Cambridge Assessment International Education

Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

1801403233

BIOLOGY **9700/35**

Paper 3 Advanced Practical Skills 1 **October/November 2020**

2 hours

You must answer on the question paper.

You will need: The materials and apparatus listed in the confidential instructions

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION

- The total mark for this paper is 40.
- The number of marks for each question or part question is shown in brackets [ ].

For Examiner's Use	
1	
2	
Total	

This document has **16** pages. Blank pages are indicated.

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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 the whole of Question 1 and Question 2.

1 Sucrase is an enzyme which hydrolyses the disaccharide sucrose into reducing sugars, as shown in Fig. 1.1.

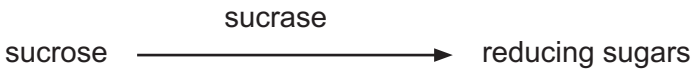


Fig. 1.1

The progress of this reaction can be followed by measuring the concentration of reducing sugar produced. To do this, samples can be taken at time intervals and the action of sucrase stopped in the sample.

The concentration of reducing sugar in the sample can then be tested using Benedict's solution and compared to known concentrations of reducing sugar.

You are provided with the materials shown in Table 1.1.

Table 1.1

labelled	contents	hazard	volume / cm^3
R	2.0% reducing sugar solution	none	50
B	Benedict's solution	harmful irritant	25
W	distilled water	none	150
U	unknown concentration of reducing sugar, sampled at 2 minutes	harmful irritant	2

If any solution comes into contact with your skin, wash off immediately under cold water.

It is recommended that you wear suitable eye protection.

[Turn over

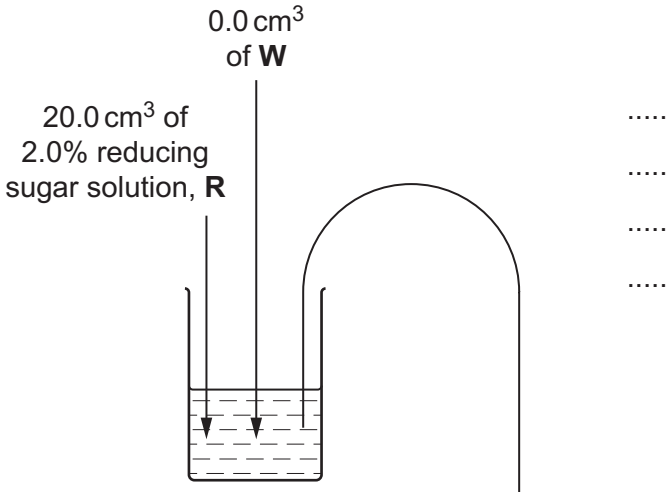
(a) You need to carry out a serial dilution of the 2.0% reducing sugar solution, **R**, to reduce the concentration by **half** between each successive dilution.

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

(i) 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 volume and concentration of reducing sugar solution available for use in the investigation
- use one arrow with a label, above the beaker, to show the volume and concentration of 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.



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.....

10.0 cm3 of 2.0% reducing sugar solution, R, available for use

.....
.....
.....
.....

Fig. 1.2

[3]

Carry out step 1 to step 8.

1. Set up a water-bath and heat to boiling ready for use in step 6.

2. Prepare the concentrations of reducing sugar solution decided in **(a)(i)** and shown in Fig. 1.2.

   Use a glass rod to mix the reducing sugar solutions and water.

3. Label test-tubes with the concentrations of reducing sugar solution prepared in step 2.

4. Put 2 cm^3 of each concentration of reducing sugar solution into an appropriately labelled test-tube.

5. Put 2 cm^3 of Benedict's solution, **B**, into each of these test-tubes. Shake gently to mix.

6. Put the test-tube labelled 2.0% into the boiling water-bath. Start timing.

7. Measure the time taken to the first colour change. Record the result in **(a)(ii)**.
   If there is no colour change after 90 seconds, record as 'more than 90'.

8. Repeat step 6 and step 7 using each of the concentrations of reducing sugar solution you prepared in step 2, instead of 2.0%. Record your results in **(a)(ii)**.

(ii) Record your results in an appropriate table.

[5]

You are provided with an unknown concentration of reducing sugar solution in the test-tube labelled **U**.

9. Put 2 cm^3 of **B** into the test-tube labelled **U**.

10. Repeat step 6 to step 7, using the test-tube labelled **U** instead of 2.0%. Record your result for **U** in **(a)(iii)**.

(iii) Record your result for **U**.

result for **U** = ... [1]

(iv) Using your results in **(a)(ii)** and **(a)(iii)**, estimate the concentration of reducing sugars in **U**.

U = ... [1]

(v) Suggest how you would make improvements to this investigation to obtain a more accurate estimate of the concentration of reducing sugars in **U**.

.....

.....

.....

.....

.....

..... [2]

[Turn over

(b) A student wanted to determine the Michaelis-Menten constant (K_m) for sucrase during the hydrolysis of sucrose, as shown in Fig. 1.1.

The student measured the initial rate of reaction at different concentrations of sucrose.

The results are shown in Fig. 1.3.

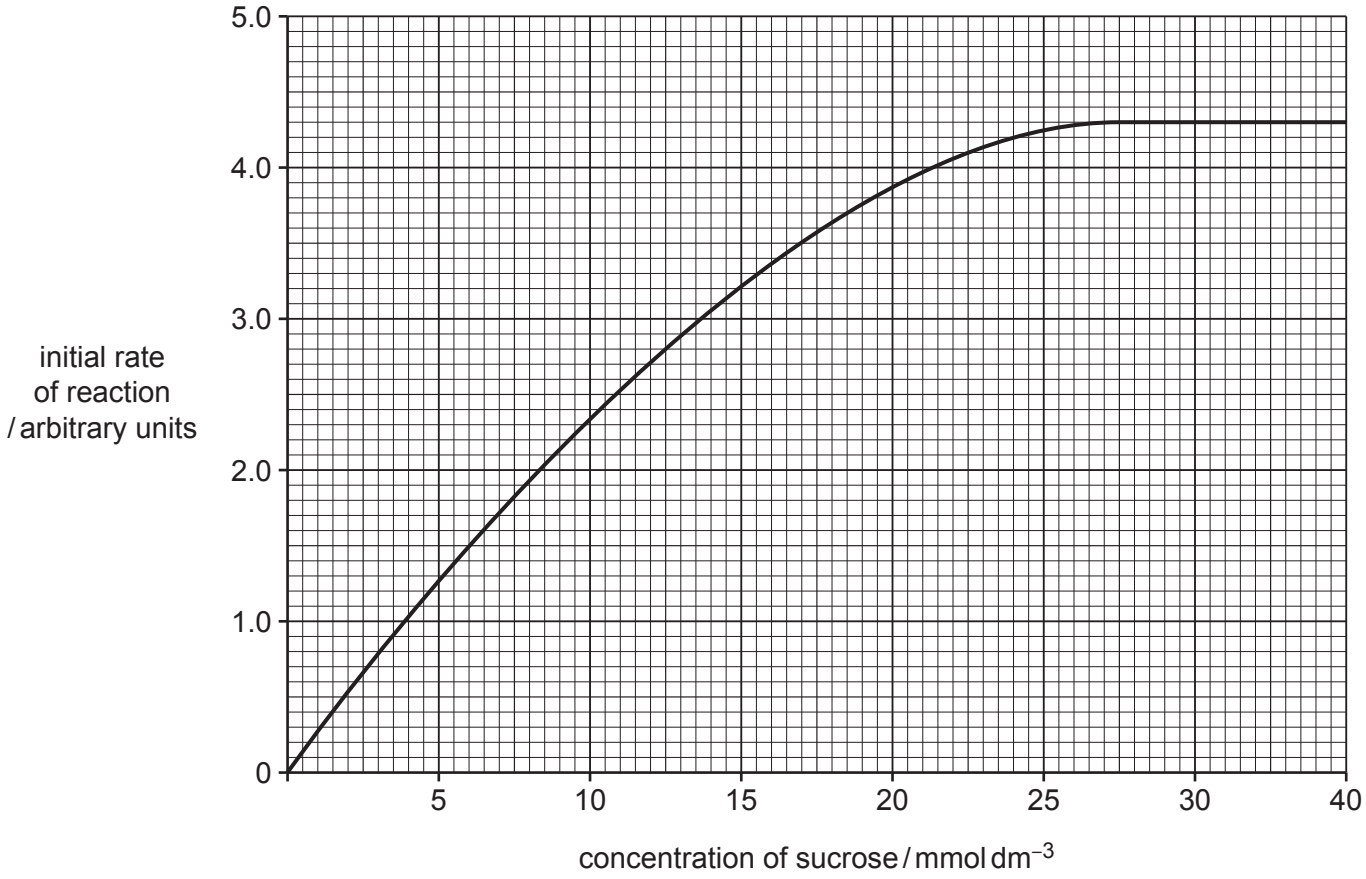

Fig. 1.3

(i) Use the graph in Fig. 1.3 to estimate the Michaelis-Menten constant (K_m).

Show your working on the graph and in the space below.

K_m = ... mmol dm^{-3} [3]

(ii) The K_m value for another enzyme, **Z**, is 0.95 mmol dm^{-3}.

State which enzyme, **Z or** sucrase, has a **lower affinity** for its substrate.

Give a reason for your answer.

enzyme .....

reason .....

..... [1]

(iii) Explain why the initial rate of reaction does not increase between 30 mmol dm^{-3} and 40 mmol dm^{-3} of sucrose.

.....

.....

..... [1]

(c) A scientist carried out some research into the sugar content of five different fruit juices.

The results are shown in Table 1.2.

Table 1.2

type of fruit juice	concentration of sugar / arbitrary units
red grape (RG)	21.25
white grape (WG)	18.50
orange (OR)	11.75
pineapple (PA)	10.25
grapefruit (GF)	14.00

Plot a bar chart of the data in Table 1.2 on the grid in Fig. 1.4.

Use a sharp pencil for drawing bar charts.

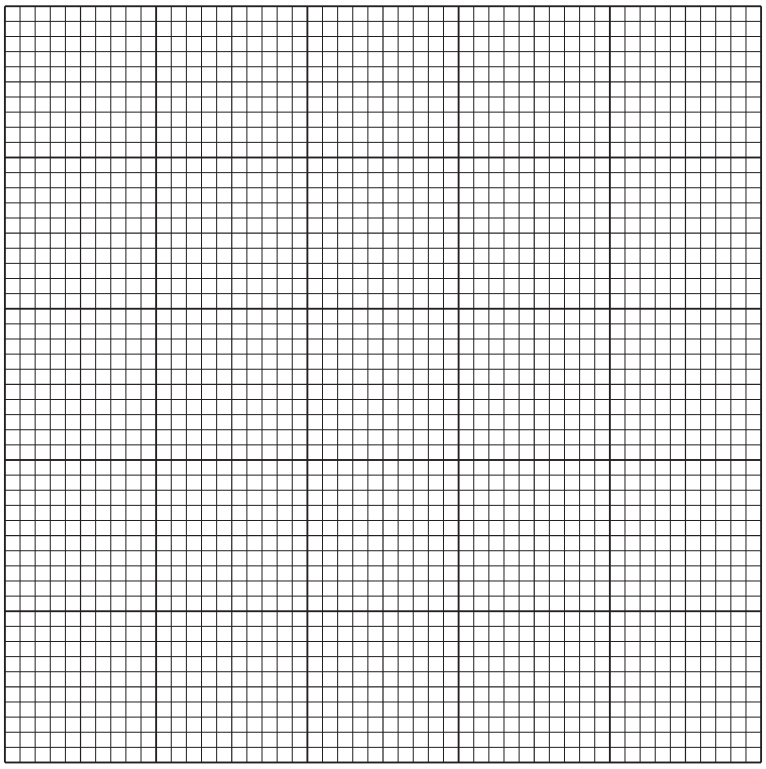

Fig. 1.4

[4]

[Total: 21]

2 **M1** is a slide of a stained transverse section through a plant leaf.

You are not expected to be familiar with this specimen.

(a) Select a field of view so that you can observe the different tissues as shown by the shaded area in Fig. 2.1.

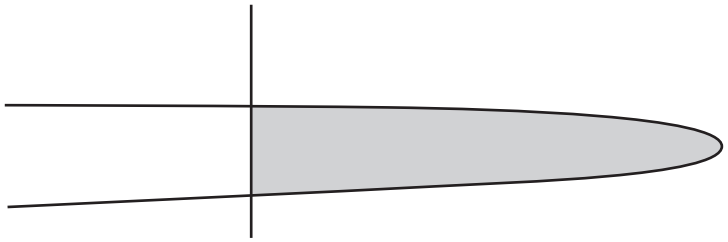

Fig. 2.1

Use a sharp pencil for drawing.

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

(i) Draw a large plan diagram of the region of the leaf on **M1** shown by the shaded area in Fig. 2.1 to include:

- the epidermis
- only **two** vascular bundles
- any other observable tissues.

Use **one** ruled label line and label to identify the epidermis.

[5]

(ii) Observe the cells in the epidermis of the leaf on **M1**.

Select a **line** of **four** adjacent cells that make up this tissue.

Each cell must touch at least one other cell.

- Make a large drawing of this line of four cells.
- Use **one** ruled label line and label to identify the cell wall of **one** cell.

[5]

You need to estimate the average width of an epidermal cell of the leaf on slide **M1**.

(iii) Put the clear plastic ruler on the stage of the microscope and view the scale lines on it using low power (×10 objective lens).

Measure the diameter of the field of view to the nearest 0.5 mm.

diameter of the field of view = ... mm

View the leaf on slide **M1**.

Estimate the number of epidermal cells across the diameter of the field of view.

number of cells across the field of view = ...

Use your answers to calculate the mean width of an epidermal cell, using appropriate units.

Show all the steps in your working.

mean width of an epidermal cell = ...
[3]

(iv) State **two** pieces of apparatus you would need to use to obtain a more accurate estimate of the width of an epidermal cell on slide **M1**.

1 .....

2 .....
[1]

(b) Fig. 2.2 is a photomicrograph of a stained transverse section through a leaf of a different type of plant.

You are not expected to be familiar with this specimen.

Fig. 2.2

(i) Suggest **one** observable feature shown by the plant in Fig. 2.2 that allows it to live in a dry habitat. Give a reason for your answer.

feature .....

reason .....

.....

[1]

(ii) Identify observable similarities **and** differences between the leaf on **M1** and the leaf shown in Fig. 2.2.

Record the observable similarities **and** differences in Table 2.1.

Table 2.1

feature	M1	Fig. 2.2
similarities		
differences		

[4]

[Total: 19]

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