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

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

BIOLOGY **9700/32**

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.

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1	
2	
Total	

This document consists of **13** printed pages and **3** blank pages.

UNIVERSITY of CAMBRIDGE International Examinations

[Turn over

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 of the work that you would like to do.

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

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1 Yeast cells contain enzymes which catalyse the breakdown of glucose to produce carbon dioxide and water.

The carbon dioxide reacts with water and forms a weak acid.

Bromothymol blue is a pH indicator and changes colour as shown in Table 1.1.

Table 1.1

pH	colour of bromothymol blue
8	blue
7	green
6	yellow

You are required

- to immobilise the yeast cells in sodium alginate beads
- to follow a student's procedure to investigate the independent variable, changing the surface area of the beads.

You are provided with

- 15 cm^3 of yeast suspension, labelled **Y**
- 15 cm^3 of 2.0 % sodium alginate solution, labelled **S**
- 50 cm^3 of 1.5 % calcium chloride solution, labelled **C**
- 40 cm^3 of 2.0 % glucose solution, labelled **G**
- 50 cm^3 of bromothymol blue, labelled **B**
- 20 cm^3 of sodium hydroxide solution, labelled **A**

1. Put 20 cm^3 of **C** into a large test-tube.

2. Put 5 cm^3 of **S** into a small beaker or container.

3. Collect 5 cm^3 of **Y from below the froth** and put it into the same container as **S**. Mix well.

4. Use a 5 cm^3 syringe to collect 2 cm^3 of the mixture **S** and **Y**.

5. Suspend the 5 cm^3 syringe over the large test-tube containing **C** as shown in Fig. 1.1.

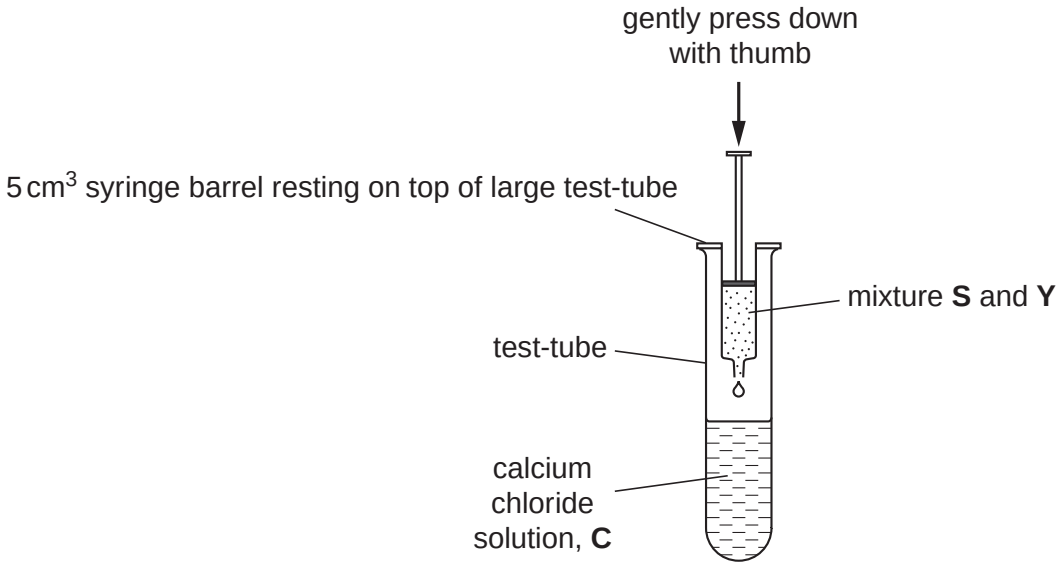

Fig. 1.1

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

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.

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You will need to calculate the mean surface area of the beads. Use blunt forceps to pick up the beads.

To do this

- decide on the number of beads you will measure
- use the 2 mm × 2 mm grid to measure each bead
- calculate the surface area of each bead using the formula

  surface area = $4\pi r^2$ where $\pi = 3.14$, r = radius of a bead
- calculate the mean surface area of the beads.

(a) (i) Prepare the space below to show your measurements and calculations.

Show all the steps in your calculation of the mean.

mean surface area of the beads .....mm^2 [5]

A student suggested that it was possible to investigate the independent variable, surface area, by changing the number of beads. The maximum number of beads used was 20. Decide the other numbers of beads to use and state the different number of beads you will use.

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Carry out the student's procedure.

9. Label as many small test-tubes as you will need with the number of beads for each test-tube.

10. Put 10 cm^3 of solution **G** into each test-tube.

11. Put 1 cm^3 of **B** into each test-tube. Put the bung in each test-tube in turn and mix.

12. If the contents of the test-tube are not blue, add one drop at a time of **A** to the contents of each test-tube to turn them all the same blue colour.

13. Put the required number of beads into each test-tube.

14. Put the bung in each test-tube in turn and mix contents. Mix every 2 minutes for 6 minutes.

15. Record your observations after each 2 minutes, up to 6 minutes.

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

[7]

(iii) The student realised that there were two independent variables in this procedure.

State the **two** independent variables.

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..... [1]

(iv) Suggest how you would make **three** improvements to the student's procedure.

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..... [3]

A student set up the apparatus as shown in Fig. 1.2 as another way to measure the carbon dioxide produced by immobilised yeast cells over a period of 75 minutes. The student measured the distance the liquid moved in the capillary tubing.

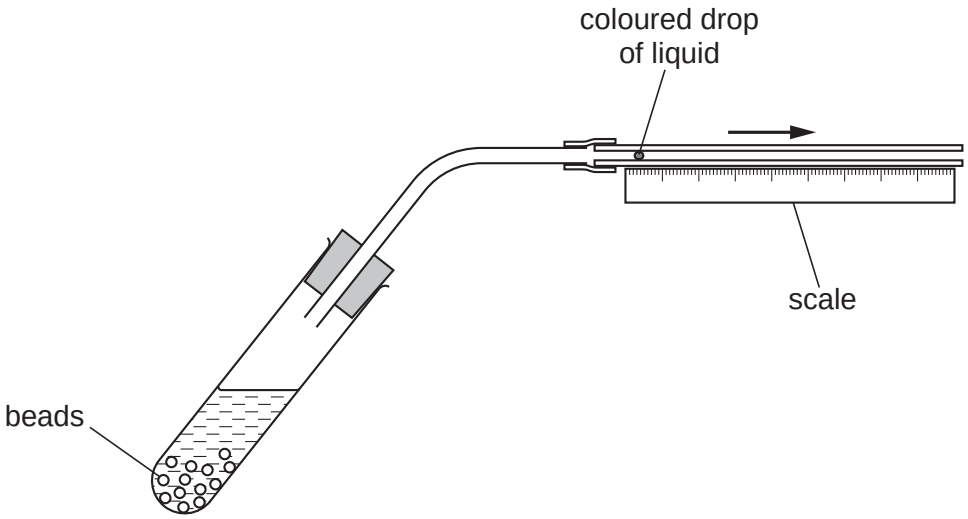

Fig. 1.2

The student's results are shown in Table 1.2.

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Table 1.2

time / min	total distance moved by the liquid in the capillary tube / mm
0	0
15	3
30	10
45	18
60	19
75	19

(b) Describe and explain the results shown in Table 1.2.

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..... [3]

[Total: 19]

2 **M1** 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 half of the specimen as shown in Fig. 2.1.

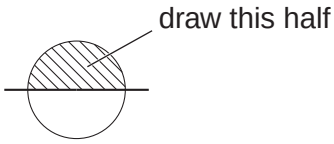

Fig. 2.1

Label the xylem and the cortex.

[5]

(ii) Make a high-power drawing of

- a group of three complete touching xylem vessels

and

- a group of three complete touching cortex cells.

Label a cell wall and a lumen.

xylem vessels

cortex cells

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[5]

Fig. 2.2 is a photomicrograph showing part of an organ from a plant of a different species.

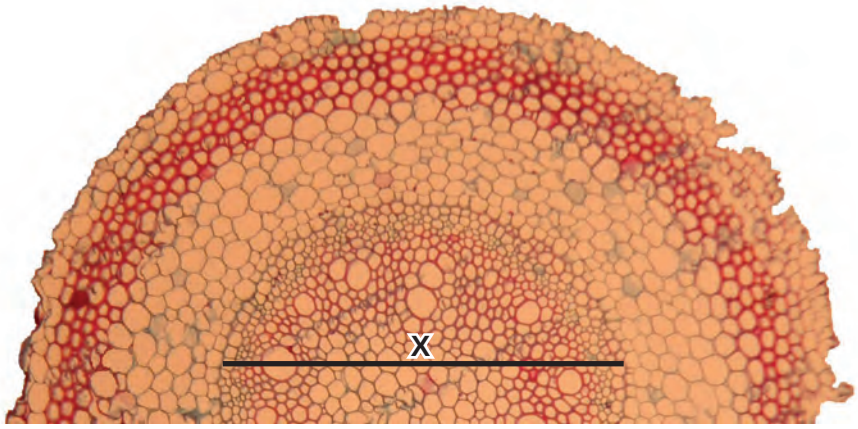

Fig. 2.2

The actual length of the line **X** is 1900 μm.

(b) (i) Calculate the magnification of the specimen shown in Fig. 2.2.

Show all the steps in your calculation.

[3]

(ii) Prepare the space below so that it is suitable for you to record the observable differences between the specimens on slide **M1** and in Fig. 2.2.

Record your observations in the space you have prepared.

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[4]

A student investigated water absorption by a plant.

The apparatus was set up by the student as shown in Fig. 2.3.

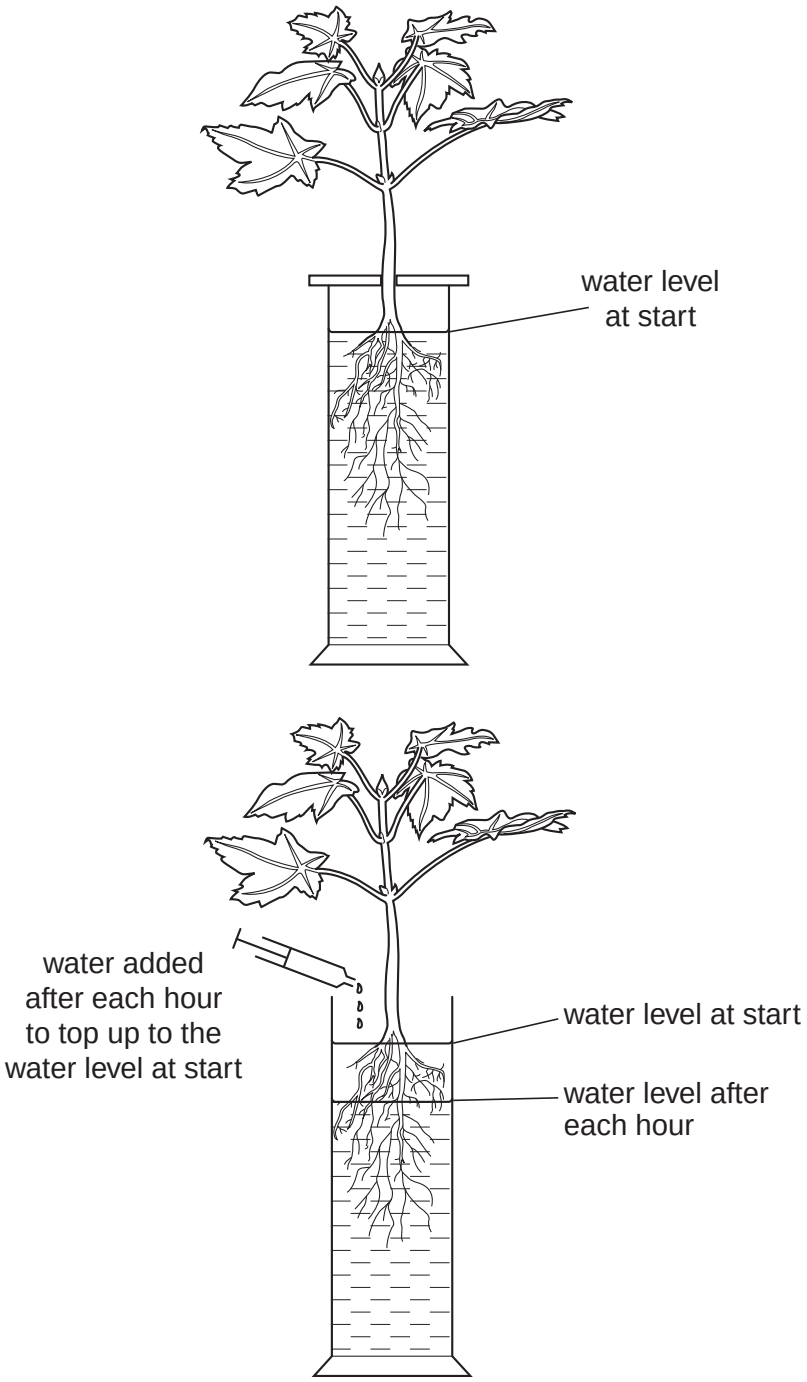


Fig. 2.3

The volume of water added to top up the water level was recorded each hour for a total of 5 hours.

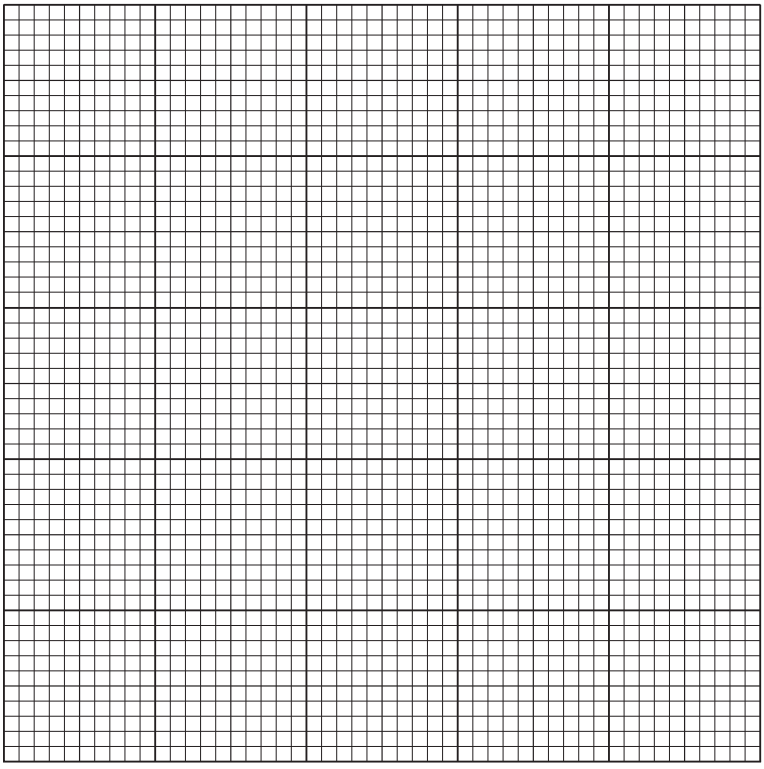
From this data the student calculated the volume of water absorbed by the plant.

The student's results are shown in Table 2.1.

Table 2.1

time /hours	volume of water absorbed / $cm^3\,hr^{-1}$
1	0.9
2	1.5
3	2.1
4	2.3
5	1.6

(c) Plot a graph of the data shown in Table 2.1.



[4]

[Total: 21]

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