THIS IS A LEGACY SPECIFICATION

OCR
RECOGNISING ACHIEVEMENT

ADVANCED GCE

BIOLOGY

2806/03/TEST

Practical Examination 2 (Part B – Practical Test)

OCE/11622

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 19 January 2010
Afternoon

Duration: 1 hour 30 minutes

2806603

Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

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 **11** printed pages, **4** blank pages and a Report Form. Any blank pages are indicated.

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

DC (SHW 00443 4/09) 11622/4

Answer **all** the questions.

Question 1 [65 minutes]

Hydrogen peroxide, H_2O_2, is a strong oxidising agent. It is produced as a waste product in many tissues and if left to accumulate, would cause damage. Such tissues often remove hydrogen peroxide by using the enzyme catalase which catalyses the decomposition of hydrogen peroxide as follows:

$$2H_2O_2 \xrightarrow{\text{catalase}} O_2 + 2H_2O$$

Tissues with high rates of metabolism tend to produce more hydrogen peroxide than those with low rates of metabolism. Measuring catalase activity can therefore be a way to determine which tissues have high metabolic rates.

You are required to measure the relative activity of catalase in different plant materials as a way of determining their relative metabolic activity.

Hydrogen peroxide is corrosive.

If any hydrogen peroxide should come into contact with your skin wash it off immediately under cold water. You should wear eye protection while using hydrogen peroxide.

You are provided with 5 g of each of the following plant materials:

A celery – petiole (leaf stalk)
B carrot – root and storage organ
C potato – stem tuber (storage organ)
D lettuce – leaf blade
E mung beans – germinating seeds
F apple – fruit

You will use the apparatus shown in Fig. 1.1 to collect and measure the volume of oxygen produced in each reaction.

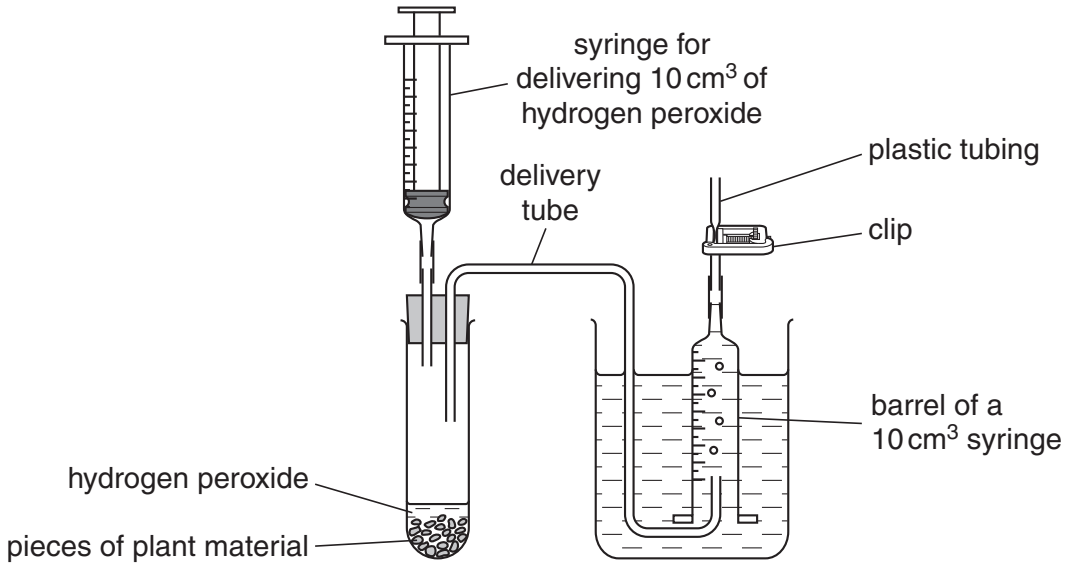

Fig. 1.1

Proceed as follows:

1 Set up the delivery tube and the syringe barrel as shown in Fig. 1.1 so that the syringe barrel is full of water. Do this by filling the syringe barrel with water, placing your finger over the end and placing it over the delivery tube.

2 Place the celery pieces from specimen tube **A** on a white tile. Use the scalpel to chop the celery into smaller pieces. Do not spend longer than about 30 seconds chopping the pieces.

3 Transfer the pieces of celery into one of the boiling tubes using a spatula.

4 Put the bung with the delivery tube into the boiling tube. Twist the bung slightly as you put it into the boiling tube.

Avoid holding the delivery tube while you do this otherwise it will snap.

5 Fill the 10 cm^3 syringe with 10 cm^3 of **20 vol** hydrogen peroxide. Place the syringe firmly into the tubing in the bung, as shown in Fig. 1.1.

6 Add the 10 cm^3 of hydrogen peroxide to the boiling tube. Leave the syringe in place whilst collecting gas.

As soon as bubbles start to appear from the end of the delivery tube, start the stopwatch or stop clock. Time how long it takes to collect 5 cm^3 of gas.

If 5 cm^3 of gas is not collected within three minutes, record the volume and stop timing.

If no bubbles appear from the end of the delivery tube after two minutes, record this as 'no reaction'.

7 When 5 cm^3 of gas is collected, or after three minutes, carefully remove the bung from the boiling tube.

8 Put the boiling tube back in the rack and repeat steps **1** to **7** with the carrot from specimen tube **B**. Use a clean boiling tube.

9 Repeat steps **1** to **7** with the other plant materials, **C** to **F**, using a clean boiling tube each time.

10 Calculate the **rate of gas production** for each of the plant materials and place them in order of activity (1 = most active; 6 = least active).

Use the space provided on page 4 to record these results.

(a) Use the space below to record all your results, including rates and order of metabolic activity.

(b) The samples of plant material provided came from different parts of the plant body.

Discuss possible reasons for the order of metabolic activity you have given above.

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(c) Describe how you could show that the catalase test is a valid way to find out if tissues have high rates of respiratory activity.

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(d) Discuss the limitations of the method you have used to determine the catalase activity of the different plant materials and suggest suitable improvements.

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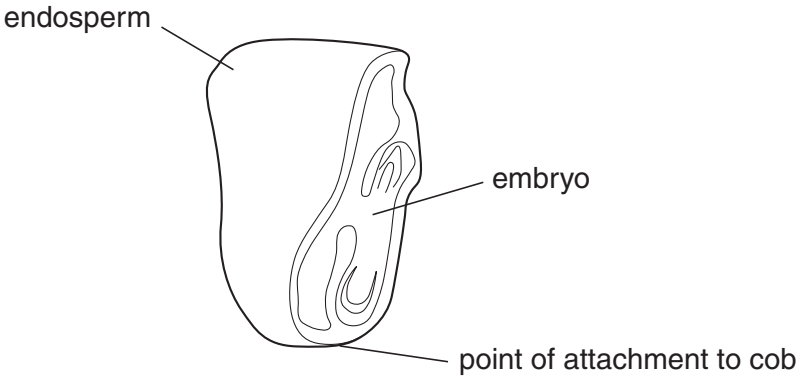
Question 2 [25 minutes]

If you begin the examination with this question, do not attempt part (d) until you have completed Question 1.

Cereal grains, such as those of maize, barley and wheat, contain an embryo and endosperm as shown in Fig. 2.1.



longitudinal section of a maize grain

Fig. 2.1

You are provided with iodine solution, which stains starch a dark blue colour, and Sudan III, which stains lipids a red colour.

1 Transfer 5 cm^3 of iodine solution to tube **G** and 5 cm^3 of Sudan III to tube **H**.

2 **Carefully** cut through the long axis of the two soaked maize grains, as shown in Fig. 2.2.

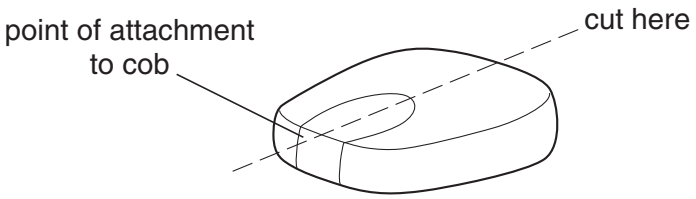


Fig. 2.2

3 Use a hand lens to examine the cut surfaces. Each cut surface should resemble the drawing shown in Fig. 2.1.

4 Use the forceps to place both halves of one grain in tube **G** for **one minute** and both halves of the other grain in tube **H** for approximately **fifteen minutes**.

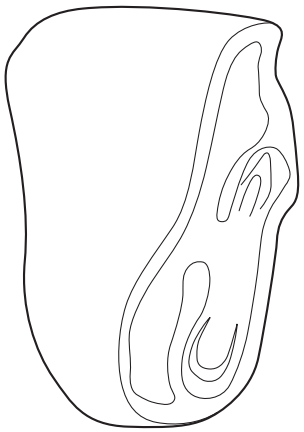
5 After one minute, pour the contents of tube **G** into a Petri dish and, using the forceps, transfer the two halves of the grain to a small beaker of water to wash off excess stain. Remove them from the beaker and use a paper towel to dry them. Use the hand lens to examine the cut surfaces of the two halves of the grain.

Indicate clearly on **Fig. 2.3 (a)** below, the areas that are stained and the colour of each area.

*While you are waiting for tube **H** you should continue with part **(c)** on page 11.*

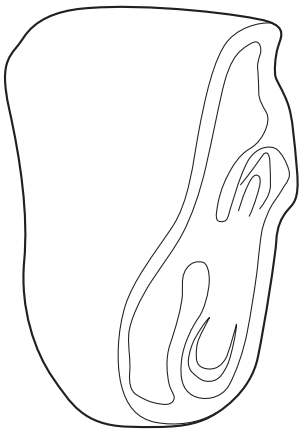
6 After tube **H** has been standing for approximately fifteen minutes, use the procedure outlined in step **5** to remove the two halves of the grain from tube **H**. Wash off the excess stain and use a paper towel to dry them. Use the hand lens to examine the cut surfaces of the two halves of the grain.

(a) Indicate clearly on **Fig. 2.3 (b)** below, the areas that are stained and the colour of each area.



L.S. maize grain stained with **iodine solution**

Fig. 2.3 (a)



L.S. maize grain stained with **Sudan III**

Fig. 2.3 (b)

(b) Iodine and Sudan III indicate the presence of **starch** and **lipids** respectively.

(i) Describe the distribution of starch and lipids as shown by your observations in Fig. 2.3 (a) and Fig. 2.3 (b).

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(ii) Explain why starch and lipids are present in grains such as maize, wheat and barley.

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(c) Take another soaked maize grain. Carefully cut through the short axis of this soaked maize grain, as shown in Fig. 2.4.

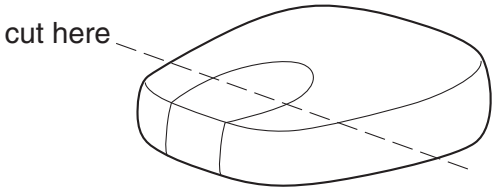

Fig. 2.4

Use a hand lens to observe a cut surface.

Make a labelled plan drawing of one of the cut surfaces of the maize grain in the space below.

*After you have completed (c), return to page 10 and continue with Step **6**.*

STEP 6(d) STARTS ON PAGE 12

(d) Cut another maize grain along the **long axis** as shown in Fig. 2.5.

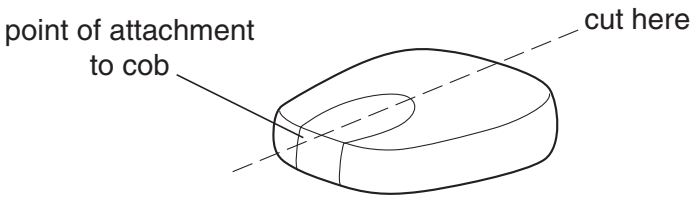

Fig. 2.5

Put the **two** pieces in a Petri dish with the cut surfaces facing upwards. Using the plastic pipette, add **5 vol hydrogen peroxide** solution to the cut surfaces. Use the hand lens to observe where bubbles appear.

(i) Describe the distribution of bubbles in the maize grain.

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(ii) Explain why bubbles appear in the regions you have described in **(d)(i)** and not elsewhere within the maize grain.

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END OF QUESTION PAPER

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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 candidate's scripts.