Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
TOTAL	

General Certificate of Education
Advanced Subsidiary Examination
June 2011

Biology BIOL1

Unit 1 Biology and disease

Monday 16 May 2011 9.00 am to 10.15 am

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

Time allowed
- 1 hour 15 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 in margins 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 maximum mark for this paper is 60.
- The marks for questions are shown in brackets.
- Quality of Written Communication will be assessed in all answers.
- You will be marked on your ability to:
  - use good English
  - organise information clearly
  - use scientific vocabulary accurately.

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

1 The equation shows the breakdown of lactose by the enzyme lactase.

$$\text{lactose} + \text{water} \xrightarrow{\text{lactase}} \text{galactose} + \text{monosaccharide } \mathbf{X}$$

1 (a) (i) Name the type of reaction catalysed by the enzyme lactase.

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(1 mark)

1 (a) (ii) Name monosaccharide **X**.

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(1 mark)

1 (b) (i) Describe how you would use a biochemical test to show that a reducing sugar is present.

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(2 marks)

1 (b) (ii) Lactose, galactose and monosaccharide **X** are all reducing sugars.
After the lactose has been broken down there is a higher concentration of reducing sugar. Explain why.

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(1 mark)

1 (c) A high concentration of galactose slows down the breakdown of lactose by lactase.
Use your knowledge of competitive inhibition to suggest why.

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(2 marks)

1 (d) People who are lactose intolerant are **not** able to produce the enzyme lactase.
Explain why these people get diarrhoea when they drink milk containing lactose.

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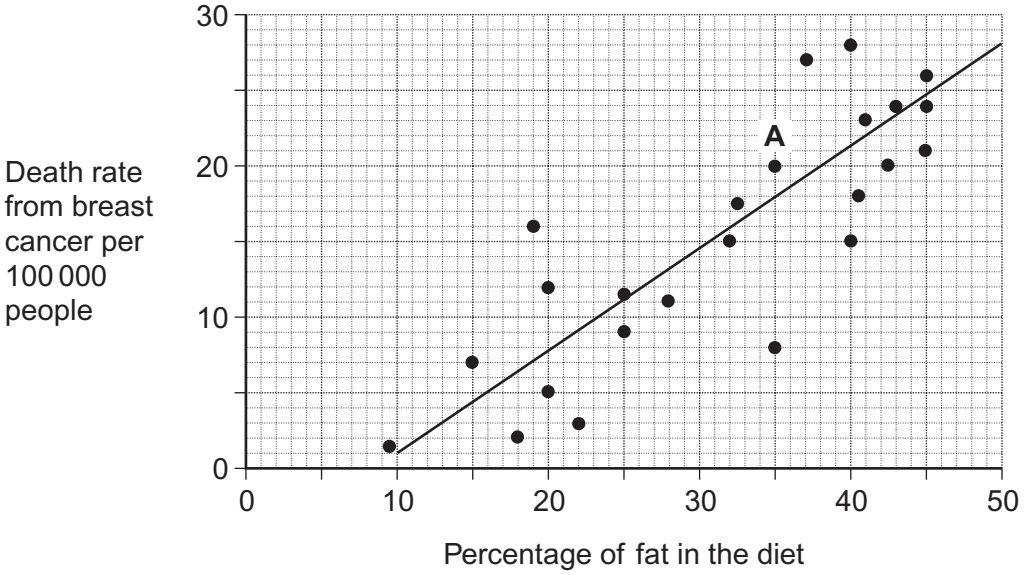
(2 marks)

9

2 Scientists investigated the relationship between the percentage of fat in the diet and the death rate from breast cancer in 24 different countries. They plotted the data from each country on the graph below.



2 (a) Describe the information given by point **A** on the graph.

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(1 mark)

2 (b) Describe how the scientists calculated the death rate from breast cancer for each country.

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(1 mark)

2 (c) Some people have used the graph to conclude that a high percentage of fat in the diet causes breast cancer. Evaluate this conclusion.

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(3 marks)

(Extra space) .....

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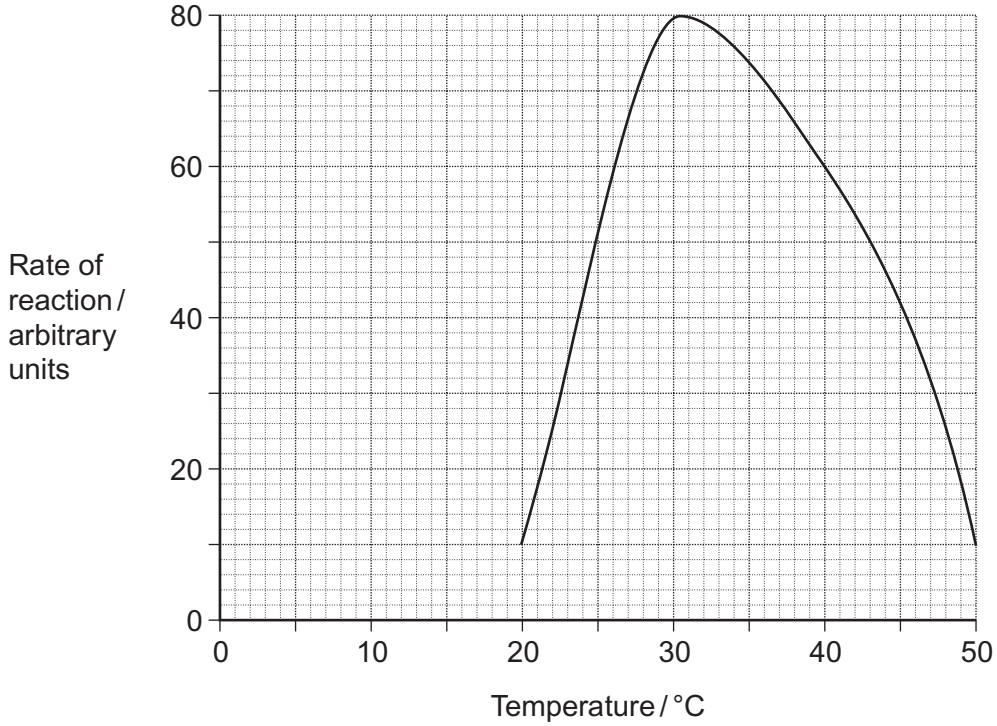
5

Turn over for the next question

3 A protease is an enzyme that digests protein. The graph shows how the activity of a protease varies with temperature.



3 (a) (i) Describe what the graph shows about the effect of temperature on the rate of reaction.

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(1 mark)

3 (a) (ii) Explain the shape of the curve between 30 °C and 50 °C.

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(3 marks)

(Extra space) .....

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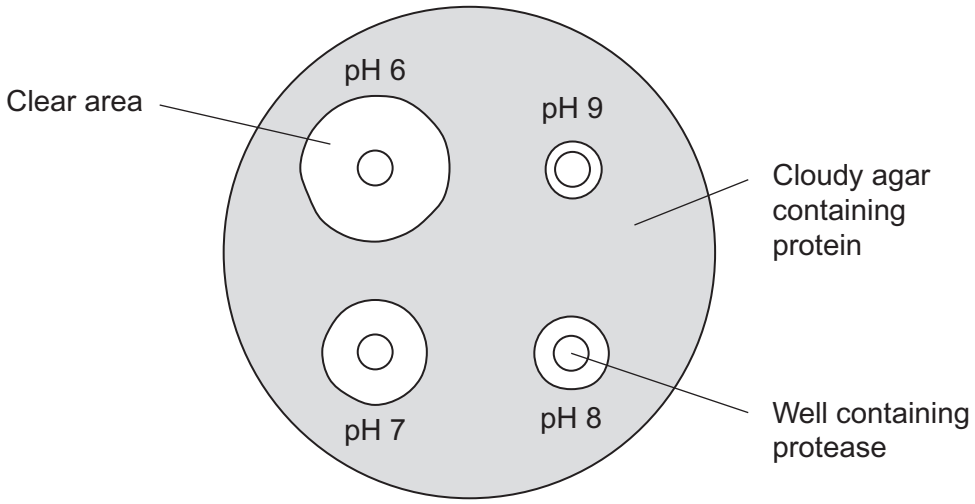
3 (b) Students investigated the effect of pH on the activity of the protease.

- The students used agar plates containing protein. The protein made the agar cloudy.
- They made four wells of equal size in the agar of each plate.
- They added a drop of protease solution to each of the wells. The protease solution in each well was at a different pH.
- The students incubated the agar plates for 4 hours at a constant temperature.

The diagram shows the agar plates after they were incubated and the pH of the protease solution in each well.



3 (b) (i) How should the students make sure that the pH of the protease solution did **not** change?

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(1 mark)

3 (b) (ii) Use the graph to suggest a suitable temperature for incubating the agar plates. Explain your answer.

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(1 mark)

3 (b) (iii) Use the diagram to describe the effect of pH on the activity of this protease.

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(1 mark)

7

4 A doctor measured the volume of air in the lungs of two people over a period of 7 seconds. Both people were resting. One person was healthy. The other had emphysema. The results are shown in the table.

Time / s	Volume of air in lungs / dm^3	
	Person **A**	Person **B**
0	6.5	7.0
1	3.8	6.0
2	3.0	5.6
3	2.3	5.1
4	2.0	4.8
5	1.7	4.5
6	1.6	4.2
7	1.6	3.9

4 (a) The two people were breathing out during the time shown. What evidence in the table supports this statement?

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(1 mark)

4 (b) Calculate the rate at which person **A** breathed air out of his lungs between 0 and 3 seconds. Show your working.

Answer ..... $dm^3\,s^{-1}$

(2 marks)

4 (c) Person **B** has emphysema. Give **one** piece of evidence from the table that shows this.

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(1 mark)

4 (d) Emphysema reduces the efficiency of gas exchange in the lungs. Explain why.

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(4 marks)

(Extra space) .....

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8

Turn over for the next question

5 (a) Give **two** ways in which active transport is different from facilitated diffusion.

1. .....

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2. .....

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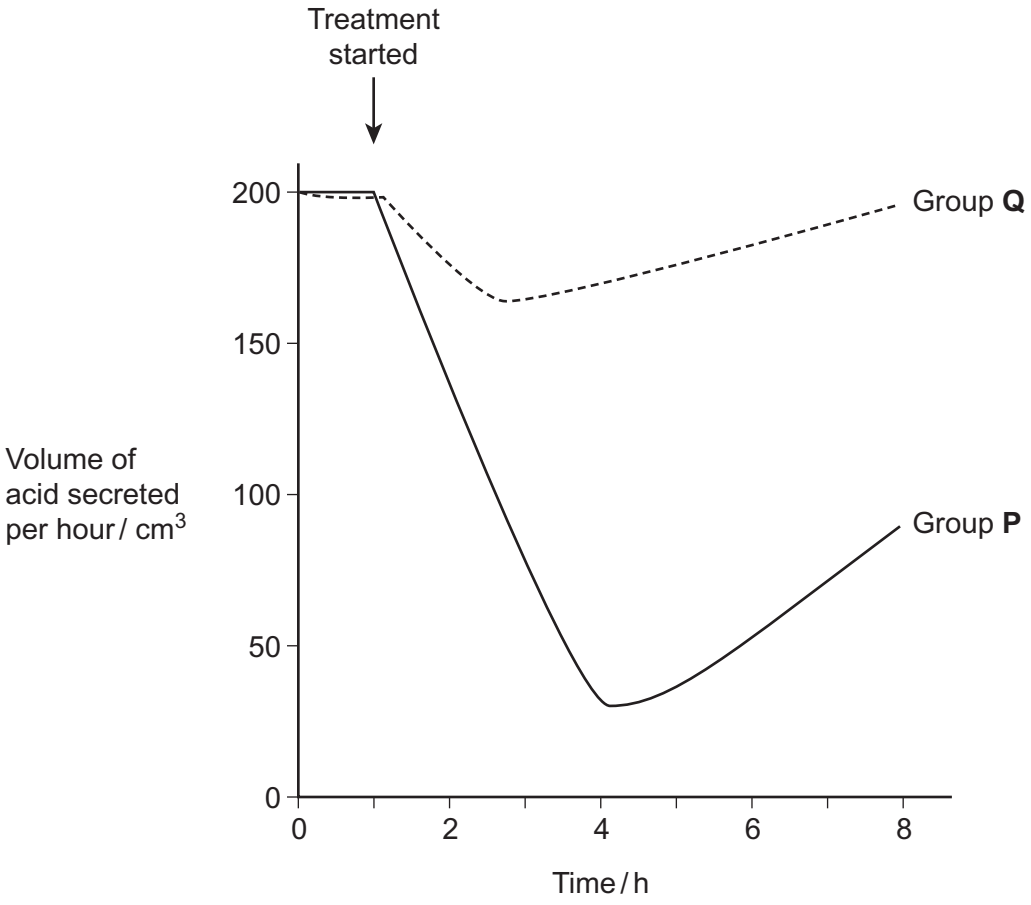
(2 marks)

Scientists investigated the effect of a drug called a proton pump inhibitor.
The drug is given as a tablet to people who produce too much acid in their stomach.
It binds to a carrier protein in the surface membrane of cells lining the stomach.
This carrier protein usually moves hydrogen ions into the stomach by active transport.

The scientists used two groups of people in their investigation. All the people produced too much acid in their stomach. People in group **P** were given the drug. Group **Q** was the control group.

The graph shows the results.



5 (b) (i) The scientists used a control group in this trial. Explain why.

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(1 mark)

5 (b) (ii) Suggest how the control group would have been treated.

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(2 marks)

5 (c) Describe the effect of taking the drug on acid secretion.

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(1 mark)

6

Turn over for the next question

6 The table shows pressure changes in the left side of the heart during one cardiac cycle.

	Blood pressure / kPa	
Time / s	**Left atrium**	**Left ventricle**
0.0	0.7	0.3
0.1	1.0	2.0
0.2	0.1	12.5
0.3	0.2	15.3
0.4	1.0	4.5
0.5	0.5	1.0
0.6	0.6	0.3
0.7	0.7	0.3

6 (a) Between which times is the valve between the atrium and the ventricle closed? Explain your answer.

Times …… s and …… s

Explanation .....

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(2 marks)

6 (b) The maximum pressure in the ventricle is much higher than that in the atrium. Explain what causes this.

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(2 marks)

6 (c) Use the information in the table to calculate the heart rate in beats per minute.

Answer ..... beats per minute
(1 mark)

5

Turn over for the next question

7 Read the following passage.

Chlamydia is a bacterium. Scientists have shown that infection with chlamydia can cause heart disease in humans. Infection with the bacterium can stimulate the formation of atheroma. This can lead to a heart attack.

Other scientists have been working with mice. These scientists have suggested that chlamydia may cause heart disease in a different way. They have found a protein on the surface of chlamydia cells which is similar to a protein in the heart muscle of mice. After an infection with chlamydia, cells of the immune system of the mice may attack their heart muscle cells and cause heart disease.

Use the information in the passage and your own knowledge to answer the following questions.

7 (a) Explain how atheroma can lead to a heart attack (line 3).

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(3 marks)

(Extra space) .....

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7 (b) (i) Using information from the passage, explain what is meant by an antigen.

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(2 marks)

7 (b) (ii) After an infection with chlamydia, cells of the immune system of the mice may attack the heart muscle cells (lines 7-8). Explain why.

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(2 marks)

7 (c) Some scientists have suggested that people should be vaccinated to prevent infection by chlamydia. Evaluate this suggestion.

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(3 marks)

(Extra space) .....

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10

Turn over for the next question

8 Different cells in the body have different functions.

8 (a) Some white blood cells are phagocytic. Describe how these phagocytic white blood cells destroy bacteria.

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(4 marks)

(Extra space) .....

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8 (b) The epithelial cells that line the small intestine are adapted for the absorption of glucose. Explain how.

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(6 marks)

(Extra space) .....

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END OF QUESTIONS

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