Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
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8	
9	
10	
TOTAL	

General Certificate of Education
Advanced Subsidiary Examination
June 2011

Human Biology HBIO1

Unit 1 The body and its diseases

Monday 16 May 2011 9.00 am to 10.30 am

For this paper you must have:
- a ruler with millimetre measurements
- a calculator.

Time allowed
- 1 hour 30 minutes

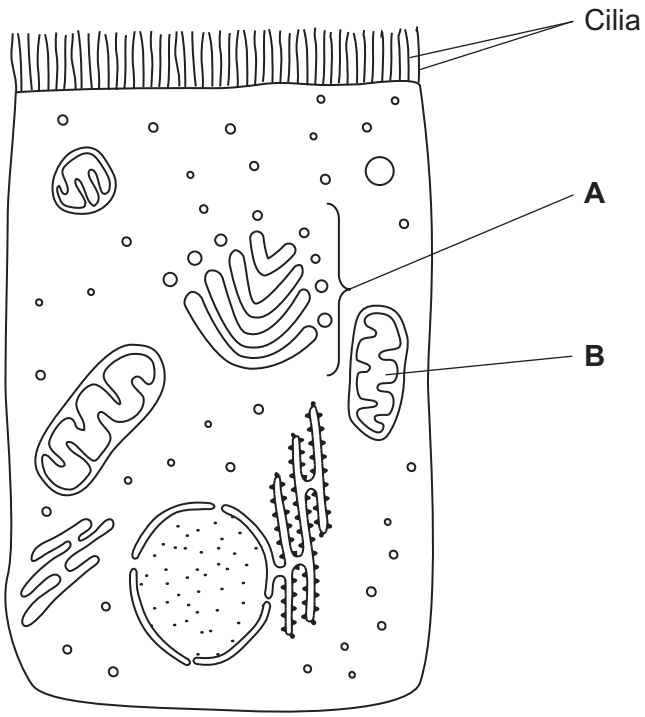
Instructions
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- You may ask for extra paper. Extra paper must be secured to this booklet.
- 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 80.
- You will be marked on your ability to:
  – use good English
  – organise information clearly
  – use scientific terminology accurately.

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

1 **Figure 1** is a drawing of a cell from the lining of one of the airways in the lung.

Figure 1



1 (a) Name

Organelle **A** .....

Organelle **B** .....

(2 marks)

1 (b) Name **two** structures found in a prokaryotic cell that are **not** visible in this drawing.

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(2 marks)

1 (c) The cilia in **Figure 1** help to keep the lungs free from infections.
Explain how.

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(2 marks)

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Turn over for the next question

2 (a) (i) Unprotected sexual intercourse and intravenous drug abuse may spread the human immunodeficiency virus (HIV) from one person to another. Explain how.

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(3 marks)

(Extra space) .....

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2 (a) (ii) Give **one** other way in which the virus may be spread.

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(1 mark)

2 (b) Antibiotics are ineffective against viruses such as HIV. Explain **one** reason why.

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(2 marks)

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3 (a) The MMR vaccine contains *attenuated* microorganisms.
What is an *attenuated* microorganism?

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(2 marks)

3 (b) A child was given the MMR vaccine and was given a second dose of the vaccine as a booster later.

3 (b) (i) It took more than a week for antibodies to appear in the child's blood after the first vaccination. Explain why.

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(2 marks)

3 (b) (ii) The concentration of antibodies increased immediately after the second vaccination. Explain why.

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(2 marks)

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4 (a) Overcrowded living conditions can increase the spread of tuberculosis (TB). Explain why.

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(3 marks)

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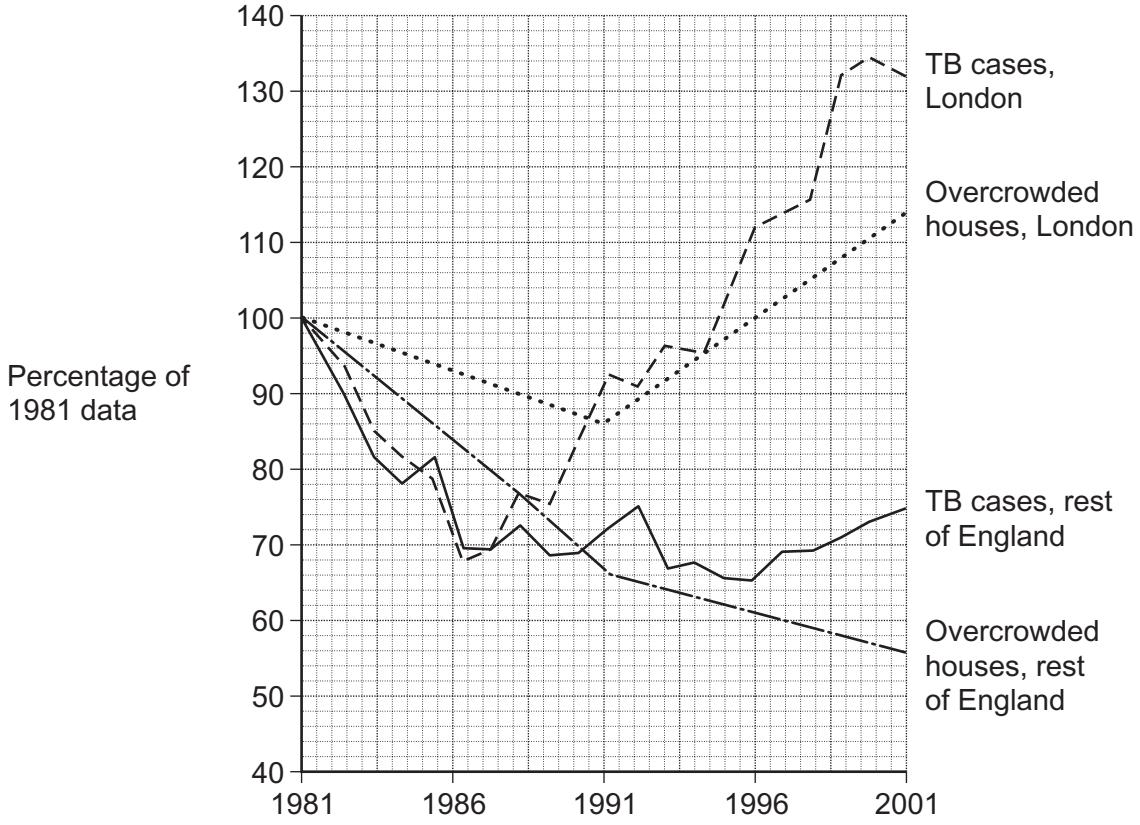
Town planners compared the number of cases of TB in London with those in the rest of England between 1981 and 2001. They also compared the number of overcrowded households in London with those in the rest of England for the same period. The numbers were recorded as percentages of the figures for 1981.
Figure 2 shows the results of these comparisons.

Figure 2



4 (b) The town planners concluded that overcrowding leads to an increase in cases of tuberculosis (TB).
Evaluate this conclusion.

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(4 marks)

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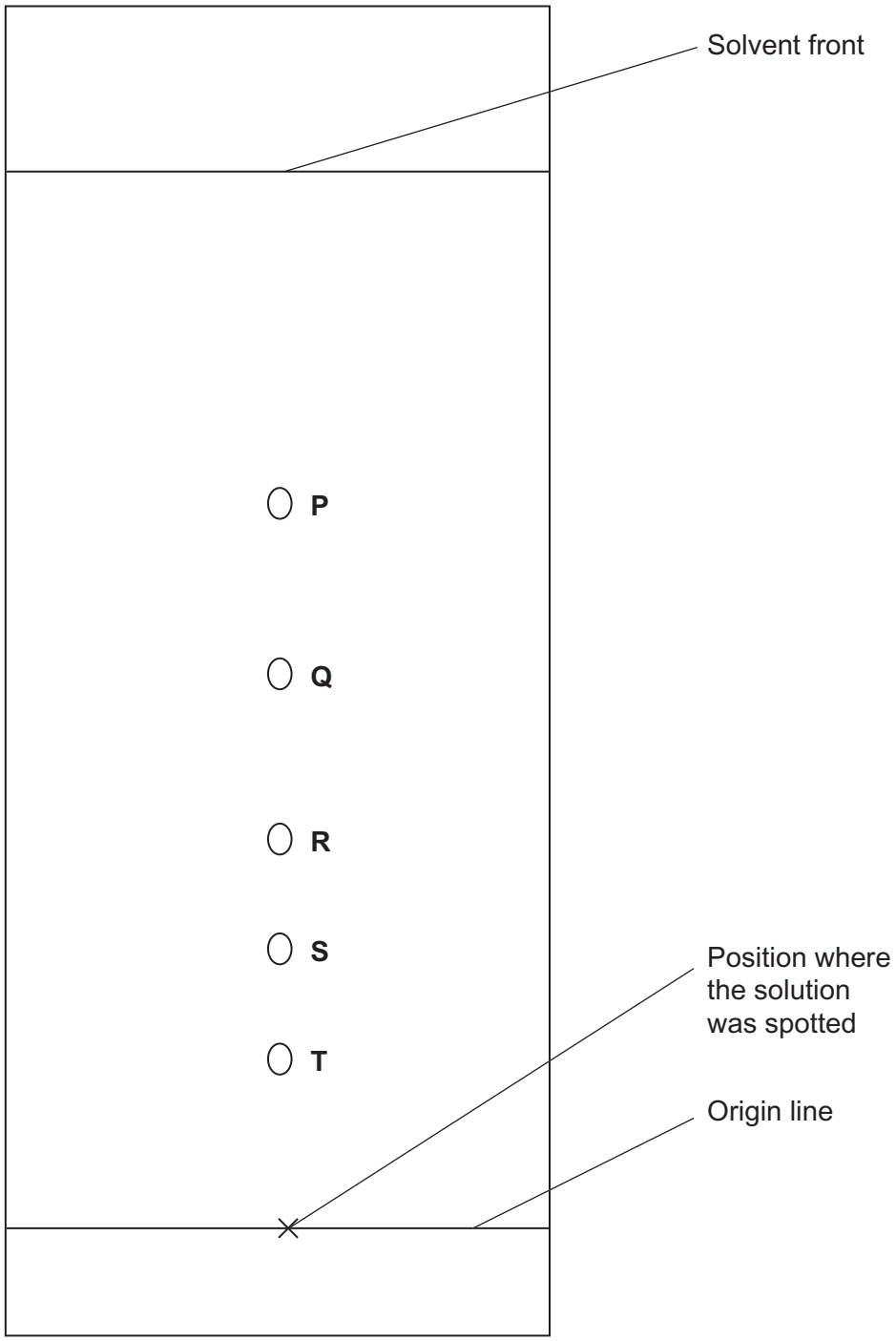
Turn over for the next question

5 A student mixed protein with a protein-digesting enzyme. This produced a solution containing a mixture of different amino acids. She used chromatography to identify the amino acids in the solution.

Figure 3 shows her results.

Figure 3



5 (a) (i) Name the type of reaction in which protein is digested to amino acids.

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(1 mark)

5 (a) (ii) The student only needed to use a small amount of the enzyme to digest a large amount of protein.
Explain why she only needed a small amount of enzyme.

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(1 mark)

5 (b) The student drew the origin line in pencil, not in ink.
Explain why.

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(1 mark)

5 (c) **Figure 4** shows the Rf values for some amino acids.

Figure 4

Amino acid	Rf value
Tryptophan	0.42
Valine	0.50
Aspartic acid	0.53
Methionine	0.57

Use the information in **Figure 4** to identify the amino acid in the spot labelled **Q** in **Figure 3**. Use a suitable calculation to support your answer.

Name of amino acid .....

(3 marks)

Question 5 continues on the next page

5 (d) Another student suggested that it would be possible to determine the Rf value of **Q** more accurately if a longer piece of chromatography paper was used. Do you think that this student is right?
Explain your answer.

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(1 mark)

7

Turn over for the next question

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ANSWER IN THE SPACES PROVIDED

6 (a) Describe the effects of cystic fibrosis (CF) on the gut.

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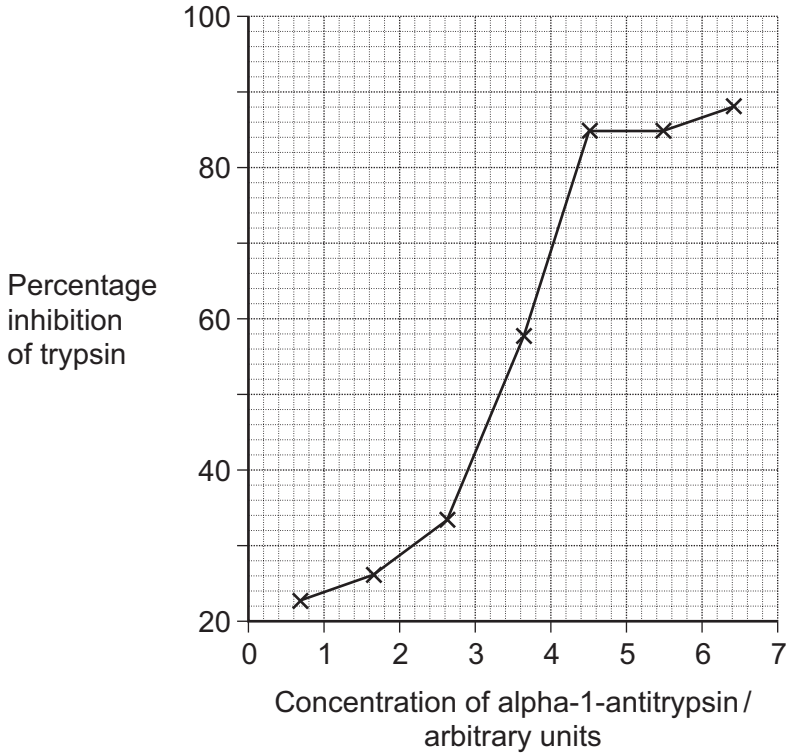
(2 marks)

Alpha-1-antitrypsin is used to treat patients with CF. It inhibits the activity of trypsin. Doctors investigated the effects of different concentrations of alpha-1-antitrypsin on trypsin activity. **Figure 5** shows the results.

Figure 5



6 (b) Describe the results.

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(2 marks)

6 (c) How would the results of this investigation be useful in determining the concentration of alpha-1-antitrypsin to be used in treating patients with CF?

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(2 marks)

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Turn over for the next question

7 (a) What is meant by the *glycaemic index* (GI) of a food?

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(2 marks)

7 (b) Scientists investigated the use of a food additive as part of a low GI diet.
They recruited two groups of volunteers.

- Group **A** were given bread to eat.
- Group **B** were given bread containing the additive.

The scientists monitored the blood glucose concentration of the volunteers after eating the bread.
Figure 6 shows their results.

Figure 6

7 (b) (i) Describe the results.

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(2 marks)

7 (b) (ii) What do these data show about the use of the additive as part of a low GI diet?

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(2 marks)

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Turn over for the next question

8 (a) Ventilation of the lungs is important for efficient gas exchange.
Explain why.

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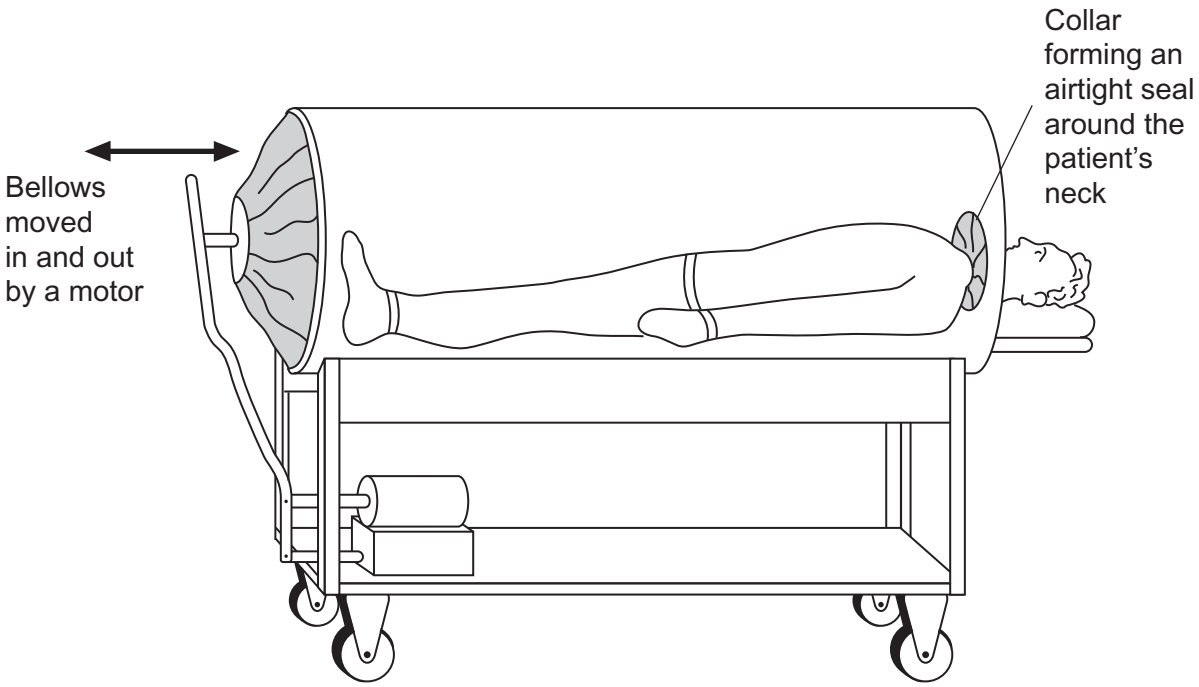
(2 marks)

Some people have medical conditions in which the muscles involved in breathing stop working.

These people can be kept alive with a machine called an iron lung.

Figure 7 shows a patient in an iron lung. The iron lung is an airtight chamber. The pressure inside the chamber is changed by bellows moving in and out.

Figure 7



8 (b) When the bellows move out, the patient breathes in. Explain how.

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(Extra space) .....

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8 (c) A patient in an iron lung is at risk of developing deep vein thrombosis (DVT). Explain why.

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(2 marks)

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Turn over for the next question

9 Gelatine is a protein. When a warm gelatine solution cools, it sets to form a jelly. Fresh pineapple juice contains an enzyme that digests protein. A student investigated the effect of pineapple juice on the setting of jelly. He set up three different tubes of warm gelatine solution and recorded which had set after three hours. The contents of each tube and his results are shown in the table.

Tube	Contents of tube	Jelly formed
A	6 cm^3 gelatine + 2 cm^3 pineapple juice + 2 cm^3 water	No
B	6 cm^3 gelatine + 2 cm^3 pineapple juice + 2 cm^3 hydrochloric acid	Yes
C	6 cm^3 gelatine + 2 cm^3 boiled pineapple juice + 2 cm^3 water	Yes

9 (a) Explain why 2 cm^3 of water was added to tubes **A** and **C**.

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(2 marks)

9 (b) Explain the results of

tube **A** .....

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tube **B** .....

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(4 marks)

9 (c) What was the purpose of tube **C**?

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(3 marks)

(Extra space) .....

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Turn over for the next question

10 Read the following passage

Statins are drugs that reduce the concentration of cholesterol in the blood and the risk of atheroma. The British Heart Foundation estimates almost 10 000 deaths a year from heart disease are avoided as a result of using statins. The cost of prescribing statins in the UK is nearly £1 billion a year. Some experts believe statins may also protect against other health problems, including blood clots.

In 1990, doctors recruited 6595 men of a similar age who had high concentrations of cholesterol in their blood. None of them had suffered a myocardial infarction. Half the men were given a statin for 5 years, and the other half were given a placebo (dummy pill). All the men stopped taking pills after 5 years.

The doctors found that 5 years of treatment with a statin resulted in 27% fewer non-fatal myocardial infarctions or deaths due to heart disease.

The doctors suggested that statins had a long-term effect in slowing the development of atheroma and heart disease. As a result of this study, the doctors suggested that everybody over the age of 50 should be given statins.

10 (a) Statins reduce the concentration of cholesterol in the blood and the risk of atheroma (lines 1 to 2). Explain how this may be linked to fewer myocardial infarctions.

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Question 10 continues on the next page

10 (b) The men in the groups were matched for age and for not having suffered a myocardial infarction (lines 7 to 9).

10 (b) (i) It was important to match the groups of men for these factors.
Explain why.

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(3 marks)

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10 (b) (ii) Suggest **one** other factor for which the two groups of men in the investigation should be matched. Explain how this factor might affect the results of the investigation.

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(2 marks)

10 (b) (iii) The doctors calculated the percentage reduction in heart disease that resulted from the statin treatment.
Explain how.

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(3 marks)

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Question 10 continues on the next page

10 (c) The doctors suggested that everybody over the age of 50 should be given statins (lines 17 to 18). Evaluate this suggestion.

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(Extra space) .....

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END OF QUESTIONS