UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

BIOLOGY **0610/31**

Paper 3 Extended **May/June 2010**

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 **17** printed pages and **3** blank pages.

For Examiner's Use

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

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..... [2]

Fig. 1.1 shows a horizontal section through the eye.

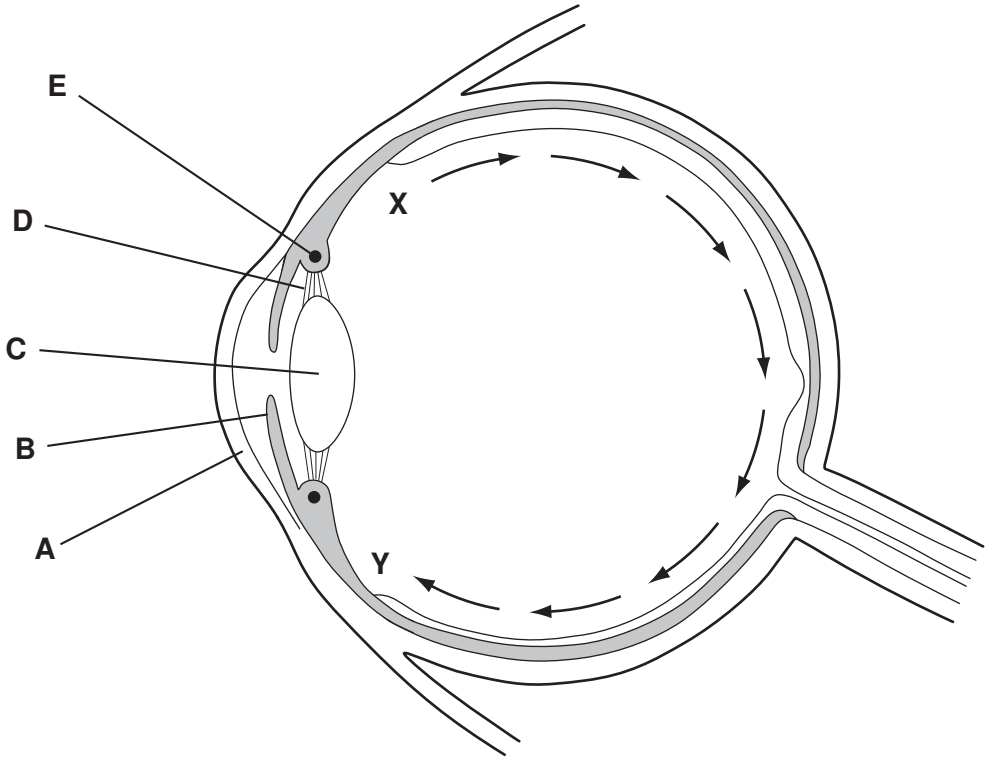

Fig. 1.1

(b) **(i)** Name structures **A** to **D**.

A .....

B .....

C .....

D ..... [4]

(ii) State the functions of structures **B** and **E**.

B .....

E ..... [2]

The retina contains light-sensitive cells known as rods and cones. The distribution of rods in the retina from point **X** to point **Y**, as shown on Fig. 1.1, was investigated.

For Examiner's Use

Fig. 1.2 shows the distribution of rods in the retina from point **X** to point **Y**.

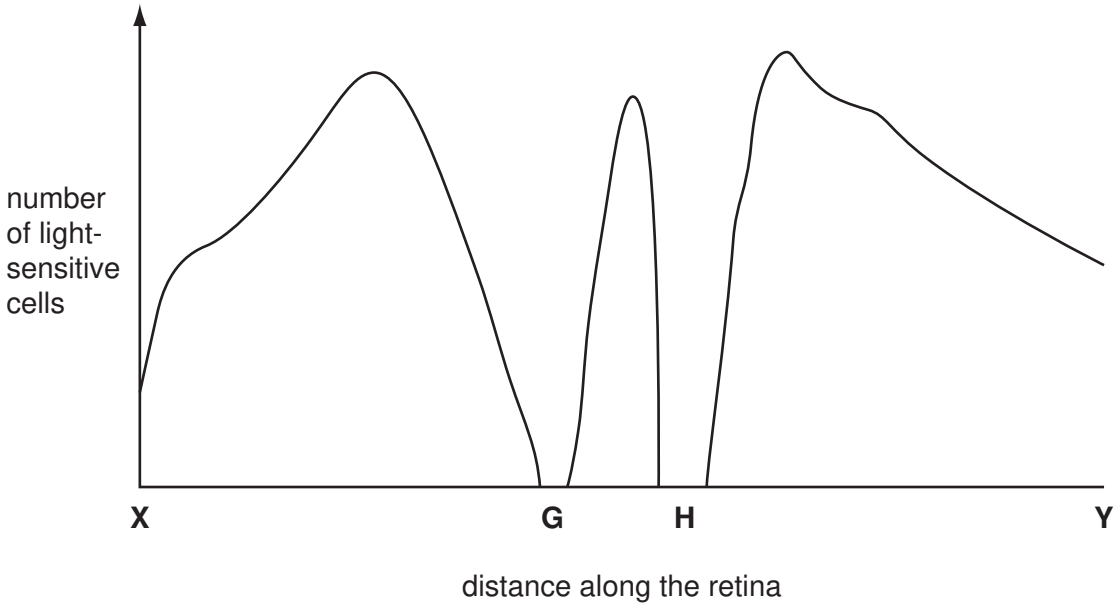

Fig. 1.2

(c) (i) **G** and **H**, as shown on Fig. 1.2, are parts of the retina.

Name **G** and **H**.

G .....

H ..... [2]

(ii) Describe the function of the rods.

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..... [2]

(iii) Draw a line on Fig. 1.2 to show the distribution of cones in the retina. [2]

[Total: 14]

For Examiner's Use

2 A student measured the uptake and release of carbon dioxide from a plant during 24 hours. It was a very bright, sunny day between sunrise and sunset.

Fig. 2.1 shows the student's results.

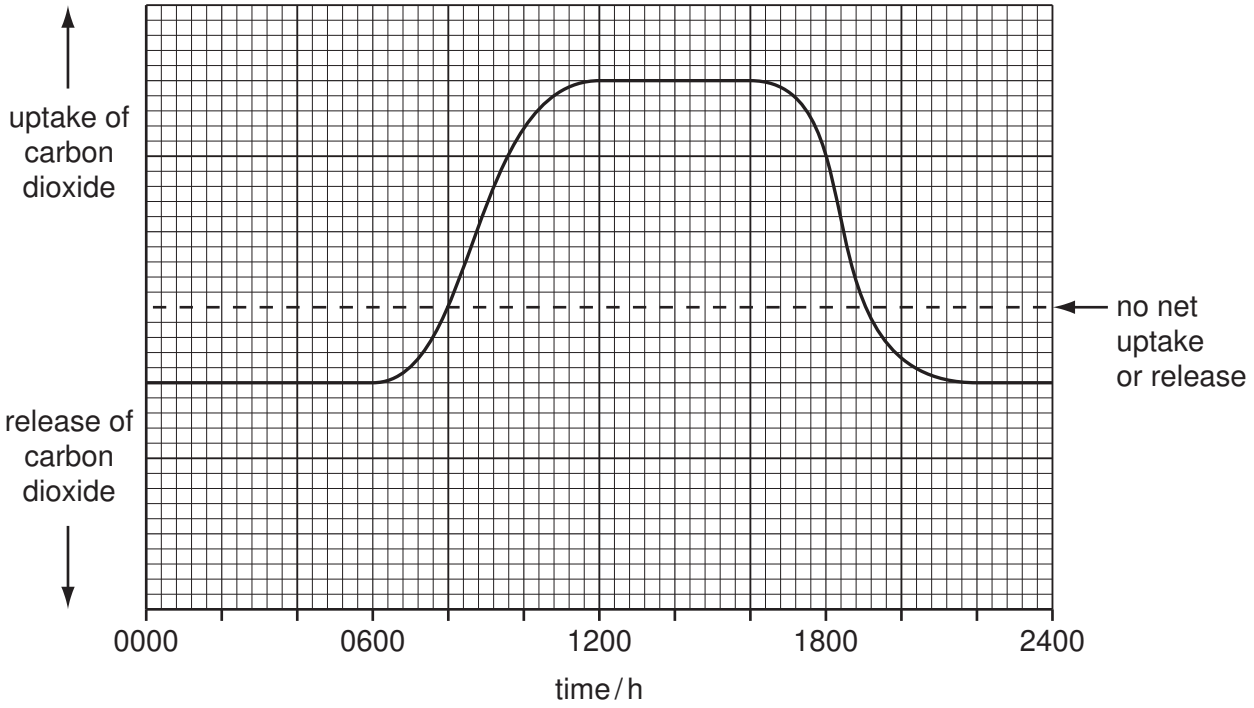

Fig. 2.1

(a) (i) Use the information in Fig. 2.1 to state the time that sunrise occurred.

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[1]

(ii) Using Fig. 2.1, state the times when there is no uptake or release of carbon dioxide.

1. .....

2. ..... [1]

(iii) State why plants release carbon dioxide at night.

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.....

[1]

(iv) Explain why it is important for plants that carbon dioxide uptake during the day is greater than carbon dioxide released at night.

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[2]

Question 2 continues on Page 6

The yields of tomatoes grown in open fields in India are very low compared with yields of tomatoes grown in glasshouses in Europe.

In a study, scientists in India grew tomato plants in glasshouses and in open fields nearby. The growth of the plants and the yields of tomatoes were recorded.

The results are shown in Table 2.1.

Table 2.1

	tomato plants grown in	
	glasshouses	open fields
mean final height of tomato plants / cm	84.1	69.0
mean number of leaves per tomato plant	123.0	82.0
mean fresh mass of tomato plants / g	988.3	491.7
mass of tomatoes per plant / g	2986.0	818.9
mean fresh mass of tomatoes / g	95.0	84.4

(b) (i) The mean fresh mass of tomatoes grown in glasshouses was greater than the mean fresh mass of tomatoes grown in open fields.

Calculate the difference in mean fresh mass as a percentage of the mean fresh mass of tomatoes grown in open fields.

Show your working.

Answer = ... % [2]

For Examiner's Use

(ii) Suggest how an increase in the height of the plants and the number of leaves on each plant affects the yield of tomatoes.

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..... [3]

(c) The scientists made sure that the only differences between the two groups of plants were the result of the protection provided by the glasshouses.

Suggest the factors that the scientists should have kept the same for the two groups of plants in this investigation.

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..... [3]

(d) The growth and final yields of crops grown in open fields are often limited by environmental factors.

Describe how these factors are controlled in commercial glasshouses to give high yields of crops such as tomatoes.

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..... [4]

[Total: 17]

3 Fig. 3.1 shows a human egg cell and a human sperm cell.

For Examiner's Use

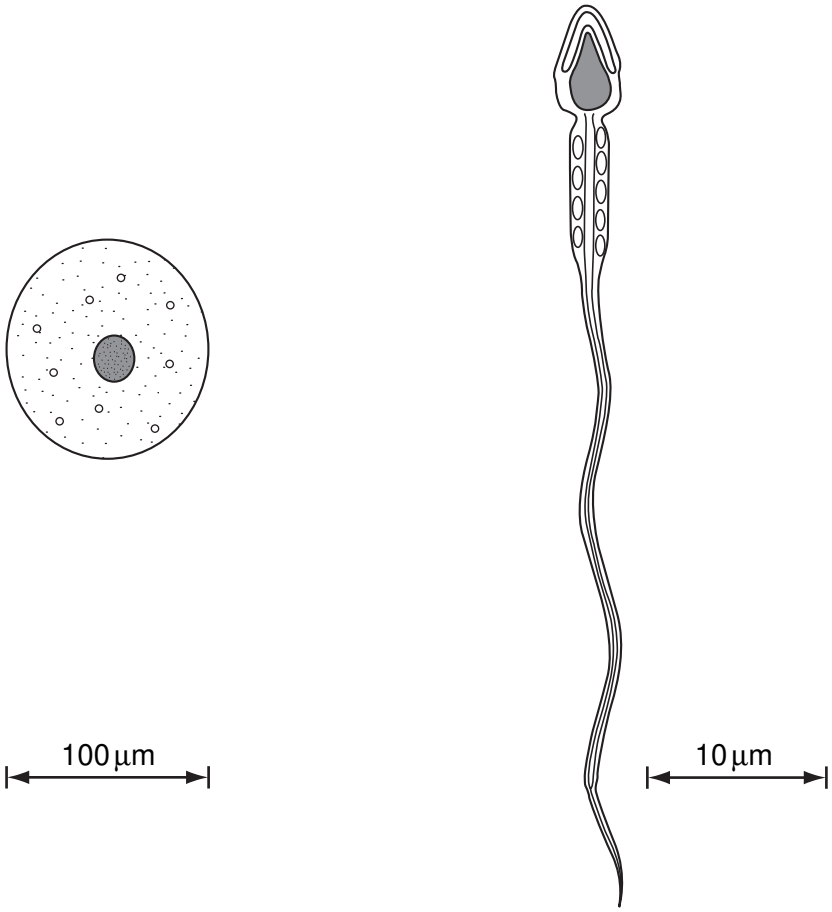

Fig. 3.1

(a) (i) What is the name given to the release of eggs from the ovary?

..... [1]

(ii) Sperm cells and egg cells are haploid. State the meaning of the term *haploid*.

..... [1]

(b) Complete the table to compare egg cells with sperm cells.

feature	egg cells	sperm cells
site of production		
relative size		
numbers produced		
mobility		

[4]

(c) Three hormones that control the menstrual cycle are:

- follicle stimulating hormone (FSH)
- luteinising hormone (LH)
- oestrogen.

(i) Name the site of production and release of oestrogen.

..... [1]

(ii) Describe the role of oestrogen in controlling the menstrual cycle.

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..... [2]

(d) Artificial insemination is sometimes used as a treatment for female infertility.

Outline how artificial insemination is carried out in humans.

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..... [2]

[Total: 11]

For Examiner's Use

4 Acid rain is a serious environmental problem in some areas of the world. Lakes in Canada, Norway and Scotland are highly acidic as a result of acid rain.

Fig. 4.1 shows a cause of acid rain.

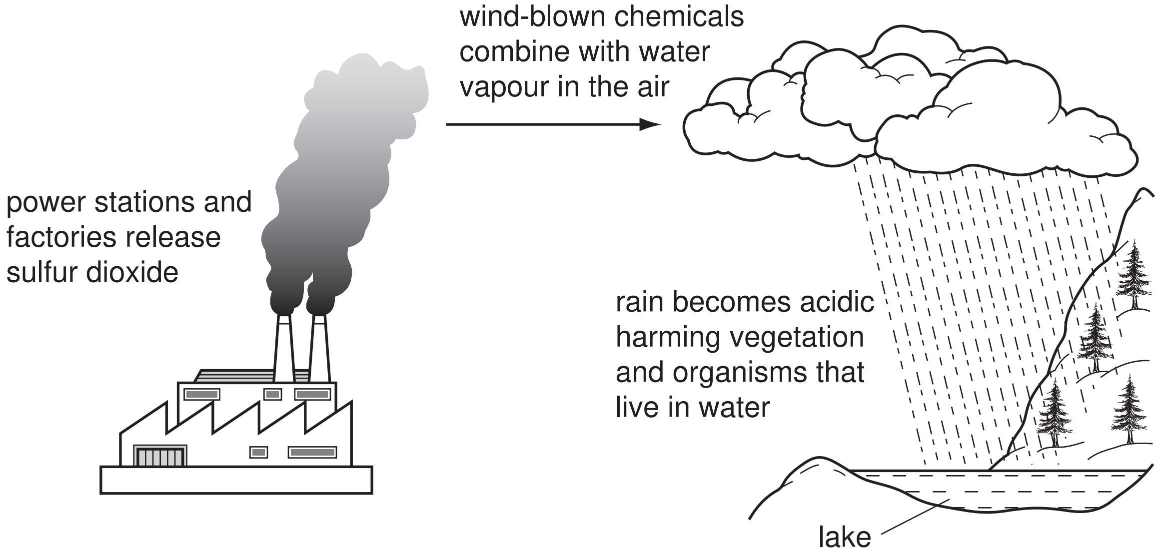

Fig. 4.1

(a) **(i)** State **one** cause of acid rain **other than that shown in Fig. 4.1**.

.... [1]

(ii) Describe two effects of acid rain on forest ecosystems.

1. ....

....

2. ....

.... [2]

(b) Describe two different ways to reduce pollution so that there is less acid rain.

1. ....

....

2. ....

.... [2]

Fig. 4.2 shows the pH ranges that some animals that live in lakes can tolerate.

For Examiner's Use

animals		pH							
group	examples	7.0	6.5	6.0	5.5	5.0	4.5	4.0	3.5
fish	trout	■	■	■	■	■			
	bass	■	■	■	■				
	perch	■	■	■	■	■	■		
amphibians	frogs	■	■	■	■	■	■	■	
	salamanders	■	■	■	■	■			
molluscs	clams	■	■	■					
	snails	■	■	■					
crustacean	crayfish	■	■	■	■				
insects	mayfly larvae	■	■	■	■				
	blackfly larvae	■	■	■	■	■	■	■	■

Fig. 4.2

(c) State **one** feature of molluscs that is **not** a feature of crustaceans.

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[1]

(d) Using the information in Fig. 4.2,

(i) name an animal that could be found in a lake with a pH of 4.0;

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[1]

(ii) name the animals that are most sensitive to a decrease in pH;

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[1]

(iii) suggest why some animals cannot tolerate living in water of pH as low as 4.0.

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[2]

[Total: 10]

[Turn over

For Examiner's Use

5 Fig. 5.1 shows the processes involved in the manufacture of yoghurt.

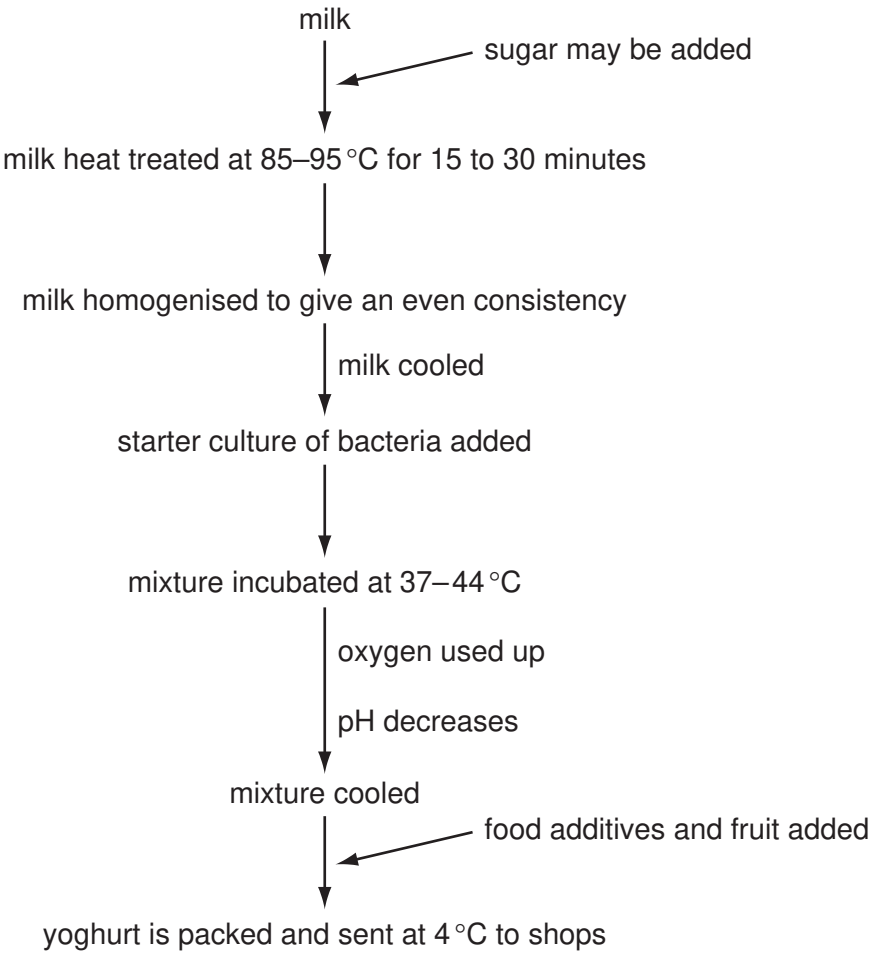

Fig. 5.1

(a) (i) Explain why the milk must be cooled before the bacteria are added.

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..... [2]

(ii) Explain why the pH decreases only **after** the oxygen in the milk has been used up.

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..... [2]

(iii) Suggest **one** type of food additive that could be added to yoghurt.

..... [1]

The starter culture contains two species of bacteria, *Streptococcus thermophilus* and *Lactobacillus bulgaricus*.

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Fig. 5.2 shows the growth of these bacteria during the production of yoghurt.

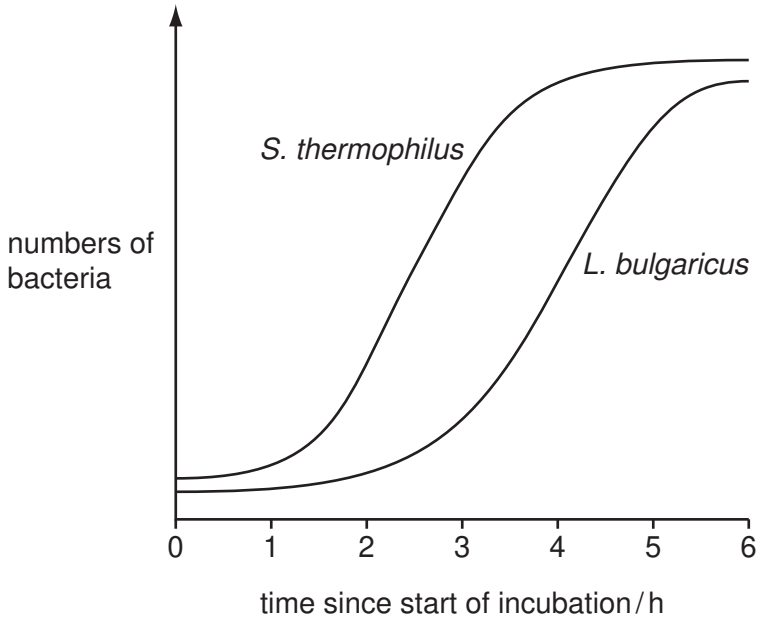

Fig. 5.2

(b) Using your knowledge of population growth and the factors that affect it, describe **and** explain the growth of *S. thermophilus*, as shown in Fig. 5.2.

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..... [5]

(c) Suggest why the numbers of *L. bulgaricus* do not start to increase until after the increase in the numbers of *S. thermophilus*.

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..... [2]

[Total: 12]

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Question 6 begins on page 16.

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6 The Food and Agriculture Organization (FAO) collects data on food supplies worldwide.

The FAO classifies the causes of severe food shortages as either by natural disasters or as the result of human action.

Natural disasters are divided into those that occur suddenly and those that take a long time to develop. Human actions are divided into those that are caused by economic factors and those that are caused by wars and other conflicts.

Fig. 6.1 shows the changes in the number of severe food shortages between 1981 and 2007.

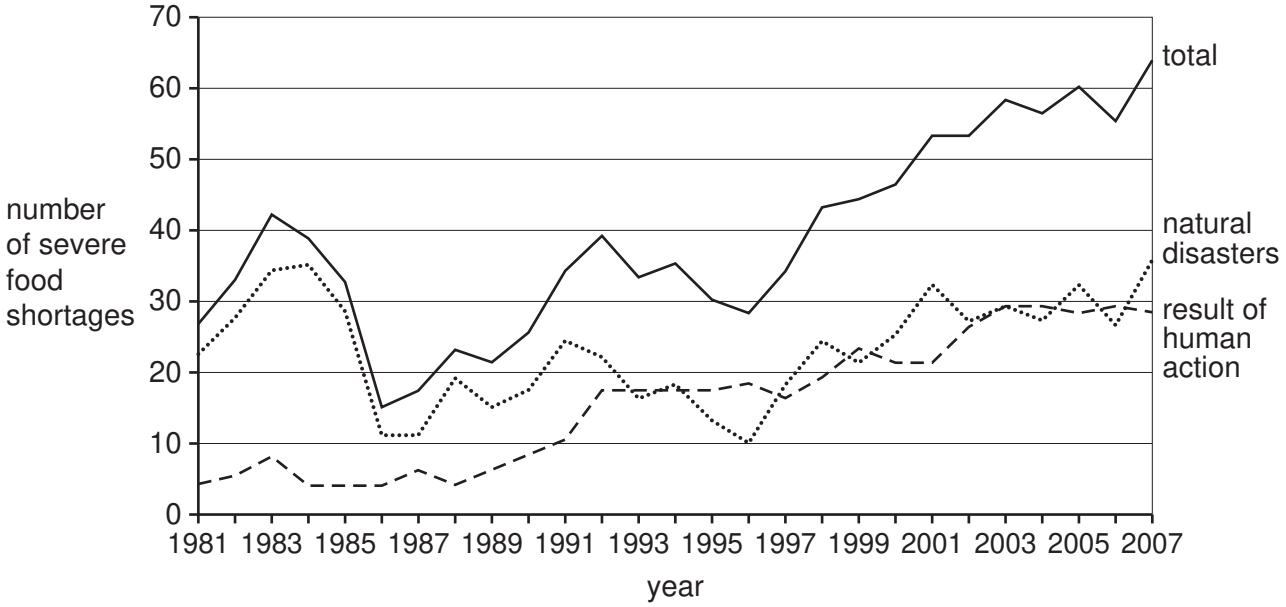

Fig. 6.1

Fig. 6.2 shows the causes of severe food shortages in the 1980s, 1990s and 2000s.

For Examiner's Use

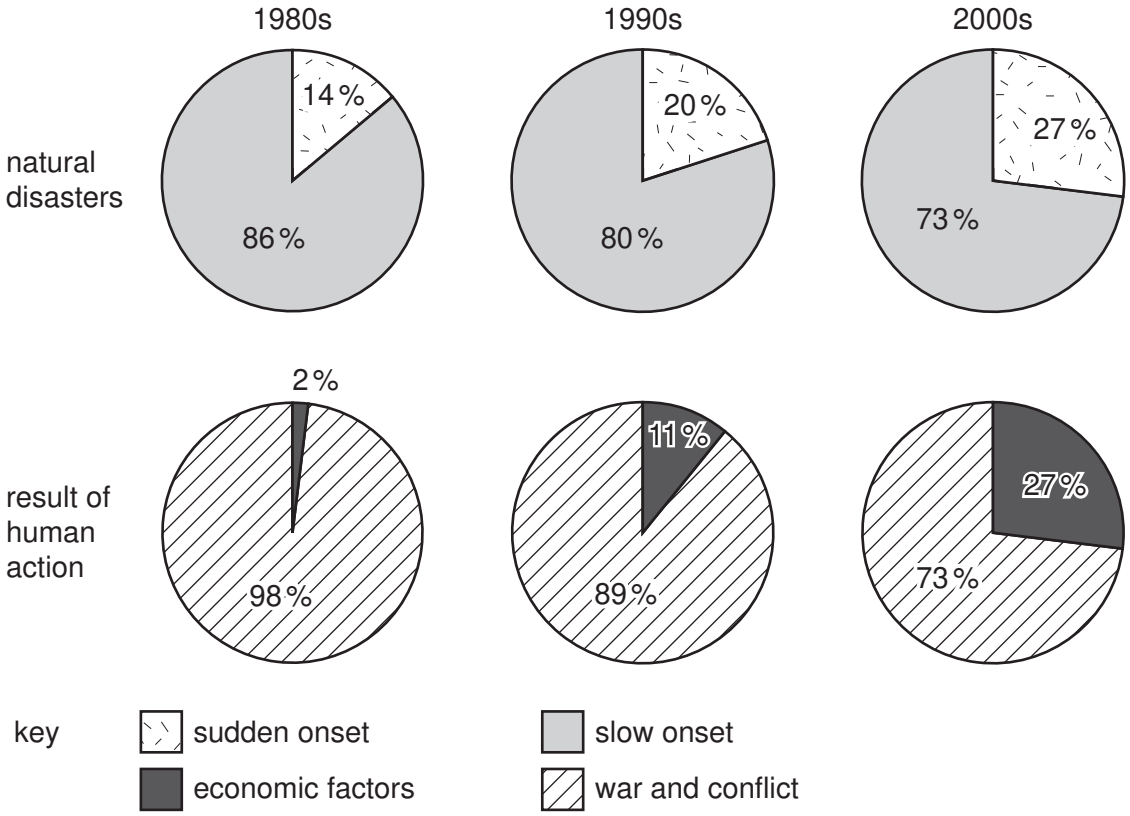

Fig. 6.2

(a) (i) State two types of natural disaster that occur suddenly and may lead to severe food shortages.

1. .....

2. ..... [2]

(ii) State **one** type of natural disaster that may take several years to develop.

..... [1]

For Examiner's Use

(b) Use the information in Fig. 6.1 and Fig. 6.2 to **describe** the changes in food shortages between 1981 and 2007.

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..... [5]

(c) Explain how the increase in the human population may contribute to severe food shortages.

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..... [3]

The quality and quantity of food available worldwide has been improved by artificial selection (selective breeding) and genetic engineering.

For Examiner's Use

(d) Use a **named** example to outline how artificial selection is used to improve the quantity or quality of food.

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..... [4]

(e) Define the term *genetic engineering*.

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..... [1]

[Total: 16]

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