OCR
RECOGNISING ACHIEVEMENT

ADVANCED SUBSIDIARY GCE

2803/03/TEST

BIOLOGY

Practical Examination 1 (Part B – Practical Test)

WEDNESDAY 10 JANUARY 2007 Morning

Time: 1 hour 30 minutes

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

Candidate Name

Centre Number

Candidate Number

INSTRUCTIONS TO CANDIDATES

- Write your name, Centre Number and Candidate Number in the boxes above.
- Answer **all** the questions.
- Use blue or black ink. Pencil may be used for graphs and diagrams only.
- Read the instructions and questions carefully before starting your answer.
- Do **not** write in the bar code.
- Do **not** write outside the box bordering each page.
- WRITE YOUR ANSWER TO EACH QUESTION IN THE SPACE PROVIDED. ANSWERS WRITTEN ELSEWHERE 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 document consists of **10** printed pages, **2** blank pages, a Report Form, an Insert and a Colour Chart.

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Answer **all** the questions.

Question 1 [65 minutes]

You are required to investigate the activity of the enzyme sucrase that is produced by yeast cells. Sucrase catalyses the hydrolysis of sucrose to glucose and fructose.

You are provided with an enzyme extract that has been prepared from a suspension of yeast cells. You are to confirm that sucrase is present in the extract and find out what effect pH has on the activity of the enzyme.

Diastix® test strips turn different colours according to the concentration of **glucose** in the test solution. You are provided with a **colour chart** to show how to interpret the colours of the strips in terms of the concentrations of glucose in the test solutions.

Use the Diastix® test strips in the following way:

- dip a strip into the liquid to be tested and remove immediately
- shake off any liquid that remains attached to the coloured strip
- place on a white tile and start a stopwatch or stop clock
- after 30 seconds, match the colour of the test strip with the colour chart and **note the glucose concentration in g 100 cm^{-3}**
- ignore any colour changes that occur after 30 seconds.

Proceed as follows:

1 Test the following with Diastix® test strips:

- distilled water
- glucose solution
- fructose solution
- sucrose solution.

(a) Record your results in Table 1.1.

Table 1.1

substance tested	glucose concentration / g 100 cm^{-3}
distilled water	
glucose solution	
fructose solution	
sucrose solution	

2 **Half fill** a beaker with warm 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.)

3 Use a 10 cm^3 syringe to put 5.0 cm^3 of the **sucrose solution** into each of the test-tubes labelled **A** to **E**. Place the test-tubes into the water bath at 35 °C.

4 Use a clean 10 cm^3 syringe to put 7.5 cm^3 of distilled water into test-tube **1** and 5.0 cm^3 into test-tube **2**.

5 You are provided with some enzyme extract that has been boiled. Use a 5 cm^3 syringe to put 2.5 cm^3 of the **boiled extract** into test-tube **2**.

6 Use a clean 5 cm^3 syringe to put 5.0 cm^3 of the buffer solutions into test-tubes **3**, **4** and **5** as shown below.

The syringe should be washed out between transferring each buffer solution.

test-tube	pH of buffer solution
3	2.2
4	5.0
5	8.0

7 Use a clean 5 cm^3 syringe to put 2.5 cm^3 of the **enzyme extract** into each of the test-tubes labelled **3**, **4** and **5**.

8 Place test-tubes **1** to **5** into the water bath.

Now read carefully instructions 9 to 12 and draw up a table for your results in the space provided on page 5. Then proceed with step 9.

9 Start the stopwatch or stop clock and **leave it running** for the duration of the investigation.

Immediately pour the contents of test-tube **1** into test-tube **A**. Put a bung into the test-tube and invert to mix. Remove the bung and replace test-tube **A** into the water bath.

10 After 60 seconds, pour the contents of test-tube **2** into test-tube **B**. Put a new bung into test-tube **B** and invert to mix. Remove the bung and replace test-tube **B** into the water bath.

11 Repeat the procedure you followed in step **10**, at 60 second intervals, with the other test-tubes. That is, pour the contents of test-tube **3** into test-tube **C**, the contents of test-tube **4** into test-tube **D**, and the contents of test-tube **5** into test-tube **E**. Use a new bung for each mixing.

12 When the stopwatch or stop clock reads **five** minutes, use a Diastix® test strip to estimate the glucose concentration of the contents of test-tube **A**. Dip a test strip into the test-tube. Place the test strip on the white tile and wait for 30 seconds before recording the **colour** and the **glucose concentration**.

13 When the stopwatch or stop clock reads **six** minutes, test the contents of test-tube **B**.

14 Repeat the procedure you followed in step **12** with the other test-tubes, **C** to **E**. That is, when the stopwatch or stop clock reads **seven** minutes test the contents of test-tube **C**. Test-tube **D** should be tested after **eight** minutes and test-tube **E** after **nine** minutes.

When you have recorded your results, discard the Diastix® test strips.

(b) Record your results in a table below.

(c) (i) Explain why test-tube **A** was included.

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(ii) Explain why the test-tubes were left in the water bath **before** they were mixed together.

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(d) Explain how your results show that an enzyme is involved in the hydrolysis of sucrose.

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(e) Explain how pH influences the activity of enzymes, such as sucrase.

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(f) Diastix® test strips contain the enzyme glucose oxidase.

With reference to the results in Table 1.1, **on page 3**, explain why Diastix® cannot be used to estimate the **reducing sugar** content of test-tubes **C** to **E**.

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(g) The sucrase you have used is an extracellular enzyme produced by yeast cells. This enzyme is found in the space between the plasma (cell surface) membrane and the cell wall of yeast cells.

Sucrase is a glycoprotein that is produced by yeast when growing in a medium containing low concentrations of glucose. Yeast cells also produce the enzyme catalase, which is not a glycoprotein.

(i) Using the information provided above, state how the structure of sucrase differs from the structure of catalase.

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(ii) Most enzymes are intracellular, that is they work inside cells.

Suggest why yeast produces an extracellular enzyme to catalyse the hydrolysis of sucrose.

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(h) Evaluation exercise

Write an evaluation of the procedure that you have followed in this investigation and of the results you have obtained.

You should include the limitations of your procedure **and** suggest ways in which the experiment may be improved to give more accurate and reliable results for estimating the **reducing sugar** content of the reaction mixtures.

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Question 2 [25 minutes]

Slide **K1** is a transverse section of the stem of marrow, *Cucurbita pepo*. You are not expected to have seen this before.

Observe the slide carefully with the **low power** of your microscope.

(a) Fig. 2.1 shows an outline of a transverse section of *C. pepo*.

(i) On Fig. 2.1 draw the outline of **one** vascular bundle.

(ii) Examine **carefully** the vascular bundle with **high power**.

On Fig. 2.1, draw and label regions within the vascular bundle to show the distribution of xylem and phloem.

Do not draw any cells.

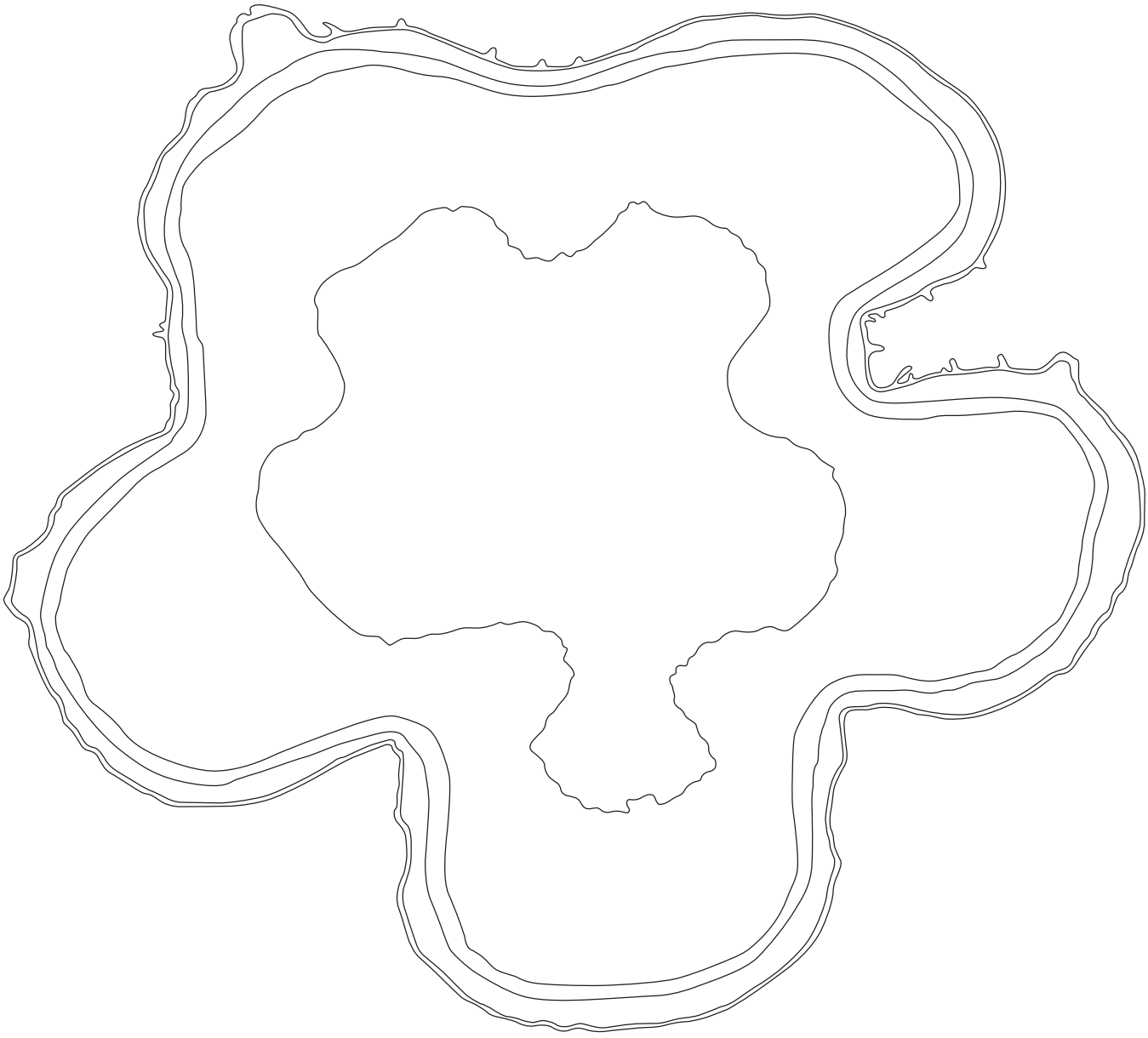

Fig. 2.1

Fig. 2.2, on an insert, shows sieve tube elements and companion cells in longitudinal section from the phloem tissue of *C. pepo*.

(b) Calculate the actual width of a phloem sieve tube element shown in Fig. 2.2.

Show your working and express your answer **to the nearest micrometre (μm)**.

Answer = ... μm

(c) State **two** features of the sieve tube elements **visible in Fig. 2.2** that are not found in xylem vessels.

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(d) The mechanism by which sucrose and other assimilates move in the phloem is often described as an active process.

Explain how the structure of phloem tissue provides evidence that the mechanism may be an **active** process.

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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 any results obtained by teacher(s) or technician(s), 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 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** or supplied on a separate sheet placed on top of the candidates' scripts.