

Surname						Other Names					
Centre Number						Candidate Number					
Candidate Signature											

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General Certificate of Secondary Education
June 2004



**HUMAN PHYSIOLOGY AND HEALTH
HIGHER TIER**

3417/H

H

Thursday 24 June 2004 9.00 am to 11.00 am

In addition to this paper you will require:
a ruler.
You may use a calculator.

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

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 in the spaces provided.
- Do all rough work in this book. Cross through any work you do not want marked.

Information

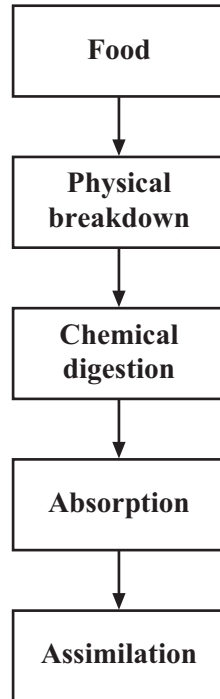
- The maximum mark for this paper is 120.
- Mark allocations are shown in brackets.
- You are reminded of the need for good English and clear presentation in your answers.

Advice

- In all calculations, show clearly how you work out your answer.

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

1 The flow chart shows some of the stages in making food available to the body.



(a) Name **one** structure involved in the physical breakdown of food.

.....
(1 mark)

(b) How is food moved along the alimentary canal?

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

(c) What happens during chemical digestion?

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(3 marks)

(d) (i) Where does absorption of digested food take place?

.....
(1 mark)

(ii) Describe what happens during absorption.

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

(e) Name the blood vessel that carries the products of digestion to the liver.

.....
(1 mark)

(f) How does the body use

(i) sugars;
.....
(1 mark)

(ii) amino acids?
.....
(1 mark)

TURN OVER FOR THE NEXT QUESTION

Turn over ►

2 (a) What is a cancerous growth (tumour)?

.....

.....

.....

.....

(2 marks)

(b) State **two** causes of cancer.

1

2

(2 marks)

(c) A cancer in one organ may spread to other organs. Explain how.

.....

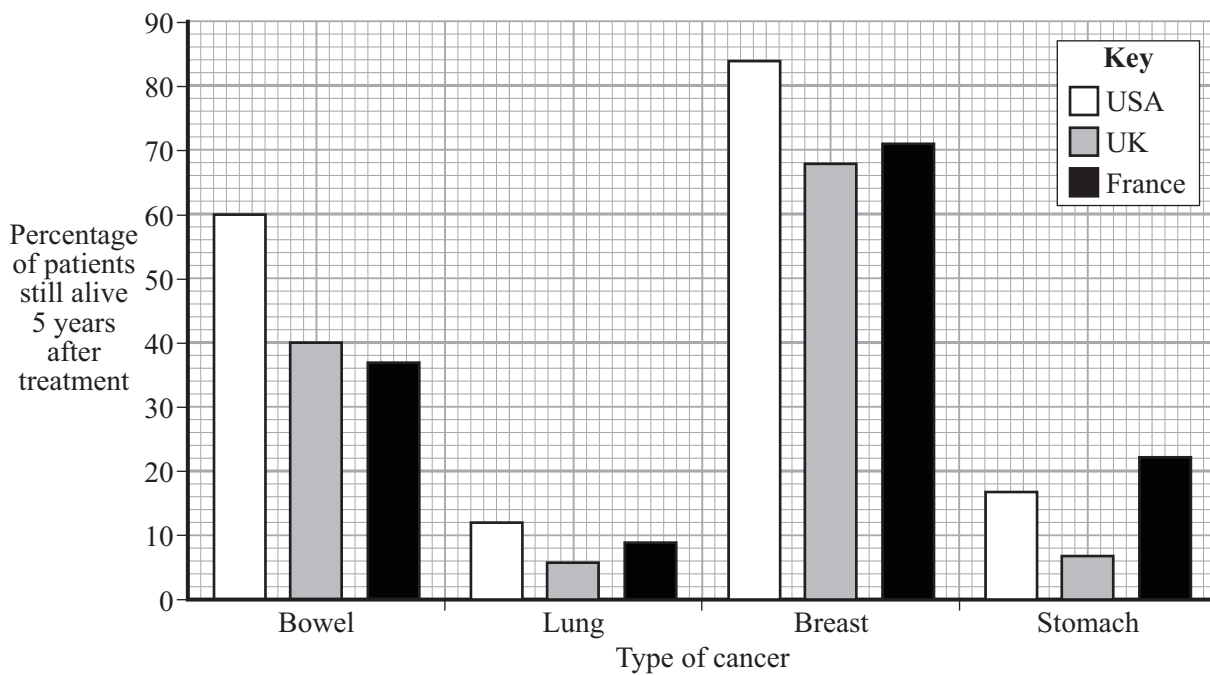
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(2 marks)

(d) The bar chart shows the survival rates of cancer patients in three countries.



(i) Which cancer patients had the lowest survival rate in France?

.....
(1 mark)

(ii) For which type of cancer was the survival rate in the USA more than twice that in the UK?

.....
(1 mark)

(iii) What percentage of patients did **not** survive five years after treatment for stomach cancer in France?

.....
(1 mark)

(iv) Suggest **two** reasons why breast cancer patients had the greatest survival rate in all three countries.

1.....

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2.....

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(2 marks)

(v) How can the risk of bowel cancer be reduced?

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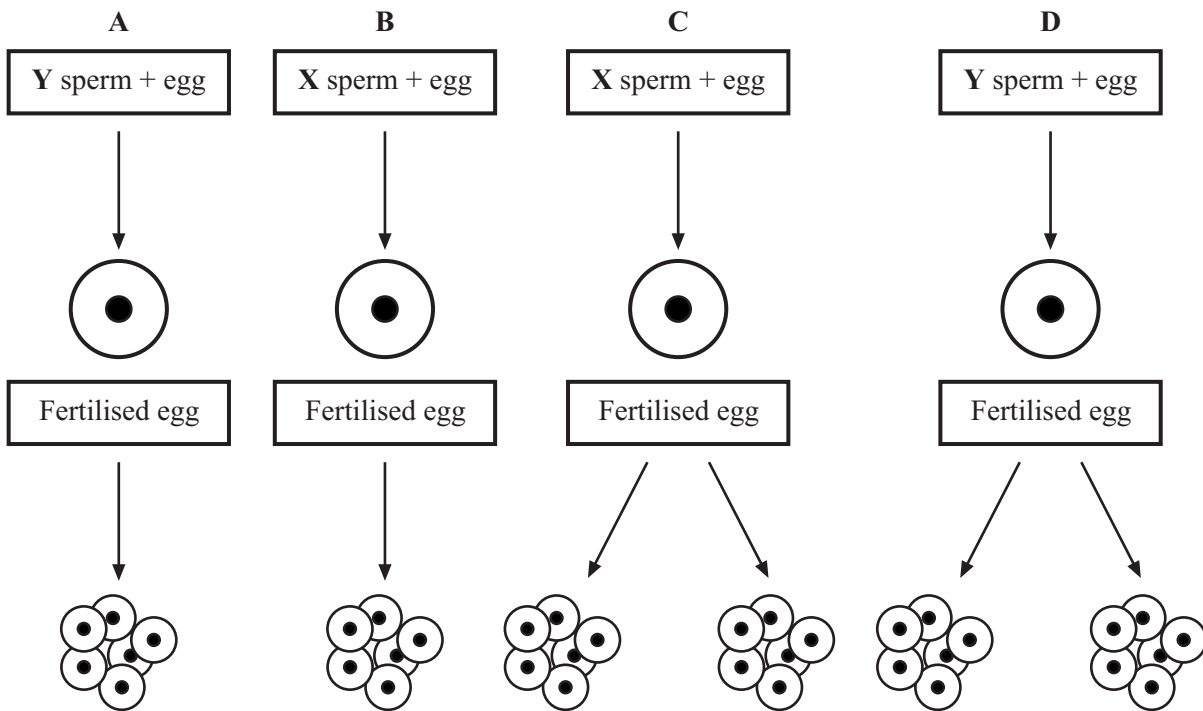
(1 mark)

12

TURN OVER FOR THE NEXT QUESTION

Turn over ►

3 (a) The diagrams represent four possible types of fertilisation and development.

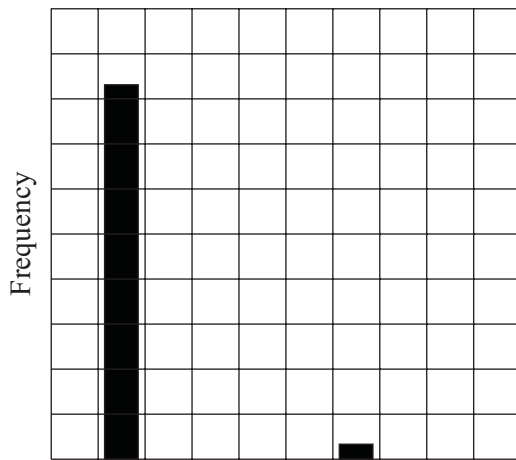


Which type of fertilisation and development (A, B, C or D,) would produce:

(i) one female baby;
(1 mark)

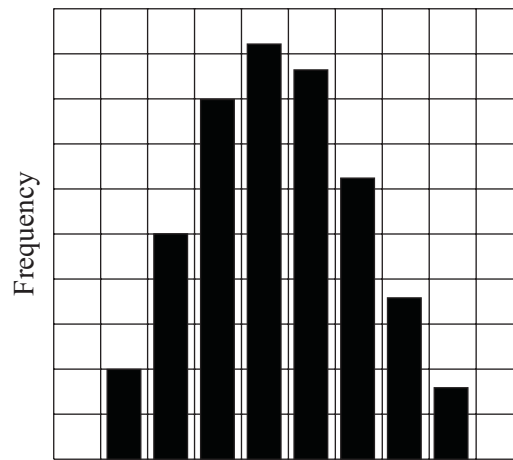
(ii) identical male twins?
(1 mark)

- (b) The frequency distribution of two characteristics in a population was measured. The graphs show the results.



Characteristic

Graph 1



Characteristic

Graph 2

Which graph represents discontinuous variation?

.....

Give a reason for your answer.

.....

.....

(1 mark)

QUESTION 3 CONTINUES ON THE NEXT PAGE

Turn over ►

(c) Cystic fibrosis is an inherited disease. The disease is caused by the inheritance of recessive alleles (**f**). People with the dominant allele (**F**) are not affected with the disease.

(i) What is an allele?

.....
.....

(1 mark)

(ii) Draw a genetic diagram to show how two people, who are not affected by cystic fibrosis, may produce a child with cystic fibrosis.

(4 marks)

○
—
8

4 (a) The table lists some diseases.

Disease	Caused by
Athlete's foot	
Cholera	
AIDS	
Malaria	

(i) Complete the table by writing the name of the type of organism causing each disease. (4 marks)

(ii) Which of the diseases in the table is caused by an organism that is spread by a vector?

..... (1 mark)

(b) Describe how the stomach and respiratory passages prevent pathogens from entering the body.

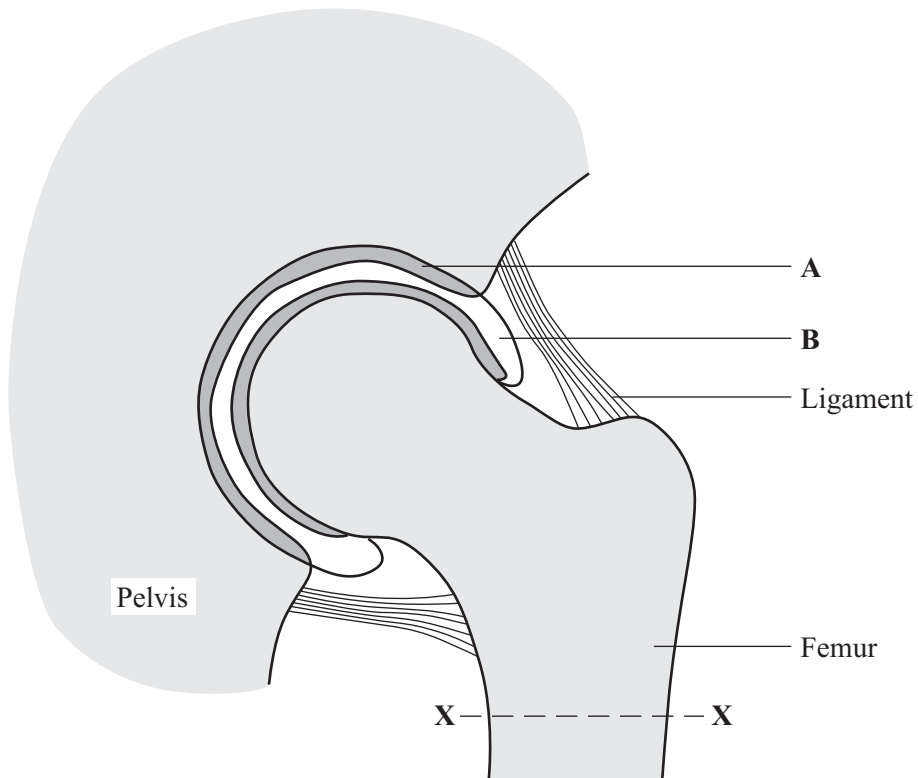
Stomach

Respiratory passages

(4 marks)

9

5 The diagram shows a section through a hip joint.



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

A

B

(2 marks)

(b) Why is it important for ligaments to be strong and slightly elastic?

Strong

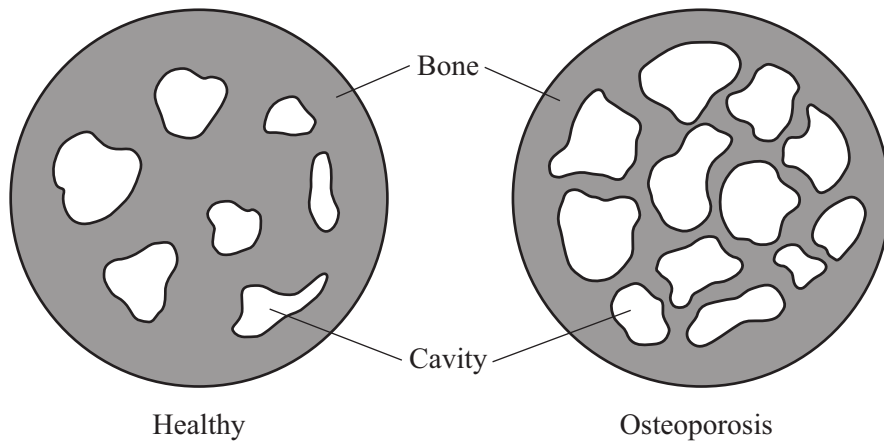
.....

Slightly elastic

.....

(2 marks)

- (c) The diagrams show sections of bone taken at X - - X on the diagram. One is from a healthy person and one is from a person suffering from osteoporosis.



- (i) Give **two** visible differences between the bone showing osteoporosis and the healthy bone.

1.....
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2.....
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(2 marks)

- (ii) What is the likely effect of osteoporosis on the femur?

.....
.....

(1 mark)

QUESTION 5 CONTINUES ON THE NEXT PAGE

Turn over ►

(d) Read the passage.

Joints may be damaged by injuries or disease. Many joint conditions and injuries may be examined and treated using a technique known as ‘keyhole’ surgery. A fibre optic cable with a tiny lens is inserted into a joint through a small hole. The cable is attached to a camera. Images from inside the joint are displayed on a monitor.

The surgeon can see inside the joint and can assess any damage. Miniature instruments are passed down a flexible tube inserted into the joint. These are used to operate on and to repair damage to the joint.

‘Keyhole’ surgery has many advantages over conventional surgery.

(i) Explain why the tube used in keyhole surgery needs to be flexible.

.....

.....

(1 mark)

(ii) The tube and instruments used in ‘keyhole’ surgery must be sterilised before use. Explain why.

.....

.....

(1 mark)

(iii) Suggest **two** advantages of ‘keyhole’ surgery compared with conventional surgery.

1.....

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2.....

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(2 marks)

- (e) In cases of severely damaged or diseased hip joints, a replacement artificial joint may be needed. This consists of a metal ‘ball’ secured to the femur and a metal and plastic ‘cup’ into which the ball fits. The ‘cup’ is secured to the pelvis using special bone glue.

Suggest **three** properties that the metal and plastic need to have to make them suitable for use in an artificial joint.

1

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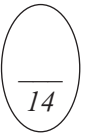
2

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3

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(3 marks)



TURN OVER FOR THE NEXT QUESTION

Turn over ►

6 (a) Explain why water needs to be treated to make it suitable for drinking.

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(2 marks)

(b) Describe and explain how water is treated as it passes through a water treatment plant.

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)



TURN OVER FOR THE NEXT QUESTION

Turn over ►

- 7 (a) Name the group of drugs that are used to treat diseases caused by bacteria.

.....
(1 mark)

- (b) Some drugs may have side effects. Suggest what this means.

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

- (c) Alcohol slows reactions and causes lack of self control. Which organ is affected by alcohol to cause these changes?

.....
(1 mark)

- (d) The table shows the effects of alcohol on typing speed and accuracy.

Units of alcohol	Average typing speed in words per minute	Average number of typing mistakes as %
0.0	80	1.0
1.6	72	1.6
3.3	64	2.8
6.4	45	4.3

- (i) What is the percentage decrease in the typing speed when the level of alcohol increases from 0.0 to 3.3 units? Show your working.

.....%
(2 marks)

(ii) State **one** conclusion that may be drawn from the information in the table.

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(1 mark)

(e) Explain what is meant by drug addiction.

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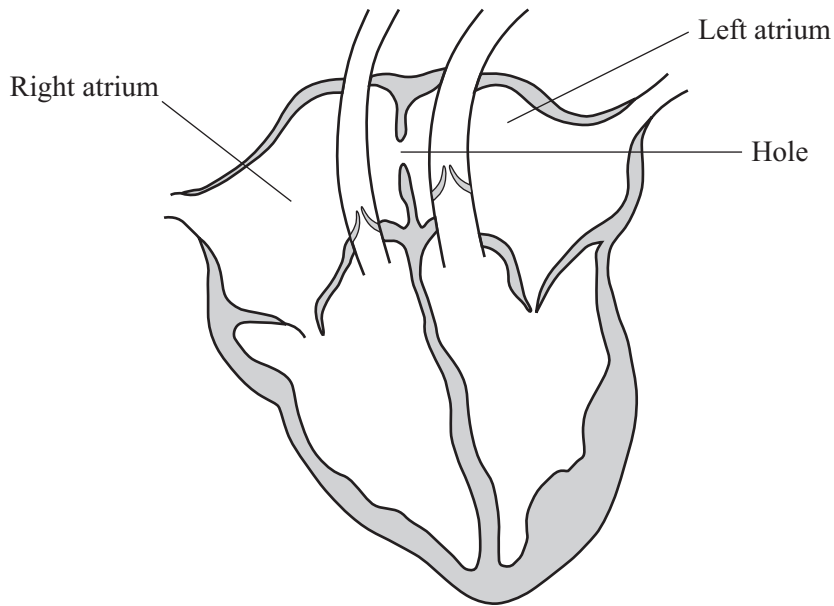
(3 marks)

9

TURN OVER FOR THE NEXT QUESTION

Turn over ►

- 8 (a) The diagram shows a section through the heart of an unborn baby, showing the hole in the wall between the left and right atria.



- (i) Explain how the presence of this hole will affect the flow of blood through the heart.

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.....

(2 marks)

- (ii) Shortly after birth, the hole in the wall between the atria seals itself. In some babies, this does not happen and the baby is said to have a 'hole in the heart'. This condition may be dangerous if not treated immediately. Explain why.

.....

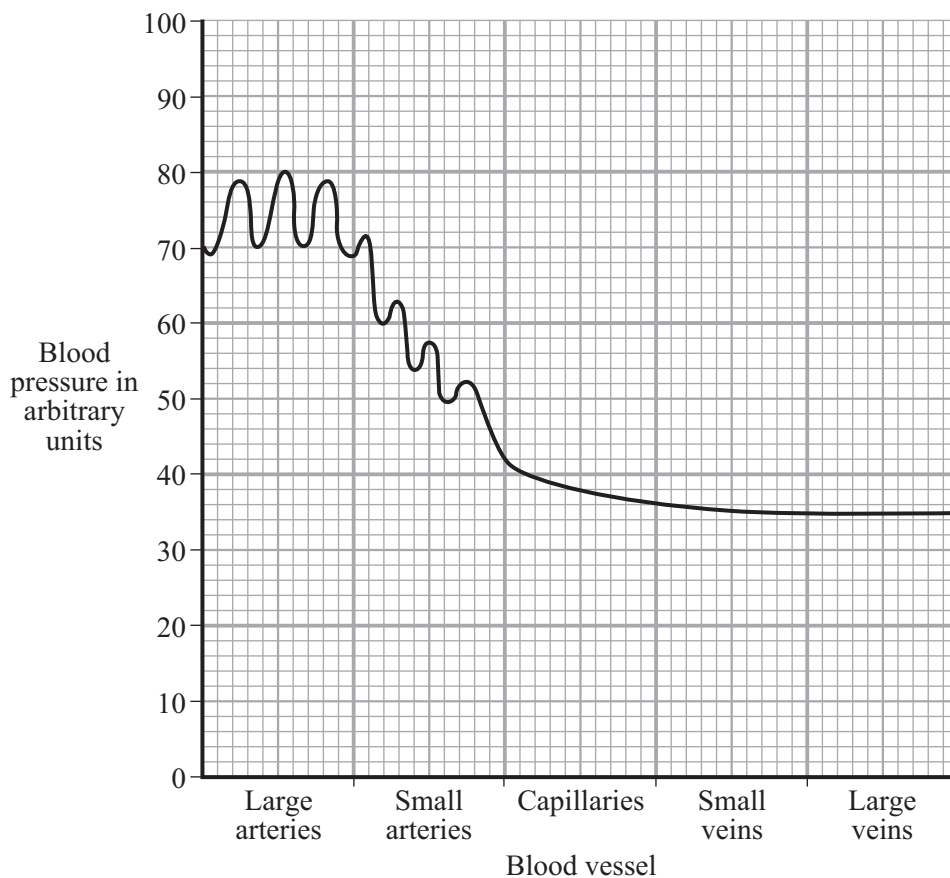
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(2 marks)

(b) The graph shows the changes in blood pressure as blood passes through a sequence of blood vessels.



(i) In which type of blood vessel does the blood pressure fall the most?

.....
(1 mark)

(ii) How does the structure of veins help the blood return to the heart?

.....

 (2 marks)

QUESTION 8 CONTINUES ON THE NEXT PAGE

Turn over ►

(iii) The blood pressure in the pulmonary artery is much less than in the aorta. Suggest what causes this difference.

.....
.....

(1 mark)

(c) Explain how a diet rich in saturated fats and cholesterol may affect blood pressure.

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)

9 (a) Read the passage.

One of the earliest experiments that led to the development of genetic engineering was carried out in 1946. Two strains of bacteria, **X** and **Y**, were isolated. Strain **X** lacked a gene for making a protein, **A**, essential for its growth and would grow only if the protein was provided in the culture (growth) medium.

Strain **Y** lacked a gene for making a different protein, **B**, essential for its growth. Strain **Y** would grow only if the culture (growth) medium contained protein **B** but was able to grow in a medium lacking protein **A**.

Both strains were grown together in a culture (growth) medium containing both proteins **A** and **B**. The mixture of strains **X** and **Y** was transferred to a culture (growth) medium lacking both proteins **A** and **B**. Most of the bacteria died.

However, a small number of the bacteria of both strains **X** and **Y** survived. These were able to grow in a culture (growth) medium lacking both the proteins **A** and **B**.

(i) Suggest why strain **Y** was able to grow in a culture (growth) medium lacking protein **A**.

.....
.....

(1 mark)

(ii) Suggest **two** reasons why some of the bacteria of both strains **X** and **Y** were able to grow in a culture (growth) medium lacking the two proteins.

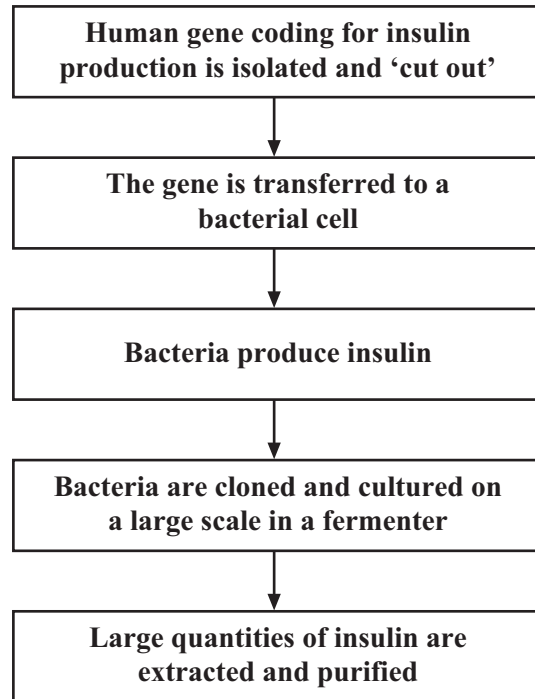
1.....
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2.....
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(2 marks)

QUESTION 9 CONTINUES ON THE NEXT PAGE

Turn over ►

(b) The flow chart shows the main stages in the production of human insulin by bacteria.



(i) Name the type of substance that is used to 'cut out' the human insulin gene.

.....
(1 mark)

(ii) What is a clone?

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

(iii) Suggest **two** conditions that need to be provided in the fermenter to ensure that the bacteria grow successfully.

1.....
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2.....
.....
(2 marks)

- (c) Genetic engineering can be used to produce human food crops that are able to make their own insecticide (an insecticide is a substance that kills insects).

Suggest **two** advantages and **two** disadvantages of producing crops in this way.

Advantages

1

.....

2

.....

Disadvantages

1

.....

2

.....

(4 marks)

11

TURN OVER FOR THE NEXT QUESTION

Turn over ►

10 (a) Describe how blood clotting takes place.

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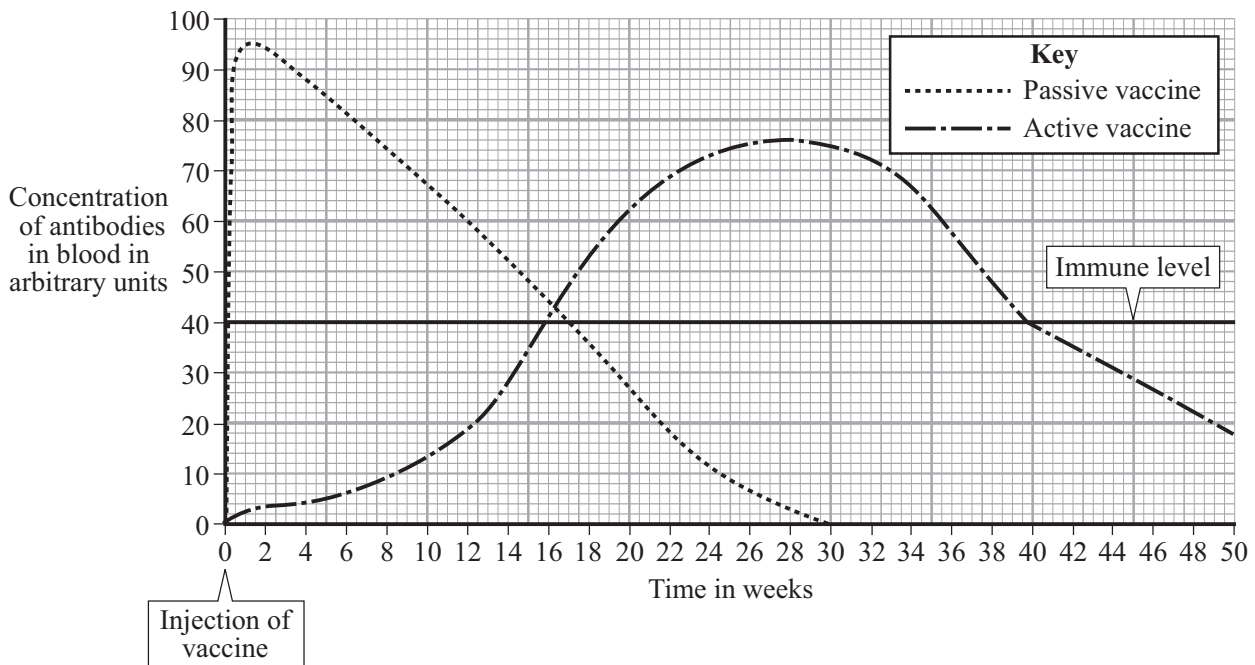
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(3 marks)

(b) The graph shows the concentration of antibodies in the blood after two types of vaccination.



(i) Explain how the injection of the active vaccine causes the body's immune response.

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(4 marks)

(ii) Using only the graph, describe **two** differences between active and passive immunity.

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2.....
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(2 marks)

(iii) For how many weeks did the active vaccine provide immunity?

.....
(1 mark)

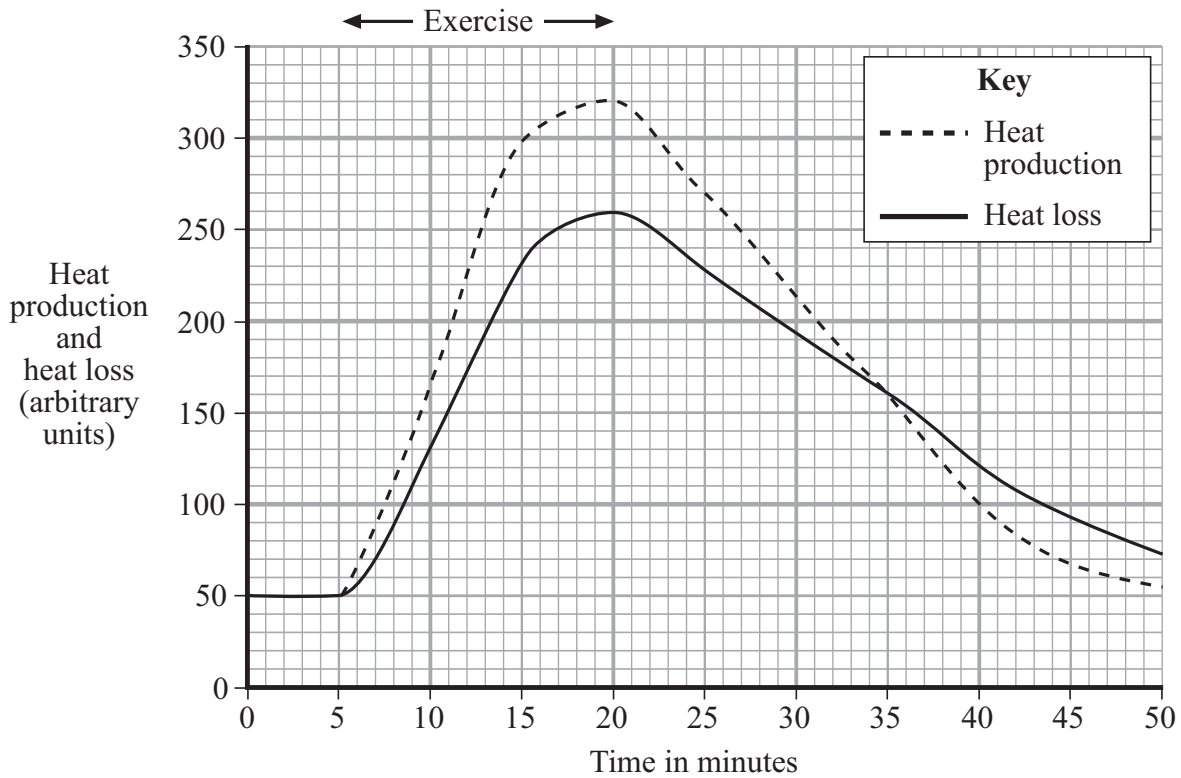
(iv) Which type of vaccine would be used for a person who had been bitten by a dog suspected of suffering from rabies? Explain why.

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(3 marks)

(c) AIDS is a disease caused by a virus. The virus destroys part of the body's immune system. Sufferers do not die from AIDS itself but from other diseases. Explain why.

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(2 marks)

- 11 The graph shows heat production and heat loss before, during and after vigorous exercise. The period of exercise is shown on the graph.



- (a) Calculate the difference between heat loss and heat production at 10 minutes.

.....arbitrary units
(1 mark)

- (b) During which period of time is there an increase in body temperature? Explain why.

.....
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(2 marks)

- (c) Explain why heat production rises during exercise.

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(2 marks)

THERE ARE NO QUESTIONS PRINTED ON THIS PAGE