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

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

5657597120

BIOLOGY **9700/31**

Advanced Practical Skills 1 **October/November 2012**

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 ink.
You may use a pencil for any diagrams, graphs or rough working.
Do **not** use red ink, staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

You may lose marks if you do not show your working or if you do not use appropriate units.

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.

For Examiner's Use	
1	
2	
Total	

This document consists of **12** printed pages.

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You are reminded that you have **only one hour** for each question in the practical examination.

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You should:

- read carefully through **the whole** of Question 1 and Question 2
- then plan your use of **the time** to make sure that you finish all the work that you would like to do.

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

1 You are required to investigate how much glucose diffuses from a plant tissue extract through a partially permeable wall of Visking (dialysis) tubing.

Fig. 1.1 shows the apparatus you will set up for this investigation.

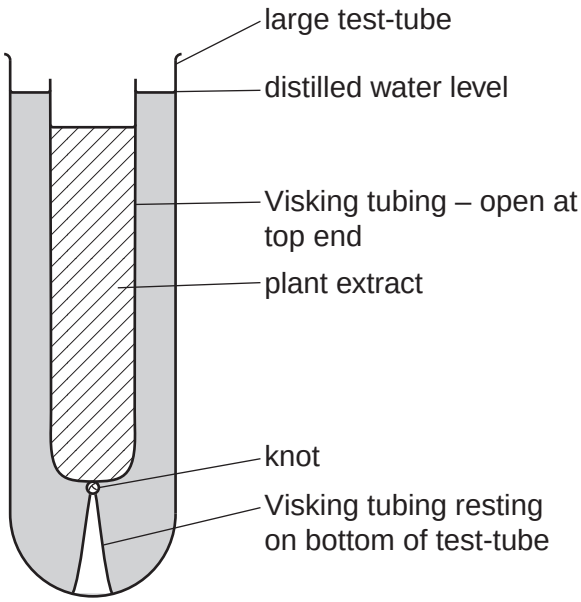


Fig. 1.1

You are provided with:

labelled	contents	hazard	volume /cm^3
P	plant tissue extract	none	20
W	distilled water	none	100
G	1% glucose solution	none	25
Benedict's solution	Benedict's solution	harmful irritant	30

labelled	contents	hazard	details	quantity
V	Visking tubing in distilled water	none	15 cm length in distilled water	1

Proceed as follows:

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1. Tie a knot in the Visking tubing as close as possible to one end so that it seals the end.

2. To open the other end, wet the Visking tubing and rub the tubing gently between your fingers.

3. Without mixing **P**, put some of **P** into the Visking tubing to the level shown in Fig. 1.1.

4. Rinse the outside of the Visking tubing by dipping it into the water in the container labelled **V**.

5. Put the Visking tubing into the large test-tube.

(a) (i) State the volume of **W** needed to reach the water level as shown in Fig. 1.1.

volume of **W** ..... cm^3 [1]

6. Put the volume of **W**, as decided in **(a)(i)**, into the large test-tube.

7. Put the large test-tube with the Visking tubing into a test-tube rack and leave for 20 minutes.

   During the 20 minutes:
   - set up a boiling water-bath ready for step 11
   - make a serial dilution of 1% solution **G** which reduces the concentration of **G** by **half** between each successive dilution.

You will need to make up 20 cm^3 of each concentration of solution **G**.

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(ii) Complete Fig. 1.2 to show how you will make **four** further concentrations of **G**, starting with the 1% solution, **G**.

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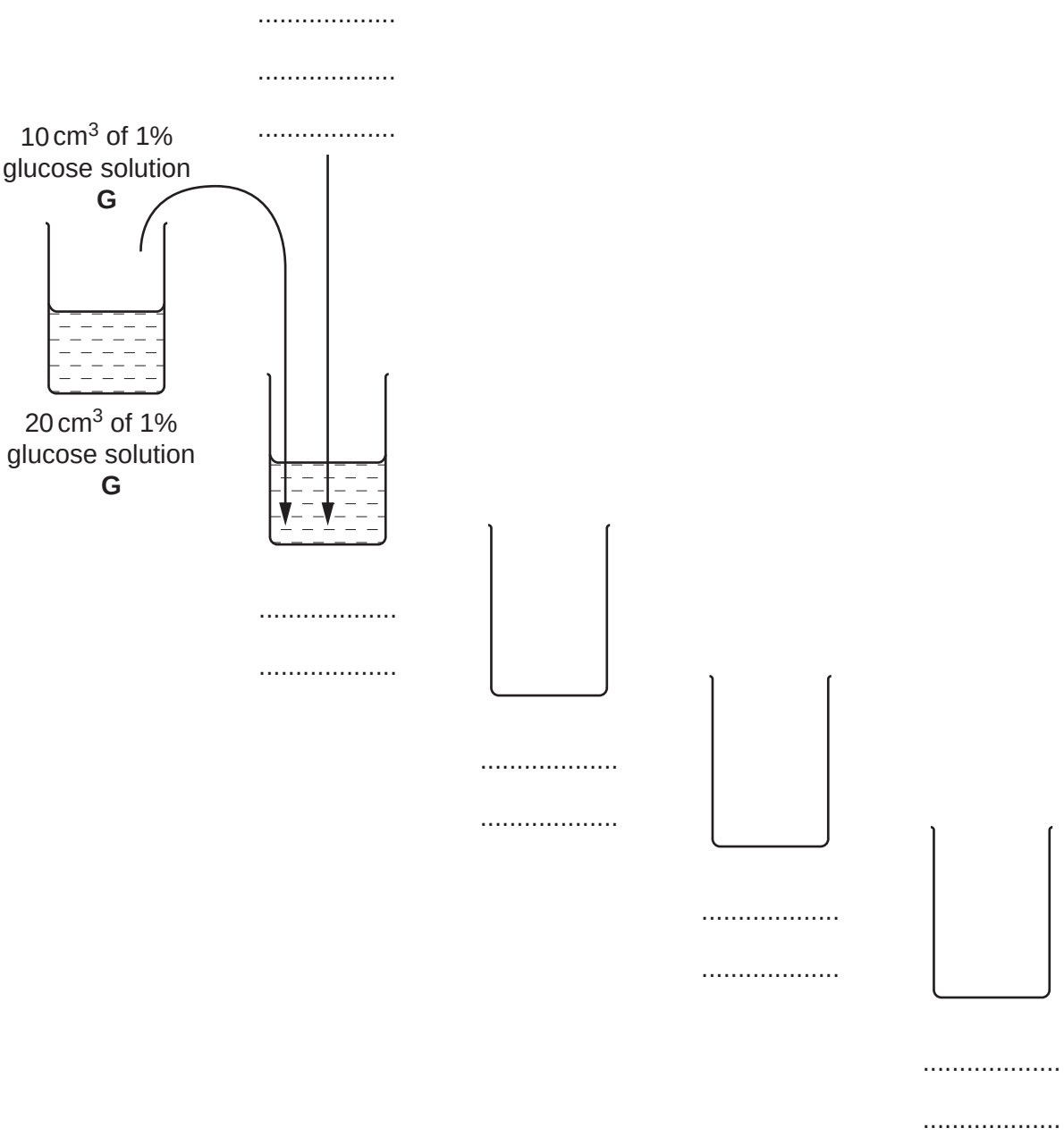


Fig. 1.2 [3]

8. Prepare the concentrations of **G** as decided in **(a)(ii)** in the containers provided.

9. After 20 minutes, which started at step 7, remove the Visking tubing and put it into the container labelled **'for waste'**.

10. Pour the water from the large test-tube into a container and label it **S**.

11. Carry out the Benedict's test on all 6 solutions (five of **G** and one of **S**).

    You will need to use 2 cm^3 of each of the solutions of **G** and **S** with 2 cm^3 of Benedict's solution.

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12. Test each solution separately and record the time taken for the first appearance of any colour change. If there is no colour change after 120 seconds record ‘more than 120’.

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(iii) Prepare the space below and record your results.

[4]

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(iv) Complete Fig. 1.3 below to show

- the positions of each of the percentage concentrations of solution **G**
- the letter **S** to show where the sample fits in the series of concentrations.

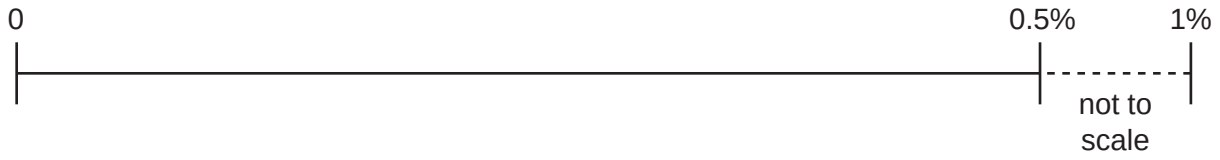


Fig. 1.3 [2]

(v) A colorimeter could **not** have been used in this investigation.

Describe **three other** modifications to this investigation which would improve the confidence in your results.

.....

.....

.....

.....

.....

.....

.....[3]

In a similar investigation, a student investigated how changing the concentration of glucose solution (independent variable) in the Visking tubing affected the quantity of glucose diffusing through the wall into the surrounding solution.
After 20 minutes a dye was added to the surrounding solution. This produced different intensities of colour depending on the glucose concentration in the surrounding solution.

A colorimeter was used to measure the absorbance of light by the coloured solution.

Other variables were considered and kept to a standard.

The student's results are shown in Table 1.1.

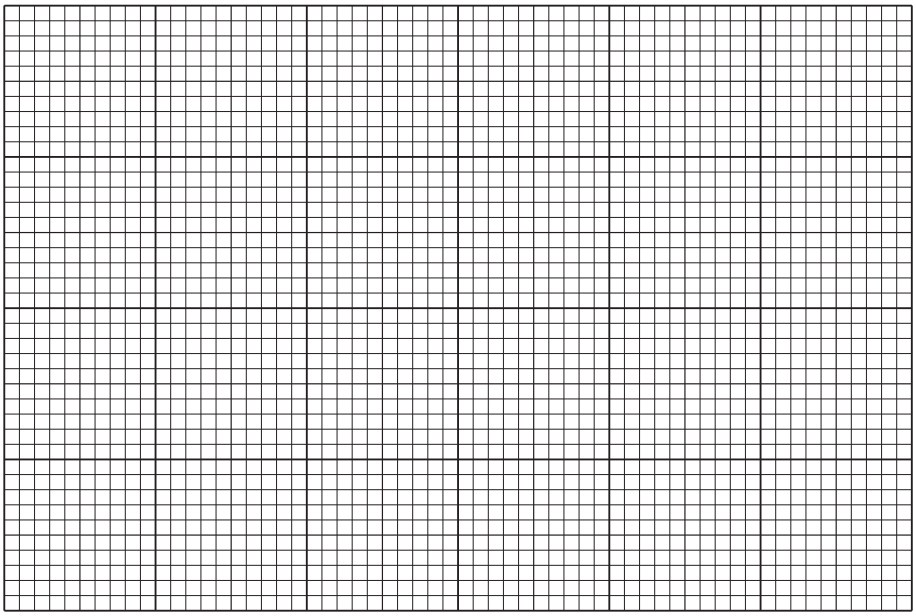
Table 1.1

concentration of glucose solution inside the Visking tubing / arbitrary units	**absorbance of light by the coloured solution / arbitrary units**
10	0.750
15	1.100
20	1.475
25	1.850
30	1.900

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

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[4]

(ii) Explain the difference in the results for the glucose concentration at 10 arbitrary units and at 15 arbitrary units.

.....

.....

.....[1]

(iii) Explain the difference in the gradients of the line between the glucose concentrations of 10 arbitrary units and 25 arbitrary units **and** between 25 arbitrary units and 30 arbitrary units.

.....

.....

.....[1]

(iv) The student used a measuring cylinder to measure the volumes of glucose solution. The smallest division on the measuring cylinder scale was 0.2 cm^3.

State the actual error in measuring a volume of 5 cm^3 using this measuring cylinder.

5 cm^3 ± ..... cm^3 [1]

[Total: 20]

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2 **J1** is a slide of a transverse section through a plant root.

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(a) **(i)** Describe one observable feature on **J1** which identifies this specimen as a root.

.....

..... [1]

(ii) Draw a large plan diagram of the whole specimen on **J1**.

On your diagram, use a label line and label to show the cortex.

[4]

(iii) Make a large drawing of one group of four complete touching xylem vessels as observed on the specimen on **J1.**

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On your drawing, use a label line and label to show one lumen.

Annotate your drawing with one observable feature.

[5]

Fig. 2.1 shows a diagram of a stage micrometer scale that is being used to calibrate an eyepiece graticule.

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One division, on either the stage micrometer scale or the eyepiece graticule, is the distance between two adjacent lines.

The length of one division on this stage micrometer is **0.1 mm.**

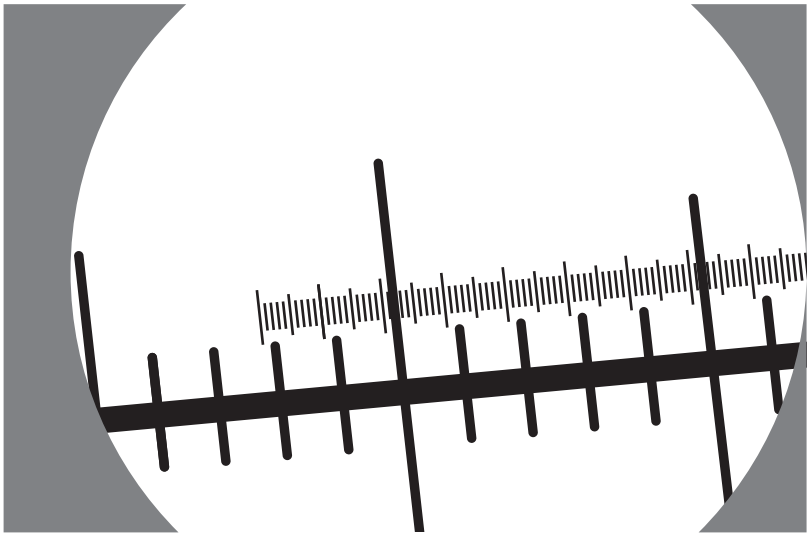


Fig. 2.1

(b) (i) Using this stage micrometer, where one division is **0.1 mm**, calculate the actual length of one eyepiece graticule unit using Fig. 2.1 by completing Fig. 2.2.

Step 1

1 eyepiece graticule unit = [ ] divided by [ ] = …… mm

Step 2

Convert the answer to a measurement with the unit most suitable for use in light microscopy.

[ ] multiplied by [ ] = ……

Fig. 2.2 [3]

Fig. 2.3 is a photomicrograph showing part of an organ from a plant of a different species.

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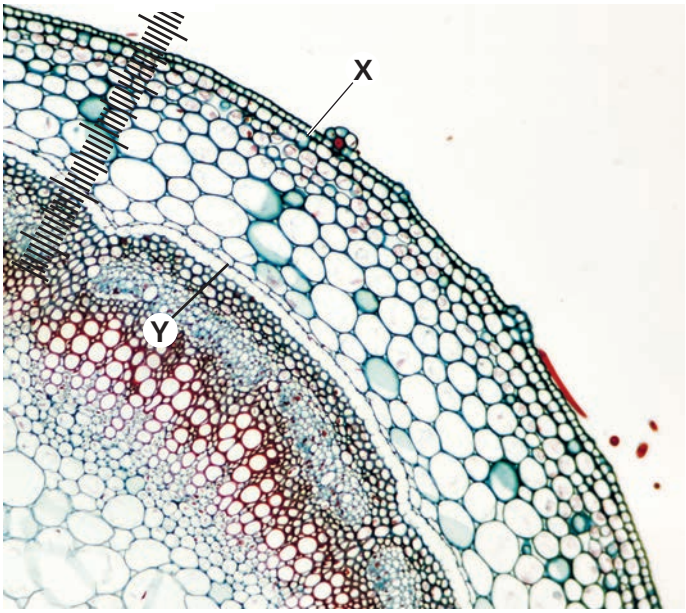


Fig. 2.3

(ii) Fig. 2.3 shows a photomicrograph taken using the same microscope with the same lenses as Fig. 2.1.

Use the calibration of the eyepiece graticule unit from **(b)(i)** and Fig. 2.3 to calculate the actual length of the plant tissue from **X** to **Y.**

You will lose marks if you do not show all the steps in your calculation and do not use the appropriate units.

[2]

Question 2 continues on page 12.

Fig 2.3 is shown again here to help you answer **(c)**.

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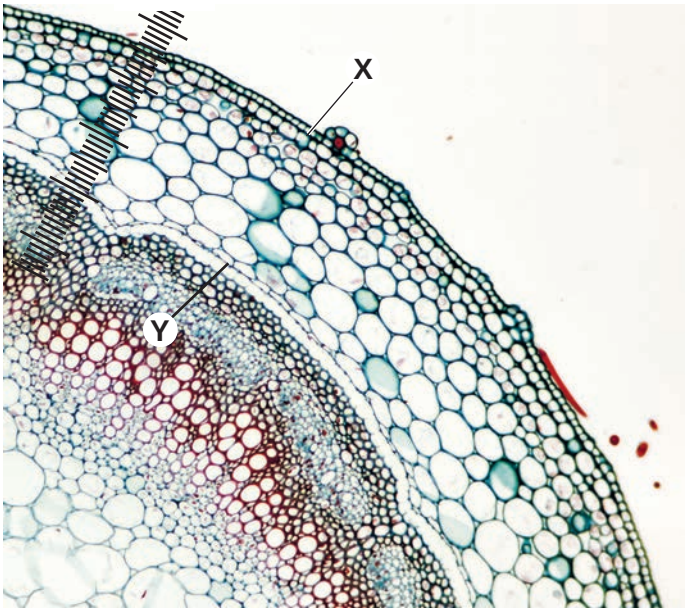


Fig. 2.3

(c) Prepare the space below so that it is suitable for you to record observable differences between the specimen on slide **J1** and in Fig. 2.3, to include:

- the vascular tissue
- at least two other tissues.

[5]

[Total: 20]

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