

Surname						Other Names					
Centre Number						Candidate Number					
Candidate Signature											

Leave blank

General Certificate of Education
 January 2003
 Advanced Subsidiary Examination



BIOLOGY (SPECIFICATION B)
Unit 1 Core Principles

BYB1

Thursday 9 January 2003 Morning Session

In addition to this paper you will require:

- a ruler with millimetre measurements.

You may use a calculator.

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			

Time allowed: 1 hour 15 minutes

Instructions

- Use blue or black ink or ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions in **Section A** and **Section B** 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.

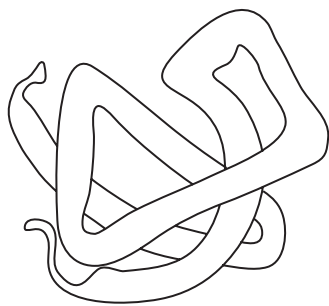
Information

- The maximum mark for this paper is 66.
- Mark allocations are shown in brackets.
- Answers for **Section A** are expected to be short and precise.
- Questions in **Section B** should be answered in continuous prose where appropriate. Quality of Written Communication will be assessed in these answers.
- In addition to the mark allocations indicated within **Section B**, 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 degree of legibility of your handwriting and the level of accuracy of your spelling, punctuation and grammar will also be taken into account.

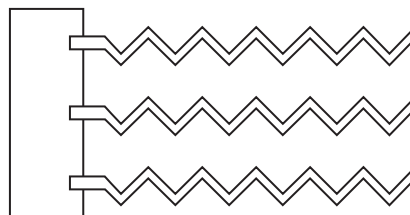
SECTION A

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

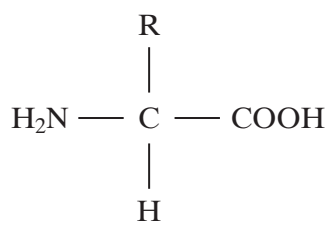
1 The diagrams show five molecules **A** to **E**.



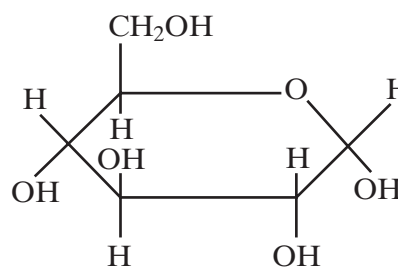
A



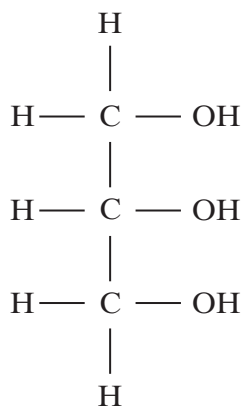
B



C



D



E

Which molecule, **A** to **E**,

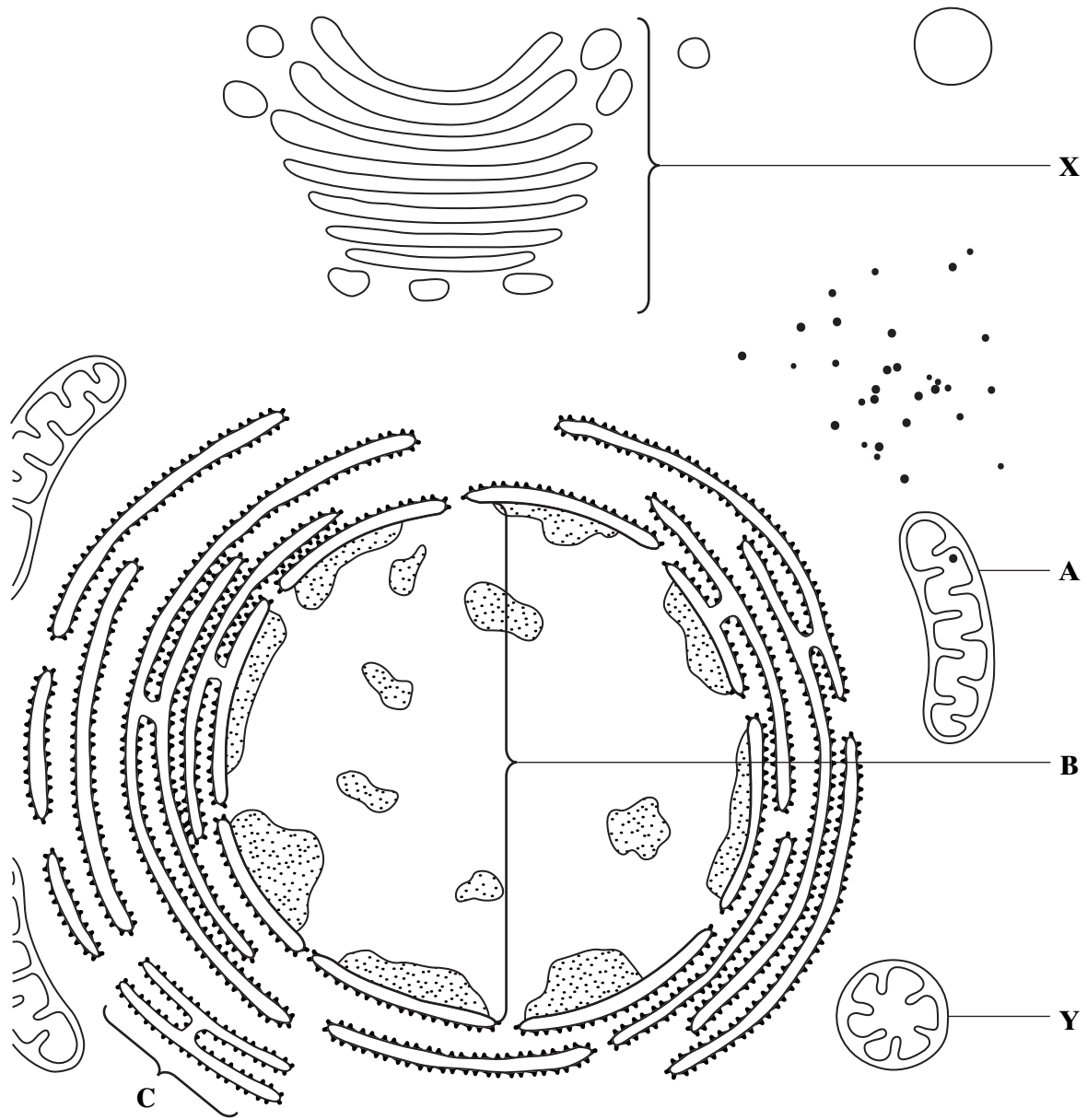
- (a) is one of the monomers which combine to form starch;
- (b) contains peptide bonds;
- (c) could be an oil;
- (d) is one of the molecules that form a triglyceride?

(4 marks)

Turn over ►

4

2 The diagram shows part of an animal cell as seen through an electron microscope.



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

A

B

C

(3 marks)

(b) Describe the function of organelle X.

.....

.....

.....

.....

(2 marks)

(c) The actual diameter of organelle Y is $0.5\mu\text{m}$.

Calculate the magnification of the diagram. Show your working.

Magnification.....

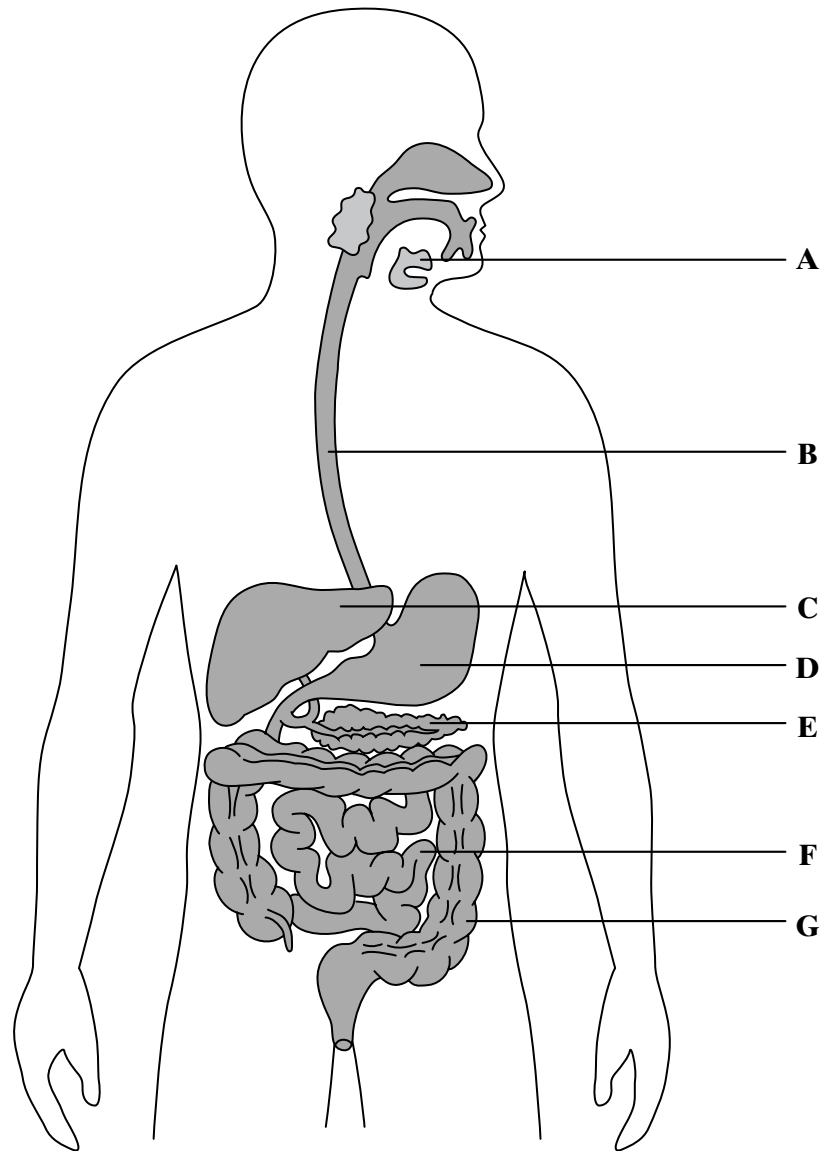
(2 marks)

$$\frac{\quad}{7}$$

TURN OVER FOR THE NEXT QUESTION

Turn over 

3 The diagram shows the human digestive system.



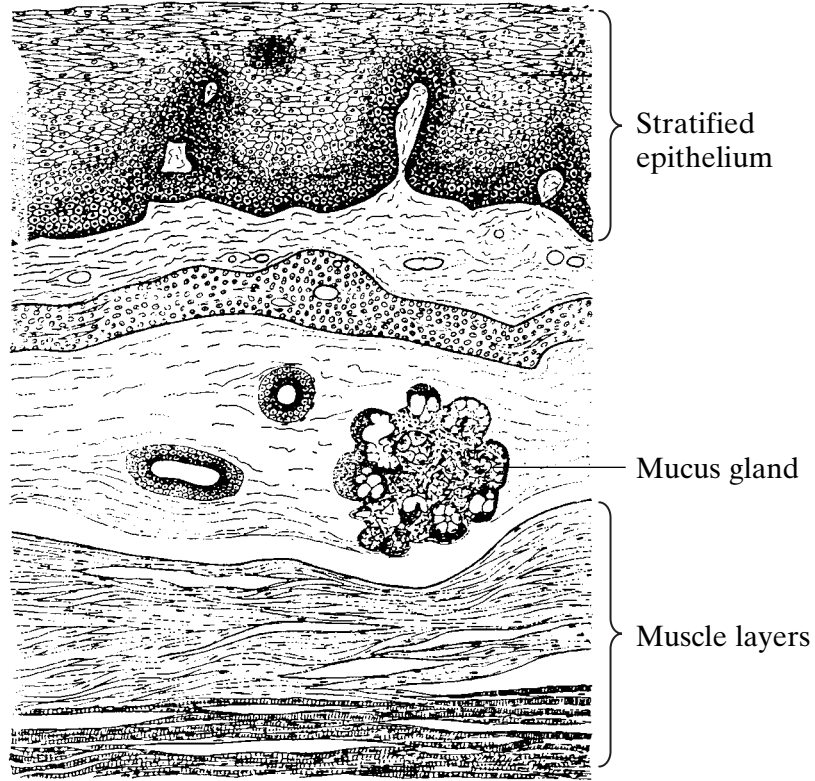
(a) Give the letter of **one** organ where each of the following is produced:

(i) amylase;.....

(ii) exopeptidases.

(2 marks)

(b) The drawing shows a section through the oesophagus wall.



(i) Describe how each of the following helps the oesophagus to carry out its function.

Stratified epithelium

.....

.....

Muscle layers

.....

.....

(2 marks)

(ii) Stratified epithelium is described as a tissue.

Explain what is meant by a *tissue*.

.....

.....

.....

.....

(2 marks)

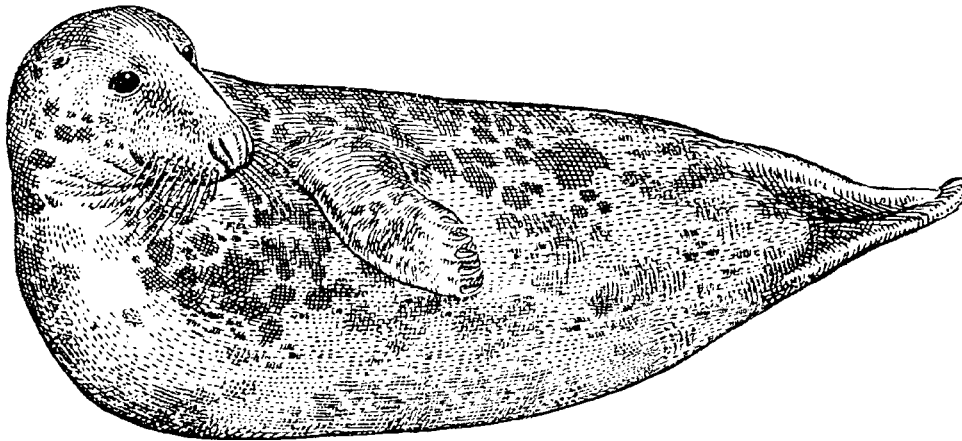
Turn over ▶

- 4 (a) What is the relationship between the size of mammals and their surface area : volume ratio?

.....
.....

(1 mark)

- (b) The drawings show two species of seal, X and Y.



Seal X



Seal Y

Seal **X** is a mammal that lives in the very cold seas of the Arctic.

It grows to a length of 2.5 m and a mass of 400 kg.

Seal **Y** is much smaller than seal **X** and lives in warmer seas.

Use the drawings (opposite) and the above information to explain **two** ways in which seal **X** is adapted for surviving in very cold conditions.

1

.....

.....

2

.....

.....

(4 marks)



TURN OVER FOR THE NEXT QUESTION

Turn over

5 (a) Give **three** factors that would result in a high rate of diffusion of molecules of a gas such as carbon dioxide through a membrane.

1

2

3

(3 marks)

(b) Scientists investigated the rate of diffusion of carbon dioxide through holes of different diameter in an artificial membrane. The table shows some of their results.

Diameter of hole / mm	Volume of carbon dioxide diffusing per hour / cm ³	Volume of carbon dioxide diffusing per cm ² of hole per hour / cm ³
22.70	0.24	0.06
12.06	0.10	0.09
6.03	0.06	0.22
3.23	0.04	0.48
2.00	0.02	0.76

Give **two** conclusions that may be drawn from these data.

1

.....

.....

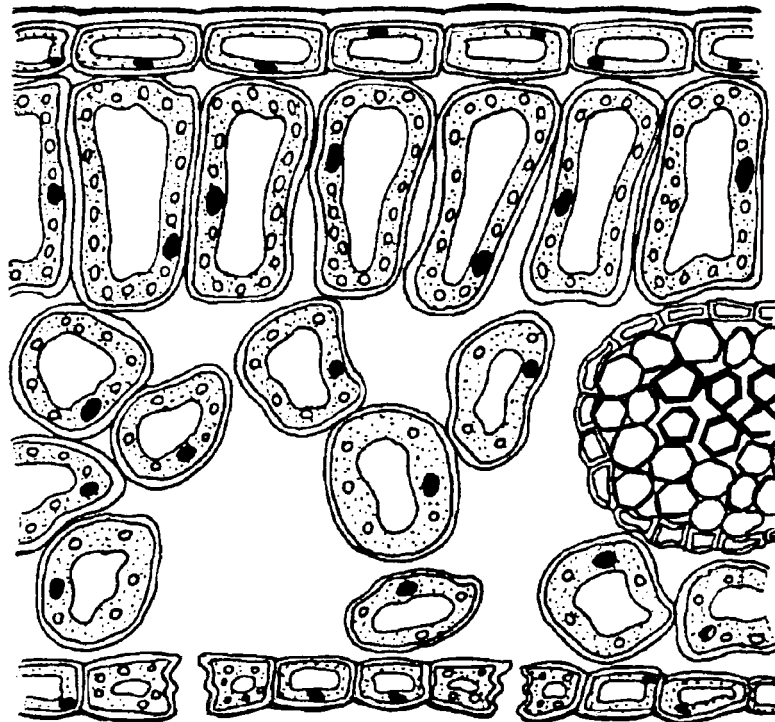
2

.....

.....

(2 marks)

- (c) The diagram shows a section through a leaf.
Annotate the diagram to explain **two** ways in which the leaf is adapted for gas exchange.



(2 marks)

7

Turn over 

6 (a) Describe osmosis in terms of water potential.

.....

.....

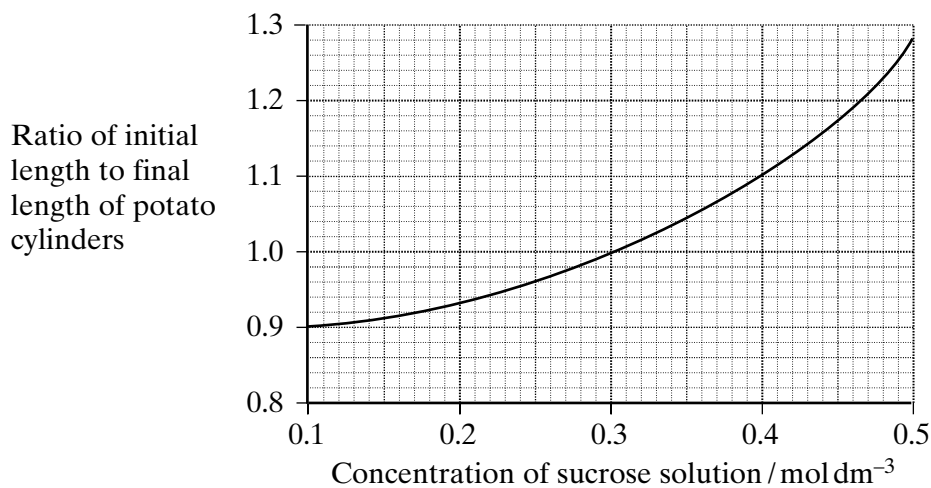
.....

.....

(3 marks)

(b) In an experiment, cylinders cut from a potato were placed in sucrose solutions of different concentrations. The cylinders were measured before and after immersion in sucrose solution.

The graph shows the effect of the sucrose solutions on the length of the potato cylinders.



(i) The initial length of the potato cylinder in 0.1 mol dm⁻³ sucrose solution was 5.0 cm. Calculate the final length of this cylinder. Show your working.

Final lengthcm
(2 marks)

(ii) On the graph

- 1 mark with a **T** a point on the curve where the potato cells are turgid;
- 2 mark with a **W** a point on the curve where the potato cells have the same water potential as the sucrose solution.

(2 marks)

7

SECTION B

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

Questions should be answered in continuous prose, where appropriate.
Quality of Written Communication will be assessed in these answers.

7 (a) (i) Describe the process by which cellulose is formed from monosaccharides.

.....
.....
.....
.....

(2 marks)

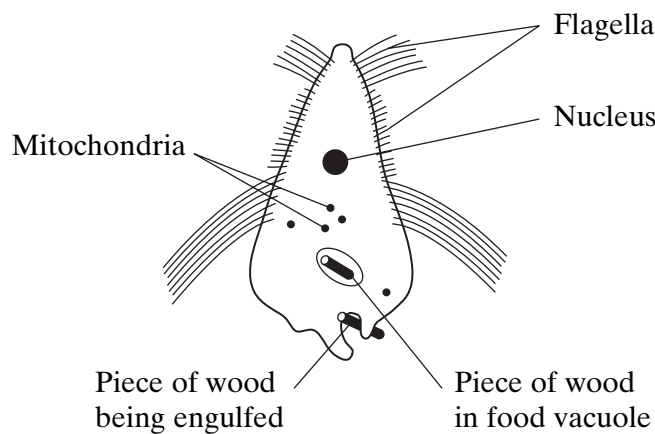
(ii) Explain **one** way in which the structure of a cellulose molecule is related to its function.

.....
.....
.....
.....

(2 marks)

Termites are insects which live together in a large colony. Their main food is cellulose which they obtain by eating wood and other plant material. This cellulose is digested by single-celled organisms such as *Trichonympha* which live in the termite gut.

The diagram shows *Trichonympha*.



(b) (i) Suggest **one** function of the flagella of *Trichonympha*.

.....

.....

(1 mark)

(ii) Describe the similarities and differences between the structure of *Trichonympha* and the structure of all prokaryotic cells.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(5 marks)

Trichonympha secrete enzymes that break down cellulose into simple sugars. The termites depend entirely on *Trichonympha* for cellulose digestion and would starve without them. Termites secrete hydrolytic enzymes into the gut.

(c) Explain why these hydrolytic enzymes cannot break down cellulose whereas some hydrolytic enzymes secreted by *Trichonympha* can.

.....

.....

.....

.....

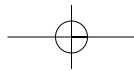
.....

.....

(3 marks)

QUESTION 7 CONTINUES ON THE NEXT PAGE

Turn over 



Worker termites feed the entire colony. They transfer food to other termites by two methods, mouth feeding and anal feeding. *Trichonympha* live in the end section of the termite gut (hind gut). In mouth feeding, the workers regurgitate chewed wood for other termites to feed on. In anal feeding, droplets of the contents of the hindgut are passed out of the anus for other termites to feed on. Newly hatched worker termites are fed by anal feeding.

(d) Suggest **two** advantages to the young termites of receiving food by anal feeding rather than by mouth feeding.

1

.....

.....

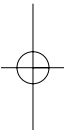
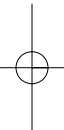
2

.....

.....

(2 marks)

15



- 8 (a) Many reactions take place in living cells at temperatures far lower than those required for the same reactions in a laboratory.
Explain how enzymes enable this to happen.

.....
.....
.....
.....
.....
.....

(3 marks)

An amylase enzyme converts starch to maltose syrup which is used in the brewing industry.

- (b) Describe a biochemical test to identify

- (i) starch;

.....
.....
.....
.....

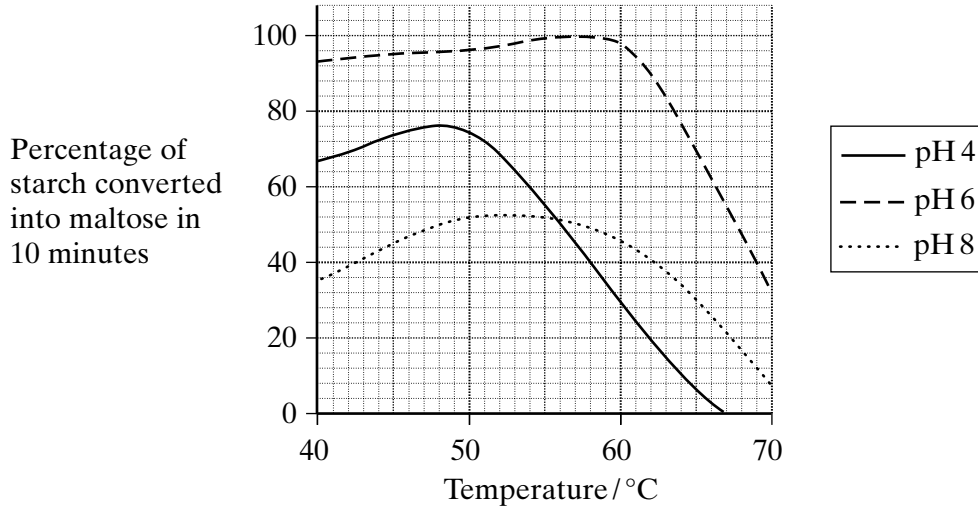
(2 marks)

- (ii) a reducing sugar such as maltose.

.....
.....
.....
.....

(2 marks)

- (c) The graph shows the results of tests to determine the optimum temperature for the activity of this amylase.



- (i) Complete the table for the optimum temperature for the activity of amylase at each pH value.

	pH		
	4	6	8
Optimum temperature / °C			

(1 mark)

QUESTION 8 CONTINUES ON THE NEXT PAGE

Turn over

(ii) Describe and explain the effect of temperature on the rate of reaction of this enzyme at pH 4.

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

(6 marks)

$\frac{\quad}{14}$

END OF QUESTIONS

QWC

$\frac{\quad}{1}$

ACKNOWLEDGEMENT OF COPYRIGHT-HOLDER

Question 3(b) From An Atlas of Histology by Freeman & Bracegirdle. Reprinted by permission of Elsevier Science.