

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
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8	
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10	
TOTAL	



General Certificate of Secondary Education
Higher Tier
June 2013

Human Health and Physiology 44151H

Unit 1 Topics in Human Health and Physiology

Wednesday 26 June 2013 9.00 am to 11.00 am

For this paper you must have:

- a ruler
- a calculator.

Time allowed

- 2 hours

Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 120.
- You are expected to use a calculator where appropriate.
- In some questions you will be assessed on your ability to use good English, organise information clearly and use correct scientific words.

Advice

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



J U N 1 3 4 4 1 5 1 H 0 1

M/Jun13/44151H

44151H

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

1 Many people have back pain.

The photograph shows a health professional manipulating a patient's spine to relieve back pain.

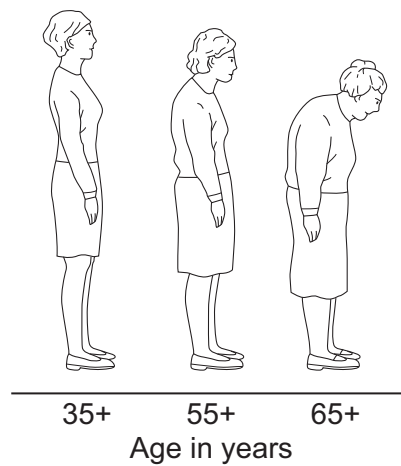


1 (a) Name **one** type of health professional who manipulates the spine.

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(1 mark)

The drawing shows changes in a woman's body caused by osteoporosis of the spine.



1 (b) Describe the effect of osteoporosis on the woman's spine. Use information from the drawing to help you.

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(2 marks)

1 (c) The development of osteoporosis can be slowed down by attention to diet.

1 (c) (i) Which mineral ion is essential for keeping bones healthy?

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(1 mark)

1 (c) (ii) Name **two** foods that contain a lot of the mineral ion which is essential for keeping bones healthy.

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2.....

(2 marks)

1 (d) There is a new drug which can help some people with osteoporosis. Doctors are **not** allowed to give the new drug to everyone with osteoporosis.

Suggest **two** reasons why.

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(2 marks)

8

Turn over ▶



2 Midwives help women during labour.

2 (a) Describe the first **two** stages of labour.

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(3 marks)

2 (b) The photograph shows a midwife examining the 'after-birth' which is pushed out during the third stage of labour.



A

2 (b) (i) Name structure A.

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(1 mark)



2 (b) (ii) Describe the main functions of structure **A**.

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(2 marks)

2 (c) Midwives tell women they should **not** drink alcohol when they are pregnant.

Suggest **two** reasons why.

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

Question 2 continues on the next page

Turn over ▶



- 2 (d)** Midwives collected information about mothers who drank alcohol before and during pregnancy.

The table shows the results.

Age of mothers in years	Percentage (%) of mothers who		
	Drank alcohol before pregnancy	Drank alcohol during pregnancy	Stopped drinking alcohol during pregnancy
Under 20	87	53	39
20–24	84	54	36
25–29	87	59	33
30–34	88	64	27
35 and over	87	71	21

- 2 (d) (i)** How does the percentage of mothers who drank alcohol **before** pregnancy change with age?

Tick (✓) **one** box.

The percentage of mothers who drank alcohol **before** pregnancy **increased** with age.

The percentage of mothers who drank alcohol **before** pregnancy **decreased** with age.

The percentage of mothers who drank alcohol **before** pregnancy did **not** change with age.

(1 mark)

- 2 (d) (ii)** Describe how the percentage of mothers who drank alcohol **during** pregnancy changed with age. Use data from the table to help you.

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(2 marks)



2 (d) (iii) Suggest **one** reason for the relationship between age and drinking alcohol **during** pregnancy.

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(1 mark)

12

Turn over for the next question

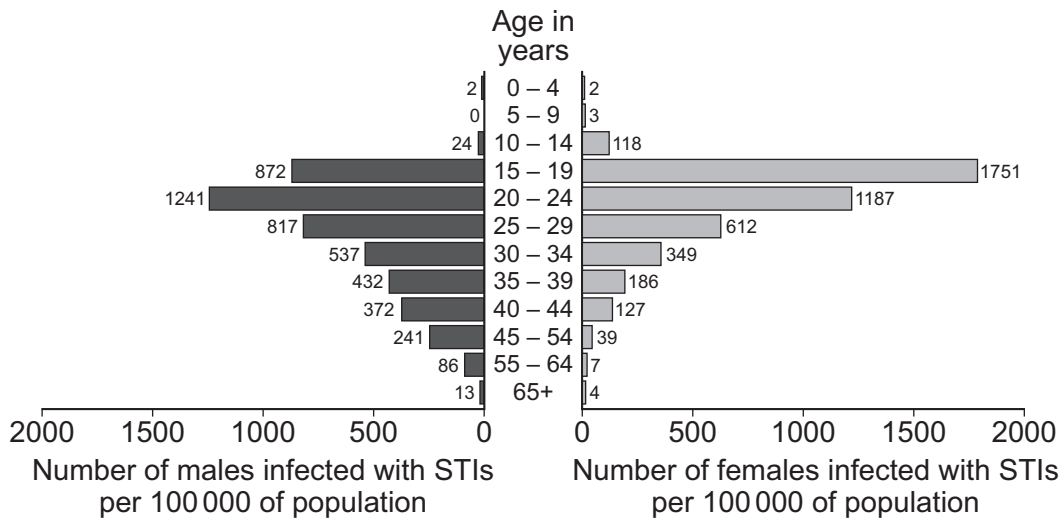
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3 Chlamydia is a sexually transmitted infection (STI).



3 (a) The chart shows the numbers of people infected with STIs in a city.



3 (a) (i) How many people per 100 000 aged 15–24 years are infected with STIs in **this** city?

Show clearly how you work out your answer.

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.....

Number of people per 100 000 = (2 marks)



3 (a) (ii) The number of people infected with STIs is highest in the 15–24 years age group.

Suggest **two** reasons for the high numbers in this age group.

1.....

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2.....

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(2 marks)

3 (b) Chlamydia is caused by a bacterium. Some strains of the Chlamydia bacterium are resistant to antibiotics. This resistance makes the infection difficult to treat.

3 (b) (i) Populations of resistant strains of bacteria are becoming more common.

Explain why.

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(2 marks)

Question 3 continues on the next page

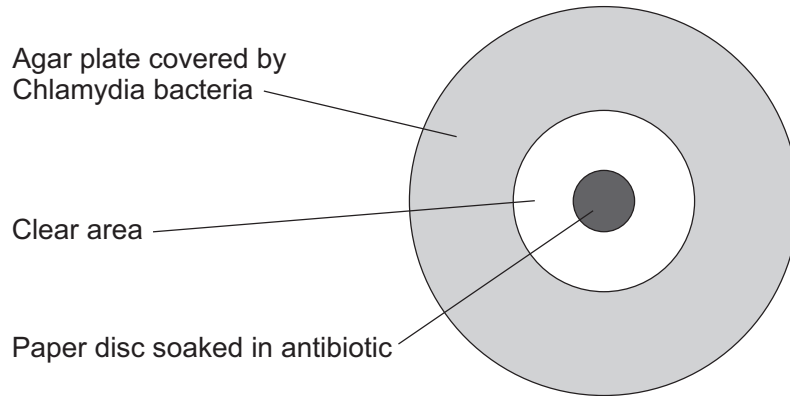
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The effectiveness of antibiotics can be tested by using discs of paper soaked in antibiotic.

A disc soaked in antibiotic is placed in the centre of an agar plate covered by bacteria.

A clear area forms around the disc if the antibiotic is effective.



A bacteriologist investigated the effect of four different antibiotics, **A**, **B**, **C** and **D**, on Chlamydia bacteria.

The table shows the results.

Antibiotic	Diameter of clear area in mm
A	30
B	37
C	32
D	33

3 (b) (ii) Which antibiotic, **A**, **B**, **C** or **D**, should the bacteriologist recommend for treating this strain of Chlamydia?

Antibiotic

Give the reason for your choice.

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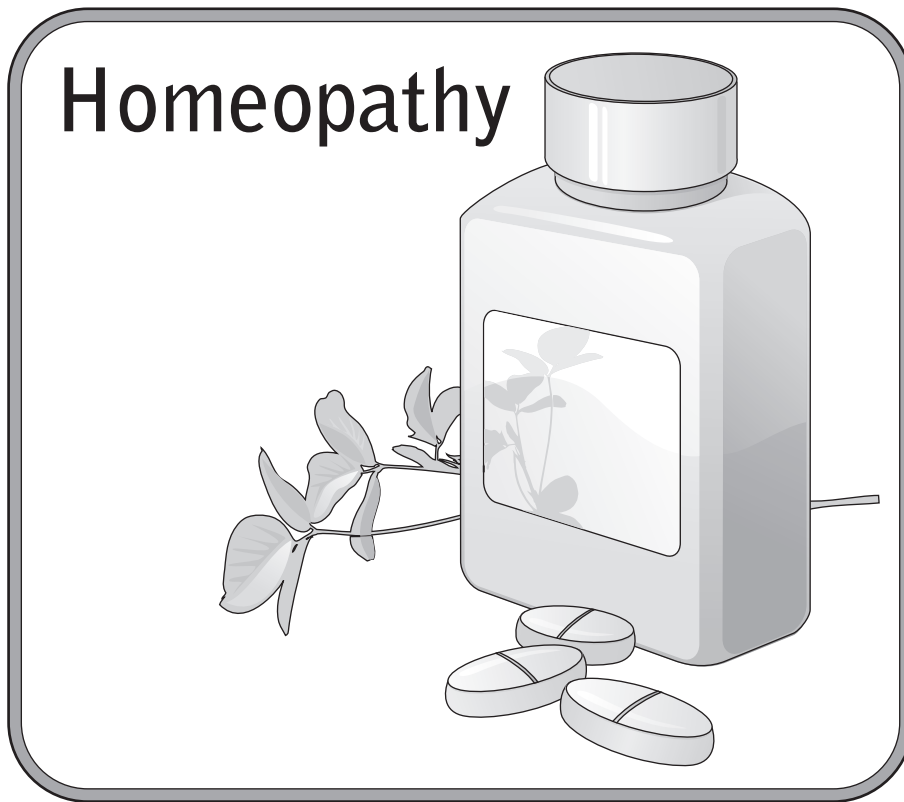
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(2 marks)

8



4 The drawing shows an advert for homeopathy.



4 (a) Describe the principle of homeopathy.

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(2 marks)

Question 4 continues on the next page

Turn over ▶



Rheumatoid arthritis makes joints become swollen and painful.

Doctors wanted to find out how effective homeopathy is in relieving the symptoms of rheumatoid arthritis.

- 112 patients with rheumatoid arthritis took part in a trial for 6 months.
- All the patients had been taking normal medication for rheumatoid arthritis before the trial.
- None of the patients took normal medication for rheumatoid arthritis during the trial.
- **Group 1** patients were all given the same homeopathic treatment for 6 months.
- **Group 2** was a control group.

4 (b) (i) Give **two** control variables in this trial.

1

2

(2 marks)

4 (b) (ii) Suggest what was given to **Group 2** patients for 6 months.

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.....

(1 mark)

4 (c) Here are the results of the trial.

- 58 patients finished the trial.
- 54 patients did not finish the trial.
- The 58 patients who finished the trial said that pain had reduced by an average of 18% by the end of the trial.
- Of the 54 patients who did not finish the trial, 31 changed back to normal medication and 10 became seriously ill.
- **Group 1**, the homeopathic group, and **Group 2**, the control group, both said they had a similar reduction in pain.

4 (c) (i) What conclusion can be made about how effective homeopathic treatment is for rheumatoid arthritis?

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(1 mark)

4 (c) (ii) Why do you think the patients who finished the trial said that their pain had reduced?

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(1 mark)



4 (c) (iii) Why do you think that many patients did **not** complete the trial?

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(1 mark)

8

Turn over for the next question

Turn over ▶

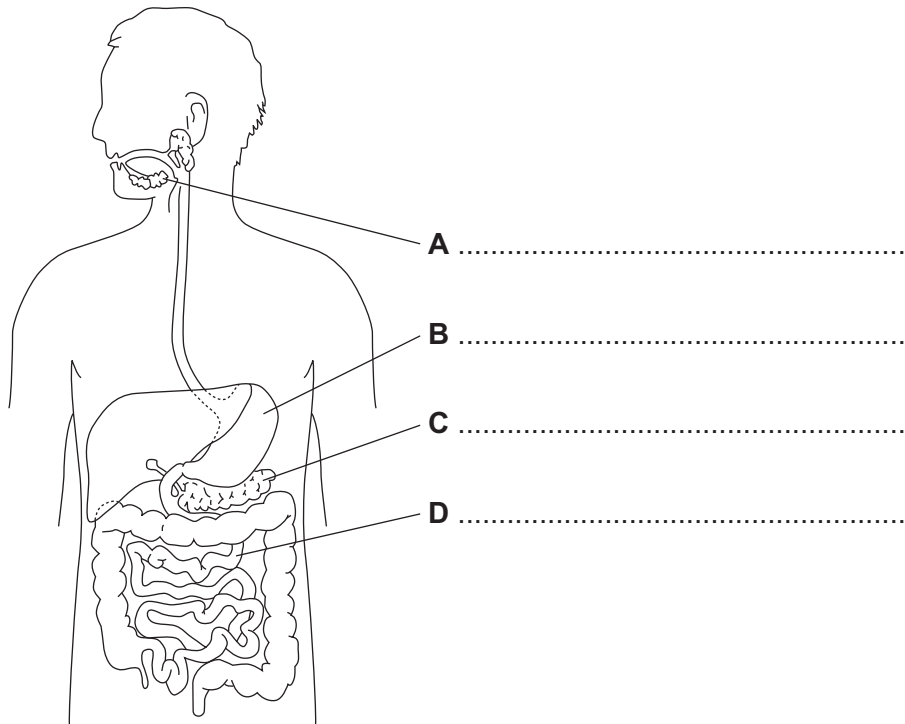


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5 The diagram shows the digestive system.



5 (a) On the diagram, name parts **A**, **B**, **C** and **D**. (4 marks)

5 (b) (i) Name the organ that produces bile.

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(1 mark)

5 (b) (ii) Give **two** functions of bile.

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

Question 5 continues on the next page

Turn over ▶



5 (c) Casein is a protein in milk.

Trypsin is a protease enzyme that digests casein.

When trypsin is added to a solution of milk powder, the casein is digested and the solution becomes clear.

5 (c) (i) You are provided with:

- a solution of trypsin
- a solution of milk powder
- a water bath
- test tubes
- a test-tube rack
- a timer
- pipettes
- a thermometer.

In this question you will be assessed on your ability to use good English, organise information clearly and use correct scientific words where appropriate.

Describe an investigation to find the effect of temperature on the digestion of casein in milk powder by trypsin.

You should include:

- the measurements you would make
- how you would make the investigation a fair test.

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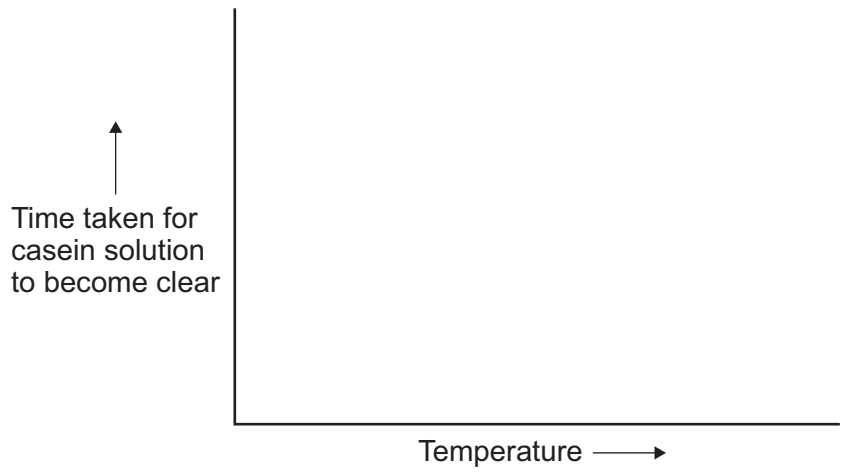
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(6 marks)

5 (c) (ii) Draw a curve on the graph of the results you would expect to obtain for the investigation described in part (c)(i).



(1 mark)

5 (c) (iii) Explain the shape of the curve you have drawn in part (c)(ii).

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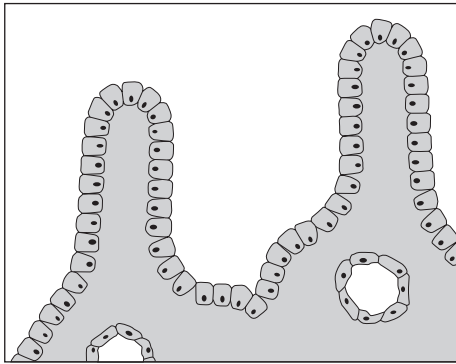
(2 marks)

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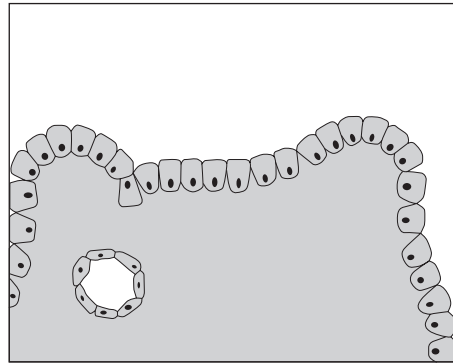
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5 (d) The diagrams show part of the lining of the small intestine of a healthy person and of a person with Coeliac disease.



Healthy person



Person with Coeliac disease

5 (d) (i) Look at the diagrams.

What is the main difference between the linings of the small intestine of a person with Coeliac disease and a healthy person?

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(1 mark)

5 (d) (ii) Explain how Coeliac disease affects the function of the small intestine. Use information from the diagrams to help you.

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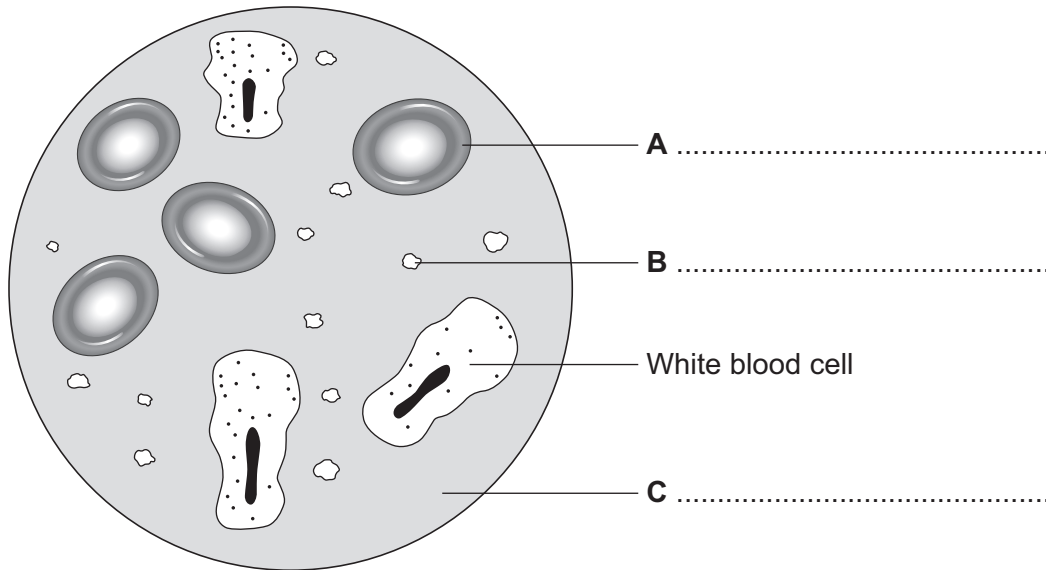
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(2 marks)



6 **Diagram 1** shows some parts of human blood seen through a microscope.

Diagram 1



6 (a) On **Diagram 1**, name parts **A**, **B** and **C**.

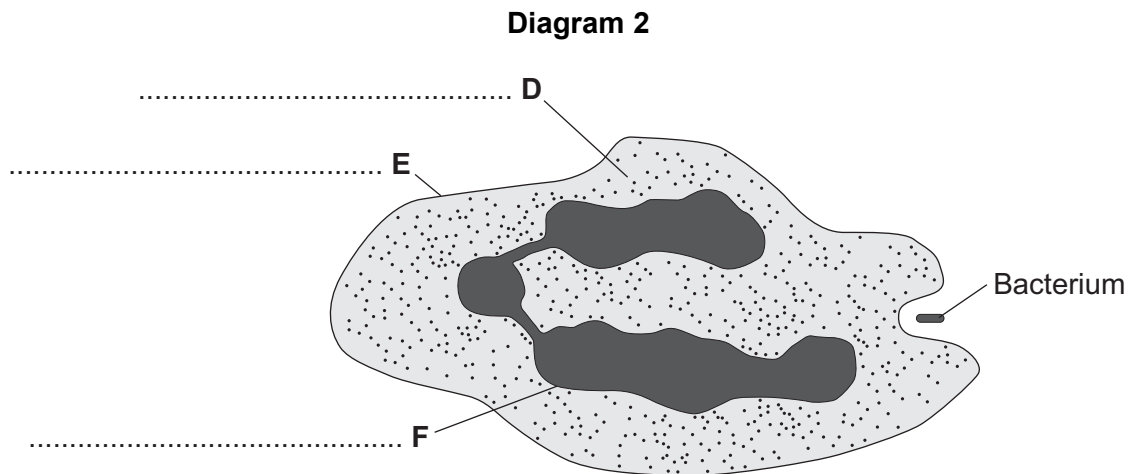
(3 marks)

Question 6 continues on the next page

Turn over ▶



6 (b) **Diagram 2** shows a white blood cell engulfing a bacterium.



6 (b) (i) On **Diagram 2**, name parts **D**, **E** and **F**. (3 marks)

6 (b) (ii) Explain how the white blood cell is adapted for engulfing bacteria.

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(2 marks)

6 (c) White blood cells are involved in the immune response.

Complete the table correctly by placing a tick (✓) in **one** box in **each** row.

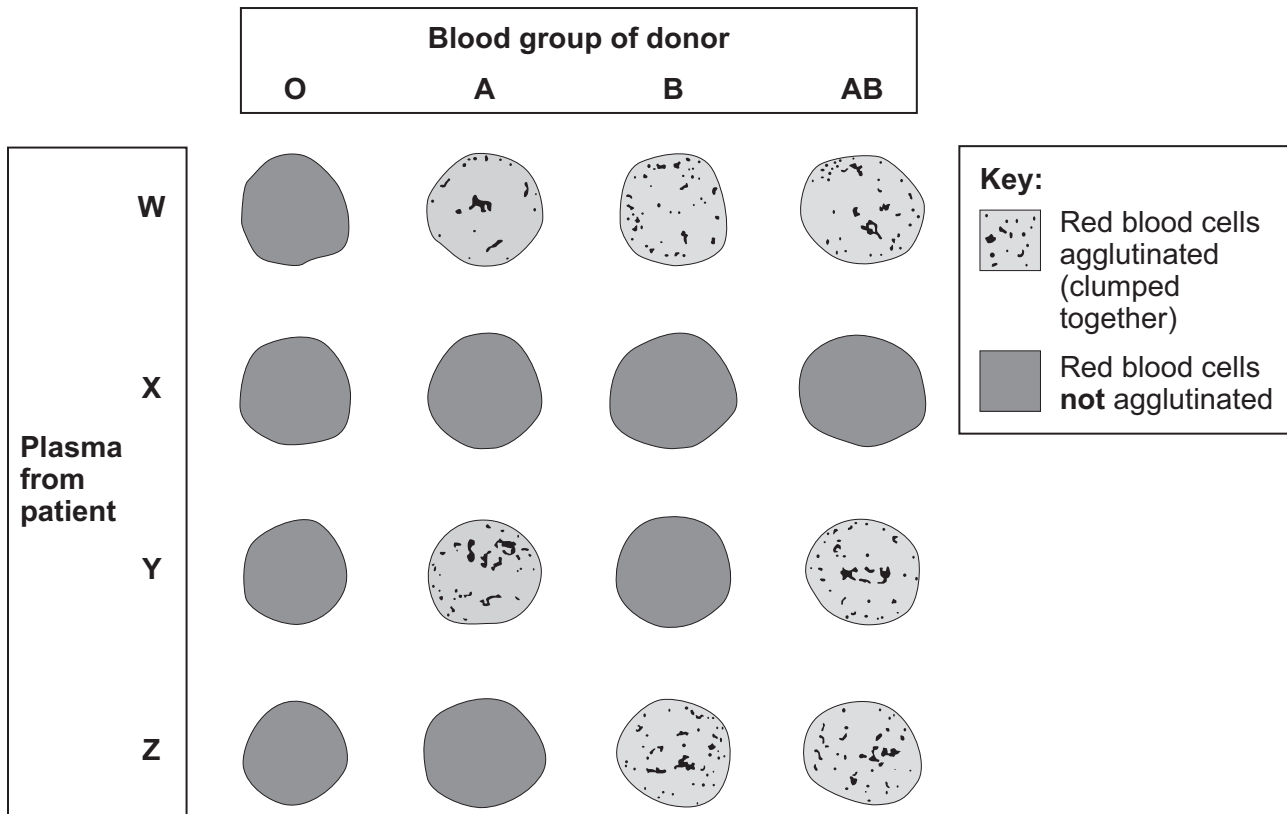
	Passive immunity	Natural immunity	Active immunity
Lymphocytes produce antibodies in response to a primary infection			
Lymphocytes produce antibodies quickly after a booster vaccination			
Antibodies are injected into a person			

(2 marks)



6 (d) A haematologist was asked to find the blood groups of four patients, **W**, **X**, **Y** and **Z**. The haematologist added one drop each of donor group **A** blood, donor group **B** blood, donor group **AB** blood and donor group **O** blood to drops of plasma from each of the patients.

The diagram shows the results.



- 6 (d) (i)** Give the blood group of
- Patient **W**
- Patient **X**
- Patient **Y**
- Patient **Z**

(3 marks)

6 (d) (ii) Explain why there was agglutination (clumping) in some of the blood mixtures.

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(2 marks)



7 Sir Richard Doll showed the link between smoking and lung cancer.

7 (a) Describe the methods used by Sir Richard Doll.

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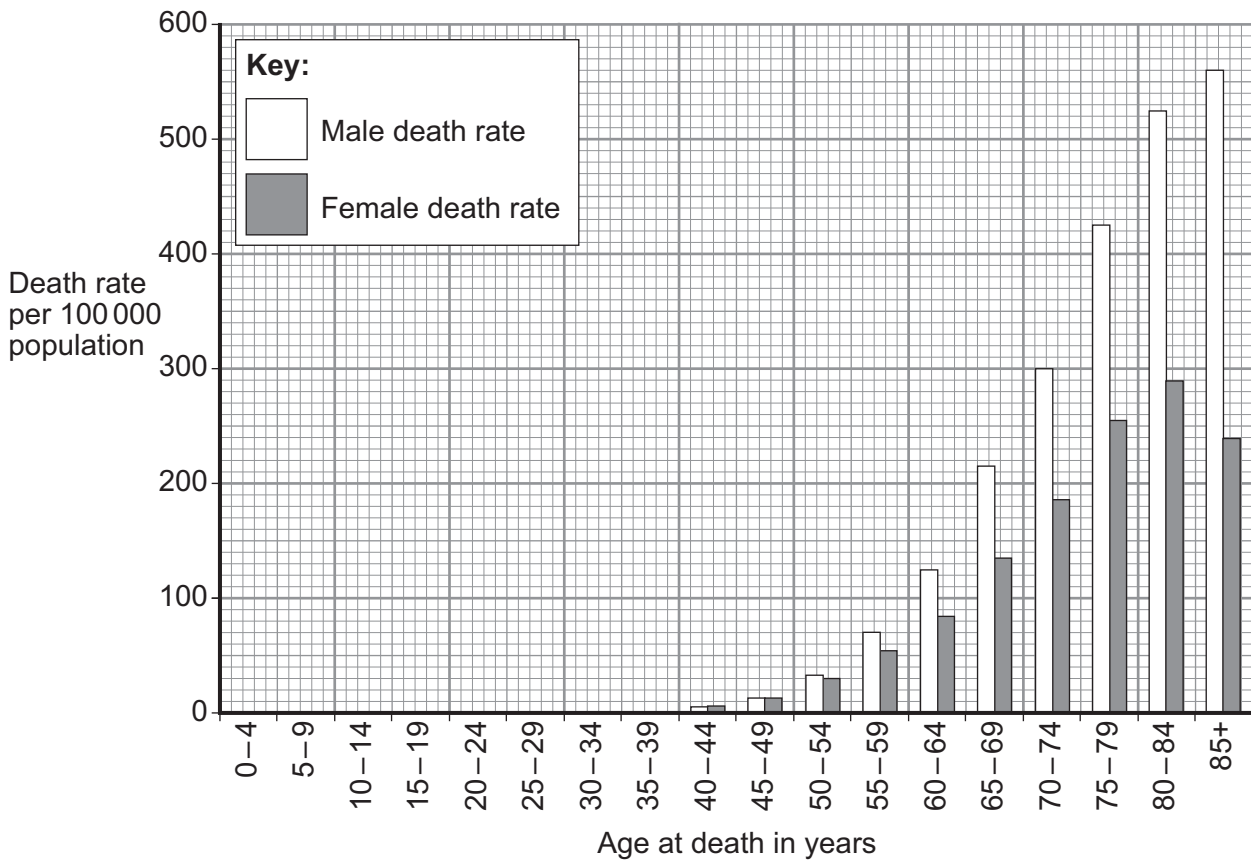
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(3 marks)



7 (b) The bar chart shows the death rates from lung cancer in the UK in 2008.



7 (b) (i) Describe **two** main differences between the data for males and females.

1.....

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 (2 marks)

7 (b) (ii) Suggest **two** explanations for the differences between the data for males and females.

1.....

 2.....

 (2 marks)

Question 7 continues on the next page

Turn over ▶



7 (c) Smoking inside public places was banned in England in July 2007.
Read the information about the effect of the ban.

The Government says that the ban on smoking inside public places in England will save the country £2.1 billion a year.
This is because:

- fewer people will die
- NHS costs will be lower
- there will be fewer fires
- cleaning costs will be cheaper.

It also costs much more to employ a person who smokes than a person who does not smoke.
This is because people who smoke take more breaks and do not do as much work as people who do not smoke.

Evaluate the government's decision to ban smoking inside public places.

Use information from the box and your own knowledge and understanding.

You should give reasons for, reasons against and a conclusion.

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(4 marks)



- 8** Babies born prematurely are often not able to control their body temperature well. These babies are put in incubators until they can control their body temperature.



- 8 (a) (i)** Name the centre in the brain which monitors body temperature.

.....
(1 mark)

- 8 (a) (ii)** In which part of the brain is this centre found?

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(1 mark)

- 8 (a) (iii)** This centre receives information about temperature from two sets of receptors.

Name the sites of these receptors.

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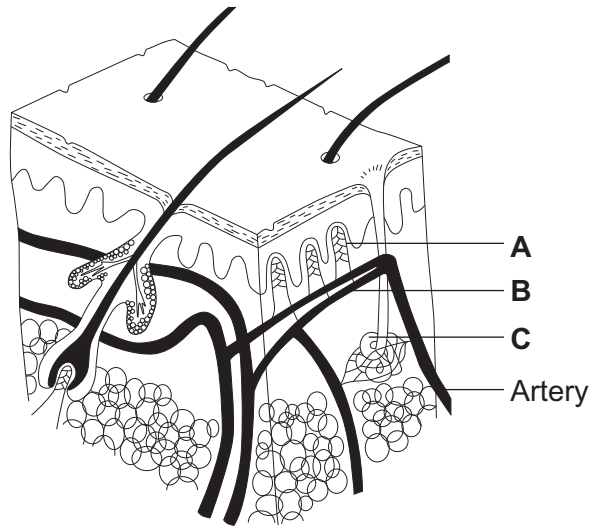
(2 marks)

Question 8 continues on the next page

Turn over ▶



8 (b) The diagram shows the structure of human skin.



8 (b) (i) Describe how parts **A** and **B** help to maintain a constant body temperature.

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(4 marks)

8 (b) (ii) Describe how part **C** helps to control body temperature.

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(3 marks)



8 (c) Heat index is a measure of how hot the body feels in different conditions. The table shows how the heat index is affected by temperature and humidity.

External temperature in °C	Relative humidity as percentage (%)										
	50	55	60	65	70	75	80	85	90	95	100
28	28.2	28.6	29.1	29.7	30.2	30.9	31.6	32.3	33.1	33.9	34.7
29	29.5	30.1	30.8	31.6	32.5	33.4	34.4	35.5	36.7	37.9	39.3
30	31.0	31.9	32.8	33.9	35.0	36.3	37.7	39.1	40.7	42.4	44.2
31	31.9	32.9	33.9	35.1	36.4	37.9	39.4	41.1	42.9	44.8	46.8
32	33.8	35.0	36.3	37.8	39.4	41.2	43.2	45.3	47.5	49.9	52.8
33	35.8	37.3	39.0	40.8	42.8	44.9	47.3	49.8	52.5	55.4	58.4
34	38.2	39.9	41.9	44.0	46.4	49.0	51.7	54.7	57.9	61.3	64.8
35	40.7	42.7	45.1	47.6	50.3	53.3	56.5	60.0	63.7	67.6	71.7
36	42.0	44.3	46.7	49.5	52.4	55.6	59.1	62.8	66.7	70.9	75.3
37	44.9	47.5	50.3	53.4	56.8	60.5	64.4	68.6	73.1	77.8	82.8
38	48.0	50.9	54.2	57.7	61.5	65.7	70.1	74.8	79.8	85.1	90.7
39	51.3	54.6	58.3	62.3	66.6	71.2	76.1	81.4	87.0	92.9	99.1
40	54.8	58.5	62.6	67.1	71.9	77.0	82.5	88.3	94.5	101.0	107.9

Key: Safe Caution needed Dangerous

8 (c) (i) Describe the patterns shown by the data in the table.

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(2 marks)

8 (c) (ii) Suggest an explanation for the effect of increasing humidity on heat index.

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(2 marks)

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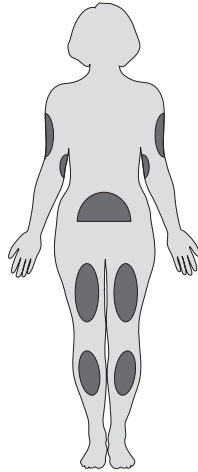
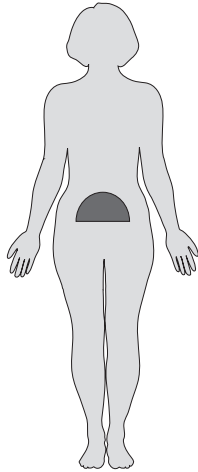


Thermography is a method of measuring skin temperature.



The drawings below show the results of an investigation in which thermographs were taken before and after exercise.

Before exercise

After exercise



Key:

	Higher temperature areas
	Normal temperature areas

8 (d) The skin temperature of parts of the legs increased during exercise. Suggest an explanation for this increase.

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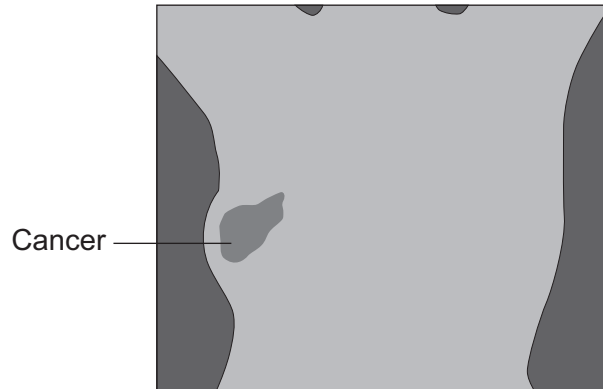
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(2 marks)



8 (e) Thermography can be used to detect breast cancer.

The diagram shows a thermograph of a woman who has a cancer in her right breast.



The skin temperature above the cancer is higher than the skin temperature in the rest of the breast.

Suggest an explanation for the higher skin temperature above the cancer.

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(2 marks)

19

Turn over for the next question

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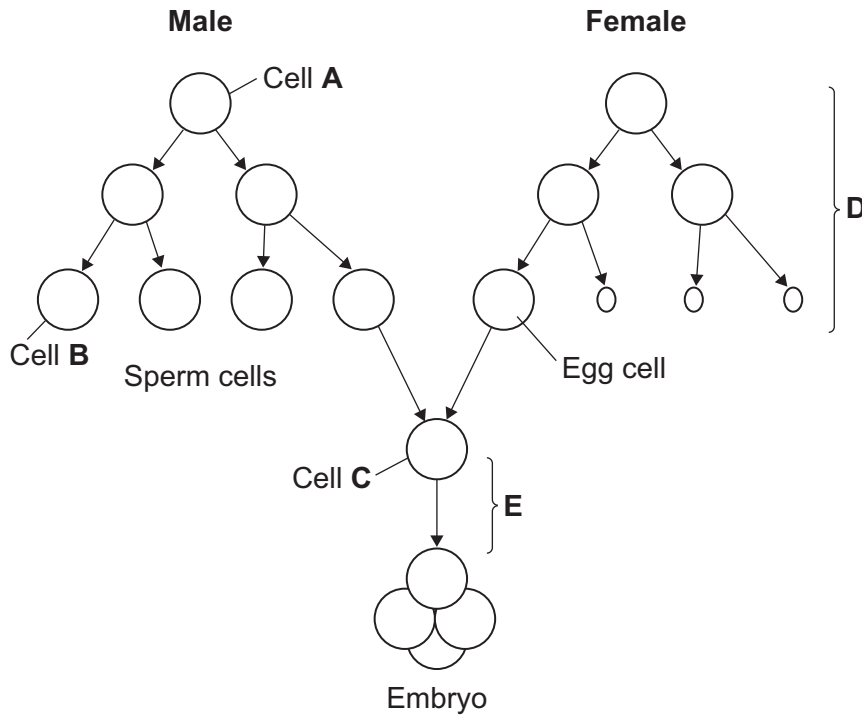


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9 The diagram shows the formation of gametes, fertilisation and the formation of an embryo in humans.



9 (a) (i) Give the number of chromosomes in

Cell A

Cell B

Cell C

(3 marks)

9 (a) (ii) Name cell C.

.....

(1 mark)

9 (a) (iii) Name the type of cell division which occurs at

D

E

(2 marks)

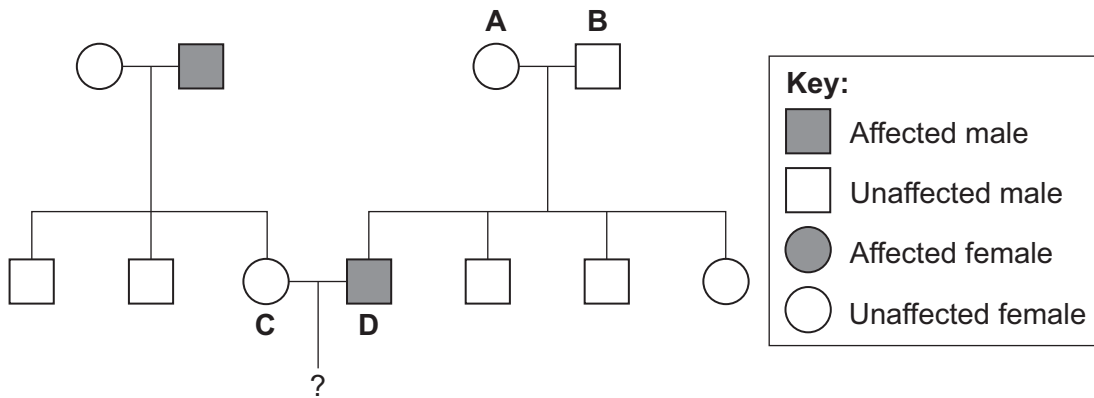
Question 9 continues on the next page

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- 9 (b)** Thalassaemia is an inherited disorder that results in abnormal haemoglobin. The allele that causes thalassaemia is recessive and is **not** sex-linked.

The diagram shows the inheritance of thalassaemia in a family.



- 9 (b) (i)** Use a genetic diagram to explain the phenotypes of the children of parents **A** and **B**.

(3 marks)



9 (b) (ii) **C** and **D** decide to have a child. They ask a genetic counsellor what the chance is of the child having thalassaemia.

What reply would the genetic counsellor give?

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Use a genetic diagram to explain your answer.

(4 marks)

13

Turn over for the next question

Turn over ▶



10 The hormone insulin was discovered as a result of Banting and Best's experiments on dogs.

10 (a) Describe the methods used by Banting and Best to investigate a treatment for diabetes.

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(4 marks)

10 (b) Evaluate the ethical issues connected with the use of dogs in Banting and Best's experiments.

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(3 marks)

END OF QUESTIONS

7



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