

Surname						Other Names					
Centre Number						Candidate Number					
Candidate Signature											

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General Certificate of Secondary Education
June 2003



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

H

Monday 2 June 2003 1.30 pm to 2.15 pm

No additional materials are required.
You may use a calculator.

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.

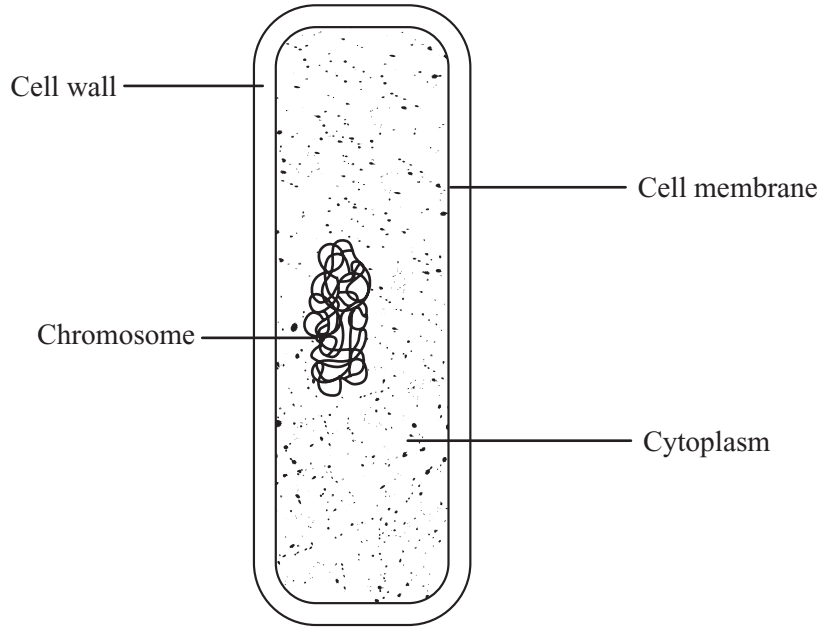
Information

- 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		5	
2		6	
3		7	
4		8	
Total (Column 1)	→		
Total (Column 2)	→		
TOTAL			
Examiner's Initials			

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

1 (a) The diagram shows a bacterial cell.



A bacterial cell is smaller than a human cell. Give **two** other ways in which the bacterial cell is different from a cell in the human body.

- 1
- 2 *(2 marks)*

(b) Describe and explain **two** natural defences which help to prevent bacteria entering and harming the human body.

- 1
-
- 2
- *(2 marks)*

- (c) The table shows changes in resistance to the antibiotic penicillin in one species of bacterium between 1991 and 1996.

Years	Percentage of cases where bacteria were resistant to penicillin
1991–92	7
1993–94	14
1995–96	22

A doctor was asked to treat a patient who had a sore throat.

- (i) How does penicillin help to treat infection?

.....
(1 mark)

- (ii) Use the data in the table to suggest why the doctor should **not** prescribe penicillin.

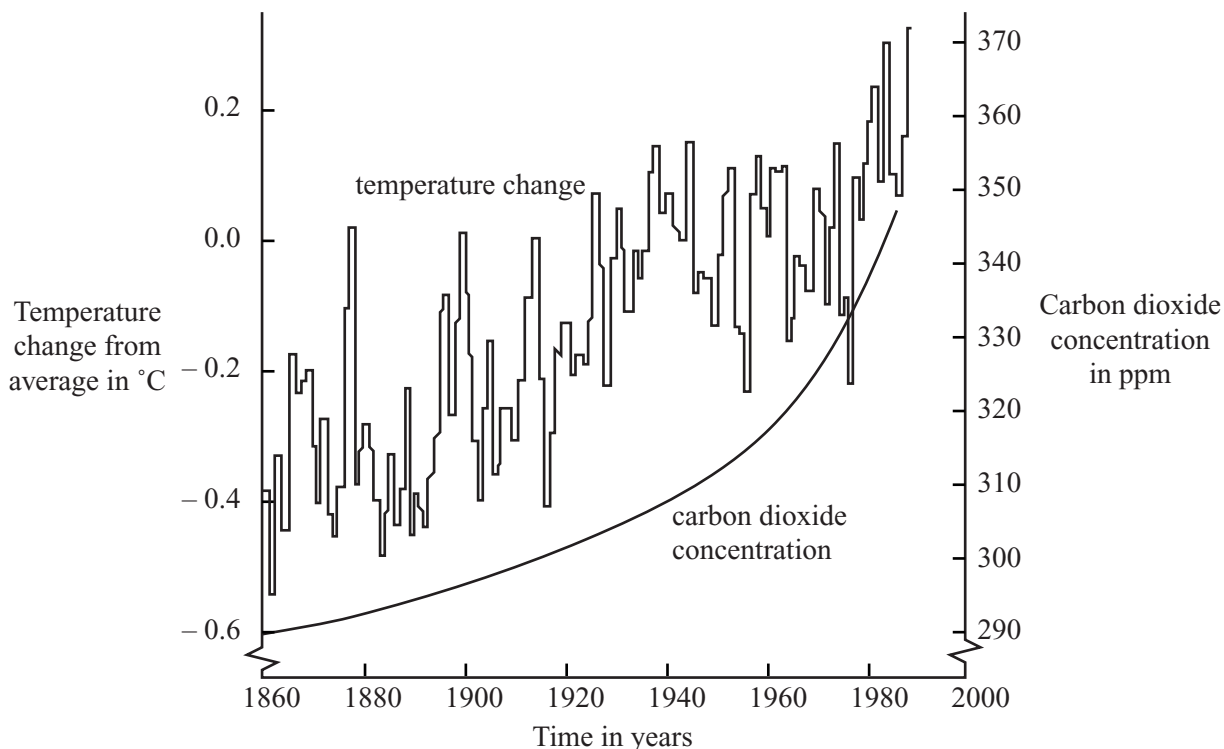
.....
.....
.....
.....
(2 marks)

7

TURN OVER FOR THE NEXT QUESTION

Turn over ►

2 The graph shows changes in temperature and in carbon dioxide concentration in the earth's atmosphere between 1860 and 1990.



(a) Give **two** human activities which may have helped to increase the concentration of carbon dioxide in the atmosphere.

1

2

(2 marks)

(b) (i) Describe the changes in temperature shown by the graph between 1860 and 1990.

.....

(2 marks)

(ii) Do the data in the graph prove that increased carbon dioxide concentrations in the atmosphere caused the changes in temperature you described in part (b) (i)? Give a reason for your answer.

.....

(1 mark)

- (c) Describe **one** way in which a change in temperature such as that shown in the graph might affect the environment.

.....

.....

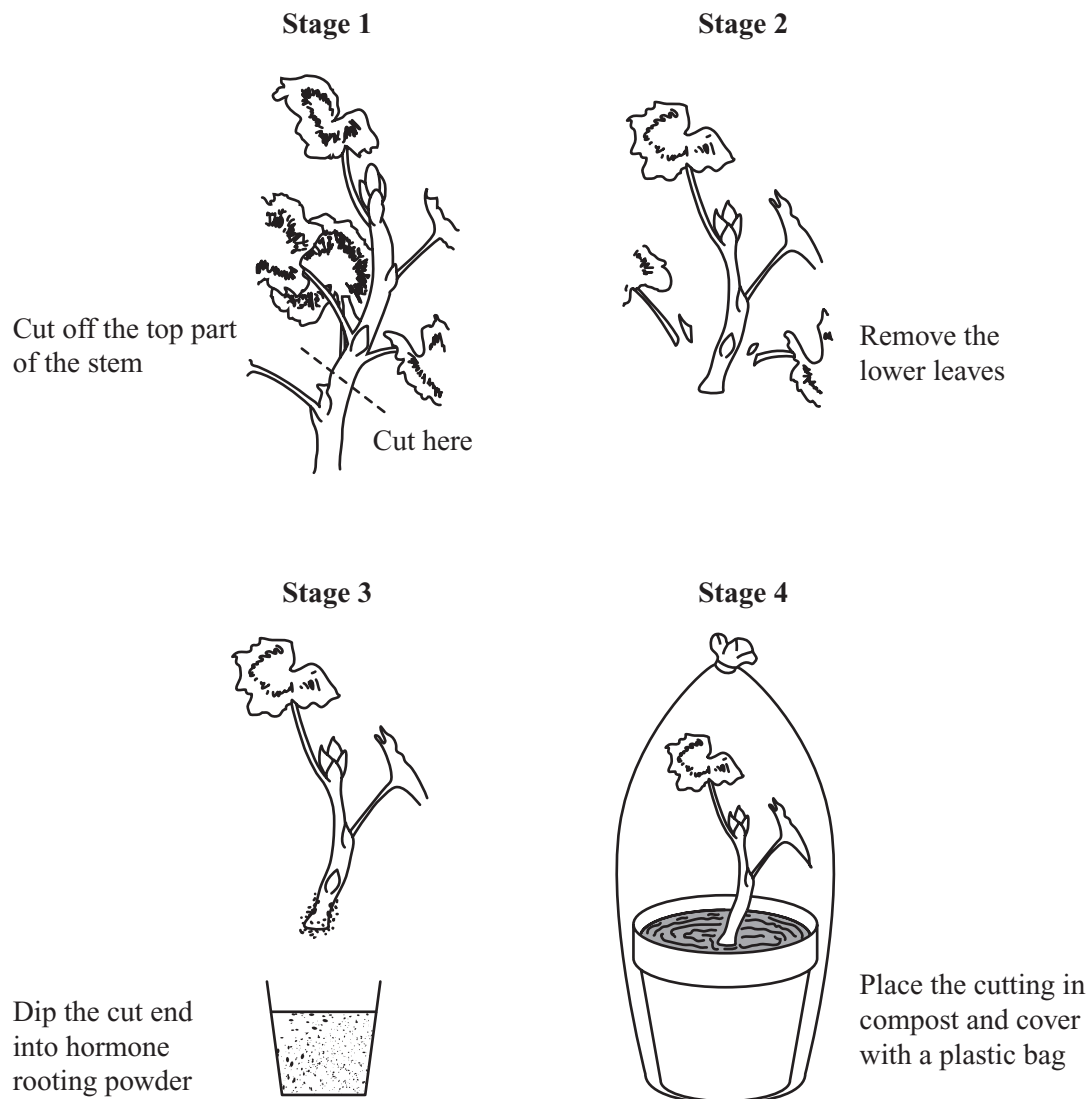
(1 mark)

$\frac{\quad}{6}$

TURN OVER FOR THE NEXT QUESTION

Turn over ►

- 3 (a) New plants can be produced from a parent plant by taking cuttings. The diagram shows how this is done.



(i) Hormone rooting powder stimulates the growth of new roots (Stage 3). Why would the cutting die without roots?

.....
(1 mark)

(ii) Why were the cutting and the pot of soil covered with a plastic bag (Stage 4)?

.....
(1 mark)

(b) A new variety of plant was developed by a gardener. Would the first plant of this new variety have been grown from a seed or from a cutting taken from another plant? Explain your answer as fully as you can.

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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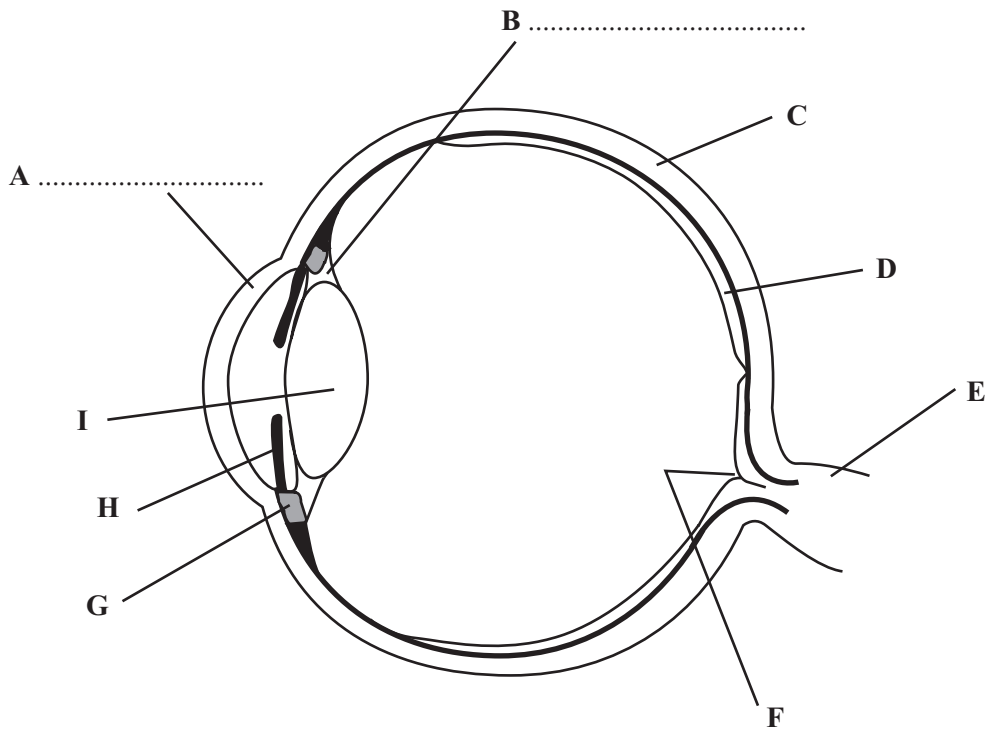
(3 marks)

5

TURN OVER FOR THE NEXT QUESTION

Turn over ►

4 The diagram shows a section through the eye.



(a) On the diagram, label parts **A** and **B**. (2 marks)

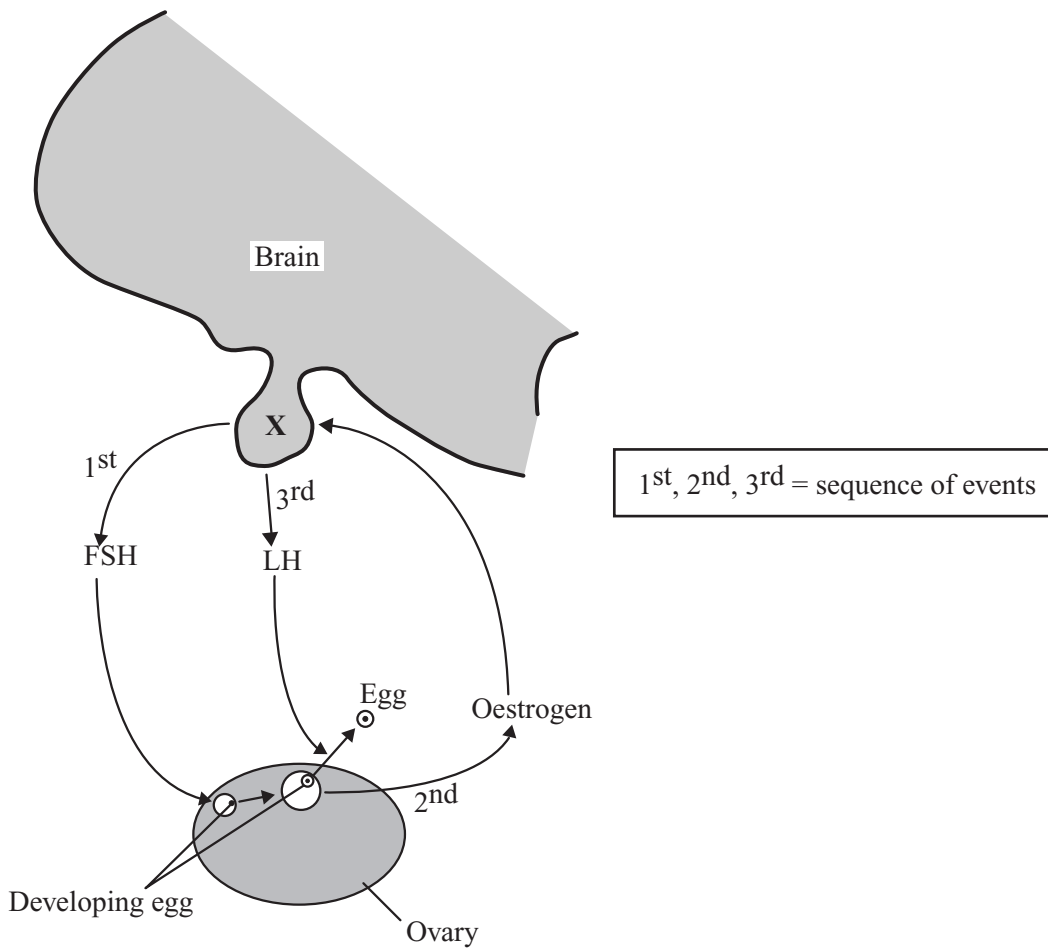
(b) Give the letter, **A** to **I**, of the part which controls the amount of light entering the eye.

Letter.....
(1 mark)

(c) What is the function of part **E**?

.....
(1 mark)

5 The diagram shows how three hormones, FSH, LH and oestrogen, work together in a woman's body.



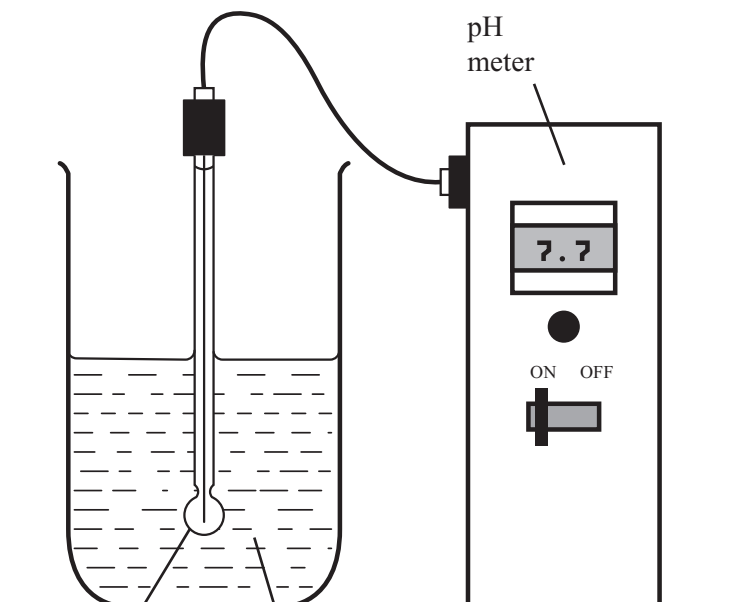
(a) Name the part of the brain labelled X.

.....
(1 mark)

(b) Use information from the diagram and your own knowledge to explain why some oral contraceptive pills contain oestrogen.

.....
.....
.....
.....
.....
.....
.....
(3 marks)

- 6 The diagram shows the apparatus used to investigate the digestion of milk fat by an enzyme. The reaction mixture contained milk, sodium carbonate solution (an alkali) and the enzyme. In Experiment 1, bile was also added. In Experiment 2, an equal volume of water replaced the bile. In each experiment, the pH was recorded at 2-minute intervals.



pH
electrode

Reaction mixture containing:

Either: Experiment 1

milk (contains fat)
sodium carbonate solution
bile
enzyme

or: Experiment 2

milk (contains fat)
sodium carbonate solution
water
enzyme

The results of the two experiments are given in the table.

Time in minutes	pH	
	Experiment 1: with bile	Experiment 2: no bile
0	9.0	9.0
2	8.8	9.0
4	8.7	9.0
6	8.1	8.8
8	7.7	8.6
10	7.6	8.2

(a) Milk fat is a type of lipid. Give the name of an enzyme which catalyses the breakdown of lipids.

.....
(1 mark)

(b) What was produced in each experiment to cause the fall in pH?

.....
(1 mark)

(c) (i) For Experiment 1, calculate the average rate of fall in pH per minute, between 4 minutes and 8 minutes. Show clearly how you work out your final answer.

.....
.....
.....
.....pH units per minute
(2 marks)

(ii) Why was the fall in pH faster when bile was present?

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

5

TURN OVER FOR THE NEXT QUESTION

Turn over ►

- 7 The table shows the concentrations of some substances in human blood plasma, in the filtrate produced by the kidney and in the urine.

Substance	Concentration in grams per dm ³		
	Blood plasma	Filtrate	Urine
Glucose	1.0	1.0	0.0
Amino acids	0.5	0.5	0.0
Urea	0.3	0.3	20.0
Protein	80.0	0.0	0.0
Ions	7.2	7.2	15.0
Water	912.0	990.0	970.0

- (a) Explain why:

- (i) the concentration of glucose in the filtrate is the same as in the blood plasma;

.....

 (1 mark)

- (ii) there is no glucose present in the urine.

.....

 (1 mark)

- (b) Suggest why there is no protein present in either the filtrate or the urine.

.....

 (1 mark)

- (c) The volume of water removed in the urine is variable. Explain how the human body reduces the volume of urine produced when less water is consumed.

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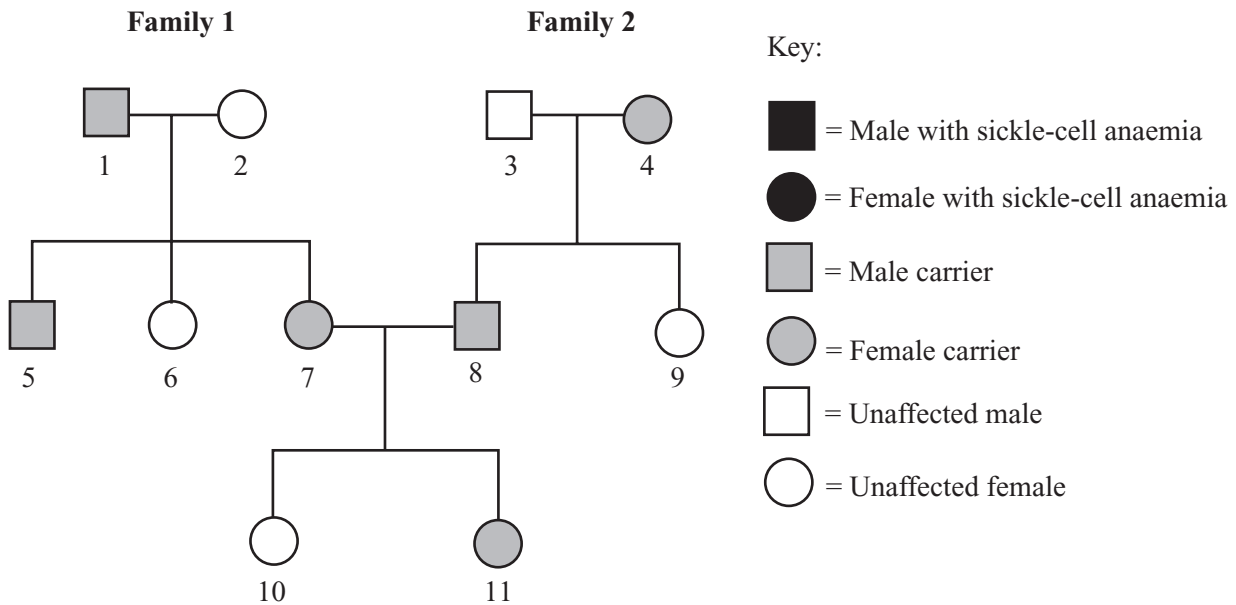
(3 marks)

6

TURN OVER FOR THE NEXT QUESTION

Turn over ►

8 The diagram shows the inheritance of sickle-cell anaemia in two families. A person with sickle-cell anaemia has red blood cells which form a 'sickle' shape at low oxygen concentrations. In the sickled condition, the red cells may block tiny blood vessels and, while normal red blood cells may live for about 120 days, sickled red cells die after about 10 to 20 days. A person who is a carrier usually shows no ill effects.



(a) Sickle-cell anaemia is caused by a change in a gene which codes for the production of haemoglobin.

(i) What biological term describes a change in a gene?

.....
(1 mark)

(ii) Suggest why a person with sickle-cell anaemia may become breathless during even light exercise.

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

(b) Person 7 is pregnant with her third child. The father is Person 8.

- (i) Use a genetic diagram to show how it is possible for this child to have sickle-cell anaemia.

Use the following symbols:

H^A = allele for unaffected haemoglobin;

H^S = allele for sickle haemoglobin.

	Person 7	Person 8
Phenotype:	Carrier	Carrier

(4 marks)

- (ii) What is the probability that Person 7's third child will have sickle-cell anaemia?

.....
(1 mark)

- (c) Give the number of any **one** person from the families on the opposite page who would **not** have been resistant to malaria.

.....
(1 mark)

END OF QUESTIONS

8