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RECOGNISING ACHIEVEMENT

ADVANCED GCE **2806/03/TEST**

BIOLOGY

Practical Examination 2 (Part B – Practical Test)

WEDNESDAY 23 JANUARY 2008 Morning

Time: 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)

CUP/T47349

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.
- Do **not** write outside the box bordering each page.
- Write your answer to each question in the space provided.

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	**28**	
2	**16**	
TOTAL	**60**	

This document consists of **10** printed pages, **1** blank page, a Report Form and an Insert.

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Answer **all** the questions.

Question 1 [60 minutes]

You are required to determine the rate of photosynthesis at different wavelengths of light.

During the light-dependent stage of photosynthesis, hydrogen ions and electrons are transferred to hydrogen acceptor molecules, including NADP.

Dichlorophenolindophenol (DCPIP) can be used in investigations to monitor the light-dependent stage of photosynthesis. DCPIP is a blue dye which acts as a hydrogen and electron acceptor. As DCPIP is reduced, its blue colour disappears.

In this investigation, you will mix samples of a leaf extract and DCPIP solution. You will then expose the samples to five different wavelengths of light and record the time it takes for the mixture to change colour from blue-green to green.

The wavelengths of light you will be using are:

colour	wavelength / nm
purple	425
blue	450
green	525
orange	625
red	675

Two solutions are provided:

Leaf extract **Irritant**

DCPIP solution **Toxic**

Proceed as follows:

1 You are provided with a buffered leaf extract in a beaker labelled **leaf extract**. This leaf extract has been kept in a refrigerator.

2 Stir the leaf extract using the glass rod and remove a sample of the extract by inserting a capillary tube into it. Remove the capillary tube, wipe it to remove any external material and place it on the white tile. This tube will act as a **colour standard** to show the **green** colour you will see when DCPIP is reduced in the other capillary tubes.

The colour standard should be left on the white tile throughout the investigation.

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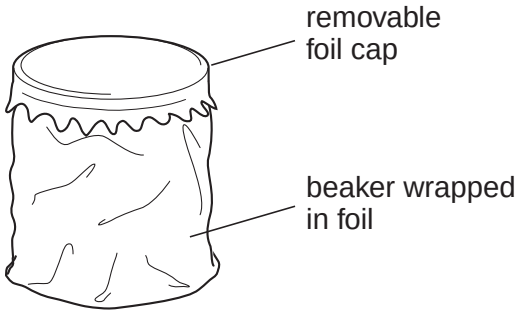
3 Use the dropping pipette to add enough of the **DCPIP solution** to the leaf extract in the beaker until it just turns **blue-green**. Shake the beaker gently as you add the DCPIP solution.

At this stage, the leaf extract should be noticeably blue-green. If the leaf extract appears green with **no blue colour**, add more drops of DCPIP solution until the colour of the leaf extract is blue-green.

Immediately wrap the beaker with foil, as shown below. Add the foil cap, which should be easy to remove when necessary, so that the mixture in the beaker is kept in the dark.

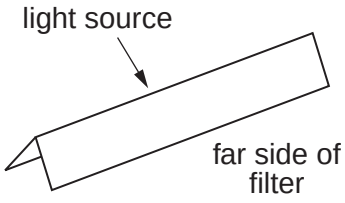


4 Set up a bench lamp approximately 15 cm from the white tile. Do **not** switch the lamp on yet.

*The following procedures will need to be carried out rapidly, so **read steps 5 to 8, and (a) on page 4 before starting step 5**.*

5 Remove the foil cap from the beaker and take a sample of the mixture by inserting another capillary tube. This will be the **reaction tube**. Replace the foil cap immediately. Wipe the reaction tube to remove any external material and place it on the white tile beside the **colour standard**.

6 Cover **both** tubes (the colour standard and the reaction tube) with the **purple** filter as soon as the reaction tube is placed on the tile.



7 Switch on the bench lamp and immediately start a stop watch or stopclock. Record the time, in seconds, for the colour in the reaction tube to match that of the colour standard. Switch off the bench lamp.

*It may be necessary to **briefly** lift the far side of the filter in order to see when the colour in the reaction tube has matched that of the colour standard.*

8 Repeat steps **5** to **7** above using each of the four remaining coloured filters (blue, green, orange and red).

If there is no change in colour in a **reaction tube** after ten minutes, record 'infinity' and the rate of change as 0.

Calculate the rate of the reduction of the DCPIP using the formula:

$$\text{rate} = \frac{1000}{t} \quad \text{where t = time in seconds}$$

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(a) Record your results in a suitable form in the space below.

(b) Plot a graph of your results on page 5.

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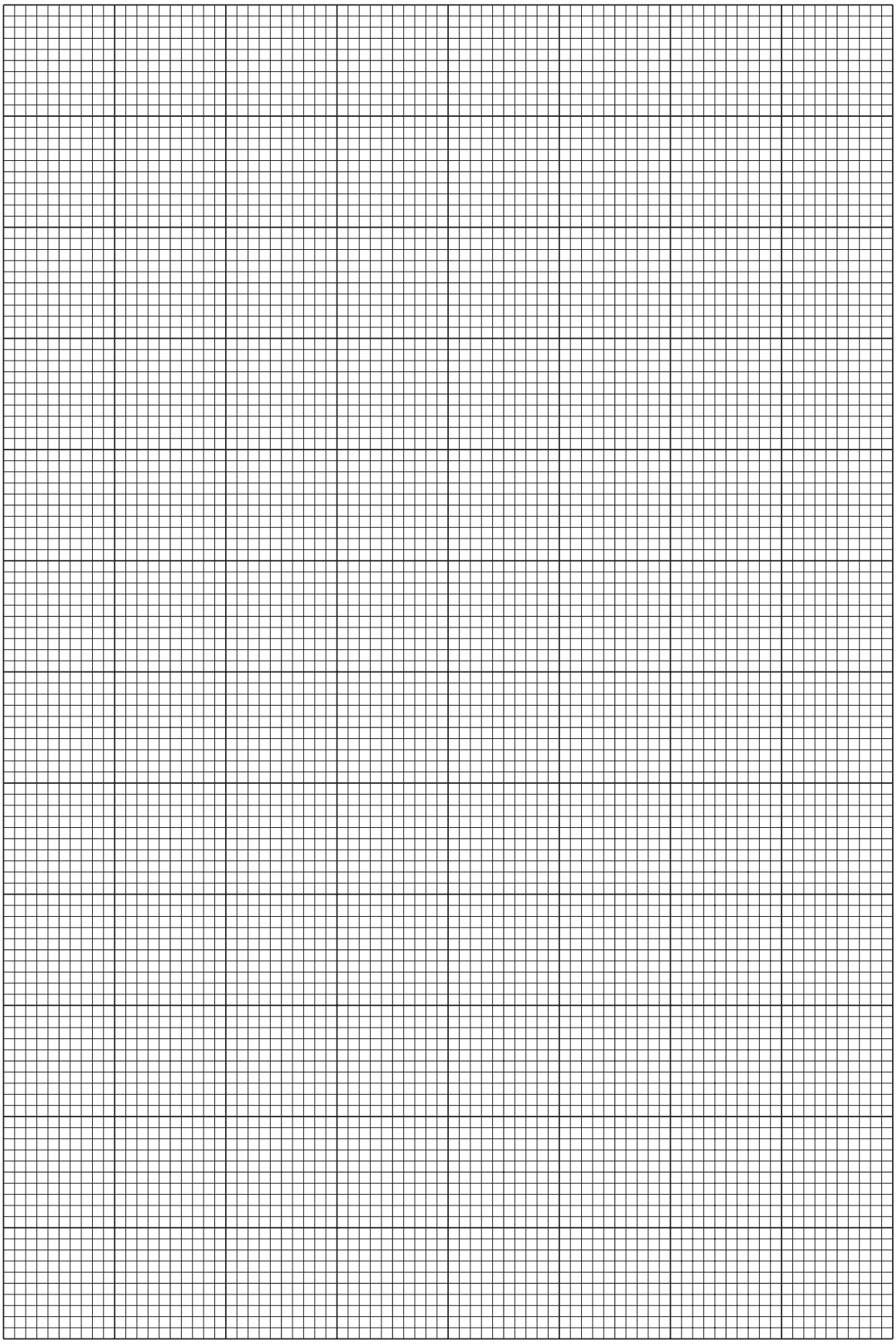

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(c) Describe **and** explain the pattern of your results.

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(d) Describe **and** explain one additional tube that could have been set up to act as a control.

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(e) Write an evaluation of the procedure that you followed.

You should include limitations of your procedure and suggest ways in which the experiment may be improved to give more accurate and reliable results.

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(f) DCPIP was used in your investigation in place of the natural hydrogen carrier NADP.

Describe the role of NADP in photosynthesis.

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[Total: 28]

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Question 2 [30 minutes]

(a) Fig. 2.1, **on the insert**, shows an electronmicrograph of a chloroplast from a leaf kept in full light.

Calculate the length of the chloroplast between the points marked **X** and **Y**. Show your working and express your answer in **micrometres**.

Answer = ...µm

(b) Name **three** structures that are visible in the chloroplast in Fig. 2.1 and describe their appearance.

name .....

appearance .....

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name .....

appearance .....

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name .....

appearance .....

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(c) Explain how the chloroplast in Fig. 2.1 is adapted for photosynthesis.

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(d) Fig. 2.2 shows an electronmicrograph of a chloroplast from a leaf that has been kept in the dark.

How does the **structure** of the chloroplast in Fig. 2.2 differ from that shown in Fig. 2.1?

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(e) A plant that is kept in the dark loses its green colour over time.

If it is then exposed to light, the green colour returns.

As the plant turns green, the ribosomes in the cytoplasm and the chloroplasts of the leaf cells become more active.

Suggest why the ribosomes in the cytoplasm and chloroplasts become more active in the light.

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[Total: 16]

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 candidates' scripts.

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