Surname		Other Names	
Centre Number			Candidate Number									
Candidate Signature												

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General Certificate of Education
June 2003
Advanced Subsidiary Examination

ASSESSMENT and QUALIFICATIONS ALLIANCE

BIOLOGY (SPECIFICATION B) BYB1
Unit 1 Core Principles

Monday 2 June 2003 Morning Session

In addition to this paper you will require:
- a ruler with millimetre measurements.

You may use a calculator.

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 in the spaces provided. All working must be shown.
- Do all rough work in this book. Cross through any work you do not want marked.

Information
- The maximum mark for this paper is 54.
- Mark allocations are shown in brackets.
- Answers for **Questions 1** to **7** are expected to be short and precise.
- **Question 8** should be answered in continuous prose. Quality of Written Communication will be assessed in the answer. You will be awarded up to 1 mark for your ability to use an appropriate form and style of writing, to organise relevant information clearly and coherently, and to use specialist vocabulary, where appropriate. The legibility of your handwriting and the accuracy of your spelling, punctuation and grammar will also be taken into account.

For Examiner's Use			
Number	Mark	Number	Mark
1			
2			
3			
4			
5			
6			
7			
8			
QWC			
Total (Column 1) →			
Total (Column 2) →			
TOTAL			
Examiner's Initials			

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

1 The table shows the results of biochemical tests on substances found in food.

Substance	Colour with Benedict's solution test	Colour with iodine solution test	Colour with biuret test	Appearance with emulsion test
A	Blue	Yellow-brown	Violet	Clear
B	Blue	Yellow-brown	Blue	Milky
C	Brick-red	Yellow-brown	Blue	Clear
D	Blue	Yellow-brown	Blue	Clear

(a) Identify substances **A**, **B** and **C**.

A .....

B .....

C .....

(3 marks)

(b) Describe a further biochemical test to find out if substance **D** is a non-reducing sugar.

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(2 marks)

(c) Name the chemical elements in a non-reducing sugar.

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(1 mark)

6

2 **Figure 1** shows apparatus used to separate amino acids by chromatography.

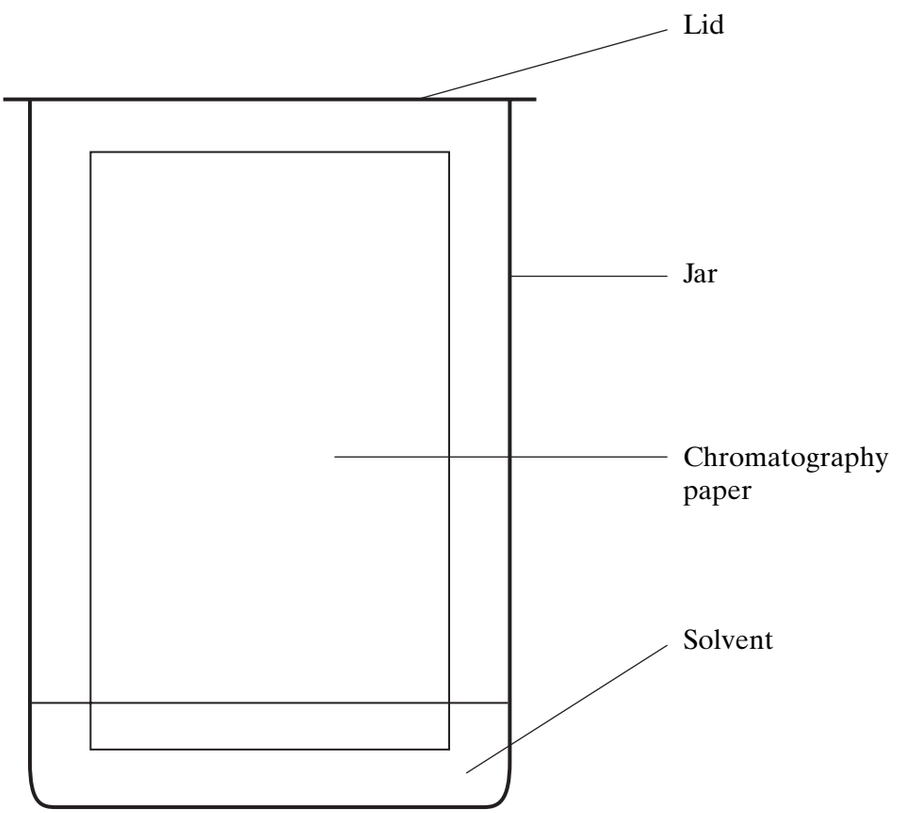

Figure 1

(a) Describe how you would apply a solution containing a mixture of amino acids to the chromatography paper before it is placed in the jar.

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(3 marks)

QUESTION 2 CONTINUES ON THE NEXT PAGE

Turn over ▶

(b) **Figure 2** shows a chromatogram produced in the apparatus.

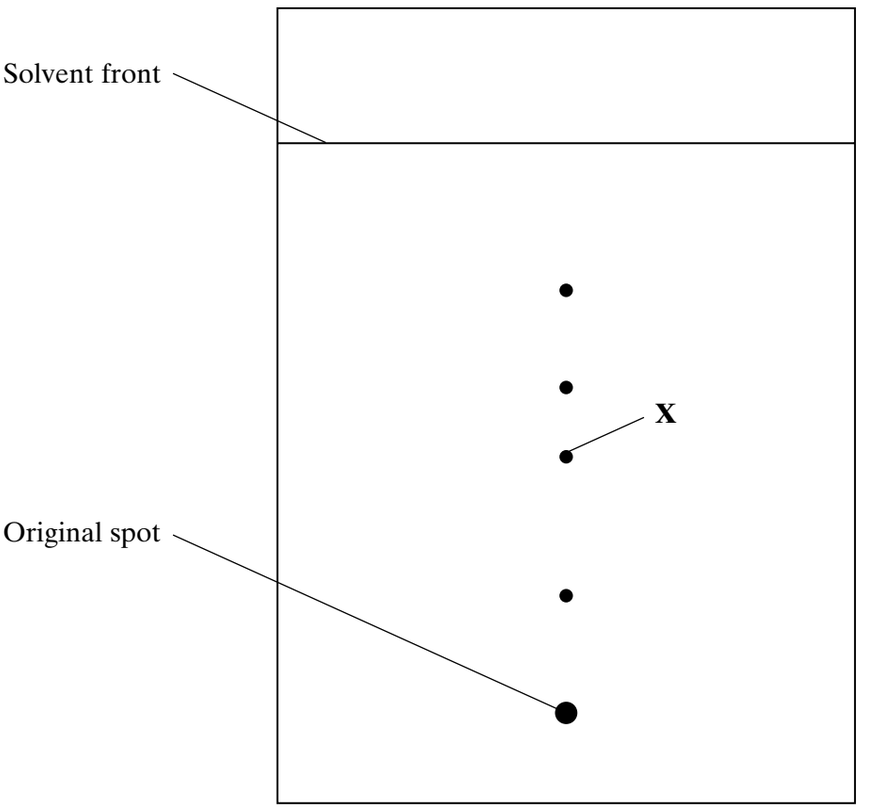

Figure 2

The table shows Rf values for some amino acids.

Amino acid	Rf value
Alanine	0.38
Arginine	0.20
Phenylalanine	0.68
Threonine	0.35
Tyrosine	0.45

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Identify amino acid **X**. Explain how you got your answer.

Amino acid **X** is .....

Explanation.

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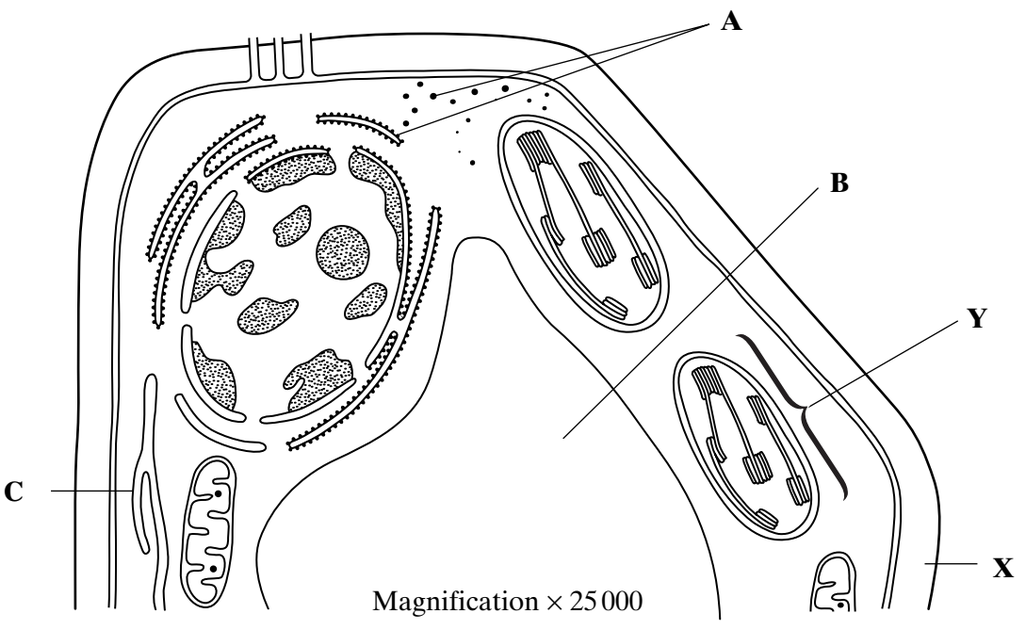
(2 marks)

5

TURN OVER FOR THE NEXT QUESTION

3 The diagram shows part of a plant cell as seen through an electron microscope.



(a) Name organelles **A**, **B** and **C**.

A .....

B .....

C .....

(3 marks)

(b) Give the function of

(i) structure **X**;

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(ii) structure **Y**.

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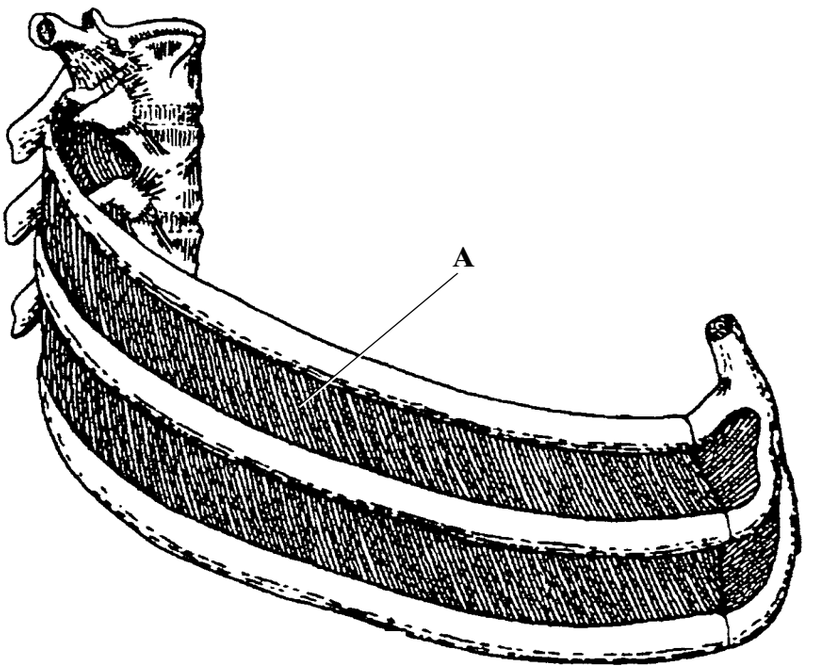
(2 marks)

(c) Calculate the width of the structure labelled **X** in micrometres.
Show your working.

Width .....micrometres (μm) *(2 marks)*

4 The drawing shows some of the structures involved in ventilating human lungs.



(a) Name structure **A** .....

(1 mark)

(b) (i) Describe the role of structure **A** in inspiration.

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(3 marks)

(ii) Explain how ventilation increases the rate of gas exchange in the alveoli.

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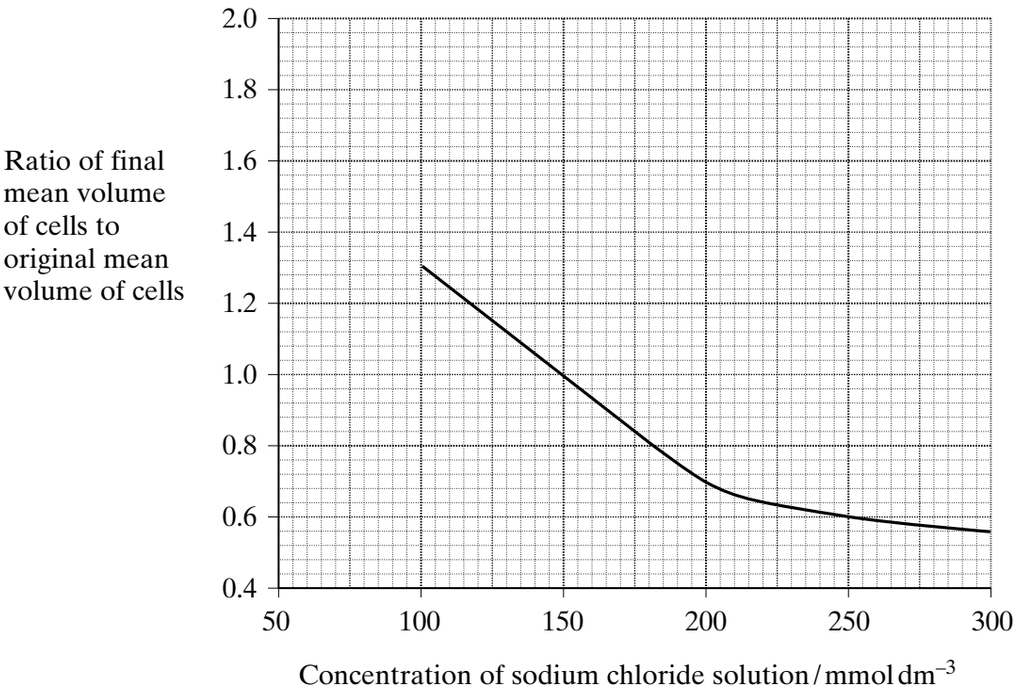
(2 marks)

Turn over ▶

5 Red blood cells were left for the same length of time in sodium chloride solutions of different concentrations. The final mean volume of the red cells was then compared with the original mean volume. The results are shown in the graph.



(a) Use the terms isotonic, hypotonic or hypertonic to explain the results for red cells placed in a sodium chloride solution of concentration

(i) 100 mmol dm^{-3};

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(ii) 150 mmol dm^{-3}.

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(4 marks)

(b) No intact cells could be seen in the 50 mmol dm^{-3} sodium chloride solution at the end of the experiment. Only fragments of membranes could be found.
Explain why.

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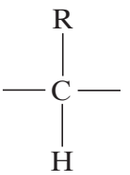
(1 mark)

5

TURN OVER FOR THE NEXT QUESTION

6 (a) Complete the structural formula of the amino acid molecule.



(2 marks)

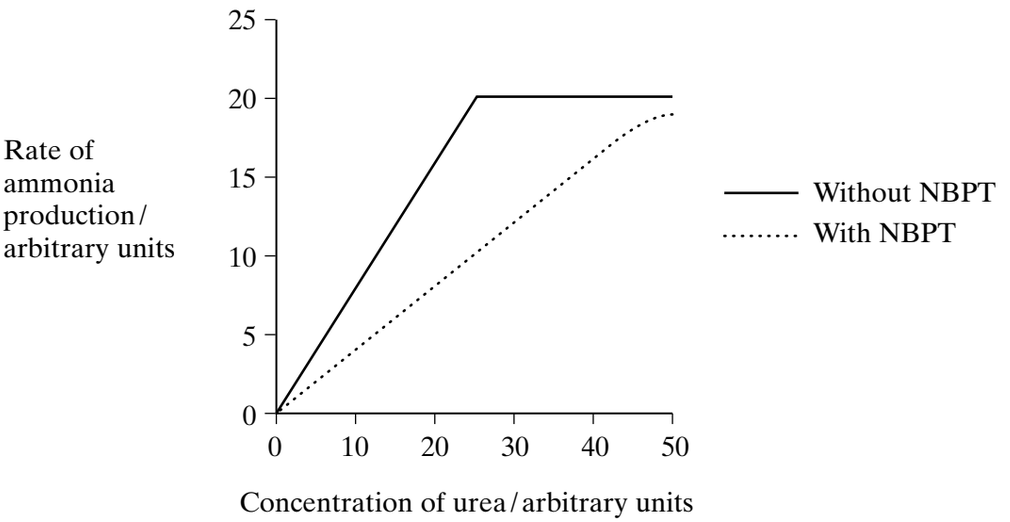
(b) In mammals, amino acids are broken down and urea is formed.

Urea from animal waste is often used as a natural fertiliser. Soil bacteria secrete an enzyme called urease that breaks down urea into ammonia and carbon dioxide. Some of this ammonia is released into the atmosphere.

urea + water $\rightarrow$ carbon dioxide + ammonia

Scientists have studied this reaction because it results in the loss of fertiliser. They have produced a substance called NBPT which is added to urea fertiliser.

NBPT is an enzyme inhibitor which affects the action of the urease produced by soil bacteria. The graph shows the results of an experiment in which a standard amount of urease and of the enzyme inhibitor NBPT were added to different concentrations of urea solution.



Describe and explain the effect on the rate of the reaction of increasing the urea concentration

(i) without NBPT present;

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(ii) with NBPT present.

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(6 marks)

8

TURN OVER FOR THE NEXT QUESTION

7 Some South American earthworms seem to have attained the maximum size allowed by the laws of physics and physiology for land-dwelling earthworms. They are about 2.5 cm in diameter and 2 m in length.

Earthworms obtain their oxygen by diffusion through the skin. The maximum amount of oxygen that can enter the bloodstream is 0.06 cm^3 of oxygen per cm^3 of worm per hour.

Assuming the worm is moderately active, this is just sufficient to meet the respiratory needs of an earthworm 2.5 cm in diameter.

(a) Apart from the number of blood vessels, explain **one** way in which an earthworm's skin is adapted for efficient gas exchange.

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(2 marks)

(b) Oxygen diffuses through the whole surface of an earthworm's skin.
Calculate the maximum volume of oxygen absorbed in one hour by a worm 1 m in length and 2.5 cm in diameter. Assume that the shape of the worm is a perfect cylinder. The formula for the volume of a cylinder is $\pi r^2 l$ where r is the radius of the cylinder and l its length. Show your working. ($\pi = 3.14$)

Volume of oxygen .....cm^3

(2 marks)

(c) Some aquatic worms have "feathery" external gills, richly supplied with blood vessels. Explain how these gills increase the theoretical maximum size attainable by an aquatic worm.

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(2 marks)

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Answers to **Question 8** should be written in continuous prose.
Quality of Written Communication will be assessed in the answer.

8 (a) Describe the digestion of triglycerides in the human gut.

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(4 marks)

QUESTION 8 CONTINUES ON THE NEXT PAGE

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(b) Describe and explain the roles of diffusion, facilitated diffusion and active transport in the absorption of digested food by the ileum.

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(6 marks)

10

END OF QUESTIONS

QWC

1