Cambridge International AS & A Level

Cambridge Assessment International Education
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

5212832049

BIOLOGY **9700/32**

Paper 3 Advanced Practical Skills 2 **May/June 2019**

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 **11** printed pages and **1** blank page.

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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.

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

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

1 Fusicoccin is a chemical that increases the sucrose concentration in phloem at the source.

In this investigation you will be provided with a sample, **U**, which has been taken from the phloem of a plant.

You will need to:

- prepare proportional dilutions of a 10% sucrose solution
- carry out the test for non-reducing sugars on each concentration of sucrose solution
- carry out the test for non-reducing sugars on the unknown concentration of sucrose, **U**
- estimate the concentration of sucrose in **U**.

You are provided with the materials shown in Table 1.1.

Table 1.1

labelled	contents	hazard	volume/cm^3
S	10% sucrose solution	none	50
Benedict's	Benedict's solution	harmful	30
W	distilled water	none	50
H	dilute hydrochloric acid	irritant	20
A	10 g sodium hydrogencarbonate powder	none	–
U	solution of unknown sucrose concentration	none	10

If any of the materials come into contact with your skin, wash off immediately under cold water.

It is recommended that you wear suitable eye protection.

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(a) You will need to:

- make a proportional dilution of 10% sucrose solution, **S**, which reduces the concentration by 2% between each successive dilution
- prepare 5 cm^3 of each concentration of sucrose solution.

(i) Complete Table 1.2 to show how you will prepare these concentrations.

Table 1.2

percentage concentration of sucrose solution	volume of **S** / cm^3	volume of **W** / cm^3
10.0	5.0	0.0

[2]

Carry out the test for non-reducing sugars on the concentrations of sucrose using step 1 to step 17.

1. Set up a water-bath and heat to boiling, ready for step 7 and step 14.
2. Prepare the concentrations of sucrose solution as shown in Table 1.2, using the beakers provided.
3. Label test-tubes with the concentrations of sucrose prepared in step 2.
4. Put 2 cm^3 of each concentration of sucrose into the appropriately labelled test-tubes.
5. Label another test-tube **U** and put 2 cm^3 of **U** into this test-tube.
6. Put 2 cm^3 of **H** into all the test-tubes. Shake gently to mix.
7. Put all the test-tubes into the boiling water-bath (set up in step 1).
   Leave the test-tubes for 2 minutes.
8. After 2 minutes, remove all the test-tubes from the water-bath and put them into the beaker of water labelled **For cooling**.

You will need the boiling water-bath again for step 14.

9. Leave the test-tubes in the beaker for 3 minutes.
10. After 3 minutes, put a small amount of **A** into each test-tube. The mixture will fizz and rise up the test-tube.

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11. Continue to put a small amount of **A** into each test-tube until there is no more fizzing and there is a small amount of **A** in the bottom of the test-tube.

12. Put 4 cm^3 of Benedict's solution into the test-tube containing the highest concentration of sucrose solution.

13. Shake the test-tube gently to mix.

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

15. Measure the time taken for 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'.

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

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

18. Repeat step 12 to step 17 with the remaining concentrations of sucrose solution.

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

[5]

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19. Repeat step 12 to step 15 with **U** and record the result from step 15 in **(a)(iii)**.

(iii) State the result for **U**.

..... [1]

A plant that has been treated with fusicoccin has a phloem sucrose concentration of between 5.5% and 7.5%.

(iv) State whether **U** is taken from the phloem of a plant treated with fusicoccin.
Give a reason for your answer.

answer.....

reason .....

..... [1]

(v) Suggest how you could change the independent variable to have more confidence in your answer to **(iv)**.

.....

.....

.....

..... [2]

An investigation was carried out to show the effect of fusicoccin on two plants, **F** and **G**.

- Plant **F** was treated with 10 cm^3 of fusicoccin solution.
- Plant **G** was treated with 10 cm^3 of water instead of fusicoccin solution.
- Plant **F** and plant **G** were grown in moist soil and in identical conditions.

(vi) State why plant **G** was treated with 10 cm^3 of water.

.....

.....

..... [1]

(b) A scientist investigated the effect of treating a plant with fusicoccin.
Samples were taken from the phloem every 35 minutes for a total of 175 minutes.

The concentration of sucrose in each sample was measured. These raw results were then used to calculate the rate of mass flow.

The results are shown in Table 1.3.

Table 1.3

time/min	rate of mass flow /$cm^3 min^{-1}$
35	6.00
70	10.25
105	15.00
140	19.50
175	23.75

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

Use a sharp pencil for drawing graphs.

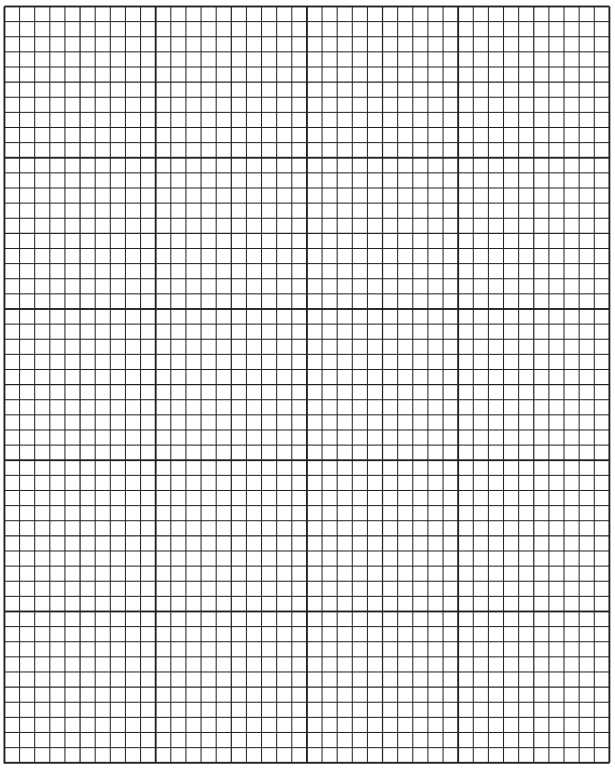


Fig. 1.1

[4]

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(ii) Use your graph to find the time when the rate of mass flow was $20\,cm^3\,min^{-1}$.
Show on the graph how you determined your answer.

time = ... [2]

(iii) Before treating the plant with fusicoccin, the scientist had obtained a rate of mass flow of $1.5\,cm^3 min^{-1}$.

Describe the effect of fusicoccin on the rate of mass flow shown in Fig. 1.1.

..... [1]

(iv) Suggest how fusicoccin increases the loading of sucrose into phloem sieve tubes.

.....

.....

.....

.....

..... [2]

[Total: 21]

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

You are not expected to be familiar with this specimen.

(a) Select a field of view so that you can observe:

- the epidermis
- at least three vascular bundles.

Use a sharp pencil for drawings.

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

(i) Draw a large plan diagram from the selected field of view which has:

- part of the epidermis
- only **three** vascular bundles
- any other observable tissues.

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

[5]

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(ii) Observe the epidermis of the organ on **M1**.

Select two epidermal cells **and** two adjacent, touching cells on the layer below the epidermis.

Each cell must touch at least two other cells.

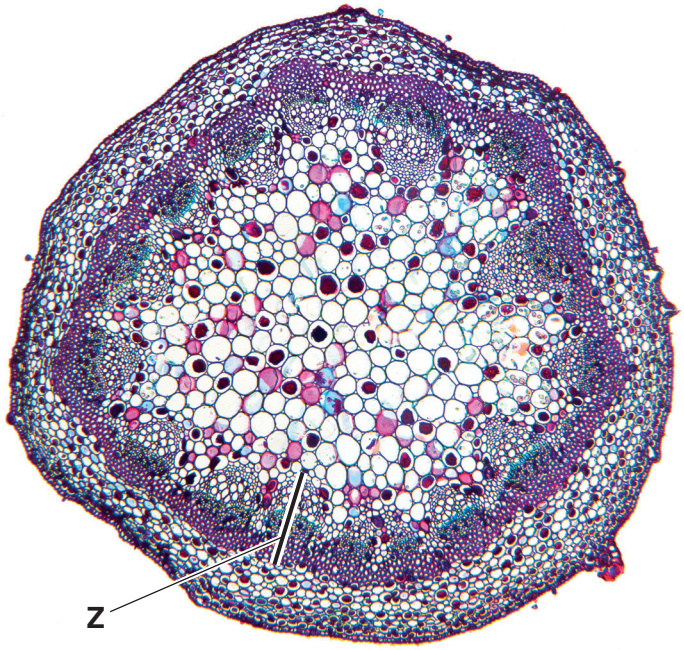
Make a large drawing of this group of **four** cells.

Use **one** ruled label line and label to identify the cell wall of **one** cell.

[5]

(b) Fig. 2.1 is a photomicrograph of a stained transverse section through an organ from a different species.

You are not expected to be familiar with this specimen.



magnification ×20

Fig. 2.1

(i) Identify the organ shown in Fig. 2.1.
Describe **one** observable feature that supports your identification.

name of organ .....

feature .....

..... [1]

(ii) Use the magnification and the line **Z** on Fig. 2.1 to calculate the actual length of the vascular bundle.

Show all the steps in your working and use appropriate units.

actual length of the vascular bundle = ...[5]

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(iii) State the apparatus that you would use with a microscope to measure the actual length of a vascular bundle in the organ on **M1**.

..... [1]

(c) Identify the observable differences between the organ on **M1** and the organ shown in Fig. 2.1.

Record the observable differences in Table 2.1.

Table 2.1

feature	M1	Fig. 2.1

[2]

[Total: 19]

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