OCR
RECOGNISING ACHIEVEMENT

OXFORD CAMBRIDGE AND RSA EXAMINATIONS
Advanced Subsidiary GCE

BIOLOGY

Practical Examination 1 (Part B – Practical Test) **2803/03/TEST**

Tuesday **16 MAY 2006** Morning 1 hour 30 minutes
Candidates answer on the question paper.
Additional materials:
Candidate's Plan (Part A of the Practical Examination)
Electronic calculator
Ruler (cm/mm)

Candidate Name	

Centre Number						Candidate Number				

TIME 1 hour 30 minutes

INSTRUCTIONS TO CANDIDATES

- Write your name, Centre number and Candidate number in the boxes above.
- Answer **all** the questions.
- Write your answers, in blue or black ink, in the spaces provided on the question paper.
- Pencils may be used for graphs and diagrams **only**.
- Read the instructions and questions carefully before starting your answers.
- Do not write in the bar code. Do not write in the grey area between the pages.
- **DO NOT** WRITE IN THE AREA **OUTSIDE** THE BOX BORDERING EACH PAGE. ANY WRITING IN THIS AREA WILL NOT BE MARKED.

INFORMATION FOR CANDIDATES

- 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 question paper consists of 11 printed pages, 4 blank pages and a Report Form.

[Turn over

Answer **all** the questions.

Question 1 [65 minutes]

The enzymes that catalyse the hydrolysis of starch are known as amylases.

You are required to investigate the effect of two different concentrations of an amylase, E1 and E2, on the hydrolysis of starch.

You are provided with solutions **E1** and **E2**.

You are also provided with a 10 g dm^{-3} solution of starch. The starch has been prepared in a buffer solution of pH 5.0.

Proceed as follows:

1 Use the plastic pipette to add two drops of starch solution to one of the depressions in the unlabelled part of a spotting tile. Add two drops of iodine solution. Record the colour that you observe.

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2 Prepare a water bath at 40 °C (+/– 2 °C) using the warm water provided. 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.)

3 Use the 10 cm^3 syringe to add 10 cm^3 starch solution to each boiling tube, **A**, **B** and **C**. Place these three boiling tubes into the water bath.

4 Use a 1 cm^3 syringe to add 1 cm^3 distilled water to test-tube **1**.

Use the same 1 cm^3 syringe to add 1 cm^3 amylase solution **E1** to test-tube **2**.

Use a **fresh** 1 cm^3 syringe to add 1 cm^3 amylase solution **E2** to test-tube **3**.

5 Place test-tubes **1**, **2** and **3** into the water bath and leave all the tubes in the water bath for **at least five** minutes.

Read carefully the rest of the instructions and prepare a table for your results on page 4.

6 Add 2 drops of iodine solution to each of the depressions in the numbered rows of three spotting tiles as shown in Fig. 1.1.

7 After the test-tubes have been in the water bath for at least five minutes, you should add the contents of the test-tubes to the boiling tubes as follows:

- test-tube 1 to boiling tube A
- test-tube 2 to boiling tube B
- test-tube 3 to boiling tube C.

8 Start a stop watch or stopclock. Use the glass pipettes provided to stir the reaction mixtures in the boiling tubes using one pipette per tube.

9 After one minute, use the glass pipettes to test the reaction mixtures in the boiling tubes. In each case, remove a small sample from the reaction mixture and add one drop to the iodine solution in row 1 of the spotting tile. Return the pipettes to the boiling tubes.

10 Use the glass rod to stir each sample with the iodine solution. Clean the glass rod after stirring each sample. Record the colours you observe in your table.

11 Continue to test samples every minute from the three boiling tubes until you see no further change in colour.

Do not take samples for longer than ten minutes.

(a) Record your results in a table in this space.

(b) **(i)** Explain why tube **A** was included.

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(ii) Explain why the starch was made up in a buffer solution.

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(iii) Explain why the boiling tubes and the test-tubes were left in the water bath for at least five minutes before the enzyme solutions were added to the starch.

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(c) Describe **and** explain the results that you have obtained for tubes **A**, **B** and **C**.

In your answer, you should refer to the colour that you obtained in step **1** of the procedure.

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A student followed the course of the reaction catalysed by an amylase using a colorimeter. The student prepared a range of starch solutions of different concentrations. A dilute solution of iodine was added to each starch solution and placed in the colorimeter. The colorimeter readings were plotted on a graph, as shown in Fig. 1.2.

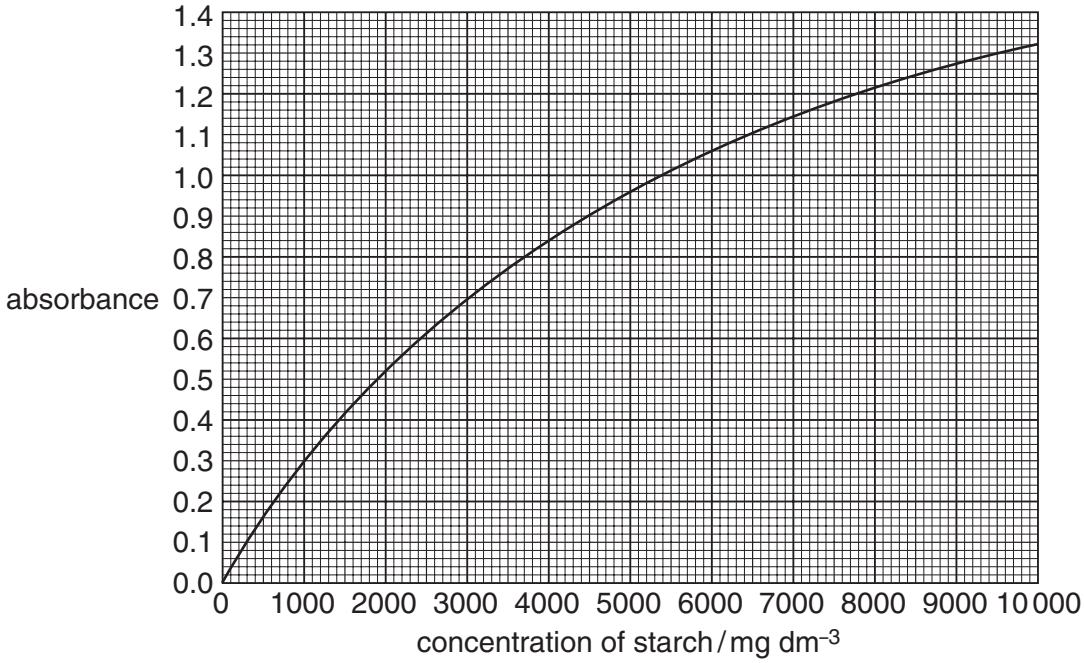


Fig. 1.2

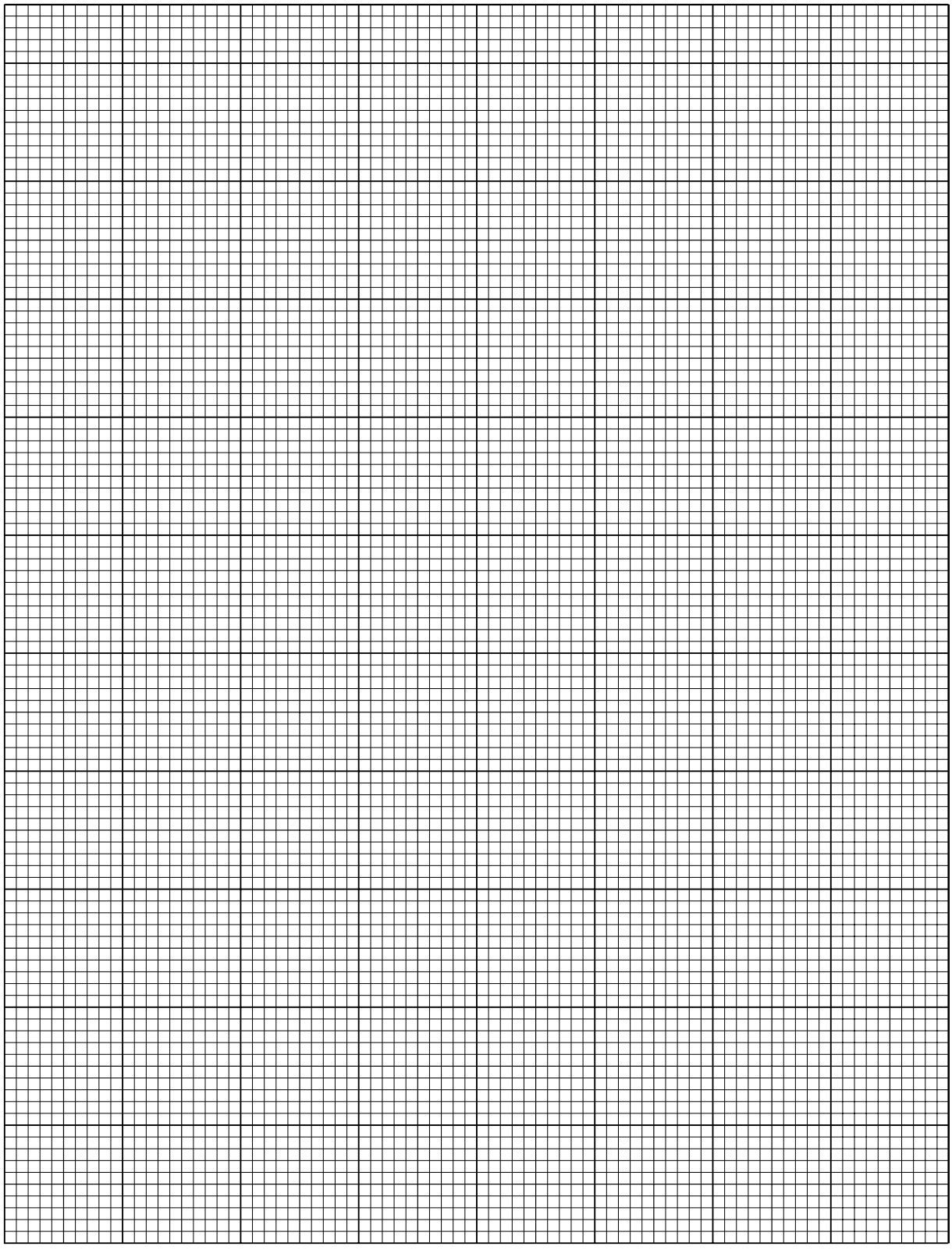
The student then followed the same procedure as in the investigation you have carried out, but kept the reaction mixture at 25 °C. Samples from the reaction mixture were taken at 2 minute intervals for 16 minutes. The samples were tested with the dilute iodine solution and placed into the colorimeter. The student used the graph in Fig. 1.2 to find the concentration of starch remaining in the reaction mixture. The colorimeter readings and some of the equivalent concentrations of starch are shown in Table 1.1.

Table 1.1

time / min	absorbance	concentration of starch / mg dm^{-3}
0	1.32	10 000
2	0.60	
4	0.30	
6	0.10	300
8	0.09	250
10	0.08	200
12	0.06	150
14	0.04	100
16	0.01	50

(d) Complete Table 1.1 to show the concentration of starch in the reaction mixture at 2 and 4 minutes.

(e) Use the results in Table 1.1 to plot a graph of concentration of starch against time.



(f) Evaluation exercise

The student followed the progress of the hydrolysis of starch by amylase using a colorimeter.

Explain the advantages **and** disadvantages of the student's method compared with the method that you used.

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[Total: 30]

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Question 2 [25 minutes]

You are required to observe the effects of treating some plant epidermal cells with a solution of 1 mol dm^{-3} potassium nitrate solution.

You are provided with a scale leaf from the bulb of a red onion.

Proceed as follows:

1 Peel off the epidermis from the **outer** or **convex** surface of the scale leaf of the red onion. Make sure that you do not have any of the underlying tissues attached to the epidermal peel.

2 Place the epidermal peel onto a microscope slide with some distilled water. Use the forceps and mounted needle to spread out the epidermis so that it is completely flat. If necessary, cut it so that it is about 5 mm $\times$ 5 mm in size. Cover with a cover slip.

3 Observe the epidermis using the low power of your microscope. Move the slide until you see an area of cells that contain red pigment. If you do not see any at all, make another preparation.

4 Using the **high power** of your microscope, select three adjacent pigmented cells that are clearly visible in your field of view.

(a) In the space below make an accurate drawing to show the shape and structure of these three cells. Label your drawing.

You are now required to irrigate the epidermis on the slide with a few drops of a 1 mol dm^{-3} potassium nitrate solution and observe the changes that occur to the cells.

5 Return your microscope to low power so that you can see a large area of pigmented cells.

6 Add a few drops of 1 mol dm^{-3} potassium nitrate solution to the edge of the coverslip at one side of the slide. Place a piece of filter paper on the other side of the coverslip to help move this solution under the coverslip.

Immediately observe the cells through the microscope at both low and high power.

(b) **Describe** what you see happening to the pigmented cells.

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(c) Using the **high power** of your microscope, make a drawing **to the same scale as in (a)** of **one** of the cells in the area that you have observed after it has been exposed to potassium nitrate solution for about five minutes.

Annotate your drawing to **explain** the change that has happened to the cell when exposed to the potassium nitrate solution.

(d) Explain why the rate of water loss from an onion bulb is likely to be much less than that from a leafy shoot.

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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 handicap. If so, give brief details.

Other cases of hardship, for example illness or temporary disability, 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 .