Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

BIOLOGY **9700/35**

Paper 3 Advanced Practical Skills 1 **May/June 2017**

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 an HB pencil for any diagrams or graphs.
Do **not** use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

Electronic calculators may be used.
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 **13** printed pages and **3** blank pages.

CAMBRIDGE International Examinations

Before you proceed, read carefully through the **whole** of Question 1 and Question 2.

Plan the use of the **two hours** to make sure that you finish all the work that you would like to do.

If you have enough time, think about how you can improve the accuracy of your results, for example by obtaining and recording one or more additional measurements.

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

1 The enzyme amylase, **E**, hydrolyses (breaks down) starch, to a reducing sugar.
You are required to investigate how much reducing sugar diffuses from a mixture of starch and amylase through a partially permeable wall of Visking tubing.

You are provided with:

labelled	contents	hazard	volume /cm^3
E	2.0% amylase solution	irritant	20
S	1.0% starch suspension	none	20
W	distilled water	none	150

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

If **E** comes into contact with your skin, wash it off immediately under cold water.
It is recommended that you wear suitable eye protection.

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

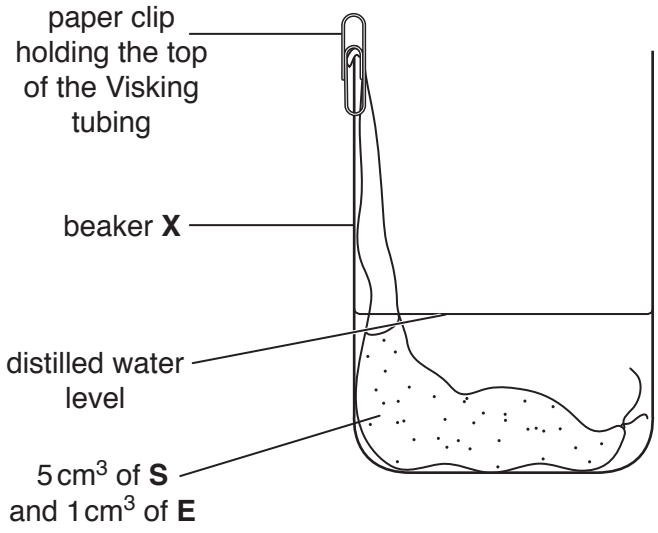


Fig. 1.1

Proceed as follows:

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. Put 5 cm^3 of **S** into the Visking tubing.

4. Put 1 cm^3 of **E** into the Visking tubing.

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

Look carefully at Fig. 1.1. This has been set up so that the volume of water is as small as possible to cover the Visking tubing. The part of the Visking tubing containing the mixture is on the bottom of the beaker.

6. Put the Visking tubing into the beaker, labelled **X**, as shown in Fig. 1.1.

7. Put **W** into the beaker up to the level shown on Fig. 1.1 using a syringe so that you can measure the volume of **W**.

(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]

8. Leave the apparatus for 20 minutes.

While you are waiting, continue with Question 1.

9. After 20 minutes, remove the Visking tubing and put it into the container labelled '**For waste**'.

You are required to:

- prepare a serial dilution of the 1.0% reducing sugar solution, **R**
- carry out the Benedict's test for the known concentrations of reducing sugar and the water surrounding the Visking tubing
- use the results to estimate the concentration of reducing sugar in the water surrounding the Visking tubing.

You are provided with:

labelled	contents	hazard	volume / cm^3
W	distilled water	none	150
R	1.0% reducing sugar solution	none	25
Benedict's	Benedict's solution	irritant	30

It is recommended that you wear suitable eye protection.

If **Benedict's** comes into contact with your skin, wash it off immediately with cold water.

(ii) You are required to make a **serial** dilution of the 1.0% reducing sugar solution, **R**, which reduces the concentration of **R** by **half** between each successive dilution.

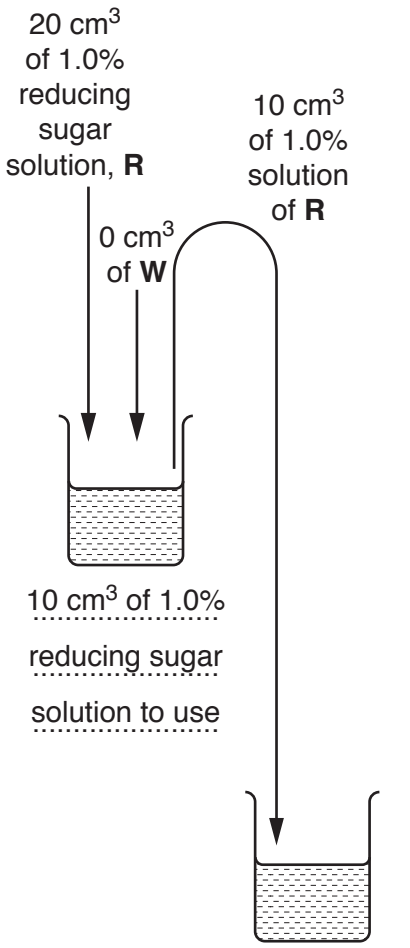
You will need to prepare 20 cm^3 of each concentration.

Fig. 1.2 shows the first two beakers you will use to make your serial dilution.

Complete Fig. 1.2 by drawing as many extra beakers as you need for your serial dilution.

For each beaker:

- state, under the beaker, the **concentration** and the **volume** of the solution available for use in this investigation
- use one arrow, with a label above the beaker, to show the **concentration** and **volume** of the reducing sugar solution added to prepare the concentration
- use another arrow, with a label above the beaker, to show the **volume** of **W** added to prepare the concentration.


20 cm3 of 1.0% reducing sugar solution, R
10 cm3 of 1.0% solution of R
0 cm3 of W
10 cm3 of 1.0% reducing sugar solution to use

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[3]

Fig. 1.2

10. Set up a boiling water-bath ready for step 12.

11. Prepare the concentrations of reducing sugar solution, as decided in **(a)(ii)**, in the containers provided.

12. Carry out the Benedict's test on each of the concentrations of reducing sugar solution and record your results in **(a)(iii)**.

    You will need to use 2 cm^3 of each of the concentrations of reducing sugar solution with 2 cm^3 of Benedict's solution.

13. Test each solution separately and record in **(a)(iii)** the time taken for the first appearance of any colour change. If there is no colour change after 180 seconds record as 'more than 180'.

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

[5]

(iv) Describe **one** significant source of error when carrying out steps 12 and 13.

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.....[1]

Before proceeding, check that you have carried out step 9 on page 3.

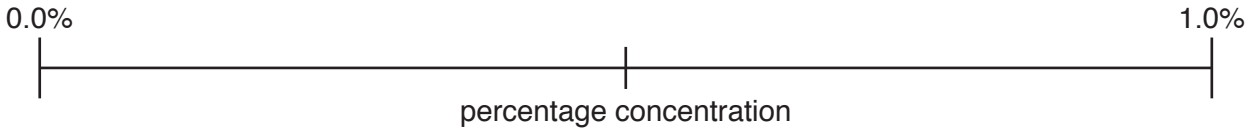
14. Carry out the Benedict's test on a sample taken from beaker **X** (sample **X**) and record the time taken for the first colour change to appear.

(v) State the time taken for the first colour change for sample **X**.

time taken = ... [1]

(vi) Complete Fig. 1.3 to show:

- the positions of each of the percentage concentrations of reducing sugar solution
- an estimate of the concentration of reducing sugar in the sample **X**, using a letter **X**.



[2]

Fig. 1.3

(vii) Describe how you could use this procedure to produce a more accurate estimate of the concentration of reducing sugar in the sample **X** than the one given in **(a)(vi)**.
Do **not** include the use of a colorimeter in your answer.

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.....[3]

(b) A scientist investigated the effect of temperature (independent variable) on the activity of the enzyme in the Visking tubing.

All other variables were kept constant.

The quantity of reducing sugar diffusing through the wall of the Visking tubing was measured by a dye in the surrounding solution. The dye reacted with the reducing sugar. The more reducing sugar present the more intense the colour.

A colorimeter was used to measure the absorbance of light by the coloured solution. The absorbance of light by pure water is 0.00 arbitrary units.

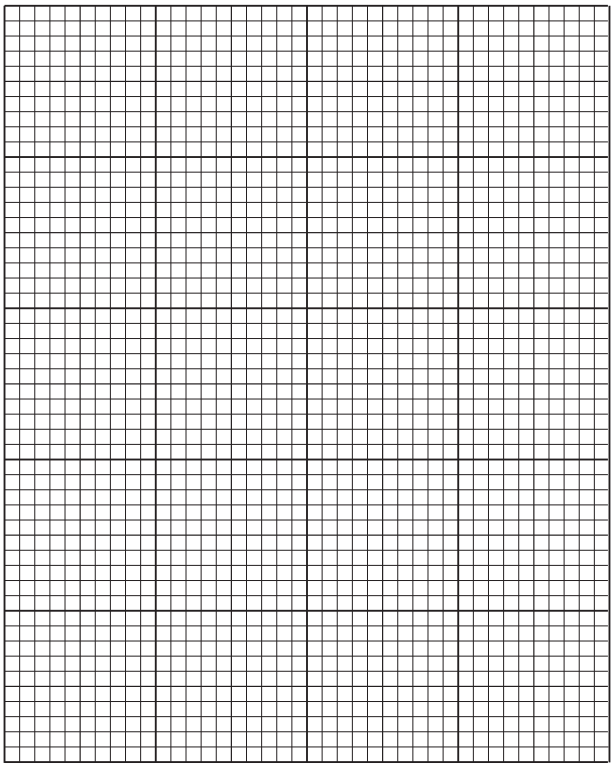
The results are shown in Table 1.1.

Table 1.1

temperature /°C	**absorbance of light by the coloured solution /arbitrary units**
30	0.90
41	1.46
49	1.58
59	1.10
70	0.65

Use a sharp pencil for graphs.

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



[4]

(ii) Explain the difference in the absorbance of light between 49 °C and 70 °C.

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.....[3]

[Total: 23]

2 **L1** is a slide of a stained transverse section through a plant leaf.

You are not expected to be familiar with this specimen.

You are required to:

- use the eyepiece graticule to measure part of a leaf and a vascular bundle
- use these measurements to calculate the depth of the vascular bundle as a percentage of the depth of the leaf
- draw a plan diagram of part of the leaf.

(a) The eyepiece graticule in the microscope can be used to measure different tissues.
Select a part of the leaf on **L1** which shows the widest part of the leaf (mid-rib) shown by **Y** in Fig. 2.1.

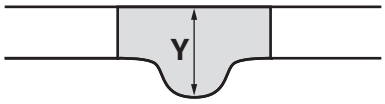

Fig. 2.1

(i) Use the eyepiece graticule in the microscope to measure:

- the depth of the leaf at **Y**
- the depth of the vascular bundle at **Y**.

depth of leaf ..... eyepiece graticule units

depth of vascular bundle ..... eyepiece graticule units [1]

(ii) Use the measurements from **(a)(i)** to calculate the depth of the vascular bundle as a percentage of the depth of the leaf.

You may lose marks if you do not show your working.

answer = ...% [2]

Use a sharp pencil for drawing.

(iii) Use the measurements from **(a)(i)** to help you draw a large plan diagram of the section of the leaf shown by the shaded area in Fig. 2.2.

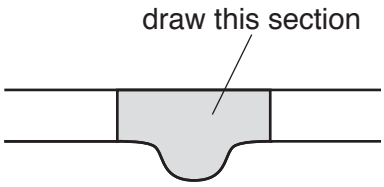

Fig. 2.2

You are expected to draw the correct shape and proportions of the different tissues.

Use **one** ruled label line and label to identify the vascular bundle.

[5]

(iv) Observe the vascular bundle in the central part of the leaf on **L1**.
Select one group of **four** adjacent (touching) xylem vessel elements. Each element must touch at least one of the other elements.

Make a large drawing of this group of **four** xylem vessel elements.

Use **one** ruled label line and label to identify the lumen of **one** xylem vessel element.

[5]

(b) Fig. 2.3 is a photomicrograph of a stained transverse section through a different type of leaf.

You are not expected to be familiar with this specimen.

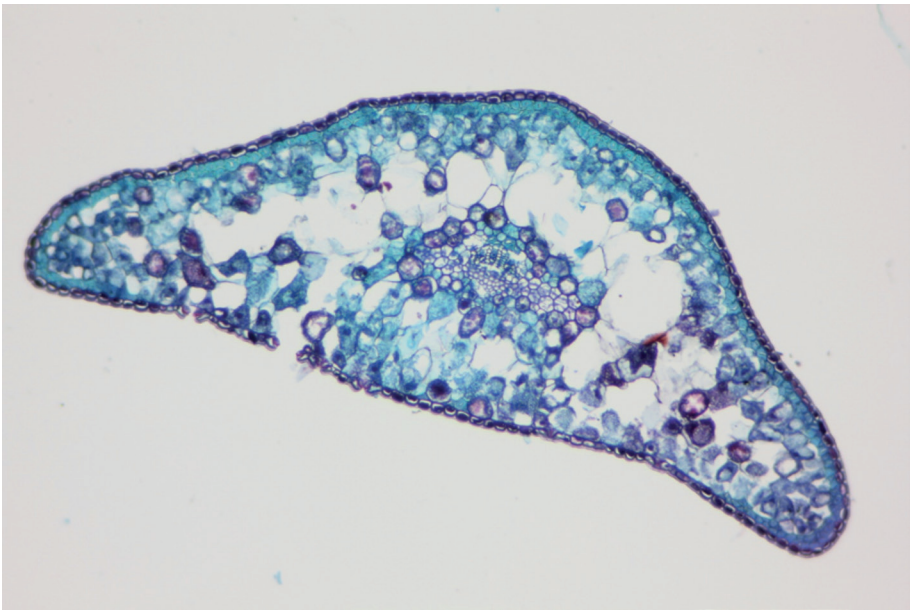

Fig. 2.3

Prepare the space below so that it is suitable for you to record the observable differences between the leaf sections on **L1** and in Fig. 2.3.

Record your observations in the space you have prepared.

[4]

[Total: 17]

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