Cambridge Assessment International Education

Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

0199211725

BIOLOGY **9700/34**

Paper 3 Advanced Practical Skills 2 **October/November 2025**

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.

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[Turn over

1 (a) A plant produces sugars in its leaves. The sugars produced are needed by other parts of the plant and are transported through the phloem as sucrose.

Sucrose is transported to the roots where it is stored as starch. Some of the sucrose is transported to the fruit of the plant where it is stored as fructose and glucose. Sucrose is also transported to the seeds of the plant.

Water and mineral ions are taken up through the roots where they are transported through the xylem to the rest of the plant.

Solutions were made to represent extracts of different tissues and fluids found in a plant:

- fluid in the phloem
- root tissue
- seed tissue
- fruit tissue
- fluid in the xylem

You are provided with **4** solutions, **S1**, **S2**, **S3** and **S4**.

You will:

- identify the biological molecules present in each of the 4 solutions
- suggest which solution, **S1**, **S2**, **S3** or **S4**, could represent each of the plant extracts.

You are provided with the materials shown in Table 1.1.

Table 1.1

labelled	contents	hazard	volume / cm^3
A	dilute hydrochloric acid	irritant	20
H	sodium hydrogencarbonate powder	low	-
Benedict's	Benedict's solution	harmful irritant	40
Iodine	iodine solution	irritant	20
S1	solution 1	low	60
S2	solution 2	low	60
S3	solution 3	low	60
S4	solution 4	low	60

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

It is recommended that you wear suitable eye protection.

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You will need to:

- carry out the test for reducing sugars
- carry out the test for non-reducing sugars
- carry out the test for starch
- identify the biological molecules in **S1**, **S2**, **S3** and **S4**.

(i) State the reagent or reagents that are used to test for reducing sugars **and** the colour or colours produced if reducing sugars are present.

reagent or reagents .....

colour or colours .....

Describe how you will carry out the test for reducing sugars.

.....

.....

.....

[1]

step 1 Label 4 test-tubes **S1**, **S2**, **S3** and **S4**.

step 2 Put 1 cm^3 of each solution into the appropriately labelled test-tube.

step 3 Carry out the test for reducing sugars on **S1**, **S2**, **S3** and **S4** described in **(a)(i)**.

step 4 Record the colours observed in **(a)(iii).**

(ii) State the reagent or reagents that are used to test for non-reducing sugars **and** the colour or colours produced if non-reducing sugars are present.

reagent or reagents .....

colour or colours .....

Describe how you will carry out the test for non-reducing sugars.

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[2]

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step 5 Label 4 clean test-tubes **S1**, **S2**, **S3** and **S4**.

step 6 Put 1 cm^3 of each solution into the appropriately labelled test-tube.

step 7 Carry out the test for non-reducing sugars on **S1**, **S2**, **S3** and **S4** described in **(a)(ii)**.

step 8 Record the colours observed in **(a)(iii)**.

step 9 Label 4 clean test-tubes **S1**, **S2**, **S3** and **S4**.

step 10 Put 1 cm^3 of each solution into the appropriately labelled test-tube.

step 11 Carry out the test for starch on **S1**, **S2**, **S3** and **S4**.

step 12 Record the colours observed in **(a)(iii)**.

(iii) Record your results in an appropriate table.

[5]

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(iv) Complete Table 1.2 to suggest which solution (**S1**, **S2**, **S3** or **S4**) could represent each of the plant extracts.

Use your results in **(a)(iii)** and the information on plant transport given in **(a)**.

A solution could represent more than one plant extract.

Table 1.2

plant extract	solution
fluid in the phloem	**S**...
root tissue	**S**...
seed tissue	**S**...
fruit tissue	**S**...
fluid in the xylem	**S**...

[2]

(v) Protein could be present in some of the solutions.

Describe how you would identify which solutions contain protein.

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.....

.....

..... [2]

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(b) A scientist investigated the effect of light on the concentration of sugars in a plant for 24 hours. The plant was kept in the dark for the first 8 hours and then exposed to light for the remaining 16 hours.

Samples were taken from the leaves and from the phloem sieve tubes. The concentration of sugars in each sample was measured.

The results are shown in Table 1.3.

Table 1.3

time / hours	concentration of sugars / μmol	
	leaves	phloem sieve tubes
0	0.38	0.22
5	0.21	0.17
8	0.13	0.11
15	0.24	0.16
24	0.39	0.22

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

Use a sharp pencil.

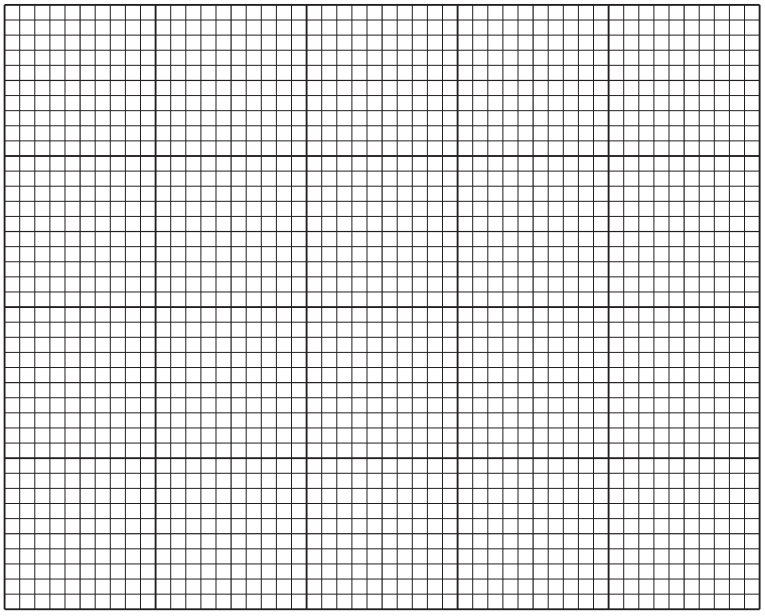


Fig. 1.1

[4]

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(ii) Describe the trend for the concentration of sugars in the leaves and phloem sieve tubes shown in Fig. 1.1.

.....

.....

.....

..... [1]

(iii) Suggest an explanation for the trend in the data when the plant was in the dark and when the plant was in the light.

plant in the dark .....

.....

.....

plant in the light .....

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[2]

(iv) Calculate the percentage increase in the concentration of sugars in the leaves between 15 and 20 hours.

Show your working.

percentage increase .....%

[2]

[Total: 21]

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

(a) **(i)** Draw a large plan diagram of the region on **L1** indicated by the shaded area in Fig. 2.1. Use a sharp pencil.

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

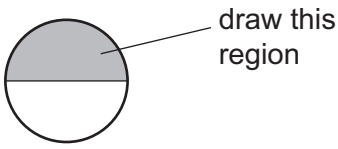


Fig. 2.1

[5]

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(ii) Observe the xylem vessel elements in the organ on **L1**.

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

Each xylem vessel element must touch at least **one** other xylem vessel element.

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

[5]

(iii) Identify the plant organ on **L1** and give a reason for your answer.

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..... [1]

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(b) Fig. 2.2 is a photomicrograph of a stained transverse section of the same organ from a different plant to **L1**.

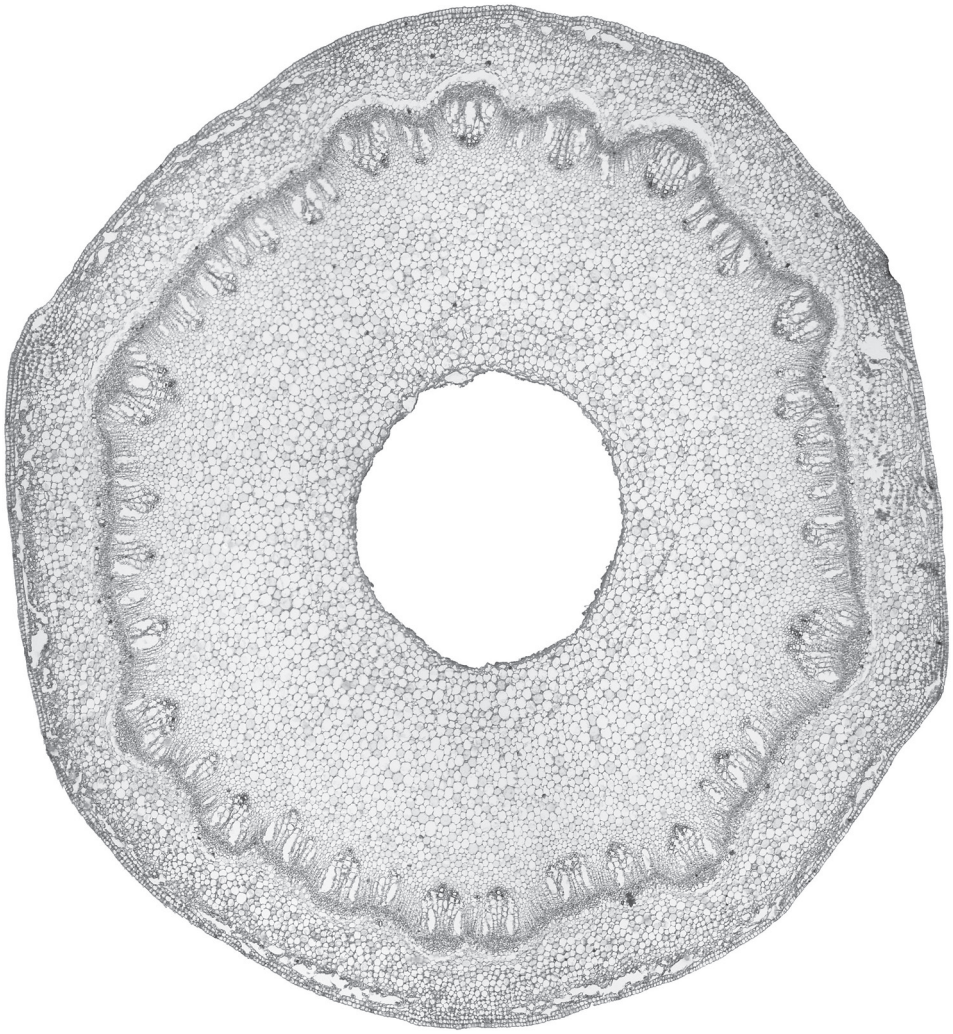


Fig. 2.2

Identify **two** observable differences, other than colour, between the section on **L1** and the section in Fig. 2.2.

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

Table 2.1

feature	L1	Fig. 2.2
1		
2		

[3]

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(c) Fig. 2.3 shows a photomicrograph of a stage micrometer scale that is being used to calibrate an eyepiece graticule.

One division, on either the stage micrometer scale or the eyepiece graticule, is the distance between two adjacent lines.

The length of one division on the stage micrometer in Fig. 2.3 is 1.0 mm.

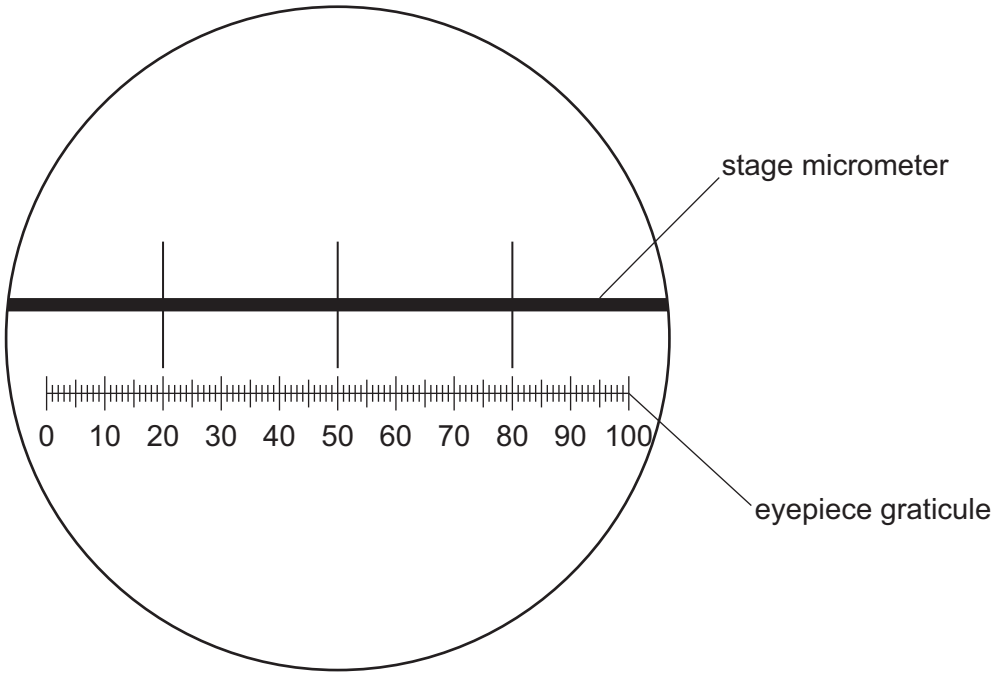


Fig. 2.3

(i) Calculate the actual length of **one** eyepiece graticule unit shown in Fig. 2.3.

Give your answer in micrometres (μm).

Show your working.

actual length = ... μm
[2]

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Fig. 2.4 is the same photomicrograph as that shown in Fig. 2.2. This was taken with the same microscope and the same lenses used to take the photomicrograph in Fig. 2.3. The eyepiece graticule has been placed across the width of the tissue.

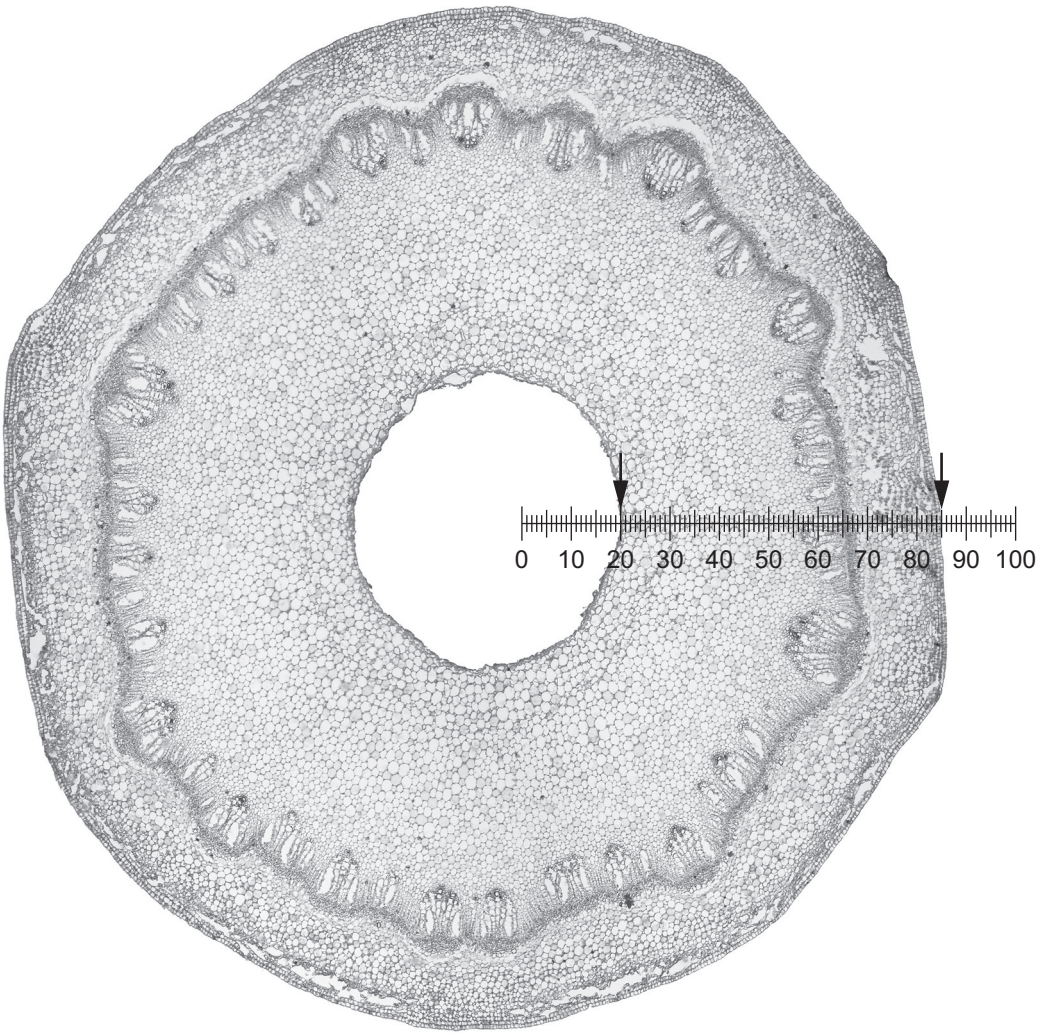


Fig. 2.4

(ii) Use your calibration of one eyepiece graticule unit from **(c)(i)** to calculate the actual width of the tissue between the arrows on Fig. 2.4.

Show your working and use appropriate units.

actual width of the tissue between the arrows .....

[2]

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(iii) The width of the tissue in Fig. 2.4 varies. Suggest how you could more accurately calculate the width of the tissue.

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..... [1]

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