OCR
RECOGNISING ACHIEVEMENT

ADVANCED SUBSIDIARY GCE

2803/03/TEST

BIOLOGY

Practical Examination 1 (Part B – Practical Test)

TUESDAY 13 MAY 2008

Afternoon

Time: 1 hour 30 minutes

Candidates answer on the question paper
Additional materials (enclosed): Insert

Additional materials (required):
Candidate's Plan (Part A of the Practical Examination)
Electronic calculator
Ruler (cm/mm)

CUP/T39362

Candidate Forename		Candidate Surname	
Centre Number		Candidate Number	

INSTRUCTIONS TO CANDIDATES

- Write your name in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use blue or 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.

INFORMATION FOR CANDIDATES

- The number of marks for each question 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.

FOR EXAMINER'S USE		
Qu.	**Max.**	**Mark**
Planning	**16**	
1	**30**	
2	**14**	
TOTAL	**60**	

This document consists of **11** printed pages, an Insert and a Report Form.

[Turn over

Answer **all** the questions.

Question 1 [60 minutes]

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

You will use a lipase enzyme that catalyses the hydrolysis of triglycerides.

Milk fat will be used as a source of triglycerides.

Phenolphthalein is a pH indicator that changes colour between pH 8 and pH 10.

Phenolphthalein is flammable.

Sodium carbonate solution is irritant.

Proceed as follows:

1 You are provided with six test-tubes labelled **A** to **F**.

Use one of the 10 cm^3 syringes to put 5.0 cm^3 of milk into each of the test-tubes **A** to **F**.

2 Use the other 10 cm^3 syringe to put 5.0 cm^3 sodium carbonate solution into each of the test-tubes **A** to **F**.

3 Use a dropping pipette to add five drops of phenolphthalein to each of the test-tubes **A** to **F**.

Put the bung provided into test-tube **A** and invert twice until the contents are a uniform pink colour.
Repeat this procedure with test-tubes **B** to **F**.

4 Stir the lipase solution with the glass rod provided. Use the 2 cm^3 syringes and the 1 cm^3 syringes to make up a range of final concentrations of lipase solution in test-tubes **1** to **6**, as shown in the table below.

test-tube	volume of lipase solution / cm^3	volume of distilled water / cm^3	final concentration of lipase solution / %
1	0.0	2.0	0
2	0.4	1.6	1
3	0.8	1.2	2
4	1.2	0.8	3
5	1.6	0.4	4
6	2.0	0.0	5

5 Put some warm water in a beaker to act as a water bath. The beaker should be about half full. Adjust the temperature of the water to 50 °C (+/– 2 °C).

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

6 Place test-tubes **A** to **F** in the water bath for **five minutes**.

Maintain the temperature of the water bath at 50 °C (+/– 2 °C) throughout the procedure.

*Now read carefully instructions **7** to **12** and draw up a table on page **4** for your results and rates of enzyme activity.*

7 Add the contents of test-tube **1** to test-tube **A**. Mix the contents by putting a bung into test-tube **A** and invert twice until the contents are a uniform pink colour. Remove the bung and return test-tube **A** to the water bath.

8 Start the stopwatch or stop clock. Immediately add the contents of test-tube **6** to test-tube **F**. Invert the contents as in instruction **7** and return to the water bath.

Record in your table the time taken for all the pink colour to disappear in tube F.

9 Repeat step **8** for each of the remaining pairs of test-tubes:

- Pour the contents of test-tube **5** into test-tube **E**, mix and return to the water bath.
- Pour the contents of test-tube **4** into test-tube **D**, mix and return to the water bath.
- Pour the contents of test-tube **3** into test-tube **C**, mix and return to the water bath.
- Pour the contents of test-tube **2** into test-tube **B**, mix and return to the water bath.

In each case, record in your table the time taken for all the pink colour to disappear in each tube.

10 If there is no colour change in a test-tube after ten minutes, then record this as 'no change'.

11 Observe the contents of test-tube **A** and add the result to the table.

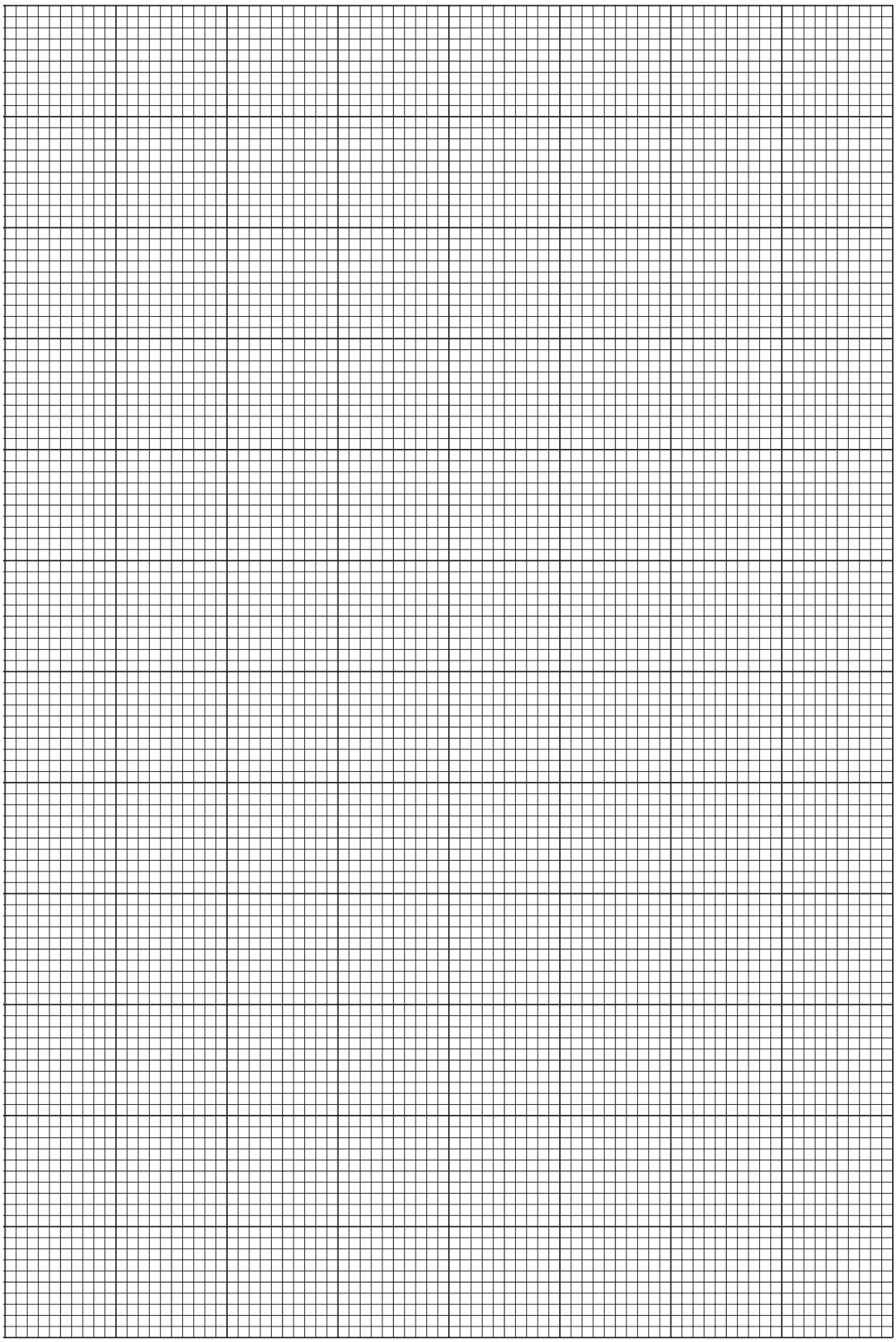
12 Convert the times into relative rates of enzyme activity using the formula:

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

If 'no change' is recorded, record the rate of enzyme activity as 0.

(a) Record your results and relative rates of enzyme activity in a table in the space below.

(b) Plot a graph on page 5 of the relative rate of enzyme activity against concentration of lipase.



(c) Describe **and** explain the pattern of results shown by your graph.

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(d) Lipase catalyses the hydrolysis of triglycerides. Explain fully why the colour of phenolphthalein has changed in some of the test-tubes.

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(e) Evaluation exercise.

Explain the **disadvantages** of the method that you have used to follow the reaction catalysed by lipase. Explain how you would improve the method to give more accurate and reliable results.

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[Total: 30]

Question 2 [30 minutes]

The cell walls of plants are composed of a variety of substances, such as cellulose, lignin, suberin, calcium pectate, proteins and fatty acids.

Calcium pectate is found mainly in the middle lamella, where plant cells are attached to one another. Calcium pectate acts rather like a 'glue' holding the cells together.

Fig. 2.1, **on the insert**, is an electronmicrograph of two neighbouring cells from the spongy mesophyll of a leaf.

(a) Calculate the actual width of a cell wall shown in Fig. 2.1.

Show your working and express your answer in **micrometres**.

Answer = ... μm

(b) State one structure, **visible within the cells in Fig. 2.1**, that shows that the cells are from leaf cells and **not** root cells.

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(c) Fig. 2.1 shows that mesophyll cells are not attached to each other along the whole length of their cell walls.

Explain why there are gaps between the cells in the spongy mesophyll.

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(d) The leaves of many plants are attached to the stem by petioles (leaf stalks). Celery and rhubarb are plants that have long petioles.

You are required to investigate **xylem tissue** in the petioles of celery and rhubarb.

(i) You are provided with **K1** which is a transverse section of a celery petiole stained to show the distribution of lignin.

Examine **K1** with a hand lens and make a drawing to show the outline of the transverse section of the petiole and the areas that contain lignin.

Label the areas that contain lignin.

(ii) **K2** is petiole tissue from rhubarb.

Make a preparation to observe **xylem vessels** in **K2**.

Proceed as follows:

1 Use the forceps to remove a small piece of petiole tissue, **K2**, from the beaker and place it in a petri dish.

2 Use the forceps and mounted needle to tease apart the tissue into fine strands. Place one fine strand of tissue onto a microscope slide.

3 Add a few drops of water to the slide and add a cover slip. If the tissue is not completely immersed, add a drop of water to the edge of the cover slip. Use the filter paper to absorb any water around the slide (if necessary).

A xylem vessel will not spread when pressure is applied to the cover slip.

4 Place the slide on the microscope and search, **using the low power objective**, for xylem vessels.

If none are visible, repeat the procedure with some more tissue from the beaker.

(e) Describe, on page 11, the appearance of the xylem vessels on the slide that you have prepared.

You may wish to use the space provided below to illustrate your answer with an annotated diagram.

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(f) Explain why the cell walls of the xylem vessels contain lignin.

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[Total: 14]

END OF QUESTION PAPER

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 teachers or technicians, using the substituted materials, on top of the candidates' scripts.

(c) Any difficulties experienced by this candidate due to deficient materials or faulty apparatus. If so, give brief details.

(d) Any assistance given to this 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 as a normal Application for Special Consideration.

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.