

**ADVANCED SUBSIDIARY GCE****BIOLOGY**

Practical Examination 1 (Part B – Practical Test)

**2803/03/TEST**

Candidates answer on the question paper

**OCR Supplied Materials:**

None

**Other Materials Required:**

- Candidate's Plan (Part A of the Practical Examination)
- Electronic calculator
- Ruler (cm/mm)

**Tuesday 12 May 2009****Afternoon****Duration: 1 hour 30 minutes**

Candidate Forename		Candidate Surname	
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Centre Number						Candidate Number				
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**INSTRUCTIONS TO CANDIDATES**

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided, however additional paper may be used if necessary.

**INFORMATION FOR CANDIDATES**

- The number of marks is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is **60**.
- In this Practical Test, you will be assessed on the Experimental and Investigative Skills:
  - Skill I: Implementing
  - Skill A: Analysing evidence and drawing conclusions
  - Skill E: Evaluating.
- You may use an electronic calculator.
- You are advised to show all the steps in any calculations.
- This document consists of **9** pages and a Report Form. Any blank pages are indicated.

FOR EXAMINER'S USE		
Qu.	Max.	Mark
<b>Planning</b>	<b>16</b>	
<b>1</b>	<b>30</b>	
<b>2</b>	<b>14</b>	
<b>TOTAL</b>	<b>60</b>	

Answer **all** the questions.

**Question 1** [65 minutes]

**You are required to investigate the effect of enzyme concentration on the rate of an enzyme-catalysed reaction.**

You will use a protease enzyme that catalyses the hydrolysis of proteins. Milk will be used as a source of protein. You are provided with a 1% solution of a protease enzyme and a 1% milk solution.

*Proceed as follows:*

- 1 Half fill a beaker with water to act as a water bath. Adjust its temperature to 35 °C (+/- 2 °C).

*Maintain the temperature of the water bath throughout this procedure.*

(If you use a Bunsen burner, note that the temperature of the water will continue to rise by a few °C after the burner is removed from beneath the beaker.)

- 2 Use the 5 cm<sup>3</sup> syringe to place 5 cm<sup>3</sup> of the 1% milk solution into each of the test-tubes labelled **A** to **G**.
- 3 Use a 1 cm<sup>3</sup> syringe to add 1 cm<sup>3</sup> distilled water to test-tube **B**.
- 4 Use a 1 cm<sup>3</sup> syringe to add 1 cm<sup>3</sup> protease solution to test-tube **A**.
- 5 Place all seven test-tubes, **A** to **G**, in the water bath.
- 6 Now read carefully steps **7** to **14** and draw up a table for your results and calculations in the space provided on page 4. Then proceed with step **7**.
- 7 Use the 1 cm<sup>3</sup> syringes to make up a range of concentrations of the protease solution in test-tubes **1** to **5** as shown in Table 1.1.

**Table 1.1**

test-tube	volume of distilled water / cm <sup>3</sup>	volume of 1% protease solution / cm <sup>3</sup>	concentration of protease / %
<b>1</b>	0.00	1.00	1.00
<b>2</b>	0.25	0.75	0.75
<b>3</b>	0.50	0.50	0.50
<b>4</b>	0.75	0.25	0.25
<b>5</b>	0.90	0.10	0.10

- 8 Shake test-tubes 1 to 5.
- 9 Remove test-tubes **A** and **B** from the water bath and observe the appearance of the contents. Record your observations in the space below. Replace the tubes in the water bath.
- A** .....
- B** .....
- 10 Remove test-tube **C** from the water bath. Pour the contents of test-tube **1** into test-tube **C**. Immediately start a stopwatch or stop clock and return the test-tube to the water bath.
- 11 Record the length of time for the cloudiness of the milk in test-tube **C** to disappear.
- 12 Repeat the procedure you followed in step **10** with the other concentrations of protease, e.g. pour the contents of test-tube **2** into test-tube **D**.

*You may find that you can set up two or three concentrations at the same time.*

- 13 Record in your table the reading from the stopwatch or stop clock when the cloudiness of the milk has disappeared. If there is no change in a test-tube after ten minutes, record this as 'no change'.
- 14 Convert the times into relative rates of enzyme activity using the following formula:

$$\text{relative rate of enzyme activity} = \frac{1000}{t} \text{ where } t = \text{time in seconds.}$$

If no change is recorded, assume that the relative rate of enzyme activity = 0.

- (a) Record your results for test-tubes **B** to **G** in a table below.

You **must** include the relative rates of enzyme activity that you have calculated.

- (b) Explain why test-tubes **A** and **B** were included in this investigation.

**A** .....

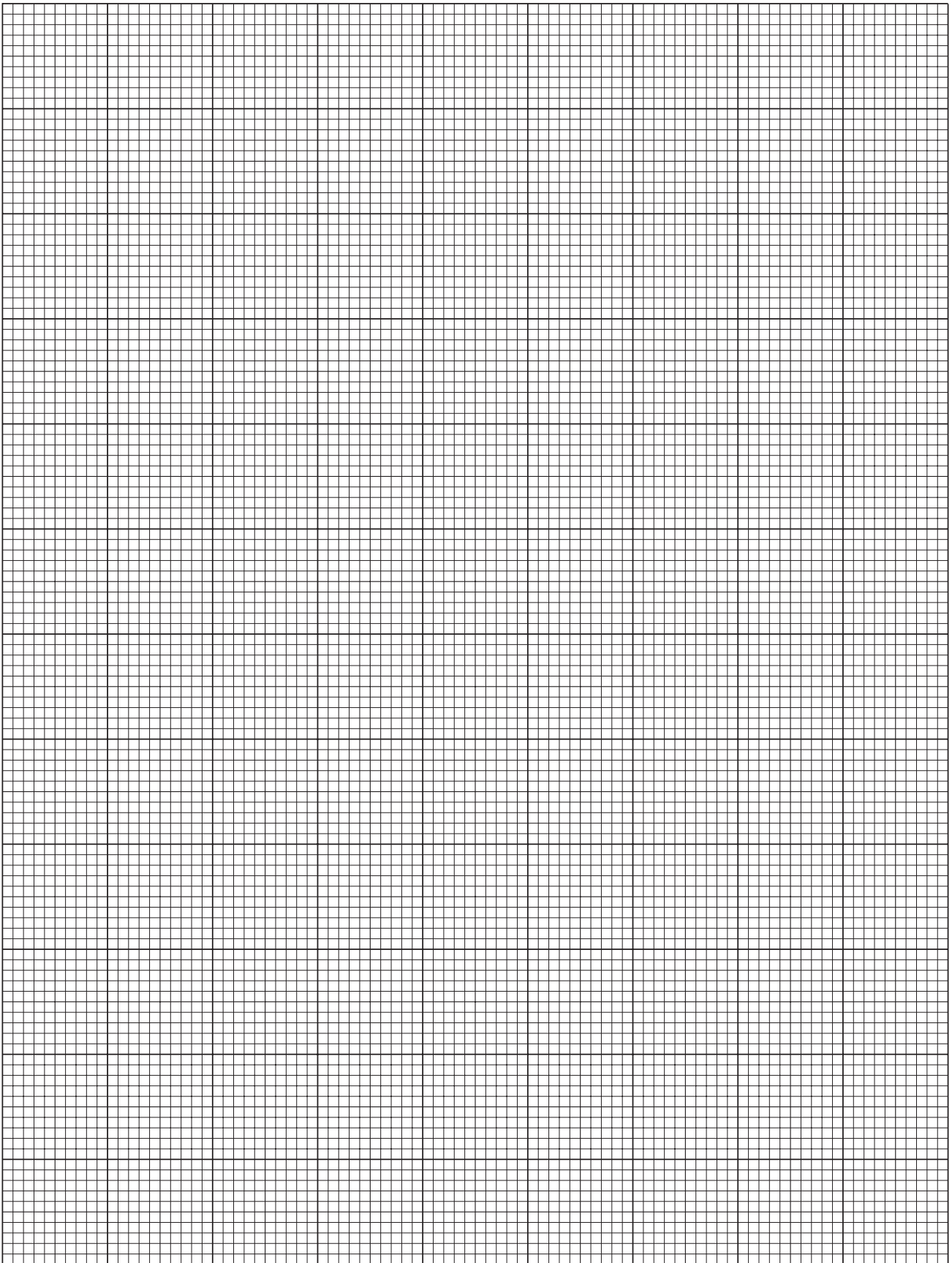
**B** .....

- (c) Explain why it was important to maintain the temperature of the water bath at 35 °C.

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- (d) Draw a graph of the relative rate of enzyme activity against protease concentration.

Use the graph paper on page 5.



(e) Describe the results shown by your graph.

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(f) Explain your results.

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**(g) Evaluation exercise**

Evaluate the procedure that you followed by giving **five** different limitations of the investigation.

For each limitation that you give, describe **one** way in which the experimental procedure could be improved.

1. *limitation* .....

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*improvement* .....

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2. *limitation* .....

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*improvement* .....

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3. *limitation* .....

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*improvement* .....

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4. *limitation* .....

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*improvement* .....

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5. *limitation* .....

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*improvement* .....

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**[Total: 30]**

**Question 2** [25 minutes]

**K1** are seedlings of radish, *Raphanus sativus*. Part of the root is covered with root hairs.

Use the hand lens to examine one seedling and the distribution of root hairs.

- (a) (i) Make a large drawing of the seedling **K1** in the space below and show the distribution of the root hairs.
- (ii) Indicate the scale of your drawing.

**K2** are seedlings of *R. sativus* which have been soaked in a dye that turns red in the presence of many mitochondria.

Examine one **K2** seedling using the hand lens.

- (b) Indicate on your drawing of **K1** the area or areas of the **K2** seedling that are stained red.
- (c) Explain why there are many mitochondria and many root hairs present in seedlings.

*mitochondria* .....

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*root hairs* .....

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**K3** are seedlings of *R. sativus* that have been soaked in iodine solution.

(d) Describe **and** explain the appearance of one **K3** seedling.

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(e) The cell surface membranes of root hair cells contain many proteins.

Describe the functions of these proteins.

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[Total: 14]

**END OF QUESTION PAPER**

**10**  
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11  
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## REPORT FORM

The teacher responsible for the supervision of the Practical Test is asked to report on the following:

- (a) Any particular difficulties encountered in making preparations for the Practical Test.
- (b) Whether it was necessary to make any substitutions for the materials listed in the Instructions. Submit a copy of the results obtained by a teacher or technician, using the substituted materials, on top of the candidates' scripts.
- (c) Any difficulties experienced by the candidate due to deficient materials or faulty apparatus. If so, give brief details.
- (d) Any assistance given to the candidate with respect to colour blindness or other physical disability. If so, give brief details, and attach a copy of the letter giving permission.

Other cases of hardship, for example illness, should be reported directly to OCR by the Examinations Officer using the Special Consideration form.

Signed .....

Information that applies to **all** candidates should be given on the first candidate's script **only** or supplied on a separate sheet placed on top of the candidates' scripts.

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