

Centre Number						Candidate Number				
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Other Names										
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For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
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6	
7	
8	
9	
10	
TOTAL	



General Certificate of Education
Advanced Subsidiary Examination
January 2012

Human Biology

HBIO1

Unit 1 The body and its diseases

Wednesday 11 January 2012 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.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

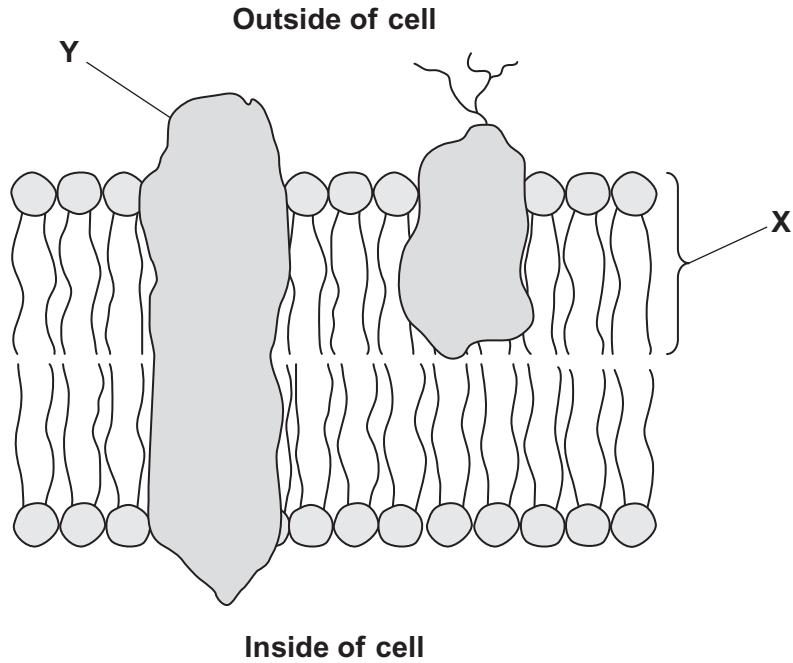
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 80.
- You will be marked on your ability to:
 - use good English
 - organise information clearly
 - use scientific terminology accurately.



J A N 1 2 H B I O 1 0 1

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

1 The diagram shows the structure of part of a cell membrane.



1 (a) Name X.

..... (1 mark)

1 (b) (i) Name molecule Y.

..... (1 mark)

1 (b) (ii) Give **two** possible functions of molecule Y.

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2

..... (2 marks)

1 (c) Name the organelle which produces most of the ATP in cells.

..... (1 mark)

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2 How does each of the following help in the treatment of coronary heart disease?

2 (a) Coronary by-pass surgery.

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(2 marks)

2 (b) Betablockers.

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(2 marks)

2 (c) Angioplasty.

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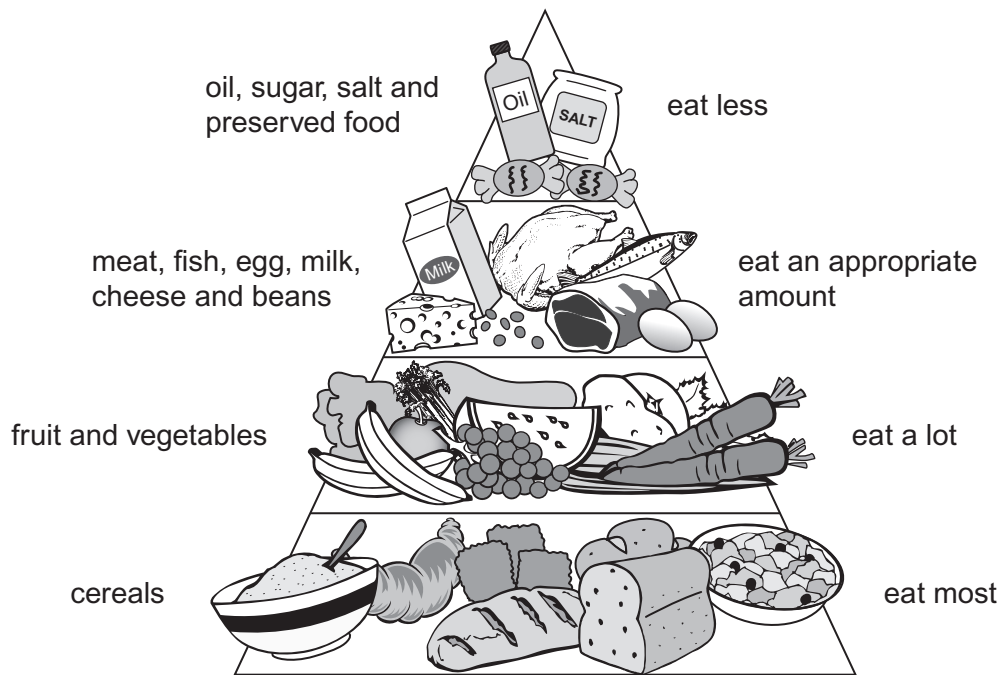
(2 marks)

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Turn over ►



3 The diagram shows an illustration used in a leaflet to advise people about eating a healthy diet.



3 (a) Explain why the advice in the diagram is that we should eat a lot of fruit and vegetables.

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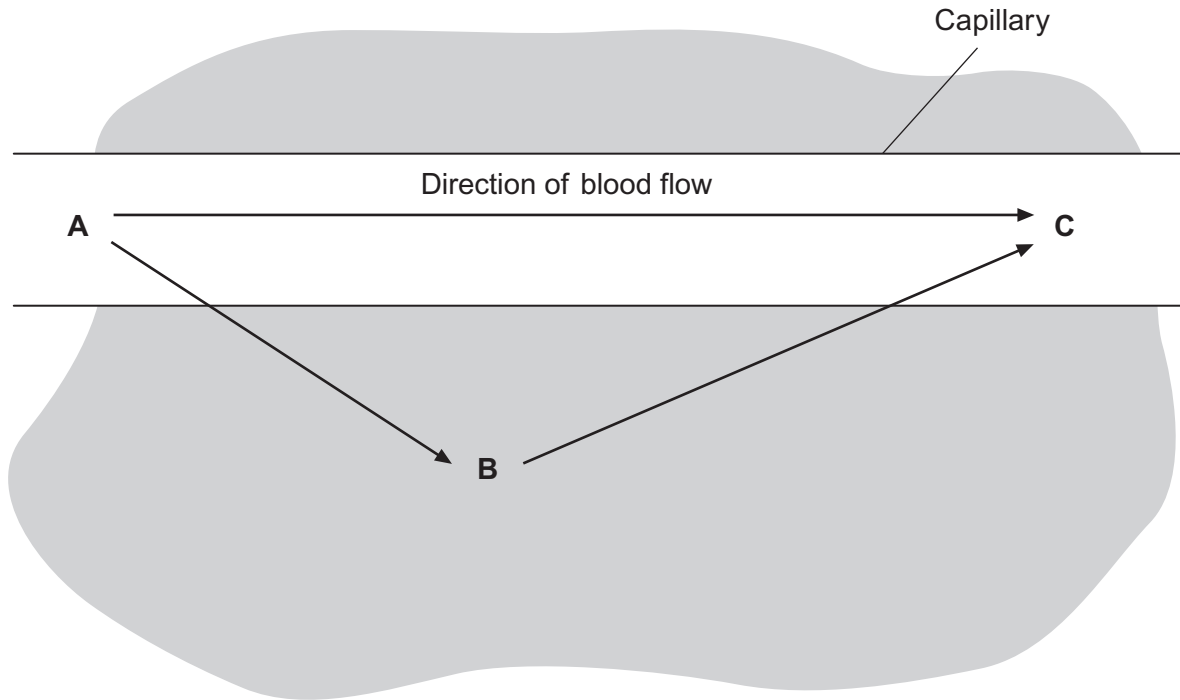
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(2 marks)



- 4 The diagram shows where tissue fluid is formed and returned to the circulatory system. **B** is tissue fluid.



- 4 (a) Give the letter, **A**, **B** or **C**, that indicates where there is the highest concentration of each of the following.

- 4 (a) (i) Glucose

(1 mark)

- 4 (a) (ii) Oxygen

(1 mark)



4 (b) In some cases, people with heart failure may have a high concentration of sodium ions in their blood plasma. This can cause oedema. Explain how.

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(3 marks)

(Extra space)

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Turn over for the next question

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5 (a) What is *osmosis*? Use the term water potential in your answer.

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(2 marks)



5 (b)

A scientist put equal samples of human blood into two solutions of sodium chloride of different concentrations.

- He immediately recorded the appearance of the contents of the tube.
- After 15 minutes, he recorded the appearance again.
- He then spun each tube in a centrifuge. The spinning forced any cells or parts of cells to the bottom of the tube to form a solid pellet.
- For each tube, he recorded the size of the pellet formed.

The table shows his results.

Tube number	Concentration of sodium chloride solution / g dm ⁻³	Appearance of contents of tube immediately after human blood added	Appearance of contents of tube after 15 minutes	Size of pellet formed
1	10	Red	Pale yellow	Large
2	3	Red	Red	Very small

Explain the results.

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(Extra space)

(4 marks)

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Turn over ►



6 (a) Explain the cause and symptoms of lactose intolerance.

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(4 marks)

(Extra space)

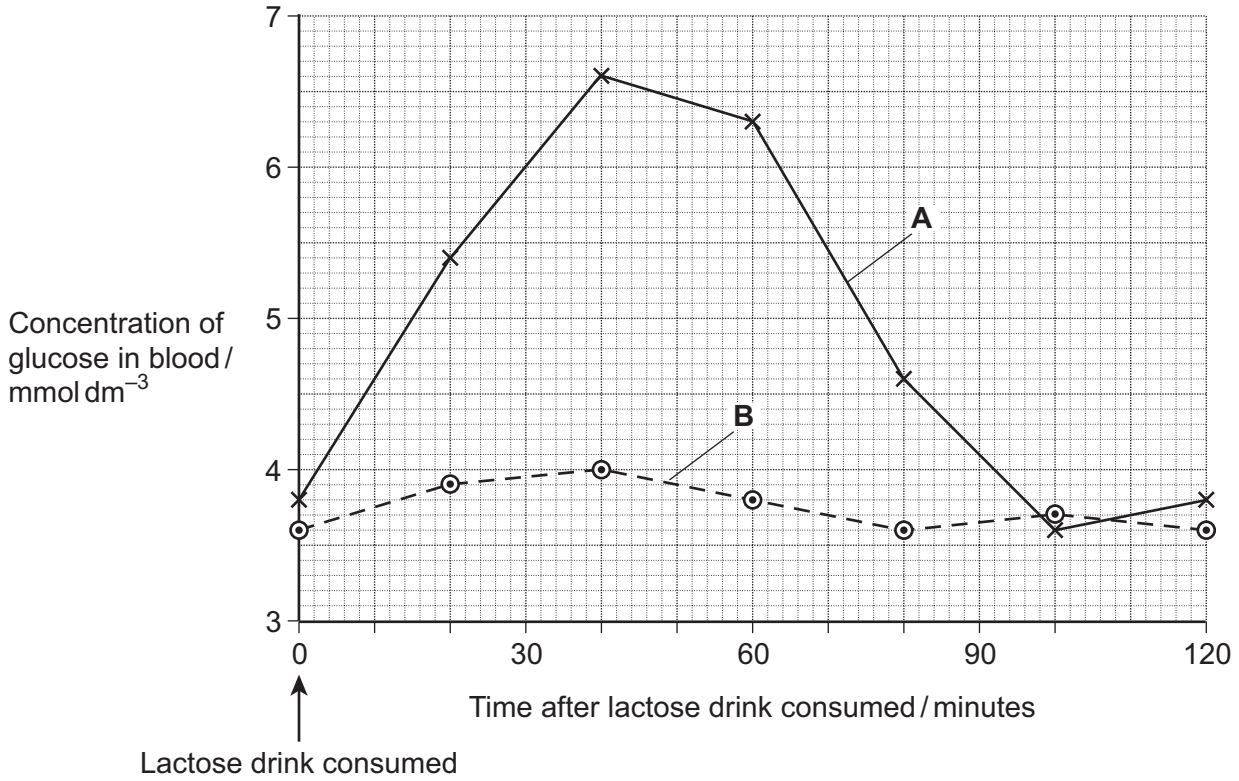
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A doctor tested two people, **A** and **B**, for lactose intolerance. Both people were given nothing to eat, and only water to drink, for 10 hours. They were then given a lactose solution to drink. The doctor measured the concentration of glucose in their blood over the next 2 hours. Her results are shown in the graph.



6 (b) Calculate the percentage increase in the concentration of glucose in the blood of person **A** between 0 and 30 minutes.

percentage increase % (2 marks)

6 (c) These data show that person **B** was lactose intolerant. Explain how.

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(2 marks)

Turn over ►



7 A hygiene expert used sterile cotton wool swabs to collect bacteria from the surface of a mobile phone. There are official guidelines for the numbers of bacteria of different types that indicate adequate hygiene.

The table shows the results for this phone.

Type of bacterium	Maximum number of bacteria per cm ² on phone surface that indicate adequate hygiene.	Mean number of bacteria per cm ² of phone surface	Number of times greater than official guidelines
Commonly found in environment	1000	105 000
Found in human gut	100	3900
Found in human faeces	10	1700

7 (a) (i) Suggest how the hygiene expert used sterile cotton wool swabs to obtain the samples of bacteria from the surface of the mobile phone.

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(2 marks)

7 (a) (ii) The hygiene expert used sterile techniques. Give **two** reasons why.

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(2 marks)



7 (b) (i) Complete the last column of the table.

(1 mark)

7 (b) (ii) The hygiene expert was very concerned by the results for this phone.
Explain why.

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(3 marks)

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8 (a) An antibody will only bind to a specific antigen. Explain why.

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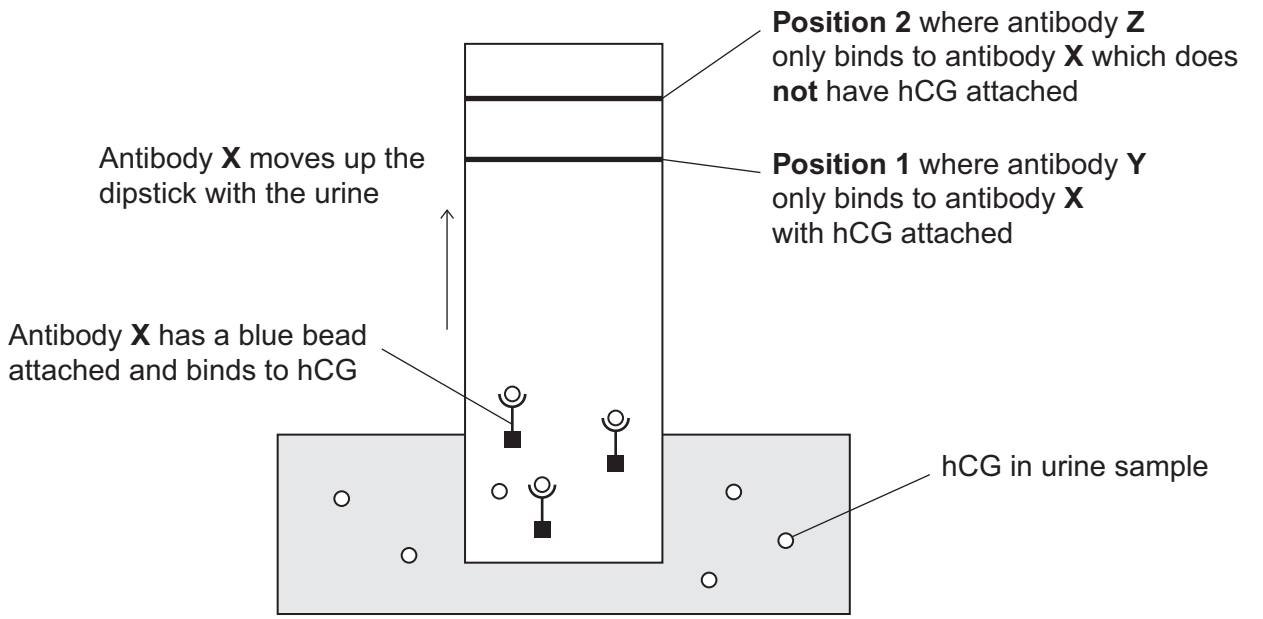
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(2 marks)

One kind of pregnancy test kit detects the hormone hCG. This hormone is found in the urine of a pregnant woman.

The test consists of a dipstick which contains three kinds of monoclonal antibody, X, Y and Z. A woman dips the end of the dipstick into a sample of her urine. The urine and antibody X move up the dipstick and a blue line forms at either **Position 1** or **Position 2**. The diagram shows how the dipstick and its antibodies are used.



- Key**
- hCG
 - blue bead
 - Y antibody X



9 Sun lotions are used to reduce skin damage caused by chemicals produced in the skin when exposed to intense sunlight. These sun lotions need to be effective at high skin temperatures.

Some sun lotions contain vitamin E which binds to the chemicals produced in the skin, making them harmless. Vitamin E is gradually broken down by ultraviolet light in sunlight.

Scientists have found an enzyme which reduces the effect of these harmful chemicals. The enzyme is produced by a bacterium that lives in deep-sea thermal vents at about 75 °C. In an investigation, they found that the enzyme broke down the harmful chemicals three times faster at 40 °C than at 25 °C.

9 (a) (i) Suggest advantages of using the enzyme from this bacterium in sun lotion rather than vitamin E.

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(3 marks)

(Extra space)
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9 (a) (ii) The enzymes found in this bacterium contain a lot of disulfide bridges. This enables them to remain active at high temperatures. Suggest why.

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(2 marks)



9 (b) Apart from sample size, describe the factors that the scientists would have to consider when designing an investigation to see whether it was better to use the enzyme, rather than the vitamin E, in sun lotion.

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(4 marks)

(Extra space)

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10 (b) In people with AIDS, the immune system stops functioning effectively (lines 11 and 12).
Explain why.

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(4 marks)

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10 (c) (i) Explain why it was important to give a placebo to half the mice (line 6).

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(1 mark)

Question 10 continues on the next page

Turn over ►



10 (c) (ii) The scientists used a large number of mice in their investigation (lines 4 and 5). Explain why.

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(2 marks)

10 (d) HIV is often transmitted between addicts who inject drugs such as morphine (lines 15 and 16). Explain why.

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(2 marks)



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