UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education
Advanced Subsidiary Level and Advanced Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

BIOLOGY **9700/34**

Paper 32 Advanced Practical Skills **May/June 2010**

2 hours

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a pencil for any diagrams, graphs or rough working.
Do **not** use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
You are advised to spend one hour on each question.

For Examiner's Use	
1	
2	
Total	

This document consists of **11** printed pages and **1** blank page.

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You are reminded that you have only one hour for each question in the practical examination. You should read carefully through the whole of each question and then plan your use of the time to make sure that you finish all the work that you would like to do.

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You will gain marks for recording your results according to the instructions.

1 Plant cells contain an enzyme, catalase, which catalyses the breakdown of hydrogen peroxide into oxygen and water.

You are required

- to immobilise the catalase in sodium alginate beads
- to investigate the independent variable, hydrogen peroxide concentration.

When a bead is dropped into hydrogen peroxide it will sink and then the release of oxygen causes the bead to rise.

You are provided with

- 50 cm^3 of 10 % hydrogen peroxide solution, labelled **H**
- 100 cm^3 of distilled water, labelled **W**
- 10 cm^3 of a plant extract containing catalase, labelled **P**
- 15 cm^3 of 2 % sodium alginate solution, labelled **S**
- 30 cm^3 of 1.5 % calcium chloride solution, labelled **C**.

Proceed as follows:

1. Put 10 cm^3 of **C** into a large test-tube.
2. Put 5 cm^3 of **S** into a small beaker.
3. Put 3 cm^3 of **P** into the same beaker and mix well.
4. Use a 5 cm^3 syringe to collect 2 cm^3 of the mixture, **S** and **P**.
5. Suspend the 5 cm^3 syringe over the large test-tube containing **C** as shown in Fig. 1.1.

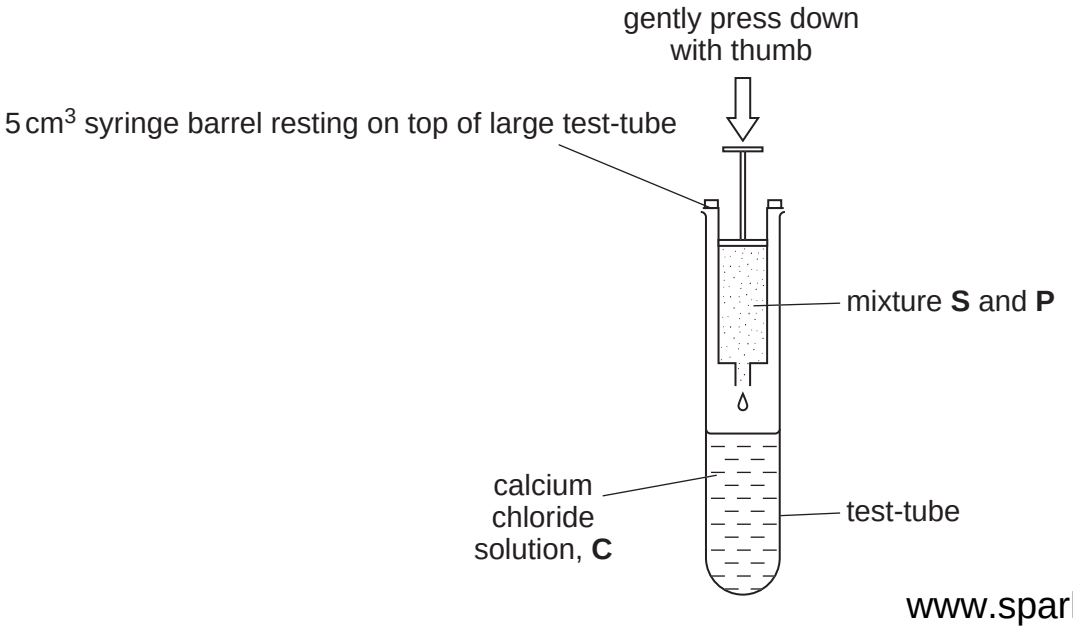

Fig. 1.1

6. Gently press down on the plunger of the 5 cm^3 syringe with your thumb to release a drop into solution **C**. The drop should form a bead.

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7. Repeat step 6 to make the number of beads that you think you will need.

8. Tip the contents of the large test-tube into a Petri dish or shallow container.

(a) (i) Decide on the concentrations of hydrogen peroxide you will use in your investigation.

You will need to make up 10 cm^3 of each hydrogen peroxide concentration.

Prepare the space below to show

- the concentrations of hydrogen peroxide
- the volumes of hydrogen peroxide
- the volumes of distilled water.

[4]

9. Put 10 cm^3 of **H** into a small test-tube in a test-tube rack.

10. Pick up a bead using blunt forceps.

11. Drop the bead into **H** and immediately start the stop clock, stop watch or note the time on a clock.

12. Record the time taken for the bead to reach the surface.

13. Repeat steps 9 to 12 with each concentration of **H** that you have chosen to use.

    (A bead may sink to the bottom of the tube. If it does not rise to the surface after three minutes, stop the experiment and record >3 minutes.)

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(ii) Prepare the space below to record your results.

[5]

(iii) Identify **three** significant errors in your investigation.

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(iv) Suggest how you would make **three** improvements to this investigation.

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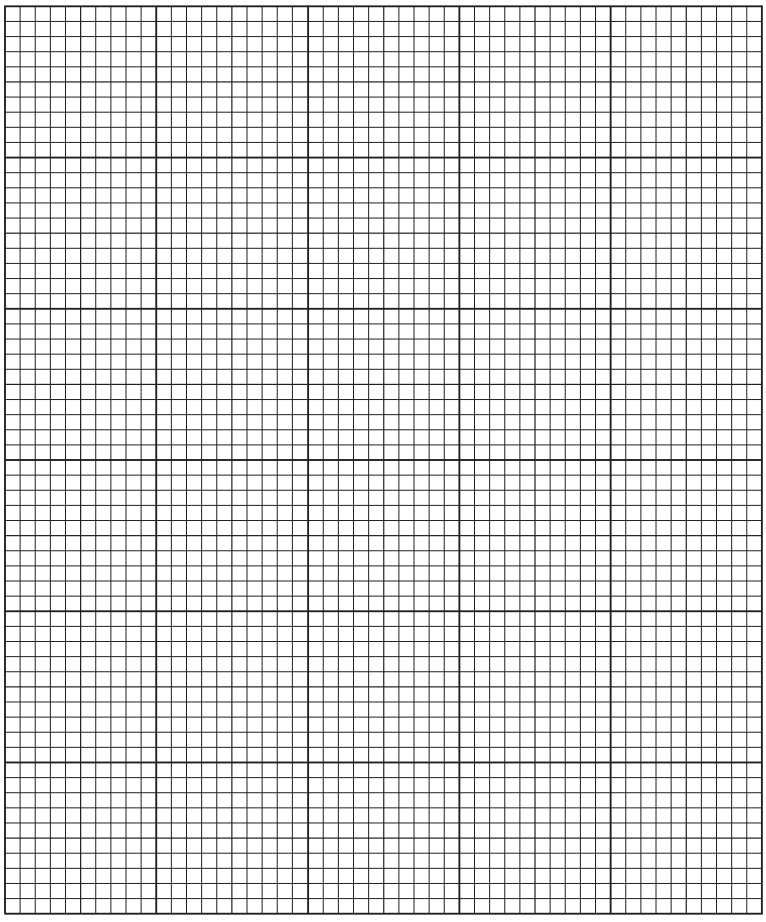
A student investigated the evolution of oxygen during the breakdown of hydrogen peroxide. Immediately the catalase and the hydrogen peroxide were mixed, a stop clock was started and the volume of oxygen released in each minute for five minutes was recorded.

The student's results are shown in Table 1.1.

Table 1.1

time / min	volume of oxygen collected in each minute / cm^3					
	trial 1	trial 2	trial 3	trial 4	trial 5	mean
1	3.0	2.8	3.0	2.9	2.8	2.9
2	0.6	0.8	0.8	0.7	0.9	0.8
3	0.4	0.5	0.6	0.6	0.7	0.6
4	0.3	0.3	0.4	0.5	0.5	0.4
5	0.1	0.2	0.2	0.1	0.3	0.2

(b) (i) Plot a graph of the data shown in Table 1.1.



(ii) Describe and explain the results of the student's investigation.

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.....[3]

[Total: 22]

2 **N1** is a slide of a stained transverse section through a plant organ.

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(a) **(i)** Draw a large plan diagram of a sector to include only three vascular bundles.

Draw a circle around one of the vascular bundles on your plan diagram.

Label the xylem.

[5]

(ii) Draw three complete cells from the epidermis which are touching.

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Draw three complete touching cells between the inner edge of a vascular bundle and the centre of the specimen. This drawing should show any difference in size observed between these cells and the two epidermal cells.

Fig. 2.1 is a photomicrograph of a transverse section of part of an organ from a different plant species.

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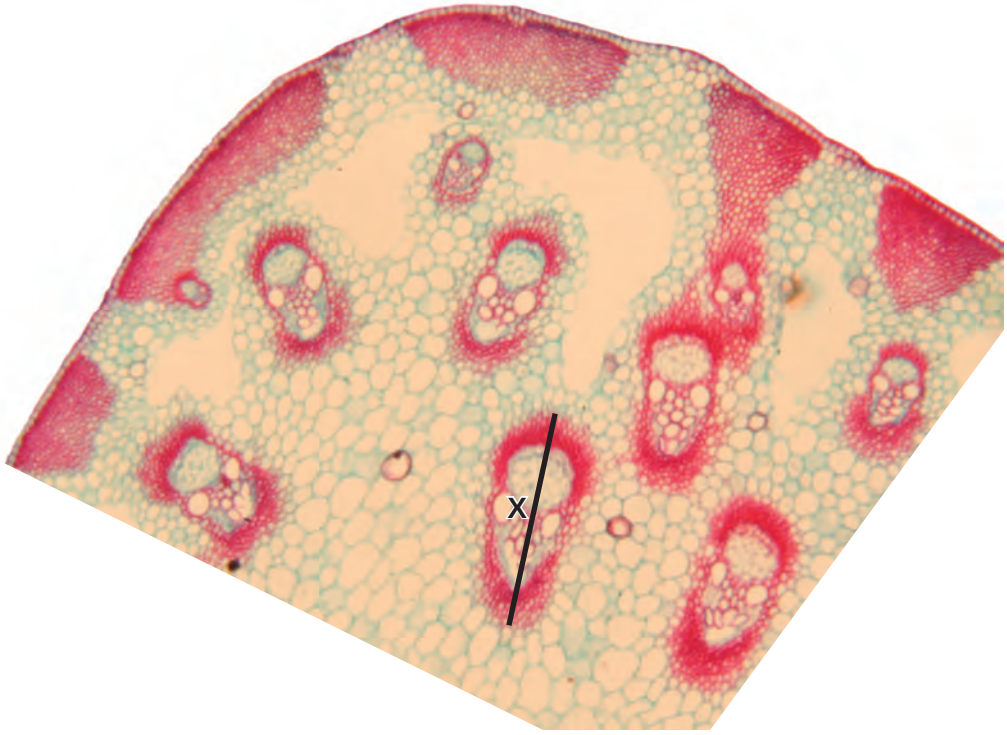

magnification ×110

Fig. 2.1

(b) (i) Calculate the **actual length,** in μm, of the structure shown by line **X**.

Show all the steps in your calculation.

Answer .....μm [2]

(ii) Using Fig. 2.1, find the mean **actual length** of these structures.

Prepare the space below and record your results.

(iii) Draw a large plan diagram of the specimen as shown in Fig. 2.1.

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[1]

(iv) Annotate your plan diagram (make notes with label lines) to show three differences between your diagram and the specimen on slide **N1**. [3]

[To

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