

Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

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General Certificate of Secondary Education
June 2004



**SCIENCE SINGLE AWARD (CO-ORDINATED) 3463/1H
HIGHER TIER
Paper 1**

Monday 7 June 2004 1.30 pm to 2.15 pm

H

<p>In addition to this paper you will require: a ruler. You may use a calculator.</p>
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Time allowed: 45 minutes

Instructions

- Use blue or black ink or ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- Do all rough work in this book. Cross through any work you do not want marked.

Information

- The maximum mark for this paper is 45.
- Mark allocations are shown in brackets.
- You are reminded of the need for good English and clear presentation in your answers.

For Examiner's Use			
Number	Mark	Number	Mark
1		4	
2		5	
3		6	
		7	
		8	
Total (Column 1)			
Total (Column 2)			
TOTAL			
Examiner's Initials			

Answer **all** questions in the spaces provided.

- 1 (a) (i) What name is given to an enzyme which catalyses the breakdown of protein?

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(1 mark)

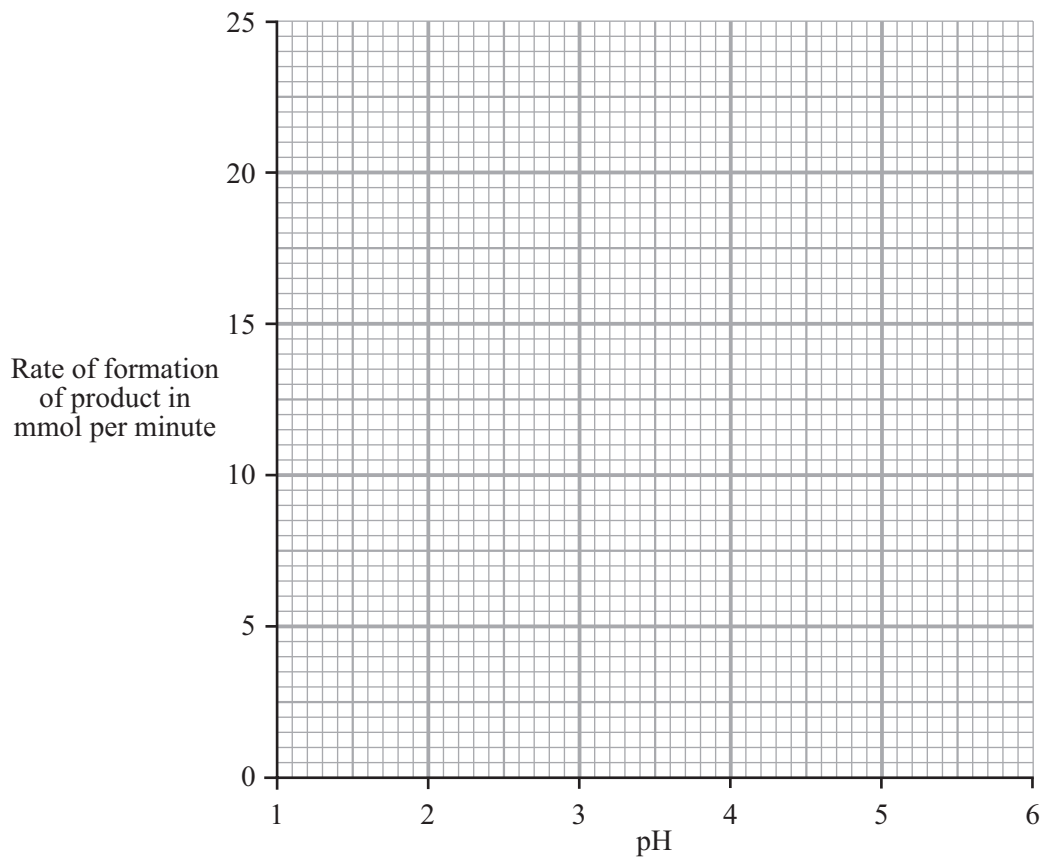
- (ii) What product is formed when protein is broken down by the enzyme?

.....
(1 mark)

The table shows the effect of pH on the activity of an enzyme which catalyses the breakdown of protein.

pH	1.0	2.0	3.0	4.0	5.0
Rate of formation of product in mmol per minute	10.5	23.0	10.5	2.5	0.0

- (b) Draw a graph of the data in the table.



(3 marks)

(c) The enzyme is produced by the human digestive system.

(i) At what pH does this enzyme work best?
(1 mark)

(ii) Suggest which part of the digestive system produces this enzyme.
.....
(1 mark)

(d) Why is it necessary to break down proteins in the digestive system?

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(3 marks)

10

TURN OVER FOR THE NEXT QUESTION

Turn over ►

2 Hormones are sometimes used to regulate human reproduction.

(a) (i) What is a hormone?

.....
.....

(1 mark)

(ii) How are hormones transported around the body?

.....
.....

(1 mark)

(b) Describe the benefits and possible problems that may result from the use of hormones to regulate human reproduction. You should refer to fertility drugs and contraceptives in your answer.

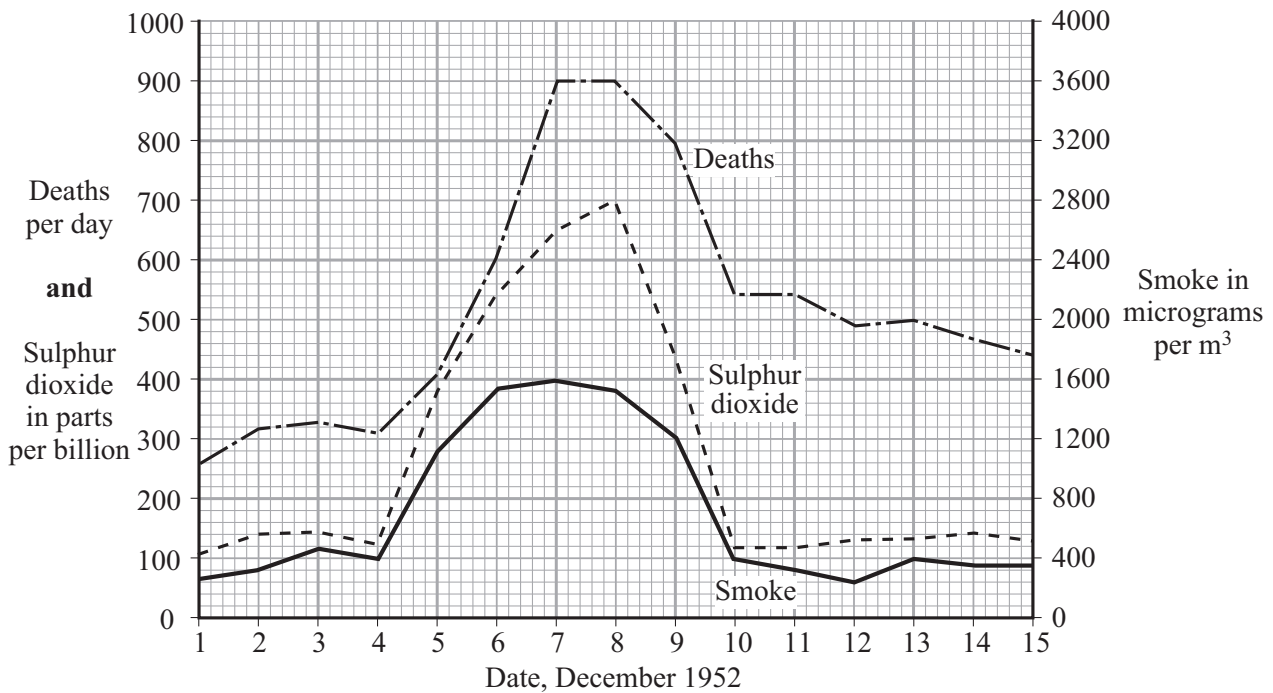
To gain full marks in this question you should write your ideas in good English. Put them into a sensible order and use the correct scientific words.

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(4 marks)



3 In December 1952, there was a thick fog in London. The graph shows changes in the amounts of sulphur dioxide and smoke in the air and the number of people dying during this period.



(a) Describe **one** human activity which releases sulphur dioxide into the air.

.....
(1 mark)

(b) Human deaths during this period were caused mainly by lung diseases.

(i) Why were the lungs particularly affected?

.....
(1 mark)

(ii) Give evidence from the graph which suggests that sulphur dioxide might have caused these deaths.

.....
.....
(1 mark)

(iii) Does the graph prove that sulphur dioxide caused these deaths? Explain your answer.

.....
.....
(1 mark)

4 (a) Each day, a boy ate food containing 12 000 kilojoules of energy. The boy's body used 80 per cent of this energy to maintain his core temperature.

(i) Name the process which releases energy from food.

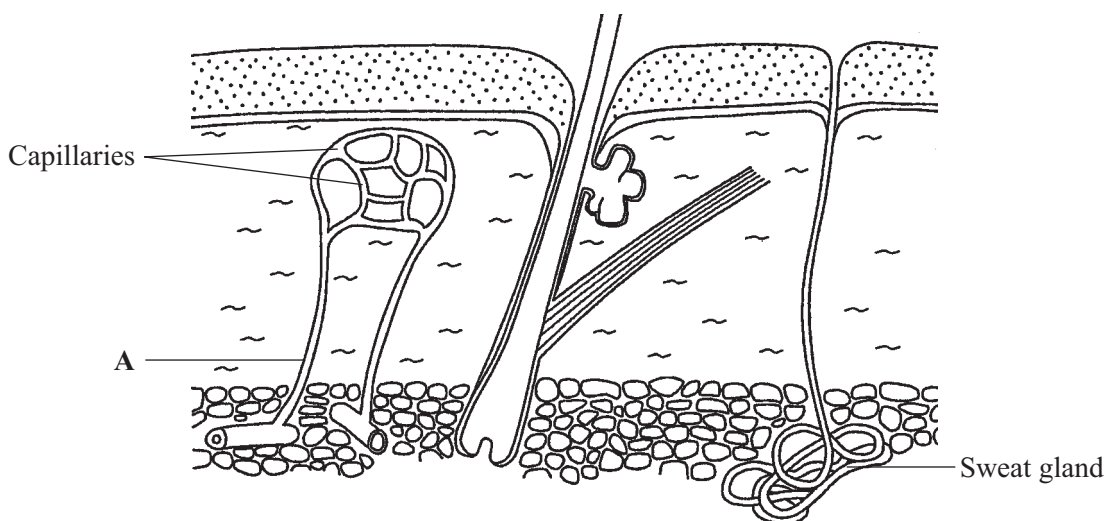
.....
(1 mark)

(ii) Calculate the amount of energy that the boy would use each day to maintain his core body temperature. Show clearly how you work out your final answer.

.....
.....

Amount of energy used each day = kJ
(2 marks)

(b) The diagram shows a section through human skin.



Explain how structure A helps to cool the body on a hot day.

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(3 marks)

(c) Body temperature is monitored and controlled by the thermoregulatory centre. Where in the body is the thermoregulatory centre?

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(1 mark)

5 Diagram 1 shows the nucleus of a cell at the start of meiosis.

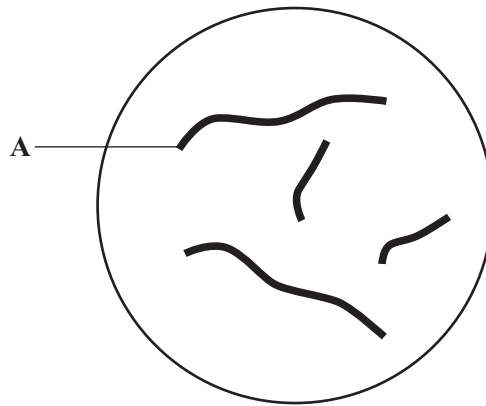


Diagram 1

(a) Name structure A. (1 mark)

(b) During meiosis, the nucleus shown in diagram 1 will divide twice to form four nuclei.

Complete diagram 2 to show the appearance of one of these nuclei.

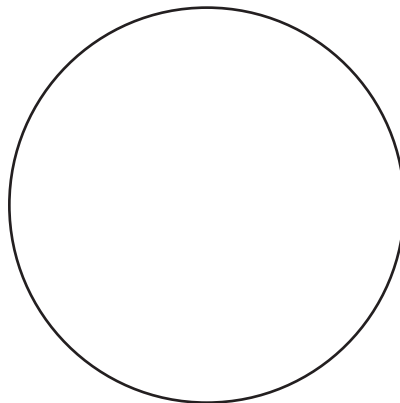


Diagram 2

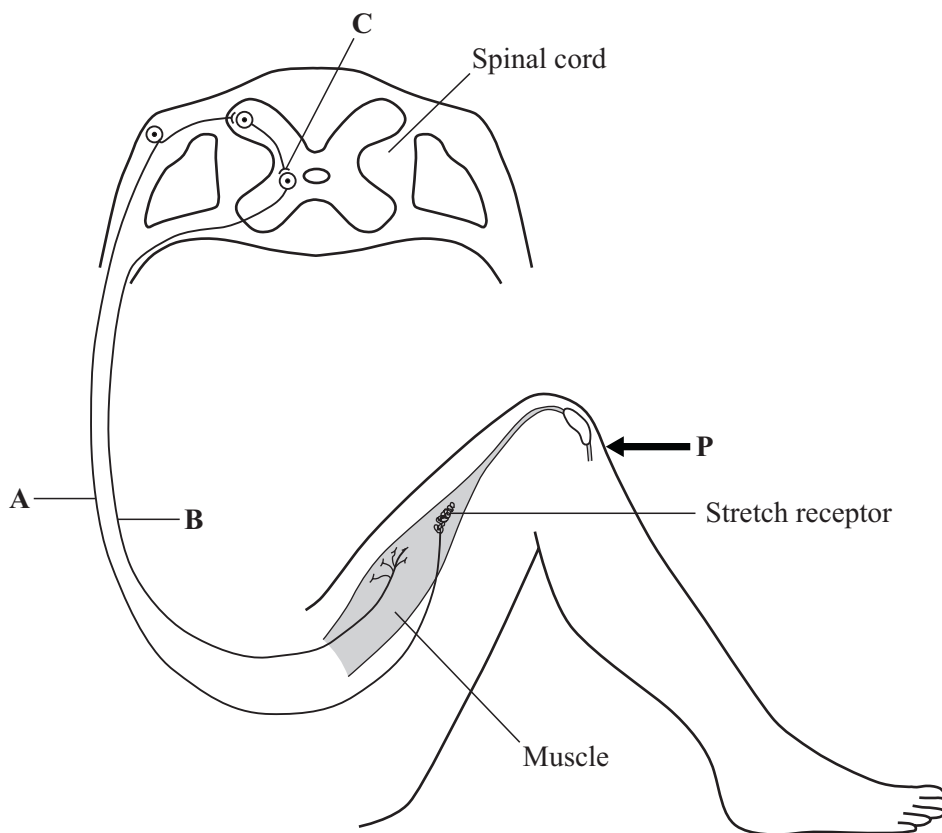
(2 marks)

3

TURN OVER FOR THE NEXT QUESTION

Turn over ►

- 6 The diagram shows the nervous pathway which is used to coordinate the knee-jerk reflex. When the person is hit at point **P**, the lower leg is suddenly raised.



- (a) (i) Name the type of neurone labelled **A**.
(1 mark)
- (ii) **On the diagram**, draw arrows next to the neurones labelled **A** and **B** to show the direction in which an impulse moves in each neurone.
(1 mark)
- (b) How is information passed across the synapse at **C**?
.....
(1 mark)
- (c) **On the diagram**, label the effector with the letter **X**.
(1 mark)

7 The vole is a small, mouse-like animal. Voles found on some cold islands to the north of Scotland are much larger than voles found in warmer areas such as southern France. Explain how natural selection may have caused the northern voles to be larger in size.

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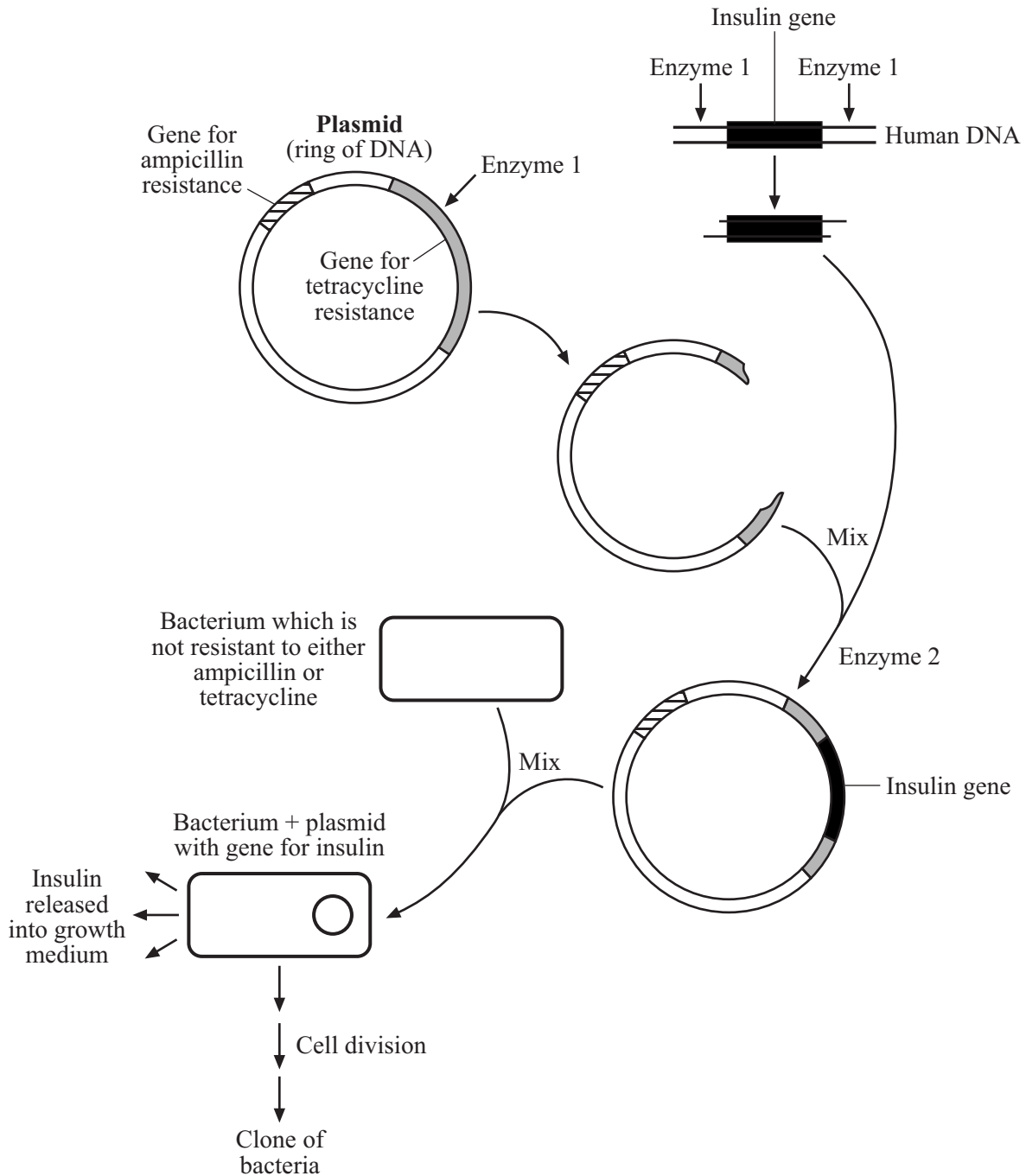
(5 marks)

5

TURN OVER FOR THE NEXT QUESTION

Turn over ►

- 8 The diagram shows how genetic engineering can be used to produce human insulin from bacteria. Ampicillin and tetracycline are two types of antibiotic. Study the diagram carefully and answer the questions.



In experiments like these, some bacteria take up the plasmid (ring of DNA) containing the insulin gene. Other bacteria fail to take up a plasmid, or they take up an unmodified plasmid (a ring of DNA which has not been cut open and which does not contain the insulin gene).

- (a) Complete the table by putting a tick (✓) in the correct boxes to show which bacteria would be able to multiply in the presence of ampicillin and which bacteria would be able to multiply in the presence of tetracycline.

	Bacterium can multiply in the presence of	
	Ampicillin	Tetracycline
Bacterium + plasmid with the insulin gene		
Bacterium without a plasmid		
Bacterium with an unmodified plasmid		

(3 marks)

- (b) The bacterium with the plasmid containing the insulin gene multiplies by cell division to form a clone of bacteria.

Will **all** the bacteria in this clone be able to produce insulin? Explain your answer.

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(3 marks)

END OF QUESTIONS



THERE ARE NO QUESTIONS PRINTED ON THIS PAGE