Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

For Examiner's Use

General Certificate of Secondary Education
June 2007

AQA
ASSESSMENT and QUALIFICATIONS ALLIANCE

HUMAN PHYSIOLOGY AND HEALTH **3417/H**
Written Paper
Higher Tier

H

Friday 22 June 2007 9.00 am to 11.00 am

For this paper you must have:
- a pencil and a ruler.

You may use a calculator.

Time allowed: 2 hours

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

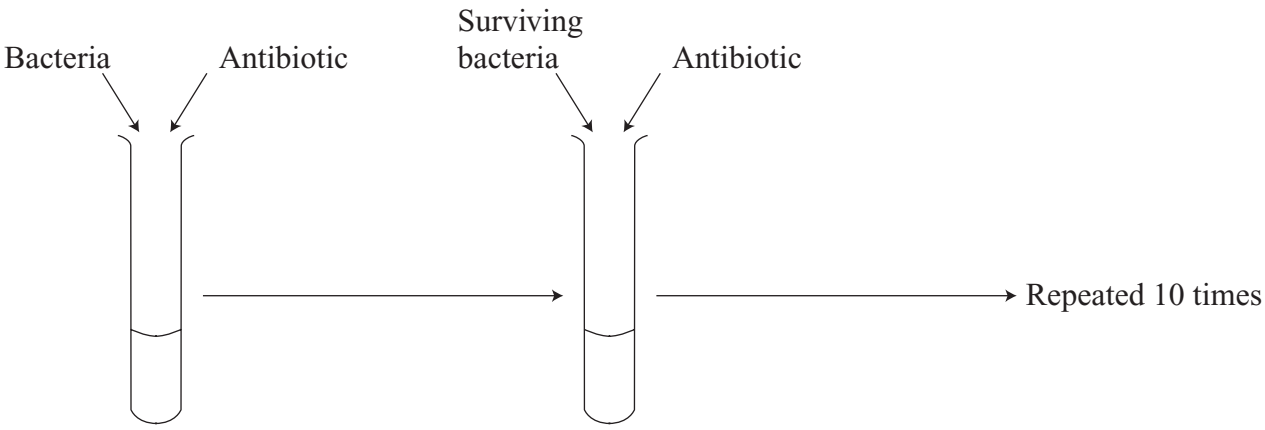
Information
- The maximum mark for this paper is 120.
- The marks for questions are shown in brackets.
- You are reminded of the need for good English and clear presentation in your answers.

For Examiner's Use			
Question	Mark	Question	Mark
1		7	
2		8	
3		9	
4		10	
5		11	
6		12	
Total (Column 1) →			
Total (Column 2) →			
TOTAL			
Examiner's Initials			

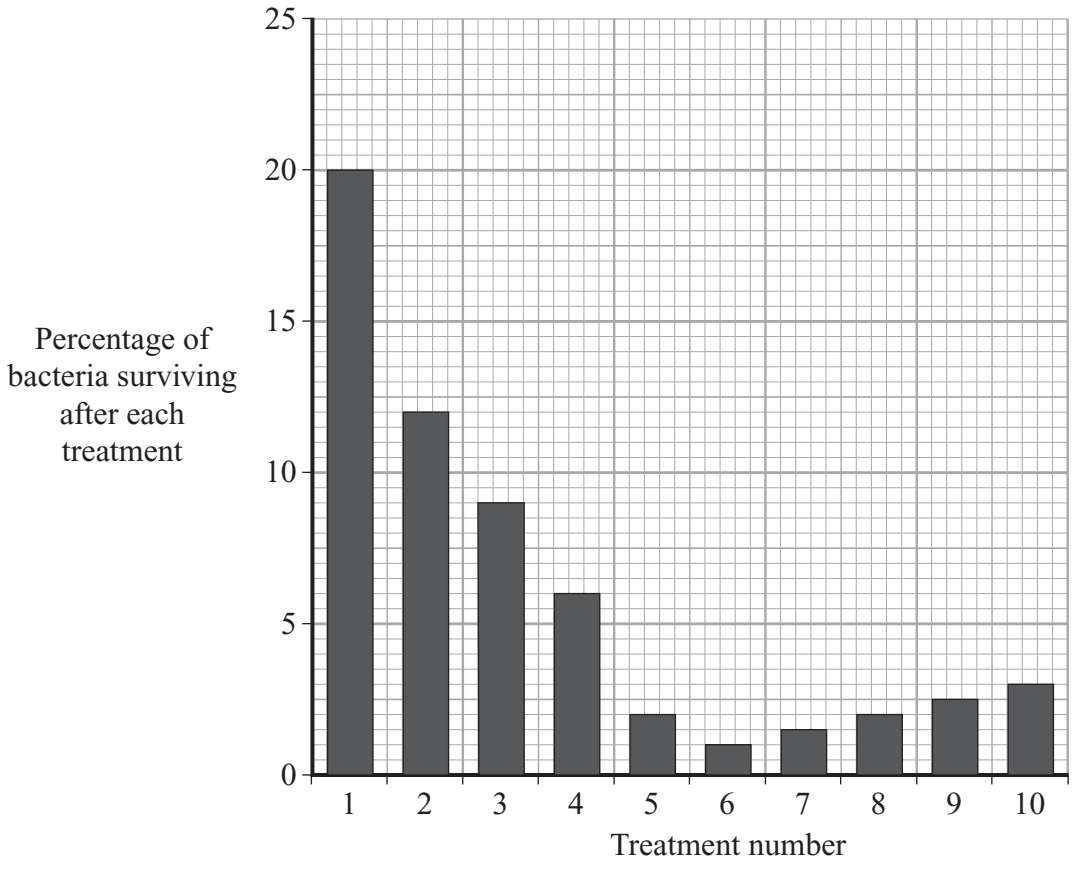
Answer **all** questions in the spaces provided.

1 In an investigation, a culture of bacteria was grown and then treated with an antibiotic. The bacteria that survived this treatment were allowed to grow and were then treated again with the same antibiotic.

This process was repeated 10 times.



The graph shows the percentage of bacteria that survived after each treatment.



(a) (i) The original culture contained 200 million bacteria.

How many remained after the first treatment?

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(2 marks)

(ii) Describe the change in the percentage of bacteria that survived between treatment **1** and treatment **5**.

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(2 marks)

(b) Explain why there is a rise in the percentage of bacteria that survived after treatment **6**.

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(3 marks)

Question 1 continues on the next page

(c) Describe the discovery of the antibiotic Penicillin.

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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(7 marks)

14

2 The table shows some features of six members of a family.

Feature	Mother	Father	Debra	Ann	Robert	Nigel
Age	46	45	16	16	13	11
Sex	F	M	F	F	M	M
Freckles	No	Yes	Yes	Yes	No	No
Height in cm	157	175	125	124	128	122
Mass in kg	64	90	58	57	49	43
Blood group	O	AB	A	A	B	A

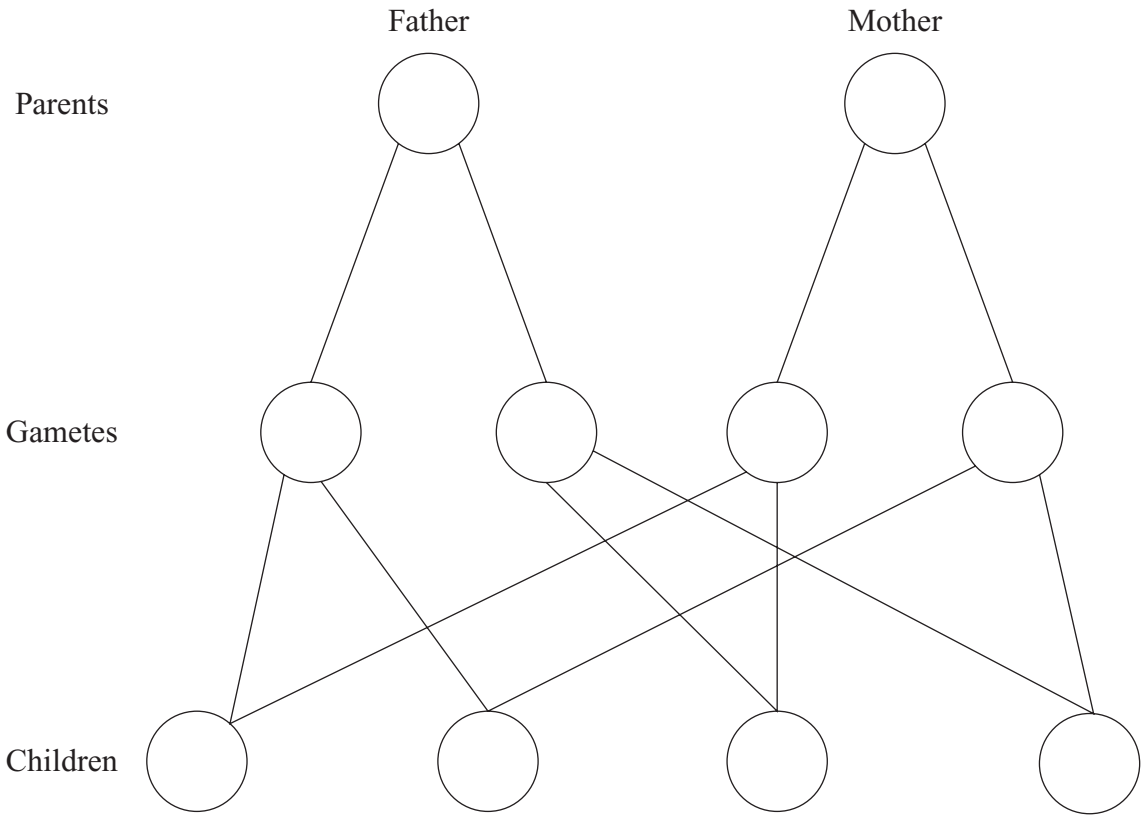
(a) Give **two** features in the table that are examples of discontinuous variation.

1 .....

2 .....

(2 marks)

(b) Complete the diagram to show how sex is inherited in this family.

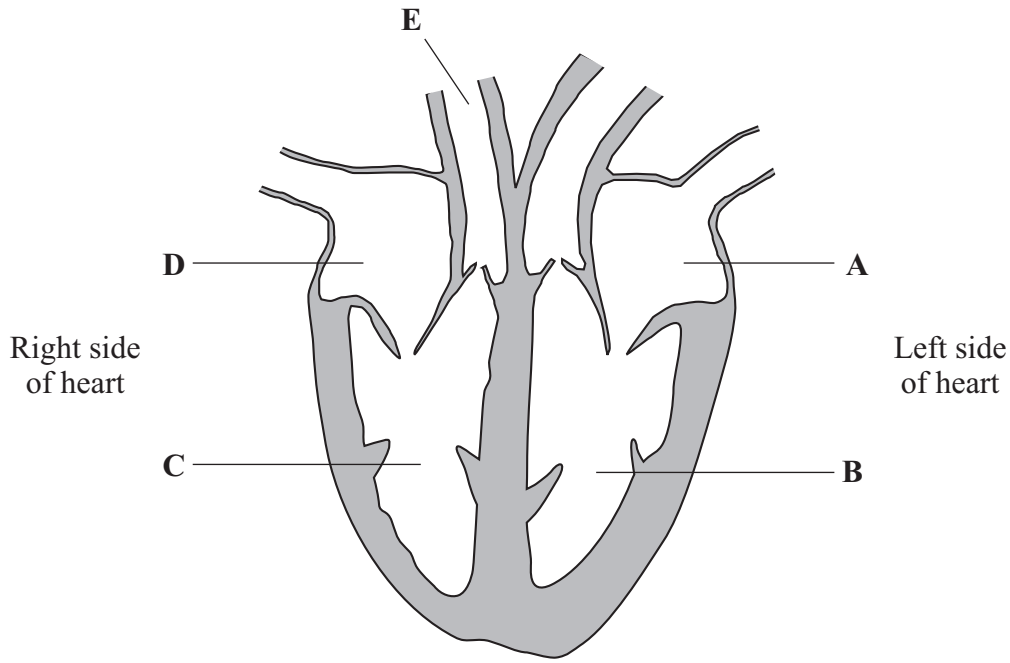


Names ....

(5 marks)

7

3 The diagram shows a section through the heart.



(a) Name the parts labelled **B**, **D** and **E**.

B.....

D .....

E.....

(3 marks)

(b) Describe and explain how blood in the part labelled **C** passes to the part labelled **A**.

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(5 marks)

(c) Complete the table to show the relative amounts of oxygen and carbon dioxide in the blood.

Use the words **high** and **low**.

	Blood in vena cava	**Blood in renal artery**	**Blood in capillaries leaving the muscle cells**
Oxygen	low		
Carbon dioxide	high		

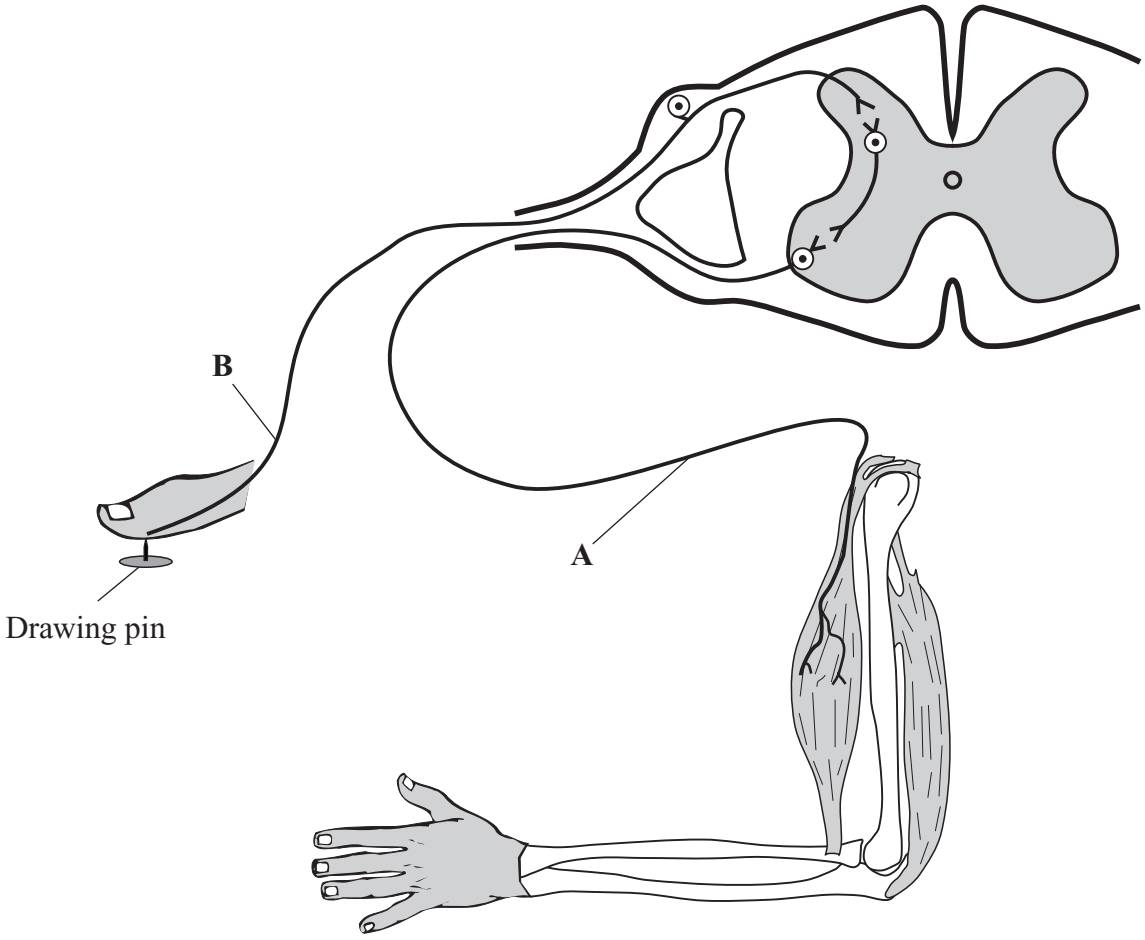
(3 marks)

11

Turn over for the next question

4 (a) A person accidentally puts his thumb on a drawing pin.
Without thinking he rapidly pulls away his arm.

The diagram shows some of the structures involved in this action.



(i) What is this type of action called?

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(1 mark)

(ii) What is the stimulus for this action?

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(1 mark)

(iii) Where is the receptor found?

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(1 mark)

(iv) Which structure brings about the response in this action?

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(1 mark)

(b) Name the parts labelled **A** and **B**.

A .....

B.....

(2 marks)

(c) Draw arrows on the diagram to show the path taken by nerve impulses as they pass from the receptor to the effector.

(1 mark)

(d) In an investigation, people of different ages were asked to respond to a flashing light by pressing a button.

The mean time taken to respond was recorded for each age group and is shown in the table.

Age group in years	**10–19**	**20–29**	**30–39**	**40–49**	**50–59**	**60–69**	**70+**
Mean response time in seconds	0.18	0.18	0.22	0.32	0.38	0.72	0.88

(i) What was the difference between the mean response time of the **20–29** age group and the **60–69** age group?

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(1 mark)

(ii) Suggest **two** reasons for the large increase in the response time after the age of **59**.

1.....

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2.....

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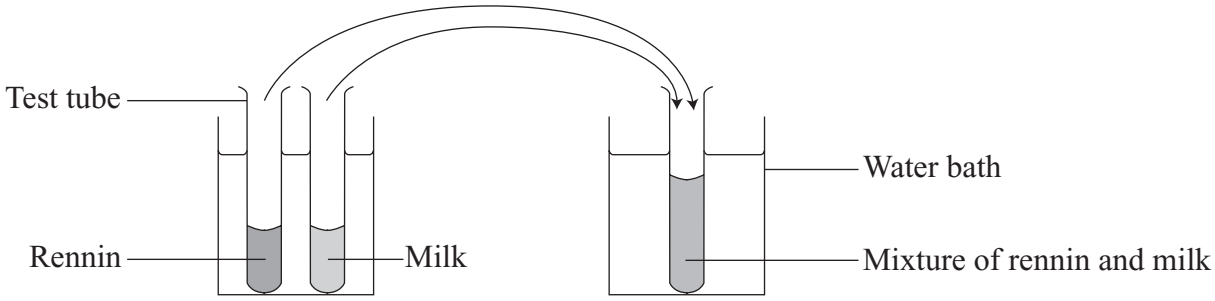
(2 marks)

10

5 Rennin is an enzyme that causes milk to clot.
An experiment was carried out to investigate the effect of temperature on the time taken for milk to clot.

Six pairs of test tubes were set up.
One of each pair of test tubes contained milk and the other contained rennin.
Each pair of test tubes was placed in a water bath at a different temperature.
After 10 minutes the milk and rennin were mixed together.



The time taken for the milk to clot was recorded for each sample of milk.

The results are shown in the table.

Temperature of water bath in °C	Time for milk to clot in seconds
10	Did not clot
20	380
30	185
40	80
50	275
60	Did not clot

(a) (i) Why were the rennin and milk kept separate for 10 minutes?

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(1 mark)

(ii) What was the difference between the clotting time at 20 °C and at 30 °C?

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(1 mark)

(iii) At which temperature was the reaction quickest?

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(1 mark)

(b) (i) The mixture originally tested at 60 °C was cooled to 40 °C and left for 400 seconds. What would be the result?

Explain your answer.

Result.....

Explanation .....

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(2 marks)

(ii) The mixture originally tested at 10 °C was warmed to 40 °C and left for 400 seconds. What would be the result?

Explain your answer.

Result.....

Explanation .....

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(2 marks)

(c) State **one** other factor that affects enzyme action.

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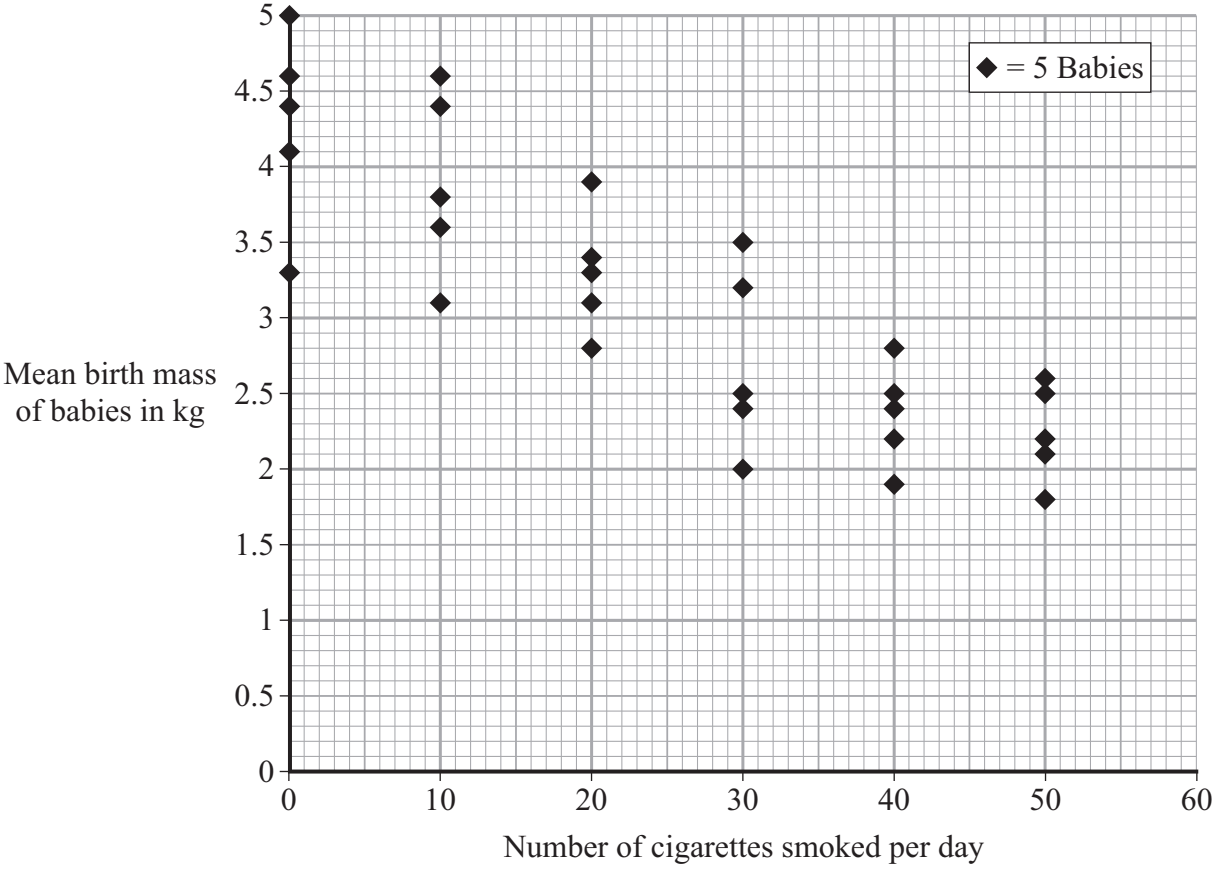
(1 mark)

8

Turn over for the next question

6 The birth masses of babies born to women who smoked during pregnancy were recorded.

The results are shown in the graph.



(a) How many babies were studied?

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(1 mark)

(b) How many babies with a birth mass of less than 3.5 kg were born to women who smoked:

(i) 10 cigarettes per day; .....

(1 mark)

(ii) 20 cigarettes per day?.....

(1 mark)

(c) What is the relationship between the number of cigarettes smoked per day and the birth mass of babies?

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(1 mark)

(d) Explain how smoking cigarettes during pregnancy may lead to a change in the birth mass of babies.

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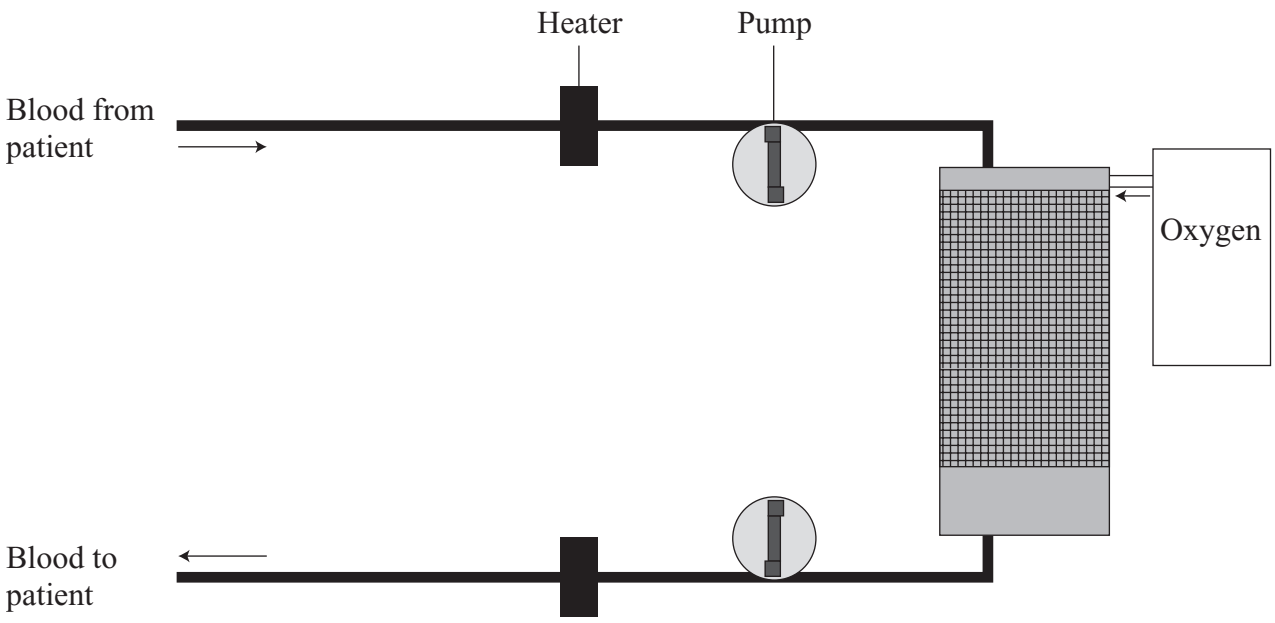
(5 marks)

9

Turn over for the next question

7 The diagram shows a heart–lung machine, which is used during heart transplant surgery.



(a) (i) Give **two** functions that are carried out by the heart–lung machine.

1 .....

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2 .....

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(2 marks)

(ii) The blood is passed through a heater.

Suggest why.

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(1 mark)

(iii) Suggest a possible danger involved with the use of the heart–lung machine.

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(1 mark)

(b) Unless the donor heart has a tissue-type similar to that of the patient, the heart may be rejected.

Explain why.

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(1 mark)

(c) Give a reason for the following procedures that are carried out after the transplant.

(i) The patient is given immunosuppressive drugs.

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(1 mark)

(ii) The patient is kept in sterile conditions.

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(1 mark)

(iii) The patient's bone marrow is irradiated.

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(1 mark)

8

Turn over for the next question

8 (a) For each of the following hormones, state where it is produced and its function.

(i) Oestrogen

Where produced .....

Function.....

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(2 marks)

(ii) Luteinising hormone (LH)

Where produced .....

Function.....

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(2 marks)

(iii) Gonadotrophin

Where produced .....

Function.....

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(2 marks)

(b) Oxytocin is a female hormone released from the pituitary gland during and after childbirth. Oxytocin is transported to the uterus and to the mammary glands.

Suggest how oxytocin affects the uterus and the mammary glands.

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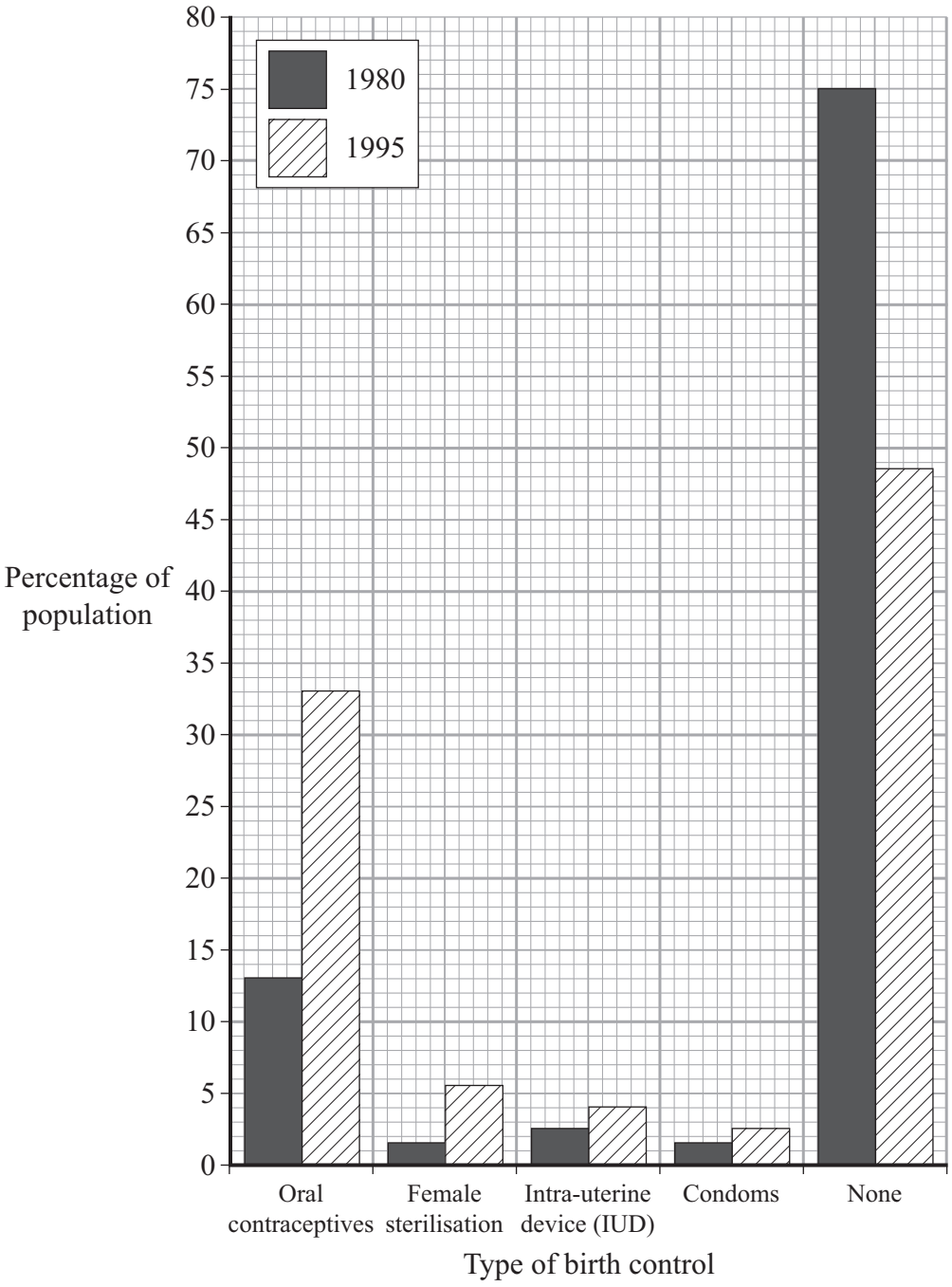
(2 marks)

(c) The bar chart shows the percentages of the population of a country using different methods of birth control in 1980 and 1995.



(i) What was the change in the percentage of the population using oral contraceptives from 1980 to 1995?

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(1 mark)

(ii) Apart from those in the bar chart, name **one** other type of birth control.

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(1 mark)

Turn over ▶

10

9 (a) (i) What substance makes up a chromosome?

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(1 mark)

(ii) Explain why the order of bases in a gene is important in protein production.

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(3 marks)

(b) (i) Red-green colour blindness is caused by a sex linked recessive allele.

Explain why red-green colour blindness is more common in males than females.

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(2 marks)

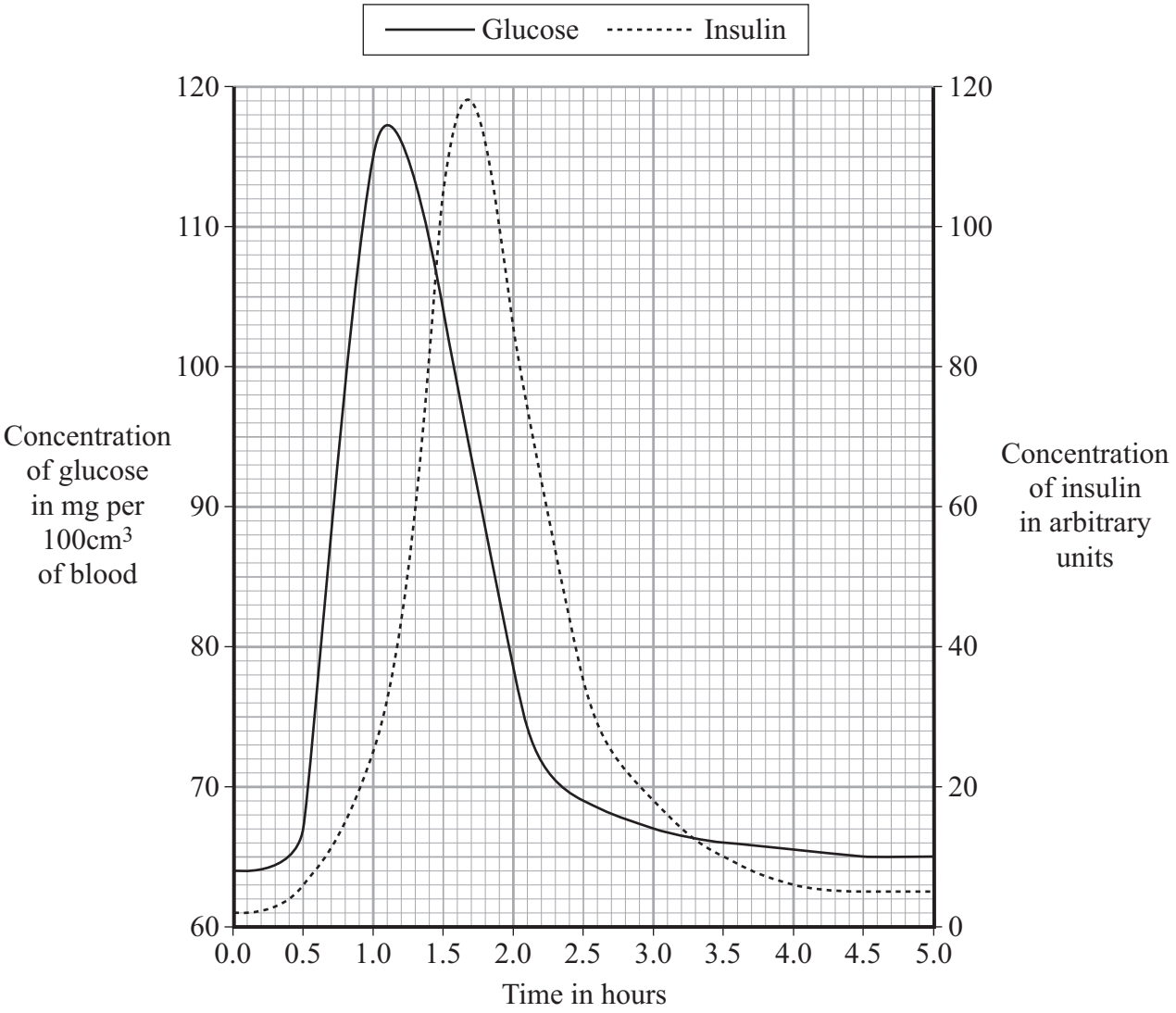
(ii) Draw a genetic diagram to show the possible offspring of a colour-blind father and a heterozygous normal-sighted mother.

Use the symbols **R** to represent the allele for normal vision and **r** to represent the allele for colour blindness.

(4 marks)

10

10 The graph shows the concentrations of glucose and insulin in the blood of a person over a period of 5 hours.



(a) (i) What is the difference between the minimum and maximum blood glucose concentrations?

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(1 mark)

(ii) Suggest what may have caused the increase in blood glucose concentration at 0.5 hours.

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(1 mark)

(iii) Explain what may cause the increase in blood insulin concentration.

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(1 mark)

(iv) Why does the blood glucose concentration fall when insulin enters the blood?

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(2 marks)

(b) The normal blood glucose concentration is 60–90 mg per 100 cm^3 of blood.

Describe what happens in the body to prevent the blood glucose from falling below this level.

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(4 marks)

9

Turn over for the next question

11 (a) Explain how the kidneys produce urine.

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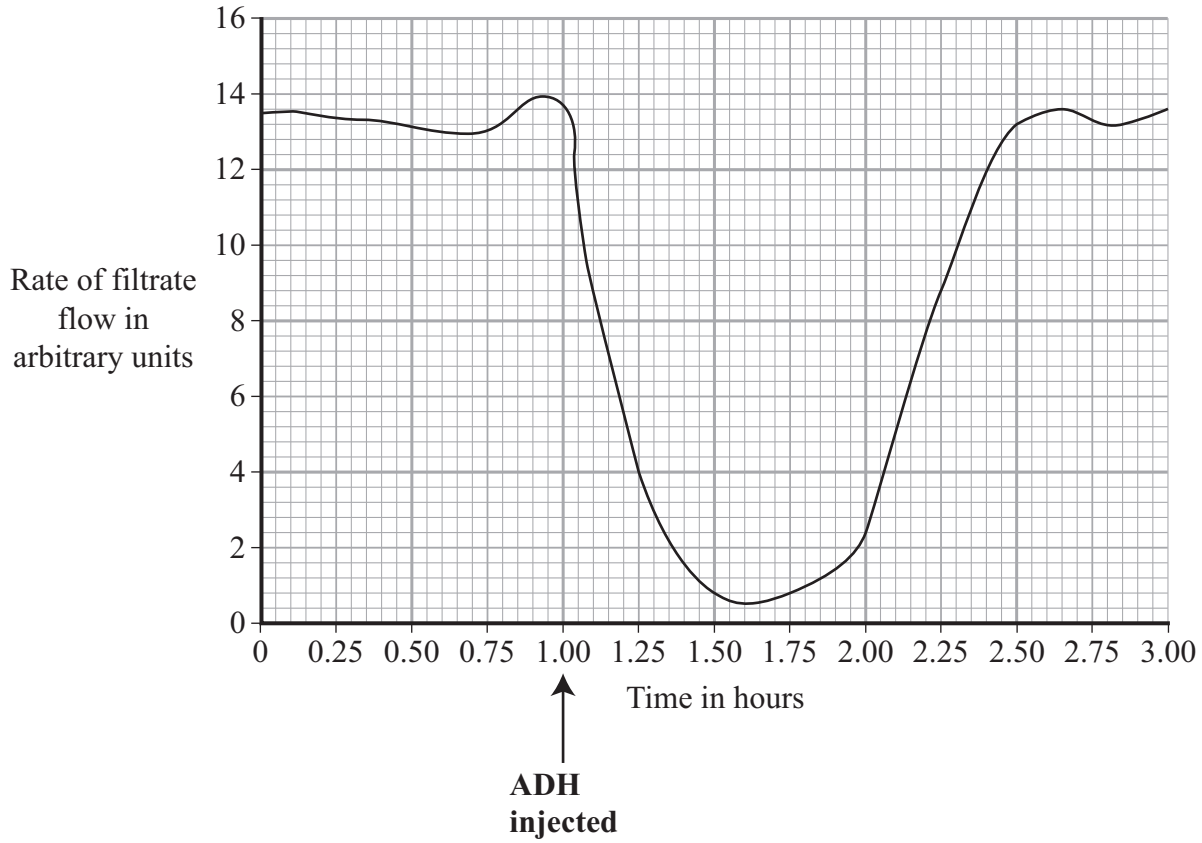
(6 marks)

(b) The graph shows the rate of filtrate flow in the kidney before and after ADH is injected into the blood.



(i) Where is ADH produced in the body?

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(1 mark)

(ii) Where are the receptors that monitor the water content of the blood?

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(1 mark)

(iii) Describe the effect of injecting ADH into the blood.

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(3 marks)

(iv) An increase of ADH in the blood affects the urine produced in the kidney.

Explain how.

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(3 marks)

(c) How are hormones carried from the organ that produces them to the place where they act?

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(2 marks)

16

12 (a) Name the part of the brain that monitors and controls core body temperature.

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(1 mark)

(b) Describe and explain how the body reacts when the core body temperature rises above normal.

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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(7 marks)

8

END OF QUESTIONS