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	
TOTAL	

General Certificate of Education
Advanced Subsidiary Examination
January 2010

Biology BIOL1

Unit 1 Biology and disease

Tuesday 12 January 2010 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. **Answers written in margins or on blank pages will not be marked.**
- 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.
- You are reminded of the need for good English and clear presentation in your answers.
- Use accurate scientific terminology in all answers.
- Quality of Written Communication will be assessed in all answers.

There are no questions printed on this page

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ANSWER IN THE SPACES PROVIDED

Areas outside the box will not be scanned for marking

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

1 (a) Some people cannot digest lactose when they are adult. They could digest lactose when they were children.

Use your knowledge of water potential to explain why these adults get diarrhoea when they drink milk.

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(2 marks)

1 (b) (i) The equation shows the reaction catalysed by the enzyme lactase. Complete this equation.

Lactose + ... ⟶ Glucose + ...

(2 marks)

1 (b) (ii) Name the type of chemical reaction shown in this equation.

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(1 mark)

1 (c) Lactase is an enzyme. Lactose is a reducing sugar.

1 (c) (i) Describe how you could use the biuret test to distinguish a solution of the enzyme, lactase from a solution of lactose.

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(1 mark)

1 (c) (ii) Explain the result you would expect with the enzyme.

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(1 mark)

7

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2 Miner's lung is a disease caused by breathing in dust in coal mines. The dust causes the alveolar epithelium to become thicker. People with miner's lung have a lower concentration of oxygen in their blood than healthy people.

2 (a) (i) Describe the path by which oxygen goes from an alveolus to the blood.

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(2 marks)

2 (a) (ii) Explain why people with miner's lung have a lower concentration of oxygen in their blood.

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(1 mark)

2 (b) In healthy lungs, a gradient is maintained between the concentration of oxygen in the alveoli and the concentration of oxygen in the lung capillaries.

2 (b) (i) Describe how ventilation helps to maintain this difference in oxygen concentration.

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(2 marks)

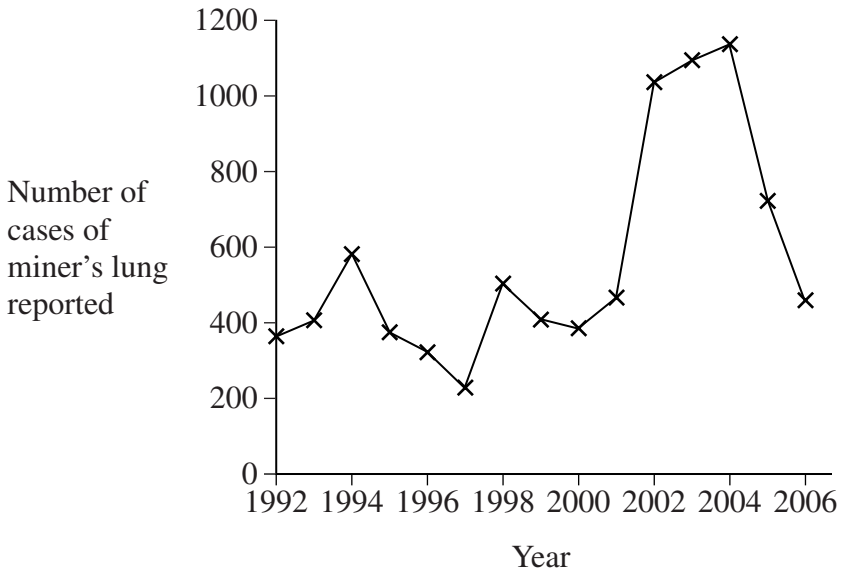
2 (b) (ii) Give **one** other way that helps to maintain the difference in oxygen concentration.

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(1 mark)

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2 (c) Scientists investigated the number of cases of miner's lung reported in Britain between 1992 and 2006.



Coal mining in Britain had been dramatically reduced by 1990.

Some scientists concluded that the rise in reported cases of miner's lung after 1992 shows that the disease takes a long time to develop.

Evaluate this conclusion.

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(2 marks)

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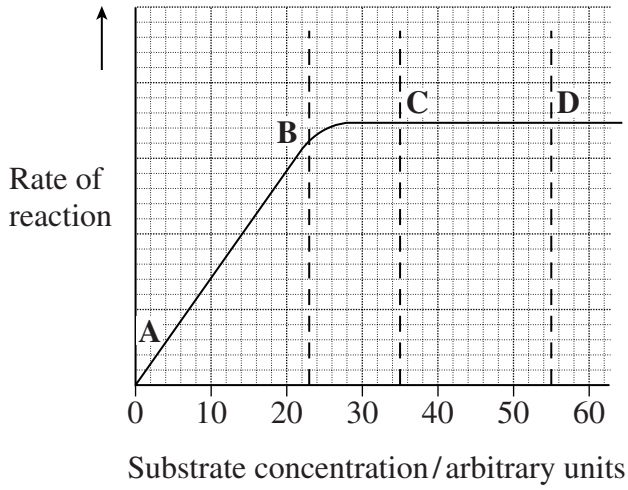
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3 The graph shows the effect of substrate concentration on the rate of an enzyme-controlled reaction.



3 (a) (i) Describe what the graph shows about the effect of substrate concentration on the rate of this enzyme-controlled reaction.

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(2 marks)

(Extra space) .....

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3 (a) (ii) What limits the rate of this reaction between points **A** and **B**? Give the evidence from the graph for this.

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(2 marks)

(Extra space) .....

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3 (a) (iii) Suggest a reason for the shape of the curve between points **C** and **D**.

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(1 mark)

3 (b) Sketch a curve on the graph to show the rate of this reaction in the presence of a competitive inhibitor.

(1 mark)

3 (c) Methotrexate is a drug used in the treatment of cancer. It is a competitive inhibitor and affects the enzyme folate reductase.

3 (c) (i) Explain how the drug lowers the rate of reaction controlled by folate reductase.

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(2 marks)

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3 (c) (ii) Methotrexate only affects the rate of the reaction controlled by folate reductase. Explain why this drug does not affect other enzymes.

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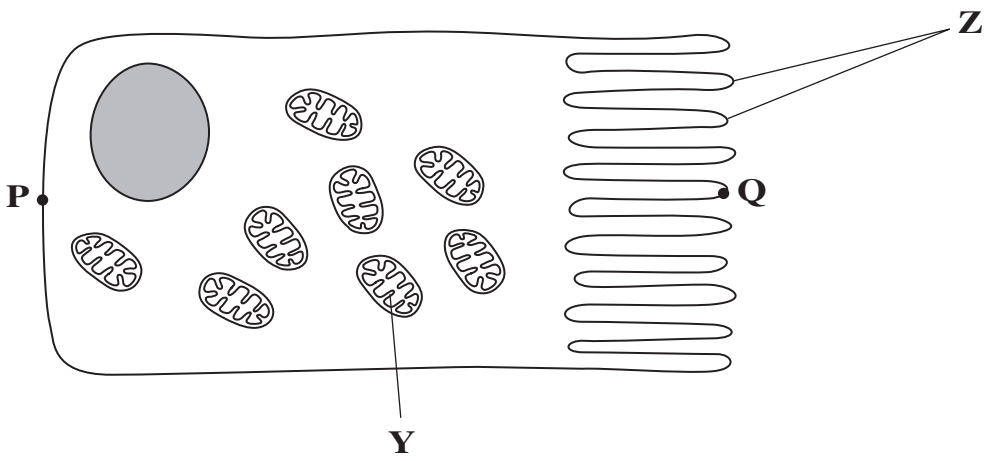
(1 mark)

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Turn over for the next question

Areas outside the box will not be scanned for marking

4 The diagram shows an epithelial cell from the small intestine.



4 (a) (i) Name organelle **Y**.

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(1 mark)

4 (a) (ii) There are large numbers of organelle **Y** in this cell. Explain how these organelles help the cell to absorb the products of digestion.

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(2 marks)

(Extra space) .....

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4 (b) This diagram shows the cell magnified 1000 times. Calculate the actual length of the cell between points **P** and **Q**. Give your answer in µm. Show your working.

Answer ..... µm
(2 marks)

4 (c) Coeliac disease is a disease of the human digestive system. In coeliac disease, the structures labelled **Z** are damaged.

Although people with coeliac disease can digest proteins they have low concentrations of amino acids in their blood.

Explain why they have low concentrations of amino acids in their blood.

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(2 marks)

(Extra space).....

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Turn over for the next question

Areas outside the box will not be scanned for marking

5 Students investigated the effect of different concentrations of sodium chloride solution on discs cut from an apple. They weighed each disc and then put one disc into each of a range of sodium chloride solutions of different concentrations. They left the discs in the solutions for 24 hours and then weighed them again. Their results are shown in the table.

Concentration of sodium chloride solution / mol dm^{-3}	**Mass of disc at start / g**	**Mass of disc at end / g**	**Ratio of mass at start to mass at end**
0.00	16.1	17.2	0.94
0.15	19.1	20.2	0.95
0.30	24.3	23.2	1.05
0.45	20.2	18.7	1.08
0.60	23.7	21.9	
0.75	14.9	13.7	1.09

5 (a) (i) Calculate the ratio of the mass at the start to the mass at the end for the disc placed in the 0.60 mol dm^{-3} sodium chloride solution.

Answer .....

(1 mark)

5 (a) (ii) The students gave their results as a ratio. What is the advantage of giving the results as a ratio?

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(2 marks)

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5 (a) (iii) The students were advised that they could improve the reliability of their results by taking additional readings at the same concentrations of sodium chloride. Explain how.

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(2 marks)

5 (b) (i) The students used a graph of their results to find the sodium chloride solution with the same water potential as the apple tissue. Describe how they did this.

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(2 marks)

5 (b) (ii) The students were advised that they could improve their graph by taking additional readings. Explain how.

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(2 marks)

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6 Read the following passage.

Pathogens affect humans. They also affect farm animals. Once pathogens have entered the body of an animal they can cause disease. Vets sometimes have difficulty identifying the disease from which a particular animal is suffering. Until recently, they have had to take blood samples and send them to a laboratory. The laboratory carries out tests on the sample.

New tests have been developed. Some of these new tests use monoclonal antibodies. Tests using monoclonal antibodies are fast, specific and allow vets to identify a disease while they are still on the farm.

Brucellosis is a disease of cattle. It is caused by bacteria. These bacteria can infect people who drink milk or eat dairy products from infected cattle. A test using monoclonal antibodies allows vets to identify cattle that are carriers. The carriers are cattle that carry the brucellosis bacteria but do not show any symptoms of the disease.

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

6 (a) Other than bacteria, name **one** type of pathogen (line 1).

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(1 mark)

6 (b) Give **two** ways in which a pathogen may cause disease when it has entered the body (lines 1–2).

1 .....

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(2 marks)

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6 (c) Some new tests use monoclonal antibodies (lines 6–7).

6 (c) (i) Explain why these antibodies are referred to as monoclonal.

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(1 mark)

6 (c) (ii) Tests using monoclonal antibodies are specific (line 7). Use your knowledge of protein structure to explain why.

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(3 marks)

(Extra space) .....

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6 (d) The tests using monoclonal antibodies allow vets to identify brucellosis while they are still on a farm. Explain the advantages of this.

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(3 marks)

(Extra space) .....

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7 (a) The cardiac cycle is controlled by the sinoatrial node (SAN) and the atrioventricular node (AVN). Describe how.

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(5 marks)

(Extra space) .....

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7 (b) What is atheroma and how may it cause myocardial infarction?

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(5 marks)

(Extra space) .....

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10

END OF QUESTIONS

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