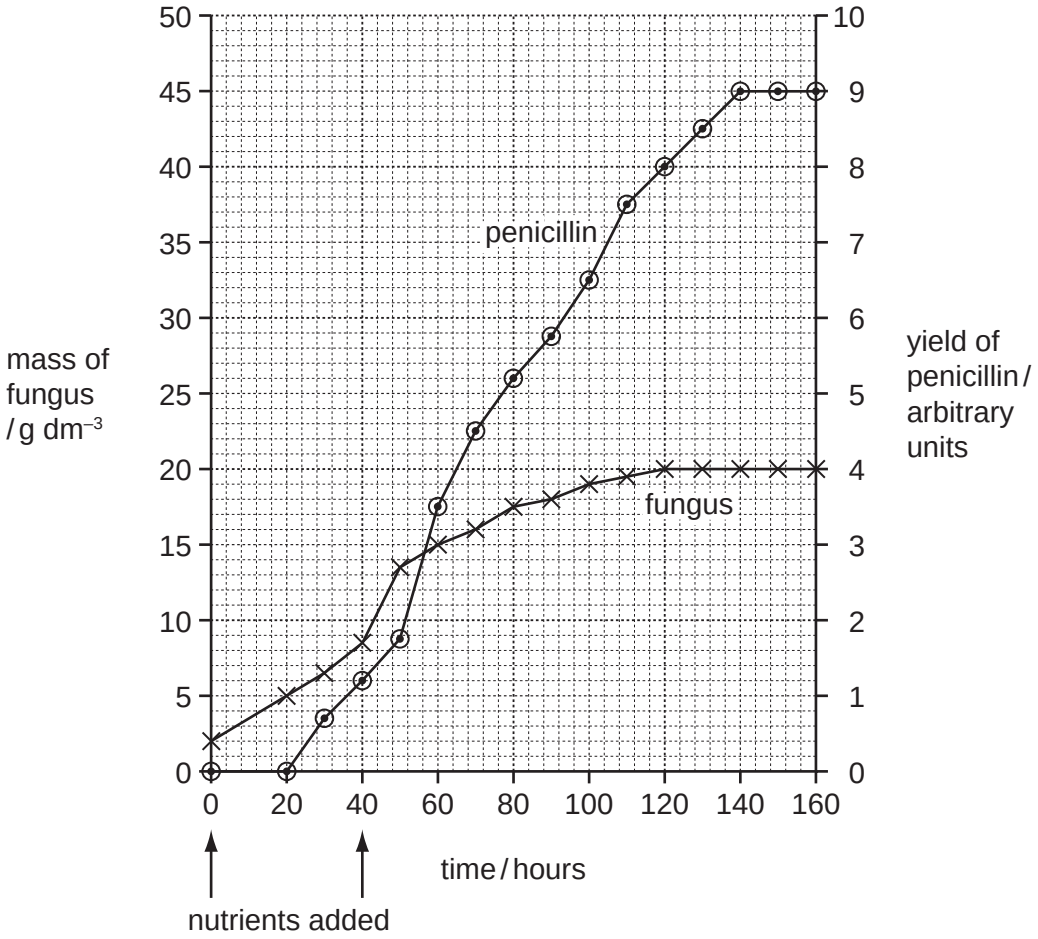

Fig. 4.2

(b) (i) State the time interval over which the fungus grew at the maximum rate.

.....

[1]

(ii) As the fungus grows in the fermenter, the nuclei in the fungal hyphae divide.

State the type of nuclear division that occurs during the growth of the fungus in the fermenter.

.....

[1]

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(iii) Explain why the growth of the fungus slows down and stops.

.....

.....

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.....

..... [3]

(c) Penicillin is not needed for the growth of *P. chrysogenum*.

(i) State the evidence from Fig. 4.2 that shows that penicillin is not needed for this growth.

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..... [2]

(ii) The people in charge of the penicillin production emptied the fermenter at 160 hours.

Use the information in Fig. 4.2 to suggest why they did **not** allow the fermentation to continue for longer.

.....

..... [1]

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(d) Downstream processing refers to all the processes that occur to the contents of the fermenter after it is emptied. This involves making penicillin into a form that can be used as a medicine.

Explain why downstream processing is necessary.

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..... [3]

(e) Explain why antibiotics, such as penicillin, kill bacteria but not viruses.

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..... [2]

[Total: 19]

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5 Haemoglobin is a large protein molecule. The structure of each haemoglobin molecule is controlled by a gene that has two alleles:

- **Hb^A** codes for the normal form of haemoglobin,
- **Hb^S** codes for an abnormal form of haemoglobin.

Red blood cells containing only the abnormal form of haemoglobin become a stiff, sickle shape in conditions of low oxygen concentration. This gives rise to sickle cell anaemia.

(a) Describe the harmful effects on the body of having red blood cells which become sickle-shaped.

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..... [5]

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People who are heterozygous for the gene for haemoglobin produce both the normal and abnormal forms of haemoglobin. These people show no symptoms or have very mild symptoms known as sickle cell trait.

(b) (i) Complete the genetic diagram to show how a couple who are both heterozygous may have a child with sickle cell anaemia.

parental phenotypes	sickle cell trait	×	sickle cell trait
parental genotypes	.....	×	.....
gametes	....	+	....

offspring genotypes ....

offspring phenotypes ....

[3]

(ii) What is the chance of a child born to this couple having sickle cell anaemia?

..... [1]

In some parts of the world, up to 25% of the population have sickle cell trait.

(c) State the advantage of having sickle cell trait.

.....

..... [1]

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(d) Discuss whether sickle cell trait is an example of codominance.

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..... [2]

[Total: 12]

Question 6 begins on page 16.

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6 The brown plant hopper is a serious insect pest of rice. Spraying with pesticides is a common way to control it. However, brown plant hoppers have become resistant to pesticides.

Fig. 6.1 shows the effect of spraying pesticides against populations of this insect pest.

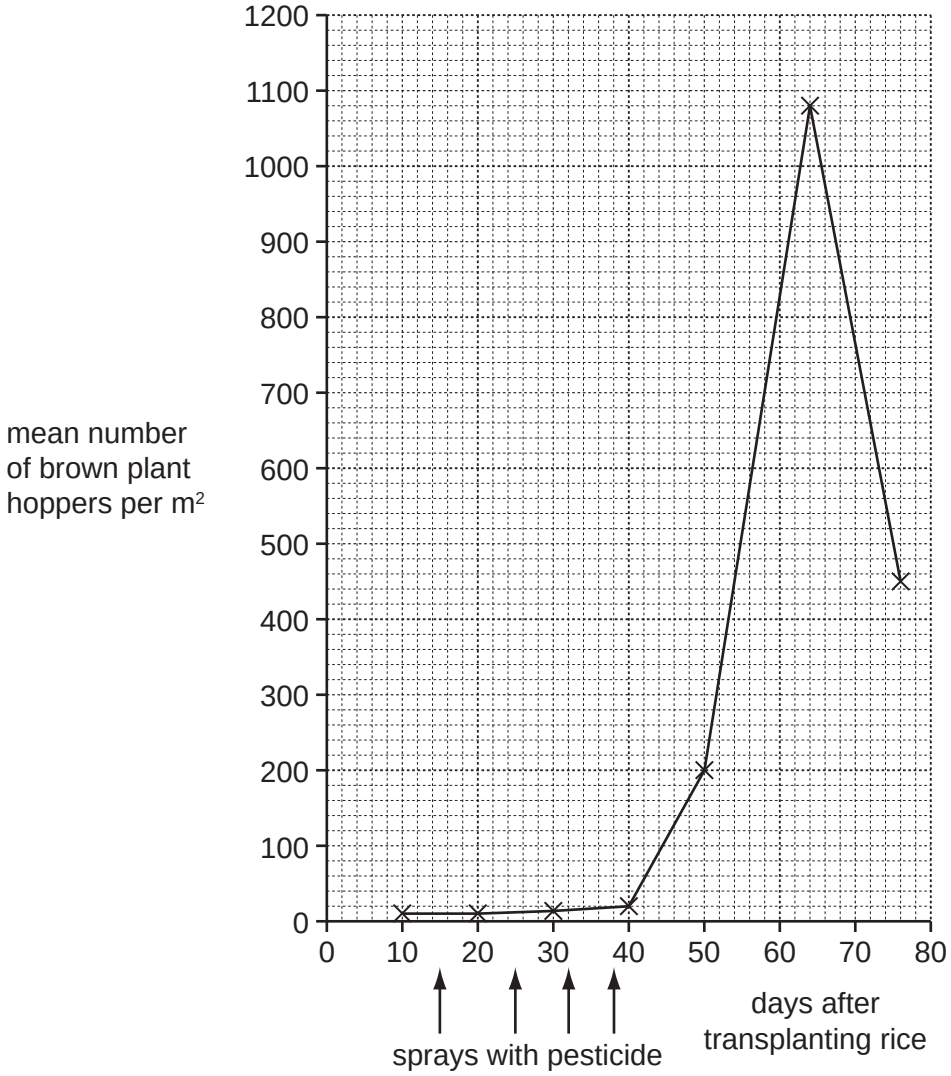

Fig. 6.1

(a) Define the term *population*.

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..... [2]

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(b) Use Fig. 6.1 to describe the effect of pesticides on populations of the brown plant hopper.

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..... [3]

(c) Some pesticides used against insects kill them on contact. Others are systemic pesticides.

Explain how these systemic pesticides kill insects.

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..... [2]

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(d) As an alternative to spraying pesticides, some farmers use predatory animals, such as the hunting spider, *Lycosa pseudoannulata*, to control brown plant hoppers.

During an investigation into the effectiveness of this method, brown plant hoppers were put into cages in rice fields. The plant hoppers could not leave the cages but were able to feed. Predators, such as hunting spiders, could enter some of the cages to feed.

Fig. 6.2 shows the change in numbers of brown plant hoppers in these cages over a period of time.

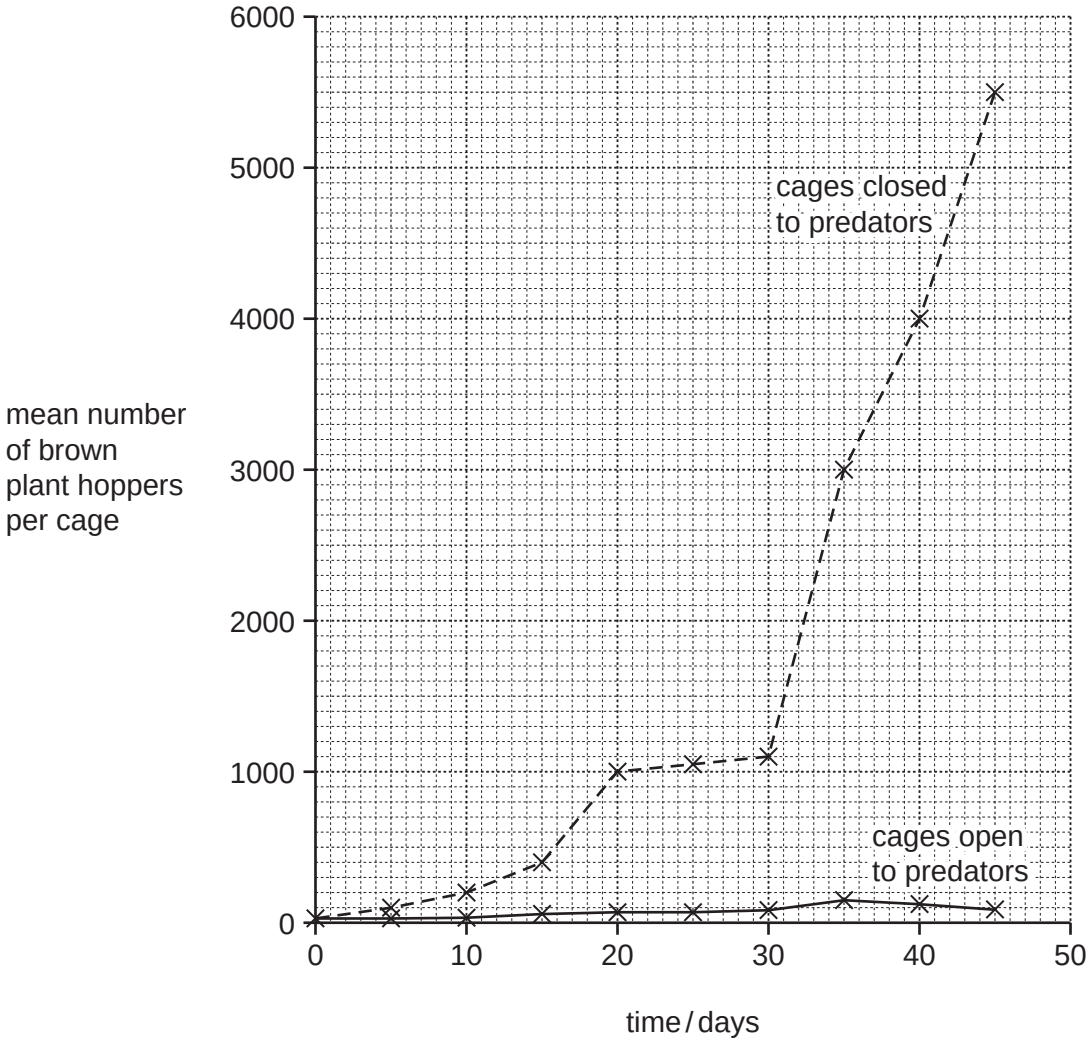

Fig. 6.2

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Use the information in Fig. 6.2 to explain the advantages of using predators, such as spiders, to control brown plant hoppers.

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..... [3]

(e) Rice growing has involved the destruction of forests.

Describe the long-term effects of deforestation on the environment.

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..... [4]

[Total: 14]

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Figure 2.1 © *Biology: A Modern Introduction;* 2nd Edition; Oxford University Press; 1982.

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