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Cambridge Assessment International Education

Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

4654969816

BIOLOGY **9700/34**

Paper 3 Advanced Practical Skills 2 **October/November 2024**

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 **12** pages. Any blank pages are indicated.

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[Turn over

1 Vegetables, such as carrots, contain sugars.

Potassium manganate(VII) solution can be used to identify the presence of sugars.

The sugars change the colour of the potassium manganate(VII) solution from purple to colourless.

You will measure the time taken for potassium manganate(VII) solution to turn colourless with sugar solutions of known concentration. You will use the results to estimate the concentration of sugars in a carrot extract.

You are provided with the materials shown in Table 1.1.

Table 1.1

labelled	contents	hazard	volume / cm^3
S	1.0 mol dm^{-3} sugar solution	none	40
W	distilled water	none	40
A	sulfuric acid	harmful irritant	20
K	potassium manganate(VII) solution	irritant	20
C	carrot extract	none	10

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

It is recommended that you wear suitable eye protection and wear gloves to protect your hands when using **A** and **K**.

You will need to:

- prepare different concentrations of sugar solution
- record the time taken for **K** to become colourless (end-point) for each of the different concentrations of sugar solution **and** for the carrot extract, **C**
- use your results to estimate the concentration of sugars in the carrot extract, **C**.

You will need to use **proportional** dilution to make five different concentrations of sugar solution.

You will need to prepare 10 cm^3 of each concentration, using **S** and **W**.

Table 1.2 shows **two** of the concentrations of sugar solution you will use and how to prepare them.

Decide which **three** other concentrations of sugar solution you will use.

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(a) (i) Complete Table 1.2 to show how you will prepare the other concentrations of sugar solution you will use.

Table 1.2

concentration of sugar solution / mol dm^{-3}	volume of S / cm^3	volume of W / cm^3
1.0	10.0	0.0
0.0	0.0	10.0

[2]

Carry out step 1 to step 11.

step 1 In the beakers provided, prepare the concentrations of sugar solution, as shown in Table 1.2.

step 2 Label the test-tubes with the concentrations of sugar solution prepared in step 1.

step 3 Put 1 cm^3 of 1.0 mol dm^{-3} sugar solution into the appropriately labelled test-tube.

step 4 Repeat step 3 with each of the other concentrations of sugar solution.

step 5 Put 1 cm^3 of **A** into each of the test-tubes. Shake gently to mix.

The reaction will start as soon as you put **K** into the test-tubes (step 6). Keep the timer running continuously until the end of step 7.

step 6 Put 1 cm^3 of **K** into each of the test-tubes and start timing. Shake gently to mix.

step 7 Measure the time taken for each concentration to reach the end-point. As each end-point is reached record the time taken in **(a)(ii)**.

If an end-point has not been reached after 600 seconds, record the time as 'more than 600'.

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(ii) Record your results in an appropriate table.

[5]

step 8 Label a test-tube **C** and put 1 cm^3 of **C** into this test-tube.

step 9 Put 1 cm^3 of **A** into the test-tube. Shake gently to mix.

step 10 Put 1 cm^3 of **K** into the test-tube and start timing. Shake gently to mix.

step 11 Measure the time taken to reach the end-point. Record the time taken in **(a)(iii)**.

(iii) State the time taken to reach the end-point for **C**.

time taken ..... [1]

(iv) Estimate the concentration of sugars in **C**.

concentration of sugars in **C** ..... $mol\,dm^{-3}$ [1]

(v) Suggest how the procedure could be modified to improve the accuracy of your estimate in **(a)(iv)**.

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..... [3]

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(vi) A student used the same procedure to compare the concentration of sugars in three vegetables: carrot, potato and onion.

State **one** variable that needs to be standardised in the procedure.

.....

..... [1]

(vii) Suggest how the student could extend this investigation to estimate the concentration of **starch** in a vegetable extract.

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..... [2]

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(b) Bananas produce ethylene gas which causes them to ripen. The production of ethylene gas continues after the bananas are removed from the plant (harvested).

The ethylene gas decreases the post-harvest life of the bananas. The post-harvest life is the time after harvesting when the bananas are suitable to eat.

Potassium manganate(VII) can be used to increase the post-harvest life of the bananas by oxidising the ethylene gas to form water and carbon dioxide.

An experiment was carried out to determine the effect of different quantities of potassium manganate(VII) on the post-harvest life of bananas.

The results are shown in Table 1.3.

Table 1.3

mass of potassium manganate(VII) / g	mean post-harvest life / days
0	9.30
2	11.25
4	12.60
6	13.65
8	11.45

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(i) Plot a graph of the data in Table 1.3 on the grid in Fig. 1.1.

Use a sharp pencil.

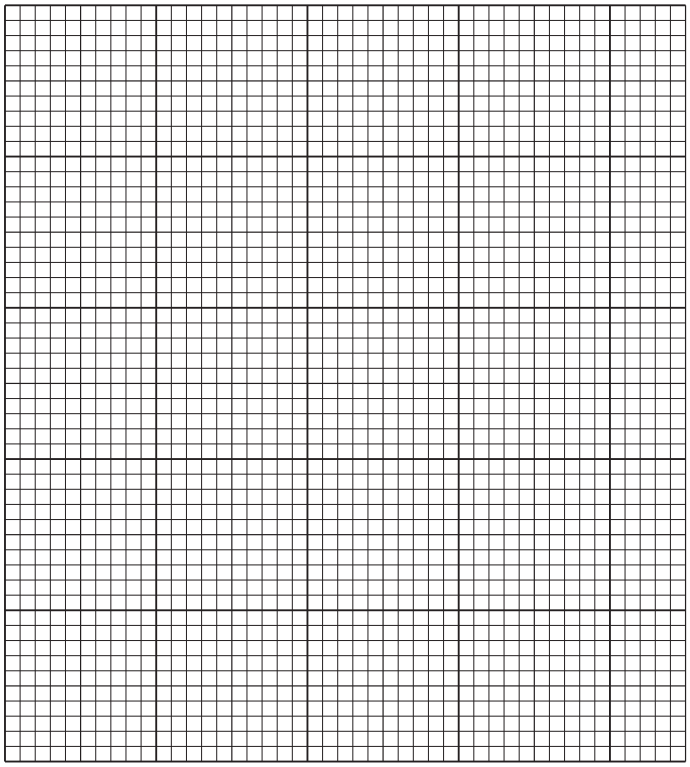

Fig. 1.1

[4]

(ii) Use your graph in Fig. 1.1 to predict the post-harvest life of bananas if the mass of potassium manganate(VII) is 6.8 g.

Show on your graph how you obtained your answer.

post-harvest life of bananas = ... days [2]

(iii) Suggest why the post-harvest life of bananas decreases when more than 6 g of potassium manganate(VII) is used.

.....

..... [1]

[Total: 22]

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

(a) **(i)** Draw a large plan diagram of the whole section on **L1**.

Use a sharp pencil.

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

[5]

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(ii) Observe the epidermis of the root on **L1** and the layer of cells beneath.

Select a group of four adjacent cells. This group must include **two** cells from the epidermis and **two** cells from below the epidermis.

Each cell must touch at least **two** of the other cells.

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

[5]

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(b) Fig. 2.1 is a photomicrograph of a stained transverse section through a different plant.

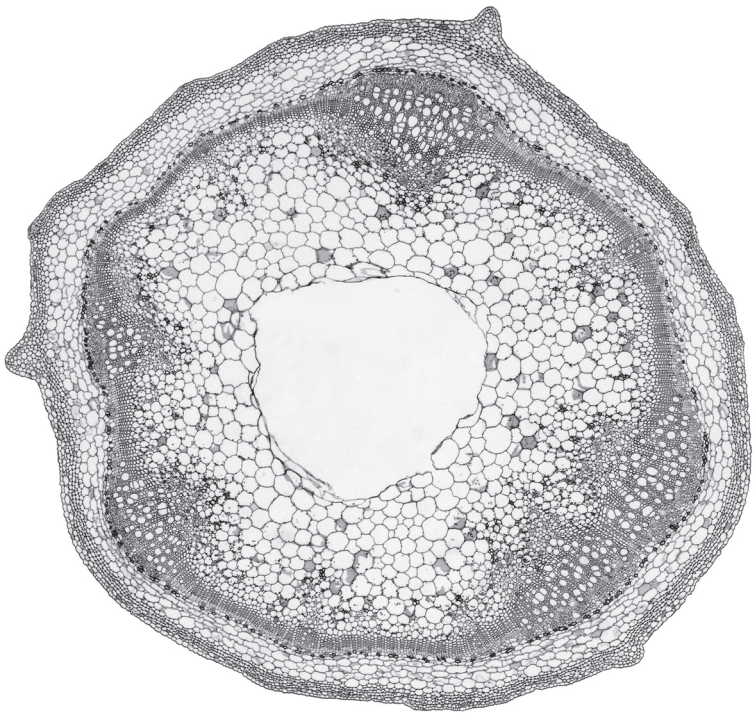

Fig. 2.1

Identify **three** observable differences, other than colour, between the section on **L1** and the section in Fig. 2.1.

Record these **three** observable differences in Table 2.1.

Table 2.1

feature	L1	Fig. 2.1

[4]

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(c) Fig. 2.2 is the same photomicrograph as that shown in Fig. 2.1.

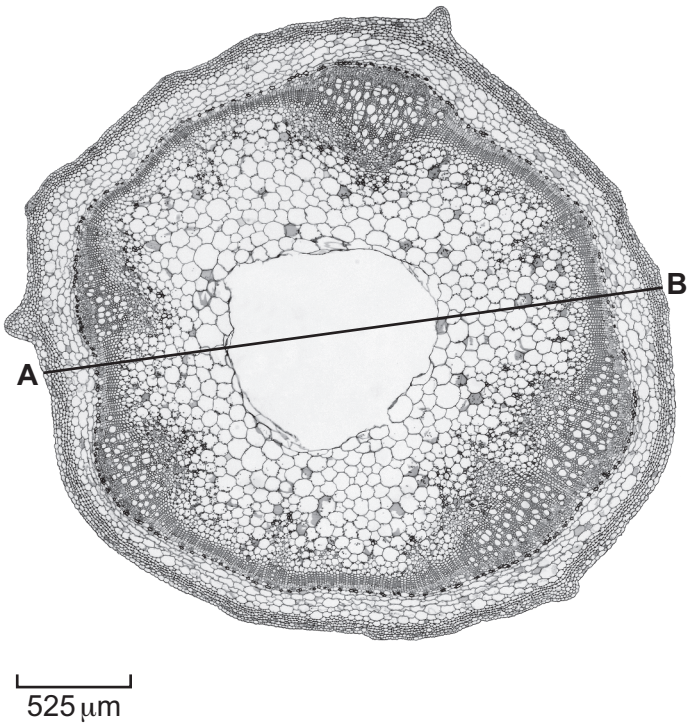

Fig. 2.2

Use the scale bar on Fig. 2.2 and the line **A–B** to calculate the actual diameter of the section in Fig. 2.2.

Show your working, including units.

actual diameter = ... [4]

[Total: 18]

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