Cambridge Assessment International Education

Cambridge International AS & A Level

CANDIDATE NAME	

CENTRE NUMBER		CANDIDATE NUMBER	

6825764380

BIOLOGY **9700/32**

Paper 3 Advanced Practical Skills 2 **May/June 2023**

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. Any blank pages are indicated.

1 Grapes are fruit that contain high concentrations of soluble sugars such as sucrose, fructose and glucose.

The proportions of these sugars change as the grapes mature.

You will determine the concentration of reducing sugars in a sample of grape extract by using 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
G	grape extract	none	20
W	distilled water	none	100
B	Benedict's solution	harmful irritant	40
R	8.0% reducing sugar solution	none	40

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

It is recommended that you wear suitable eye protection.

You will need to carry out a serial dilution of the 8.0% reducing sugar solution, **R**, to reduce the concentration by **half** between each successive dilution.

You will need to prepare **four** concentrations of reducing sugar in addition to 8.0% reducing sugar solution, **R**.

After the serial dilution is completed, you will need to have 10 cm^3 of each concentration available to use.

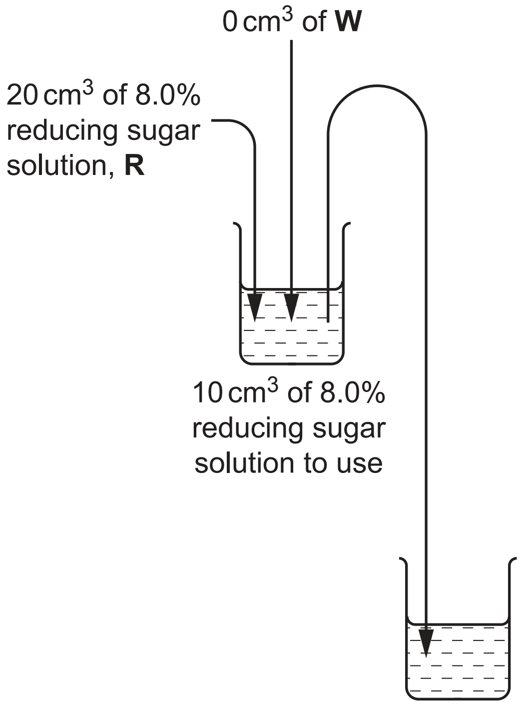
(a) **(i)** Complete Fig. 1.1 to show how you will prepare your serial dilution.

Fig. 1.1 shows the first two beakers you will use to make your serial dilution. You will need to draw **three** additional beakers.

For each beaker, add labelled arrows to show:

- the volume of reducing sugar solution transferred
- the volume of distilled water, **W**, added.

Under each beaker, state the concentration of reducing sugar solution.


0 cm3 of W
20 cm3 of 8.0% reducing sugar solution, R
10 cm3 of 8.0% reducing sugar solution to use

....

....

....

Fig. 1.1

[3]

Carry out step 1 to step 16.

step 1 Set up a water-bath and heat to boiling ready for step 6 and step 14.

step 2 Prepare the concentrations of reducing sugar solution as shown in Fig 1.1.

step 3 Label test-tubes with the concentrations shown in Fig. 1.1.

step 4 Put $2\,cm^3$ of the 8.0% reducing sugar solution into the appropriately labelled test-tube.

step 5 Put $2\,cm^3$ of Benedict's solution, **B**, into the same test-tube. Shake gently to mix.

step 6 Put this test-tube in the boiling water-bath. Start timing.

step 7 Measure the time taken to the first appearance of a colour change in the test-tube.

If there is no colour change after 120 seconds, stop timing and record as 'more than 120'.

step 8 Record the result from step 7 in **1(a)(ii)**.

step 9 Remove the test-tube from the water-bath. Put the test-tube in the test-tube rack.

step 10 Repeat step 4 to step 9 with the remaining concentrations of reducing sugar solution.

(ii) Record your results in an appropriate table for the known concentrations of reducing sugar.

[5]

(iii) Identify **one** source of error in step 7.

....

....

.... [1]

(iv) To determine the concentration of reducing sugar in grape extract **G**, you will need to test a sample of the extract.

State the volume of grape extract **G** that you will use to test for reducing sugars.

volume = ...

[1]

step 11 Label a test-tube **G**.

step 12 Transfer the volume of grape extract **G** that you stated in **(a)(iv)** into test-tube **G**.

step 13 Put $2\,cm^3$ of Benedict's solution, **B**, into the same test-tube. Shake gently to mix.

step 14 Put this test-tube in the boiling water-bath. Start timing.

step 15 Measure the time taken to the first appearance of a colour change in the test-tube.

If there is no colour change after 120 seconds, stop timing and record as 'more than 120'.

step 16 Record the result from step 15 in **(a)(v)**.

(v) Record the time taken for the first colour change in test-tube **G**.

time taken = ... [1]

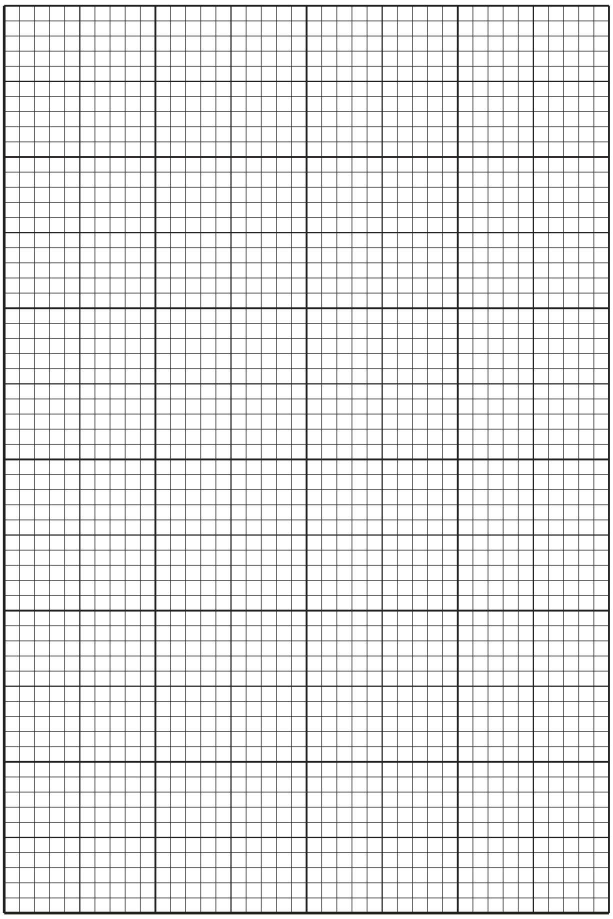
(vi) The concentration of reducing sugars in **G** can be estimated from a graph of your results.

Draw a graph of the results you recorded in **(a)(ii)** on the grid in Fig. 1.2, using a line of best fit.

The axes have been labelled for you.

Use a sharp pencil.

time to first colour change / s



percentage concentration of reducing sugars

Fig. 1.2

[2]

(vii) Use your graph to estimate the percentage concentration of reducing sugars in **G**.

Show **on your graph** how you determined your answer.

percentage concentration of reducing sugars in **G** ....

[2]

(viii) Suggest how you would modify this investigation to obtain a more accurate estimate for the concentration of reducing sugars in sample **G**.

....

....

....

.... [2]

(b) The concentration of reducing sugars in grapes changes as the grapes age (get older).

Table 1.2 shows the concentration of reducing sugars for grapes of different ages.

Table 1.2

age of grapes / days	percentage concentration of reducing sugars
14	1.1
28	1.9
42	2.6
56	3.9
70	7.5
84	11.3

(i) Plot a graph of the data shown in Table 1.2 on the grid in Fig. 1.3.

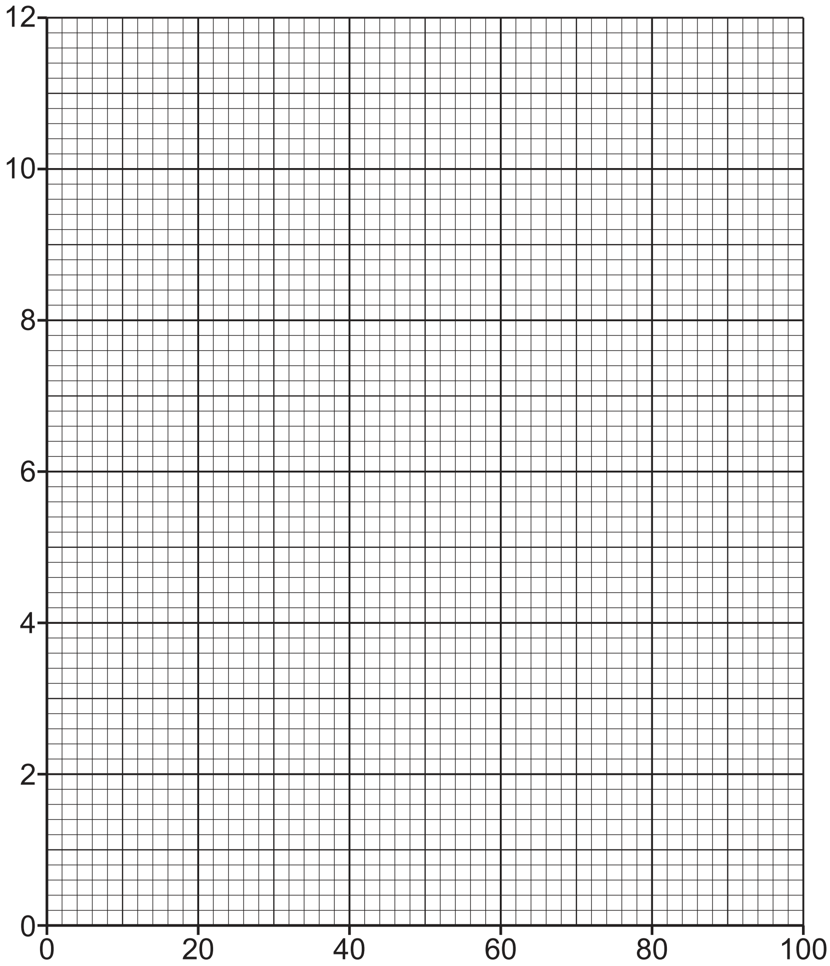


Fig. 1.3

[2]

(ii) Use your estimate from **(a)(vii)** and your graph in **(b)(i)** to estimate the age of the grapes that were used to make grape extract **G**.

age of grapes .... days [1]

(c) Grapes contain starch as well as reducing sugars. In a study, the concentration of amylase in grapes was measured as the grapes aged.

The results of the study are shown in Fig. 1.4.

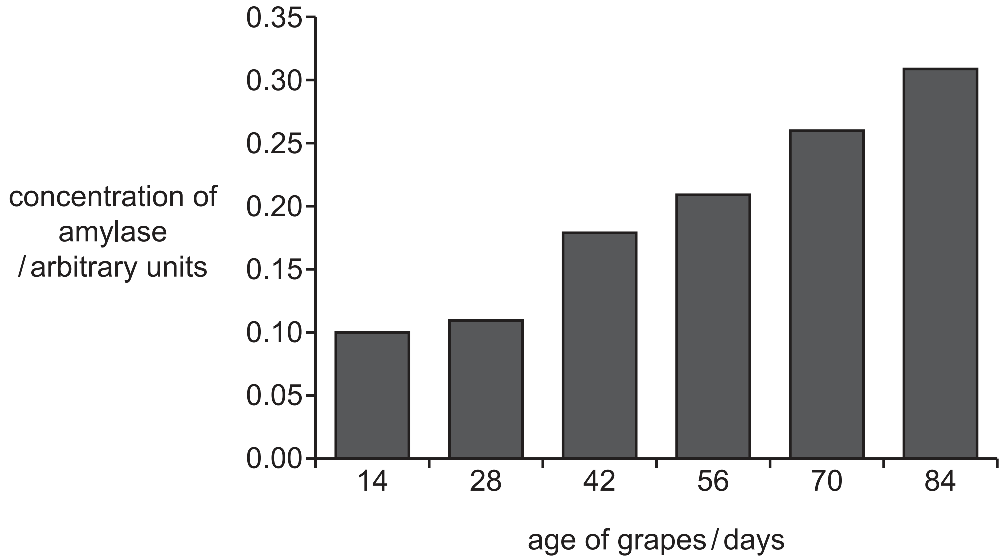


Fig. 1.4

Use the data in Fig. 1.3 and Fig. 1.4 to suggest a possible explanation for the change in the concentration of reducing sugars in grapes as they age.

....

....

....

....

....

.... [3]

[Total 23]

2 **K1** is a slide of a stained transverse section through a plant root.

(a) **(i)** Draw a large plan diagram of the region of the root on **K1** indicated by the shaded region in Fig. 2.1. Use a sharp pencil.

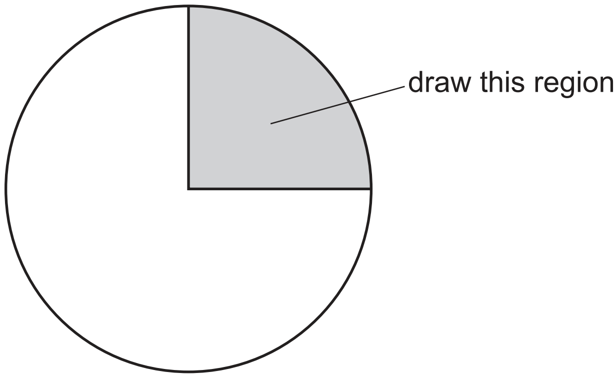


Fig. 2.1

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

[5]

(ii) Observe the xylem vessel elements in the root on **K1**.

Select a group of **four** adjacent xylem vessel elements.

Each xylem vessel element must touch at least **two** other xylem vessel elements.

- Make a large drawing of this group of **four** xylem vessel elements.
- Use **one** ruled label line and label to identify the cell wall of **one** xylem vessel element.

[5]

(b) Fig. 2.2 shows a photomicrograph of a transverse section through a different root.

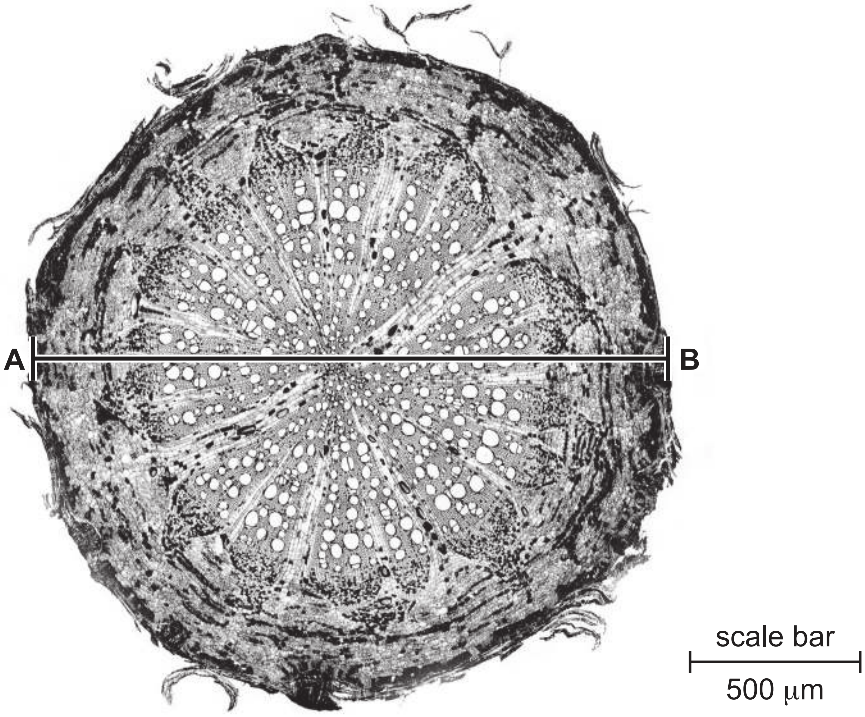


Fig. 2.2

(i) Identify **three** observable differences, other than colour, between the root section on **K1** and the root section in Fig. 2.2.

Record these observable differences in Table 2.1.

Table 2.1

feature	K1	Fig. 2.2
1		
2		
3		

[3]

(ii) Line **A**–**B** represents the diameter of the root in Fig. 2.2.

Use the scale bar on Fig. 2.2 to calculate the **actual diameter** of the root.

Show your working.

Include the unit in your answer.

actual diameter = ...

[3]

(iii) Use your value from **(b)(ii)** to calculate the magnification of Fig. 2.2.

Give your answer to **two** significant figures.

magnification = × ....

[1]

[Total 17]

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