

New  
Specification



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ADVANCED SUBSIDIARY (AS)  
General Certificate of Education  
2009

StudentBounty.com

Centre Number  
71

Candidate Number

## Biology

### Assessment Unit AS 1

*assessing*

### Module 1: Cell Biology

[AB111]



MONDAY 1 JUNE, AFTERNOON

#### TIME

1 hour 30 minutes.

#### INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

Write your answers in the spaces provided in this question paper.

Write your answer to Section B on the lined paper at the end of this booklet.

Answer **all eight** questions.

You are provided with **Photograph 1.5** for use with Question 5 in this paper.

Do not write your answers on this photograph.

#### INFORMATION FOR CANDIDATES

The total mark for this paper is 75.

Section A carries 60 marks. Section B carries 15 marks.

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

You are reminded of the need for good English and clear presentation in your answers.

Use accurate scientific terminology in all answers.

You should spend approximately **20 minutes** on Section B.

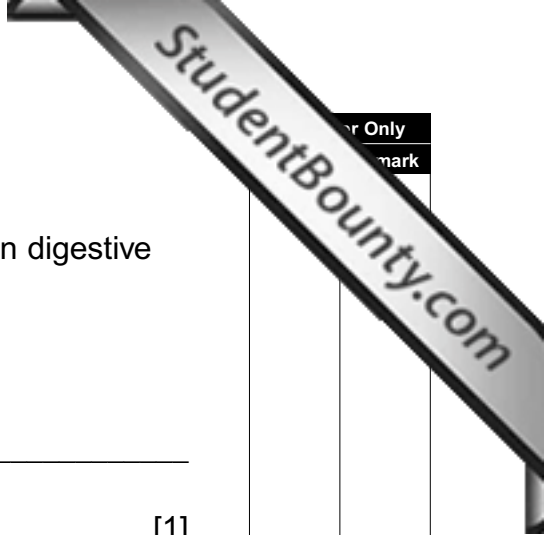
You are expected to answer Section B in continuous prose.

Quality of written communication will be assessed in **Section B**, and awarded a maximum of 2 marks.

| For Examiner's use only |       |
|-------------------------|-------|
| Question Number         | Marks |
| 1                       |       |
| 2                       |       |
| 3                       |       |
| 4                       |       |
| 5                       |       |
| 6                       |       |
| 7                       |       |
| 8                       |       |

|             |  |
|-------------|--|
| Total Marks |  |
|-------------|--|

**Section A**



er Only  
mark

**1** The ileum is an organ which makes up part of the mammalian digestive system.

**(a) (i)** Why can the ileum be described as an organ?

\_\_\_\_\_  
\_\_\_\_\_ [1]

**(ii)** Why can the digestive system be described as a system?

\_\_\_\_\_  
\_\_\_\_\_ [1]

**(b)** Describe the role of the following structures in the functioning of the ileum.

- muscularis mucosa

\_\_\_\_\_  
\_\_\_\_\_

- goblet cells

\_\_\_\_\_  
\_\_\_\_\_

- muscularis externa

\_\_\_\_\_  
\_\_\_\_\_

[3]

2  $\alpha$ -glucose molecules can be linked together to form the helical and branched polysaccharide, amylopectin

(a) State what type of reaction occurs when one glucose molecule bonds with another glucose molecule.

\_\_\_\_\_ [1]

(b) State which carbon atoms in adjacent glucose molecules are linked to produce a branch in amylopectin.

\_\_\_\_\_ [1]

(c) Describe an advantage of amylopectin having many branches.

\_\_\_\_\_ [1]

(d) Name another branched polysaccharide.

\_\_\_\_\_ [1]

(e) (i) Name a biochemical test that could be used to distinguish glucose from polysaccharide molecules.

\_\_\_\_\_ [1]

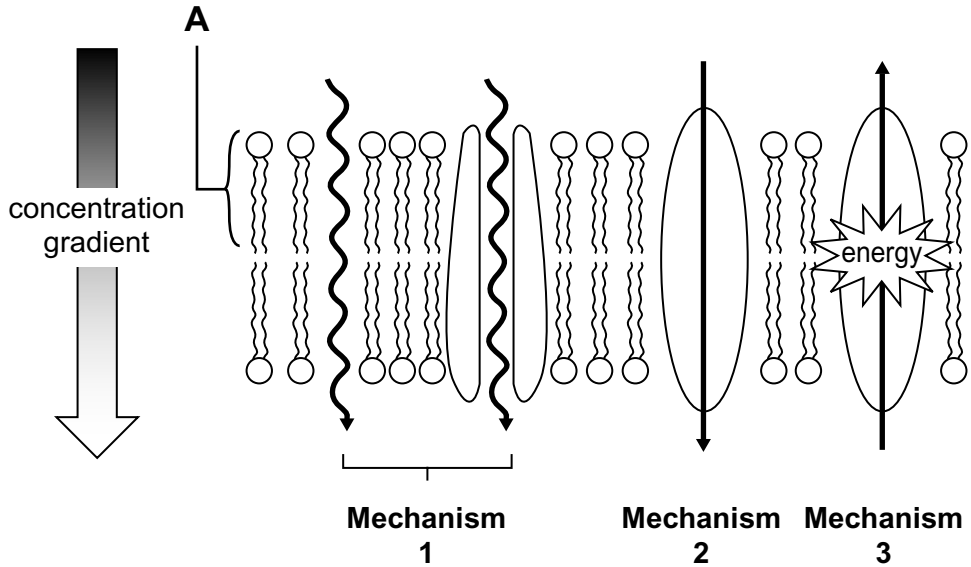
(ii) Describe the biochemical test you have named.

\_\_\_\_\_  
\_\_\_\_\_ [1]

(iii) Describe the result of the above test that would allow you to distinguish glucose from polysaccharides.

\_\_\_\_\_  
\_\_\_\_\_ [1]

3 The diagram below represents the fluid mosaic model of membrane structure and three mechanisms (labelled 1, 2 and 3) by which substances may move across the membrane. The concentration gradient across the membrane is also shown.



(a) Identify the structure labelled A.

\_\_\_\_\_ [1]

(b) Identify each mechanism of membrane transport and, in each case, give a reason for your identification.

(i) Mechanism 1

Identification \_\_\_\_\_

Reason \_\_\_\_\_

\_\_\_\_\_ [2]

(ii) Mechanism 2

Identification \_\_\_\_\_

Reason \_\_\_\_\_

\_\_\_\_\_ [2]

(iii) Mechanism 3

Identification \_\_\_\_\_

Reason \_\_\_\_\_

\_\_\_\_\_ [2]

(c) Mechanism 1 involves two different paths across the membrane. Explain why there are two paths for this mechanism of membrane transport.

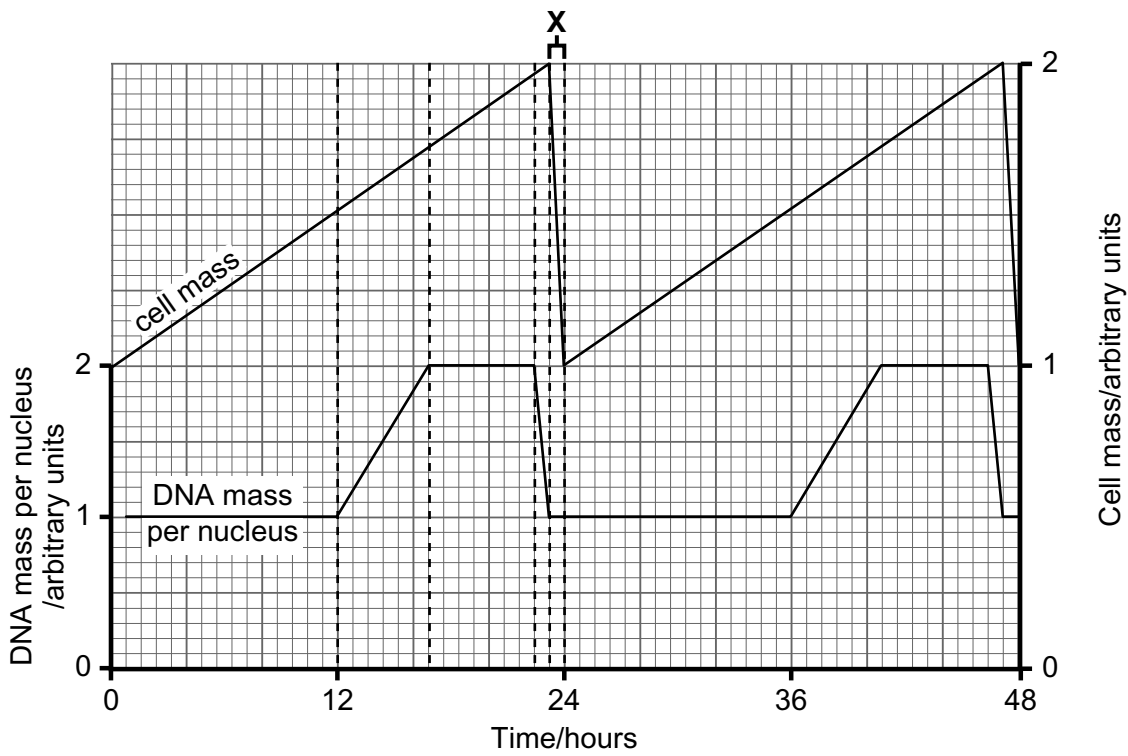
\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_ [2]

4 The graph below shows changes in both cell mass and DNA mass per nucleus during several mitotic cell cycles in a mammalian embryo.



(a) Between which times shown on the graph does the G<sub>1</sub> phase (first growth phase) occur during the first cell cycle?

\_\_\_\_\_ [1]

(b) State what is occurring during the phase indicated by X on the graph.

\_\_\_\_\_ [1]

(c) Explain the changes in the DNA mass per nucleus during one cell cycle.

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_ [3]

(d) The DNA mass per nucleus during a **meiotic** cell cycle follows a similar pattern to that shown opposite, but with one major difference. Describe and explain this difference.

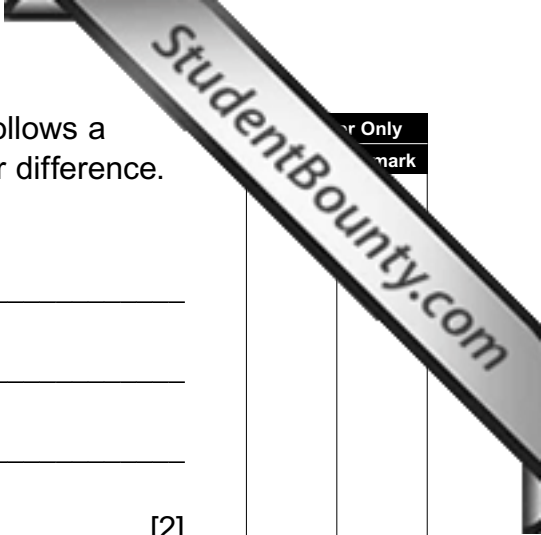
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[2]



er Only  
mark

5 **Photograph 1.5** is an electron micrograph showing part of two neighbouring plant cells.

(a) Identify the features labelled **A** to **D**.

**A** \_\_\_\_\_

**B** \_\_\_\_\_

**C** \_\_\_\_\_

**D** \_\_\_\_\_ [4]

(b) The magnification of the photograph is  $\times 32\,000$ . Calculate the actual diameter (in  $\mu\text{m}$ ) of the organelle along the line **XY** in the photograph. (Show your working in the space below.)

Answer \_\_\_\_\_ [2]

(c) Suggest **one** piece of evidence visible in the photograph that would suggest that these cells are from the spongy mesophyll layer of a leaf.

\_\_\_\_\_

\_\_\_\_\_ [1]



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**(Questions continue overleaf)**

- 6 An experiment was undertaken to investigate the effect of pH on two proteolytic enzymes, enzyme 1 and enzyme 2. Cubes of protein, each of 200mg mass, were placed in solutions of each enzyme at different pHs, and the time taken for the protein to be digested was measured. The results are shown in the table below.

| pH of reaction mixture | Time for protein to be digested/minutes |          |
|------------------------|---|----------|
|                        | Enzyme 1                                | Enzyme 2 |
| 1                      | 80                                      | –        |
| 2                      | 50                                      | –        |
| 3                      | 7                                       | –        |
| 4                      | 55                                      | 80       |
| 5                      | 72                                      | 65       |
| 6                      | 80                                      | 52       |
| 7                      | –                                       | 32       |
| 8                      | –                                       | 20       |
| 9                      | –                                       | 42       |
| 10                     | –                                       | 71       |
| 11                     | –                                       | 80       |

- (a) Plot the above data, using the most appropriate graphical technique. (Use the graph paper opposite.) [6]

- (b) (i) Suggest how the pH in each reaction mixture would have been maintained.

\_\_\_\_\_ [1]

- (ii) State **one** factor that should have been controlled in the experiment and explain the influence of that factor on enzyme activity.

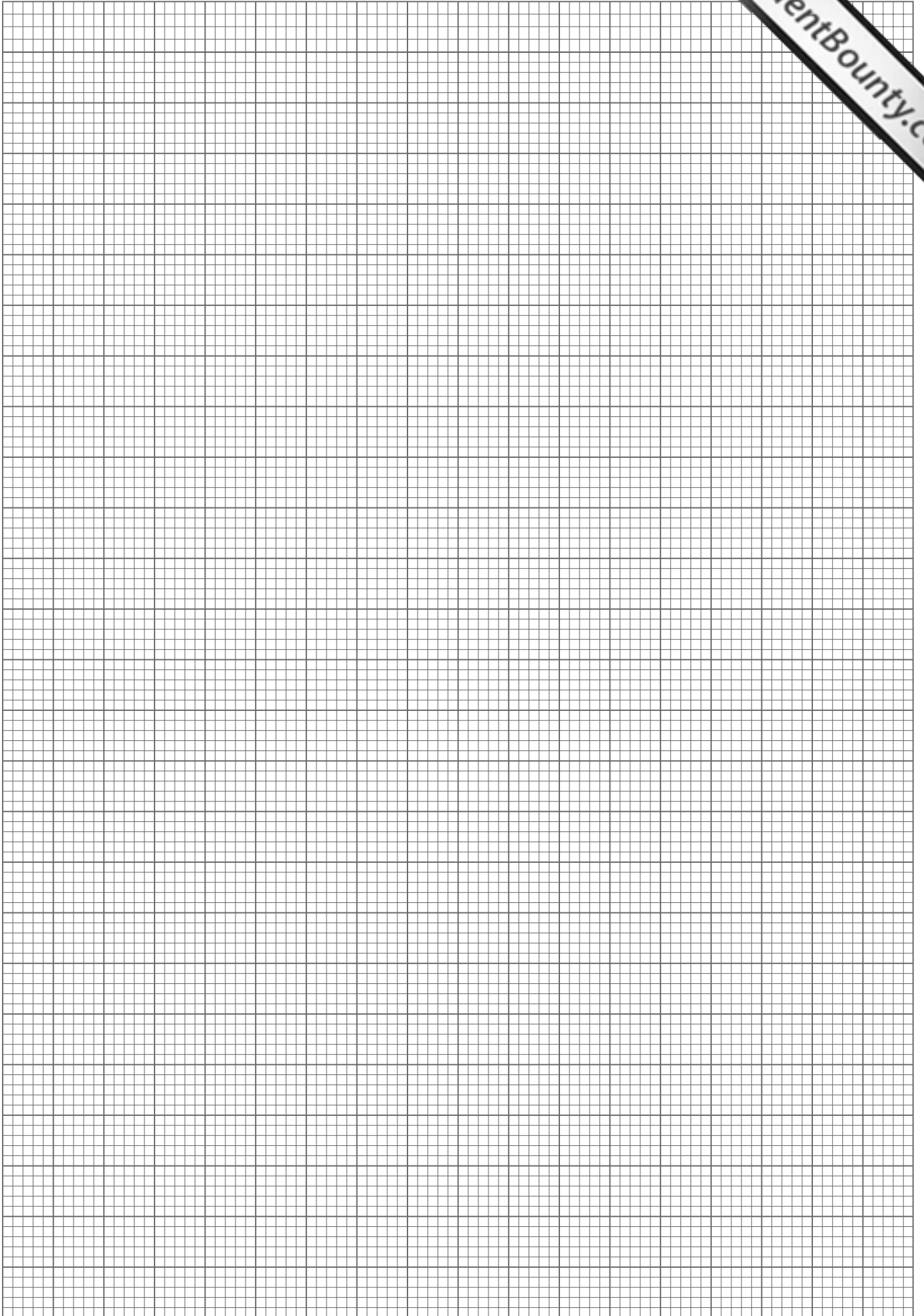
Factor \_\_\_\_\_

Influence \_\_\_\_\_

\_\_\_\_\_ [2]

- (c) Using the information in your graph, calculate the rate of reaction for enzyme 1 at pH 2 in units of  $\text{mg hour}^{-1}$ . (Show your working.)

Answer \_\_\_\_\_ [2]



(d) Which of the two enzymes would normally be found in the mammalian stomach? Explain your answer.

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[1]

(e) State the pH range over which both enzymes are active.

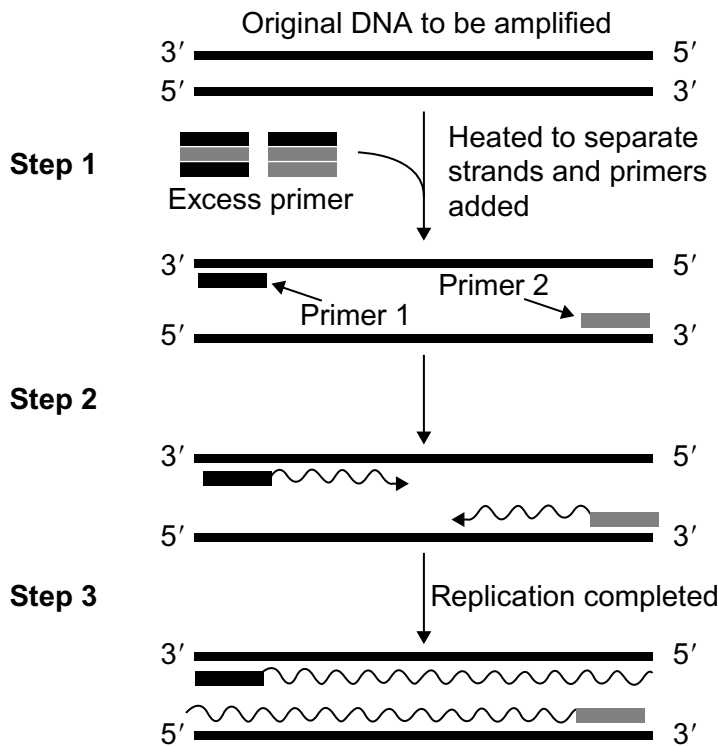
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[1]

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**(Questions continue overleaf)**

7 The diagram below represents the processes involved in the polymerase chain reaction (PCR). This technique allows forensic scientists to analyse and potentially match DNA samples left at the scene of a crime.



(a) What advantage does PCR offer to forensic scientists?

\_\_\_\_\_ [1]

(b) (i) In **step 1**, what is the purpose of heating the DNA sample to 95 °C?

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_ [2]

(ii) Primers, each containing roughly twenty bases are also added to the DNA sample in **step 1**. What is the purpose of these primers in the process?

\_\_\_\_\_  
 \_\_\_\_\_ [1]

(iii) Name the enzyme that would be added to the DNA sample in **step 2**.

\_\_\_\_\_ [1]

(iv) What else should be added to the process in **step 2** to allow successful replication of the DNA sample?

\_\_\_\_\_ [1]

(c) In **step 3**, replication of the DNA is completed. Describe the sequence of events, following the separation of the DNA strands in **step 1**, which lead to the DNA being replicated.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ [3]

The heating of the DNA sample to 95 °C in **step 1** could denature the enzymes involved.

(d) (i) Describe precisely how high temperatures could denature the enzymes.

\_\_\_\_\_  
\_\_\_\_\_ [1]

(ii) Suggest how scientists have solved this potential problem.

\_\_\_\_\_  
\_\_\_\_\_ [1]

(e) In some legal cases, the use of PCR has been discredited. Suggest **one** possible source of error in the PCR process.

\_\_\_\_\_  
\_\_\_\_\_ [1]









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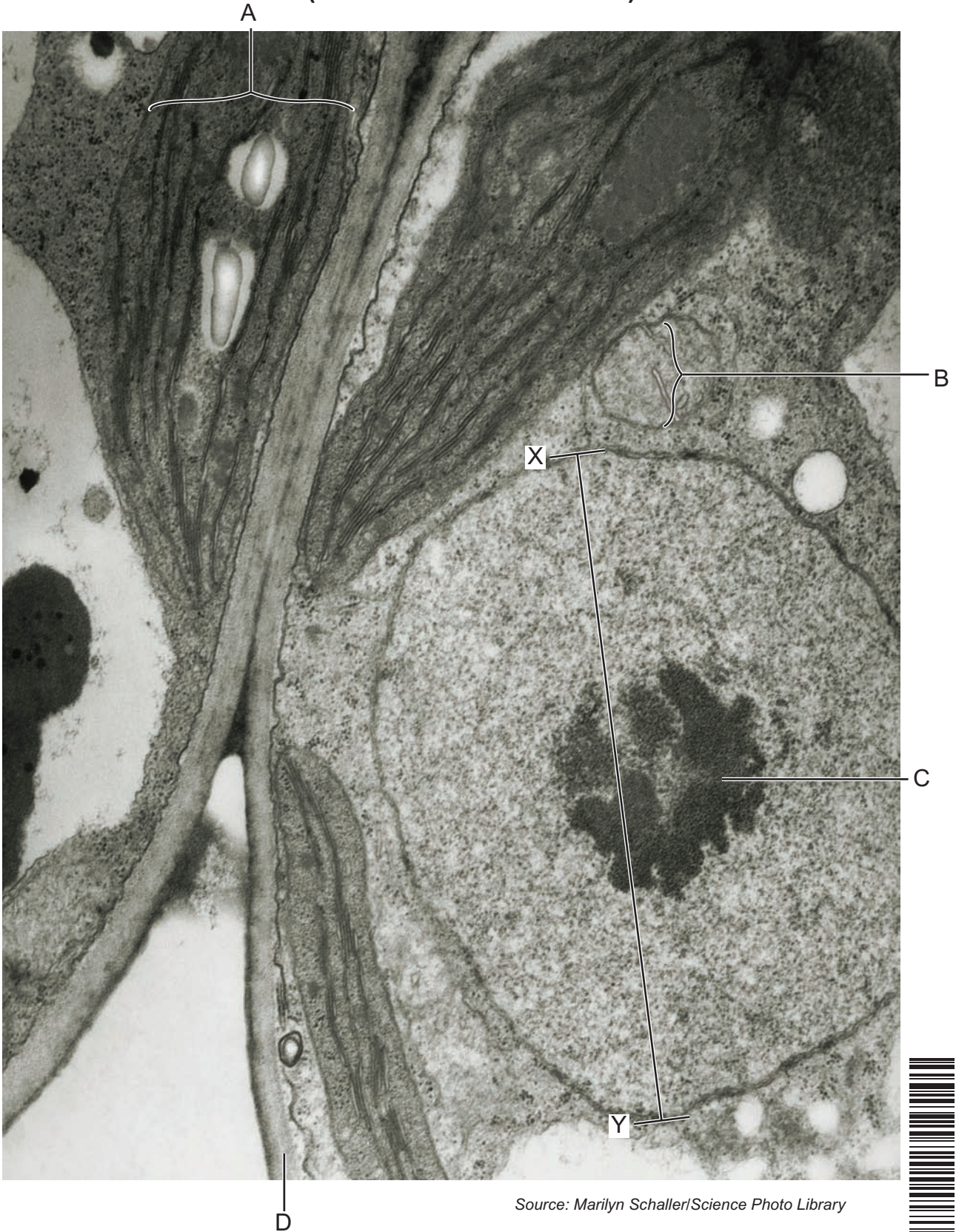
**THIS IS THE END OF THE QUESTION PAPER**

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Photograph 1.5

(For use with Question 5)



Source: Marilyn Schaller/Science Photo Library

