

Surname						Other Names					
Centre Number						Candidate Number					
Candidate Signature											

For Examiner's Use

General Certificate of Education
January 2007
Advanced Subsidiary Examination



BIOLOGY (SPECIFICATION B)
Unit 1 Core Principles

BYB1

Wednesday 10 January 2007 9.00 am to 10.00 am

<p>For this paper you must have:</p> <ul style="list-style-type: none"> a ruler with millimetre measurements. <p>You may use a calculator.</p>
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Time allowed: 1 hour

Instructions

- Use blue or black ink or ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- Answer the questions in the spaces provided.
- 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 54.
- The marks for questions are shown in brackets. One mark will be awarded for Quality of Written Communication.
- You are reminded of the need for good English and clear presentation in your answers.
- Use accurate scientific terminology in your answers.
- Answers for **Questions 1 to 6** are expected to be short and precise.
- Answer **Question 7** in continuous prose. Quality of Written Communication will be assessed in the answer.

For Examiner's Use			
Question	Mark	Question	Mark
1			
2			
3			
4			
5			
6			
7			
Total (Column 1) →			
Total (Column 2) →			
Quality of Written Communication			
TOTAL			
Examiner's Initials			

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

- 1 (a) The table shows some statements about four different carbohydrates. Complete the table with a tick if the statement is true or a cross if is not true. Do not leave any box blank.

	Sucrose	Maltose	Glycogen	Cellulose
Made only from glucose molecules joined together				
Branched molecule				
Soluble in water				

(3 marks)

- (b) Describe how you would use a biochemical test to show that a solution contained a non-reducing sugar, such as sucrose.

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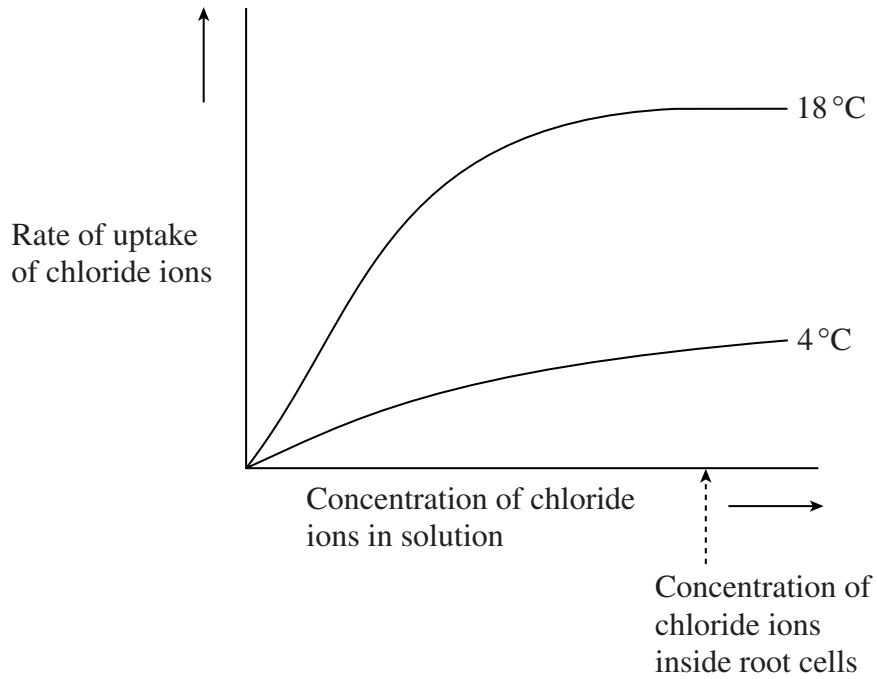
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(3 marks)

2 Plants were grown with their roots in solutions containing different concentrations of chloride ions. The rate of uptake of chloride ions by the plant roots was measured at 4 °C and 18 °C. The results are shown in the graph.



(a) Explain **one** piece of evidence from the graph that shows the uptake of chloride ions by roots is by active transport.

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(1 mark)

(b) Explain the shape of the curve for 18 °C.

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(2 marks)

(c) Explain the difference in the rate of uptake for 4 °C and 18 °C.

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(2 marks)

Turn over ►

3 Differential centrifugation was used to isolate five components from leaf cells.

- (a) The leaf tissue was first homogenised in ice-cold isotonic sucrose solution. Explain why an isotonic solution was used.

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(2 marks)

- (b) The homogenate was then centrifuged five times, each time at a higher speed. The pellet formed at the bottom of the centrifuge tube after each centrifugation was removed. Each pellet contained a different cell component. The components were cell walls, chloroplasts, mitochondria, nuclei and ribosomes.

- (i) Complete the table to show the order in which the cell components were isolated from the homogenate.

Order in which pellets were produced	Cell component
1	
2	
3	Chloroplasts
4	
5	

(2 marks)

- (ii) Which of these cell components contains the most polysaccharide?

.....
 (1 mark)

- (iii) Which of these cell components is the site of protein synthesis?

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 (1 mark)

- (c) Complete the table to give **two** structural differences, other than size, between a chloroplast and a mitochondrion.

Chloroplast	Mitochondrion

(2 marks)

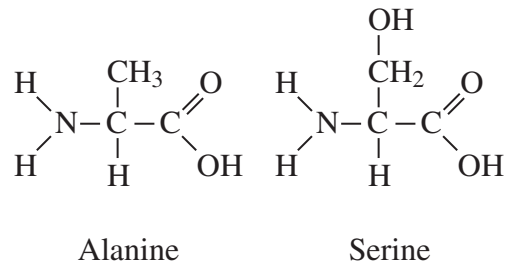
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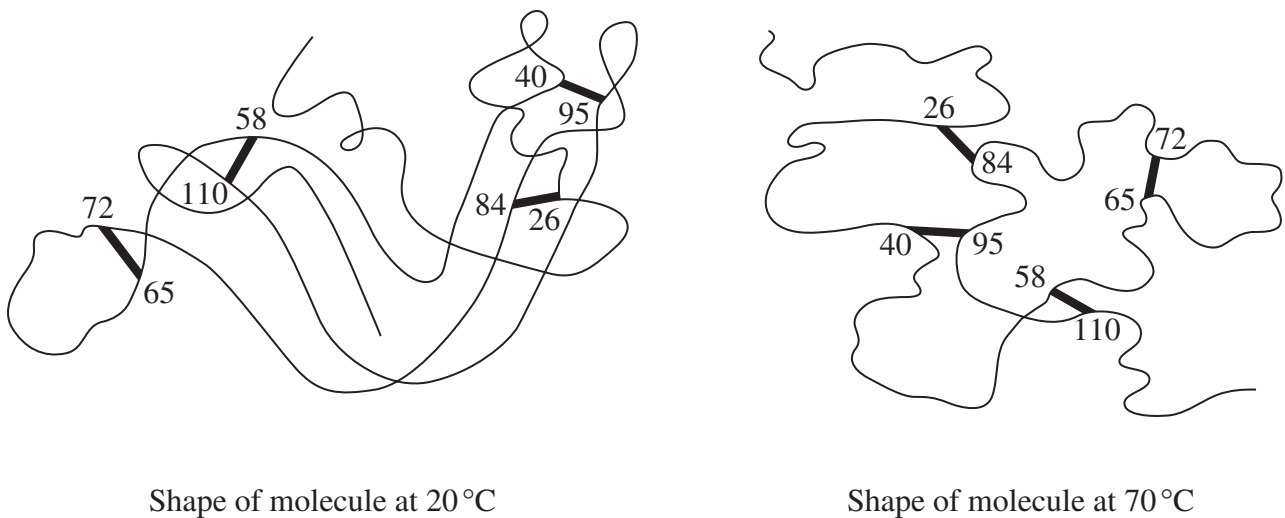
- 4 (a) **Figure 1** shows the structure of the amino acids alanine and serine.

Figure 1



- (i) Name the type of reaction which takes place when amino acids are joined together.
-
- (1 mark)
- (ii) Draw a box around the parts of the two amino acids that are removed when the two molecules are joined together.
- (1 mark)
- (iii) What type of bond is formed between the two amino acids?
-
- (1 mark)
- (b) Ribonuclease is a protein consisting of a chain of 124 amino acids. **Figure 2** shows the shape of a ribonuclease molecule at 20°C and after heating at 70°C. The numbers refer to the position of the amino acids in the chain, and the thick lines between them show chemical bonds.

Figure 2



- (i) Some of the bonds in the ribonuclease molecule have been broken by heating. Name **one** type of bond which has been broken.

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(1 mark)

- (ii) The amino acids numbered in **Figure 2** remain bonded together after heating to 70°C. The numbered amino acids are all the same amino acid. Use the table to identify this amino acid. Explain your answer.

Amino acid	Chemical formula
Alanine	$\text{CH}_3 - \text{CH}(\text{NH}_2) - \text{COOH}$
Asparagine	$\text{H}_2\text{N} - \text{CO} - \text{CH}_2 - \text{CH}(\text{NH}_2) - \text{COOH}$
Aspartic acid	$\text{HOOC} - \text{CH}_2 - \text{CH}(\text{NH}_2) - \text{COOH}$
Cysteine	$\text{HS} - \text{CH}_2 - \text{CH}(\text{NH}_2) - \text{COOH}$
Glycine	$\text{H} - \text{CH}(\text{NH}_2) - \text{COOH}$
Serine	$\text{HO} - \text{CH}_2 - \text{CH}(\text{NH}_2) - \text{COOH}$

Amino acid

Explanation

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(3 marks)

- 5 (a) Describe the relationship between the size of an organism and its surface area to volume ratio.

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(1 mark)

- (b) Mammals maintain a constant body temperature using heat from respiration. The rate of respiration can be measured by the rate of oxygen uptake. The table shows the mean body masses and mean rates of oxygen uptake for five species of mammal. The mean oxygen uptake was measured when the animals were at rest.

Mammal	Mean body mass/kg	Mean oxygen uptake /cm ³ kg ⁻¹ h ⁻¹
Cat	3	435
Elephant	3700	70
Human	70	200
Mouse	0.025	1500
Squirrel	0.5	880

- (i) Describe and explain the relationship between body mass and oxygen uptake.

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(4 marks)

(ii) Suggest why the rate of oxygen uptake was measured when the mammals were at rest.

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(2 marks)

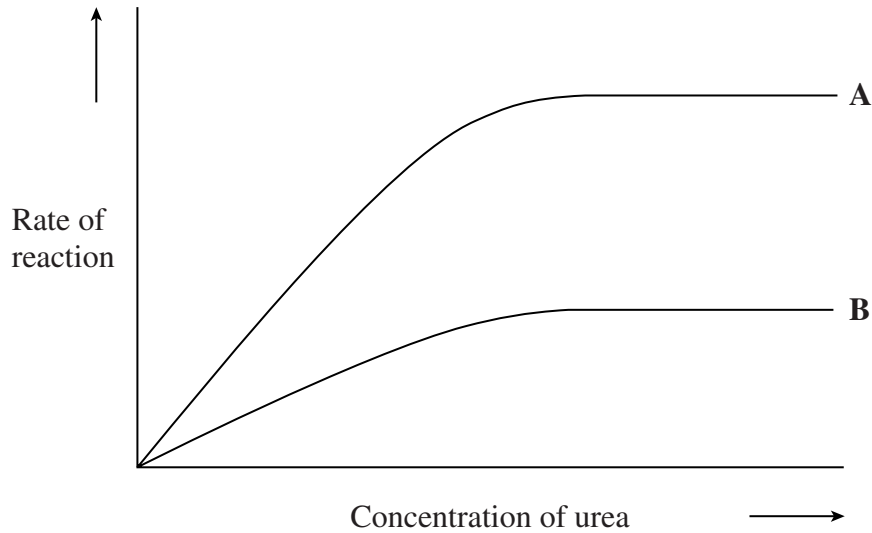
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- 6 Urease is an enzyme which converts urea into ammonia. The effect of urea concentration on the rate of reaction of urease was investigated. Curve **A** on the graph shows these results.

The investigation was then repeated with thiourea present. Thiourea is an inhibitor of urease. Curve **B** on the graph shows these results.



- (a) Explain the shape of curve **A**.

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(2 marks)

(b) Explain how thiourea inhibits urease, using evidence from the graph to support your answer.

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(4 marks)

(c) The rate of reaction was determined by measuring the change in pH. The temperature was kept constant in all the reaction tubes. Give **one** other factor which should be kept constant. Explain your answer.

Factor

Reason

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(2 marks)

8

Turn over for the next question

Turn over ►

Answer **Question 7** in continuous prose.
Quality of Written Communication will be assessed in these answers.

7 (a) Explain what is meant by an *unsaturated* fatty acid.

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(2 marks)

(b) Explain the role of phospholipids in the structure and functioning of cell membranes.

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(4 marks)

(c) Describe the processes involved in the digestion of triglycerides and the absorption of the products of this digestion in the small intestine.

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(6 marks)

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END OF QUESTIONS

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