GradeMax

* 0000800000001 * DFD

CAMBRIDGE
International Education

Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

* 1 7 0 9 4 0 4 9 7 4 *

BIOLOGY **9700/32**

Paper 3 Advanced Practical Skills 2 **May/June 2026**

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. Do **not** use correction fluid or tape.
- 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.

DC (SL/CT) 354277/3
© Cambridge University Press & Assessment 2026

[Turn over

GradeMax

BLANK PAGE

DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN

© Cambridge University Press & Assessment 2026

GradeMax

DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN

1 Vitamin C is an important part of a balanced diet and is present in a variety of fruits and vegetables.

You will investigate the effect of heating on a sample of vitamin C.

You are provided with the materials shown in Table 1.1.

Table 1.1

labelled	contents	hazard	volume / cm^3
C	1.0% vitamin C solution	none	40
U	vegetable extract with an unknown concentration of vitamin C	none	20
DCPIP	DCPIP solution	none	20
W	distilled water	none	100

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

It is recommended that you wear suitable eye protection.

A student suggested the hypothesis:

The concentration of vitamin C in a solution decreases when the solution is heated to boiling.

To test this hypothesis you will:

- prepare different concentrations of vitamin C solution
- estimate the concentration of vitamin C in a vegetable extract before and after boiling.

The concentration of vitamin C in a sample can be determined by adding a solution of DCPIP. The vitamin C reacts with the blue DCPIP to give a yellow/orange colour. The end-point is when the blue colour disappears. The higher the concentration of vitamin C, the less vitamin C solution will be required to reach the end-point.

To identify the end-point, carry out step 1 to step 4.

step 1 Put 1.0 cm^3 of **DCPIP** solution into a clean test-tube.

step 2 Fill a clean 1 cm^3 syringe with 1.0 cm^3 of the 1.0% vitamin C solution, **C**.

step 3 Add **one** drop of **C** to the **DCPIP** solution in the test-tube and swirl to mix.

step 4 Repeat step 3 until the blue colour disappears. This is the end-point.

© Cambridge University Press & Assessment 2026

GradeMax

You will need to carry out a **serial** dilution of the 1.0% vitamin C solution, **C**, to reduce the concentration by **half** between each successive dilution.

You will need to prepare **four** concentrations of vitamin C solution in addition to the 1.0% vitamin C solution, **C**.

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

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

Each beaker should have:

- a labelled arrow to show the volume of vitamin C solution transferred
- a labelled arrow to show the volume of distilled water, **W**, added
- a label under the beaker to show the concentration of the vitamin C solution.

DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN

© Cambridge University Press & Assessment 2026

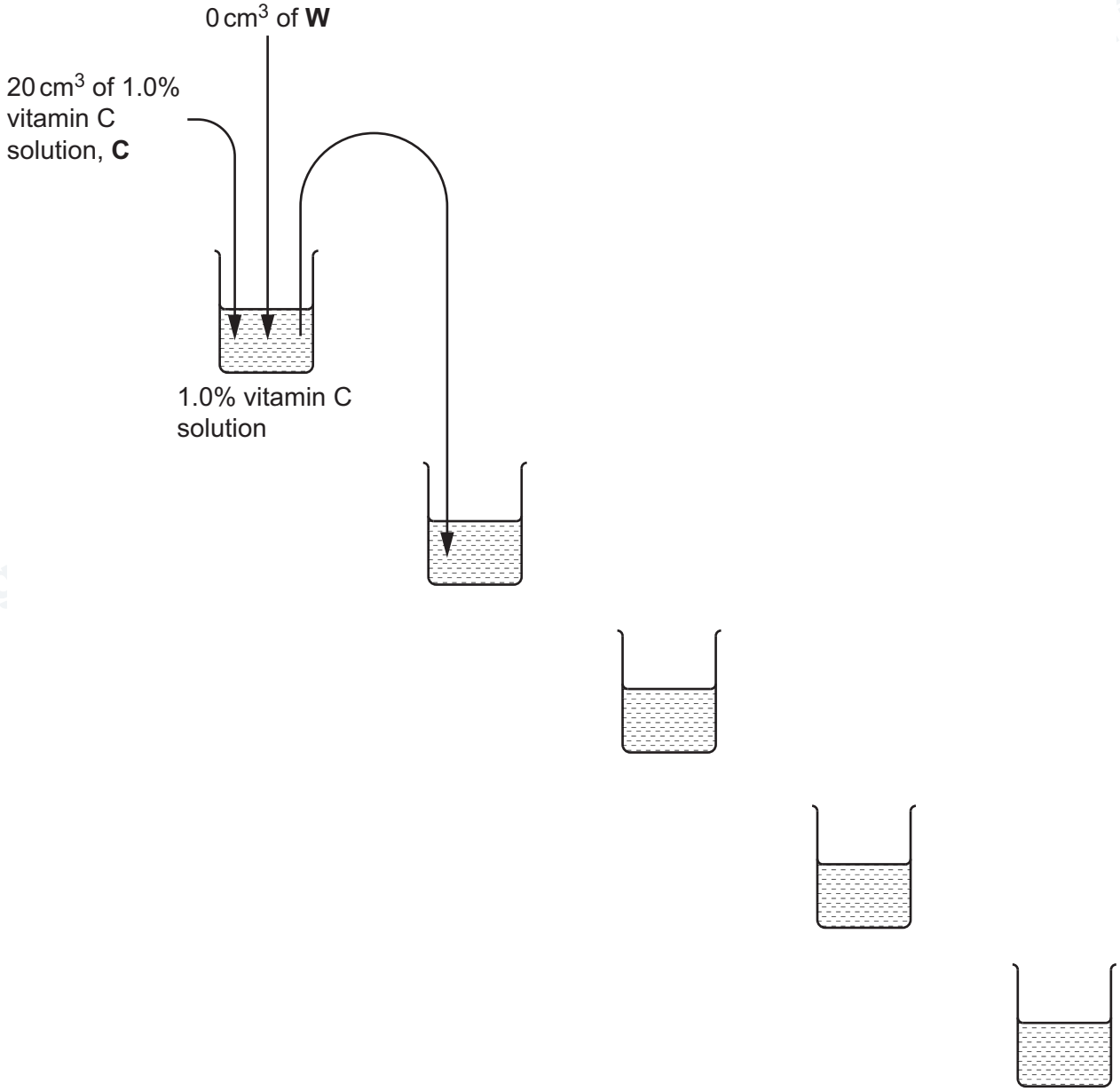


Figure 1.1

[3]

DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN

GradeMax

Carry out step 5 to step 11.

step 5 Using appropriately labelled beakers, prepare the concentrations of vitamin C solution shown in Figure 1.1.

step 6 Label test-tubes with the concentrations prepared in step 5.

step 7 Put 1.0 cm^3 of **DCPIP** solution into each labelled test-tube.

step 8 Fill a clean 1 cm^3 syringe with 1.0 cm^3 of the 1.0% vitamin C solution.

step 9 Add the 1.0% vitamin C solution, **one** drop at a time, to the **DCPIP** in the test-tube labelled 1.0% until the end-point is reached.

step 10 Record in **1(a)(ii)**, to the nearest 0.01 cm^3, the volume of vitamin C solution added to reach the end-point.

If the **DCPIP** solution remains blue after adding all of the 1.0 cm^3 vitamin C solution, record as 'more than 1.0'.

step 11 Repeat step 8 to step 10 with the other concentrations of vitamin C solution prepared in step 5.

(ii) Record your results in an appropriate table.

[5]

DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN

© Cambridge University Press & Assessment 2026

GradeMax

You are provided with a vegetable extract **U** containing an unknown concentration of vitamin C.

You will investigate the effect of boiling on the concentration of vitamin C in extract **U**.

Carry out step 12 to step 22.

step 12 Put 1.0 cm^3 of **DCPIP** solution into a clean test-tube.

step 13 Fill a clean 1 cm^3 syringe with 1.0 cm^3 of **U**.

step 14 Add **U**, one drop at a time, to the **DCPIP** solution until the end-point is reached.

step 15 Record in **1(a)(iii)** the volume of **U** added to reach the end-point.

step 16 Set up the Bunsen burner, gauze and tripod and heat the remaining solution **U** until it is boiling. When it is boiling, start timing.

step 17 After boiling **U** for 2 minutes, leave the beaker on the gauze and tripod to cool for at least 5 minutes.

step 18 After leaving it to cool for at least 5 minutes, transfer the beaker containing boiled **U** to a heat-proof mat.

step 19 Put 1.0 cm^3 of **DCPIP** solution into a clean test-tube.

step 20 Fill a clean 1 cm^3 syringe with 1.0 cm^3 of boiled **U**.

step 21 Add boiled **U**, one drop at a time, to the **DCPIP** solution until the end-point is reached.

step 22 Record in **1(a)(iii)** the volume of boiled **U** added to reach the end-point.

(iii) Record the volumes of **U** and boiled **U** added to reach the end-point.

volume of **U** = ... cm^3

volume of boiled **U** = ... cm^3

[1]

(iv) Use the values in **1(a)(ii)** and **1(a)(iii)** to estimate the concentration of vitamin C in **U** before and after boiling.

concentration of vitamin C in **U** before boiling = ... %

concentration of vitamin C in **U** after boiling = ... %

[1]

(v) Suggest **one** possible explanation for your results in **1(a)(iv)**.

.....

.....

..... [1]

DO NOT WRITE IN THIS MARGIN

© Cambridge University Press & Assessment 2026

(vi) Suggest a reason for determining the end-point in step 1 to step 4.

.....

.....

..... [1]

(vii) A student carried out the same investigation but counted the number of drops instead of measuring the volume of vitamin C solution added.

Suggest why counting the number of drops is less accurate than measuring the volume.

.....

.....

..... [1]

(b) Some people do not have enough vitamin C in their diet and need to take vitamin C tablets.

Scientists investigated the effect of taking vitamin C tablets by measuring the concentration of vitamin C in the blood.

- Tablets containing 3.0 g of vitamin C were consumed by 250 healthy volunteers.
- Blood samples were taken from the volunteers after 5 hours and tested for vitamin C.
- The procedure was repeated using tablets containing different masses of vitamin C.

The results are shown in Table 1.2.

Table 1.2

mass of vitamin C in tablet / g	average concentration of vitamin C in blood / μmol dm^{-3}
0.00	98
1.00	168
1.25	178
2.00	194
3.00	202

DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN

© Cambridge University Press & Assessment 2026

GradeMax

(i) Plot a graph of the data in Table 1.2 on the grid in Figure 1.2.

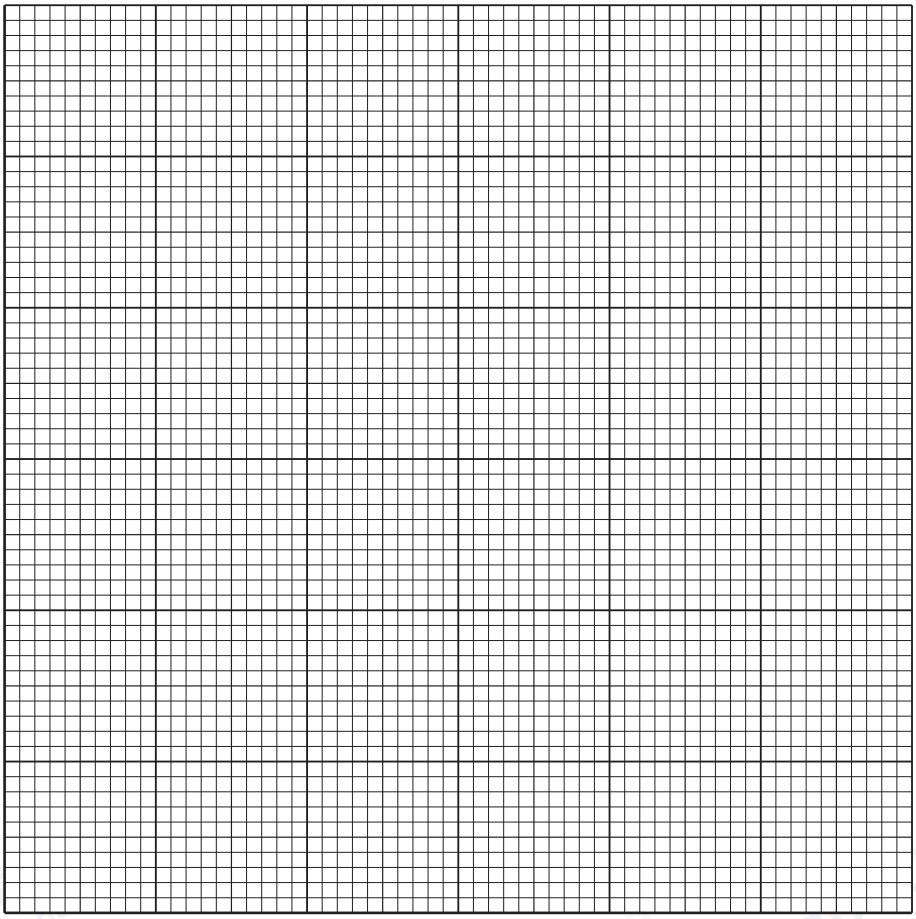


Figure 1.2

[4]

DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN

PapaCambridge
papacambridge.com

(ii) State **two** conclusions from the data.

1 .....

.....

.....

.....

2 .....

.....

.....

.....

[2]

(iii) Use the graph to estimate the mass of vitamin C that would need to be consumed to increase the concentration of vitamin C in the blood by 50%.

Show your working.

mass of vitamin C = ... g [2]

(iv) Suggest an advantage of using 250 people in the study.

.....

.....

..... [1]

[Total: 22]

DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN

© Cambridge University Press & Assessment 2026

GradeMax

DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN

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

(a) **(i)** Draw a large plan diagram of the whole section on **K1**. Use a sharp pencil.

Use **one** ruled label line and label to identify the palisade mesophyll.

[5]

© Cambridge University Press & Assessment 2026

GradeMax

(ii) Observe the outer layer of the leaf on **K1**.

The outer layer consists of a cuticle and two rows of cells: a row of epidermal cells above a row of hypodermal cells.

Select a group of **two** adjacent epidermal cells and **two** adjacent hypodermal cells.

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

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

[5]

DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN

© Cambridge University Press & Assessment 2026

(iii) Figure 2.1 is a photomicrograph of a stained transverse section of a leaf from a different type of plant.

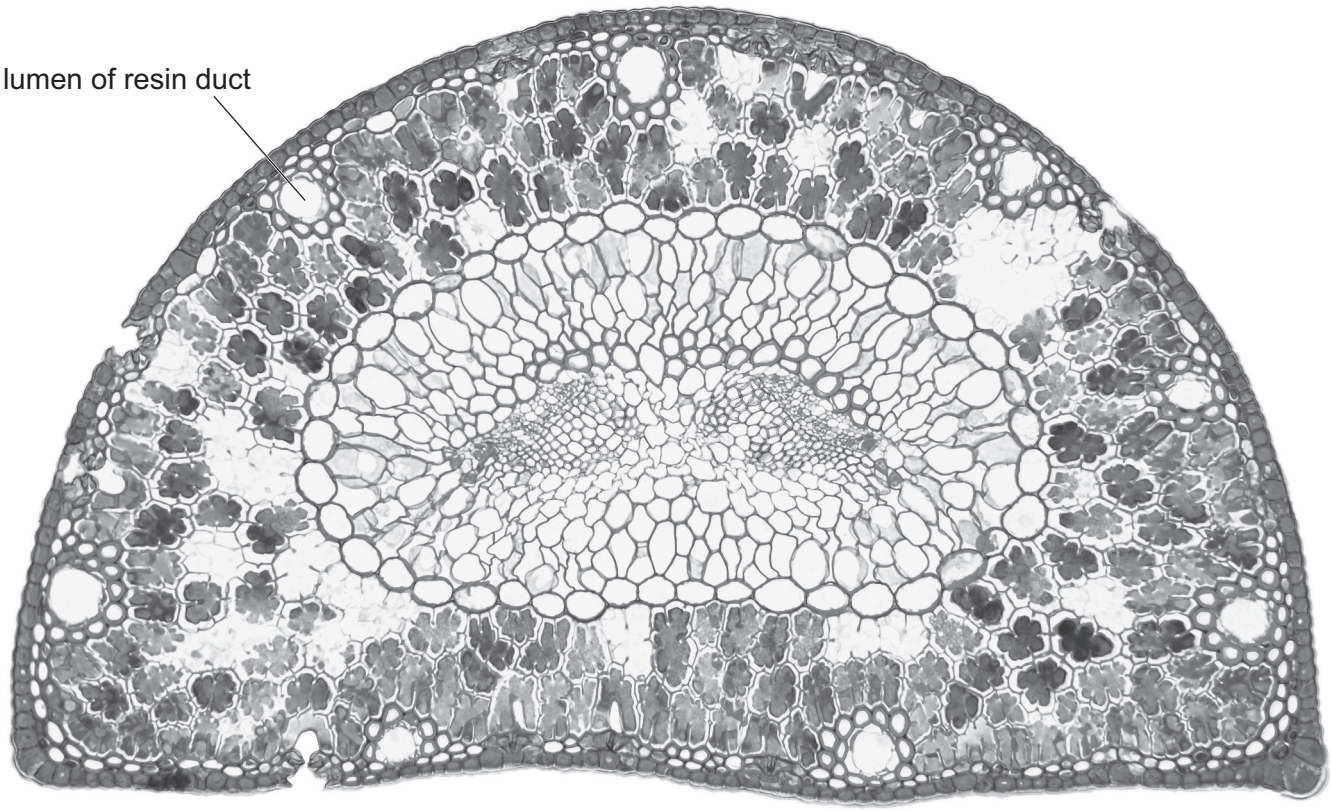


Figure 2.1

Identify **three** observable differences, other than colour, between the leaf section on **K1** and the leaf section in Figure 2.1.

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

Table 2.1

feature	K1	Figure 2.1
1		
2		
3		

[3]

DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN

GradeMax

(b) Figure 2.2 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 Figure 2.2 is 0.25 mm.

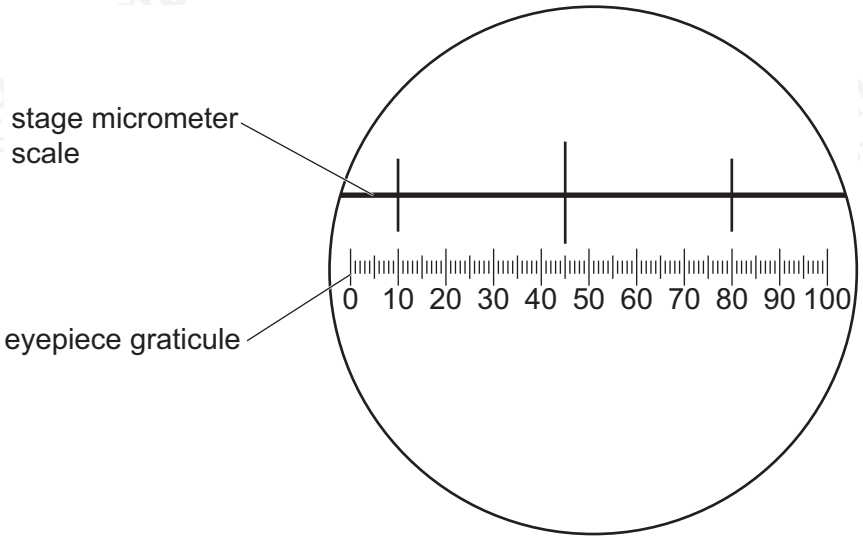


Figure 2.2

(i) Calculate the actual length of **one** eyepiece graticule unit shown in Figure 2.2.

Give your answer in micrometres (μm).

Show your working.

actual length = ... μm [2]

DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN

© Cambridge University Press & Assessment 2026

GradeMax

(ii) Figure 2.3 is a photomicrograph of a transverse section of a leaf from the same species of plant as Figure 2.1.

This was taken with the same microscope and the same lenses used to take the photomicrograph in Figure 2.2.

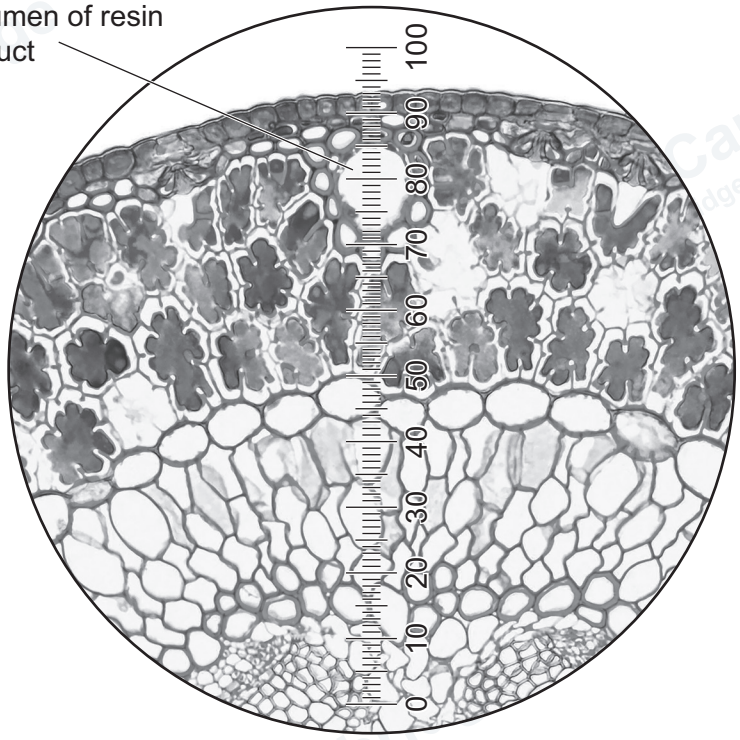


Figure 2.3

Use the calibration of the eyepiece graticule unit from **2(b)(i)** to calculate the actual length of the lumen of the resin duct labelled in Figure 2.3.

Show your working.

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

actual length = ... [3]

[Total: 18]

DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN

© Cambridge University Press & Assessment 2026

GradeMax

BLANK PAGE

DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (Cambridge University Press & Assessment) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in our Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge International Education is the name of our awarding body and a part of Cambridge University Press & Assessment, which is a department of the University of Cambridge.

© Cambridge University Press & Assessment 2026