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5612284140

BIOLOGY **9700/35**

Paper 3 Advanced Practical Skills 1 **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 **12** pages.

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1 You will be investigating the effect of salt concentration on the movement of water in potatoes.

You are provided with the materials shown in Table 1.1.

Table 1.1

labelled	contents	hazard	volume / cm^3
P	5 lengths of potato	none	–
W	distilled water	none	150
S	1 mol dm^{-3} salt solution	none	150

It is recommended that you wear suitable eye protection.

(a) You will need to make different concentrations of salt solution using proportional dilution of the 1.00 mol dm^{-3} salt solution, **S**.

You will need to prepare 40 cm^3 of each concentration.

Table 1.2 shows two of the concentrations you will use.

Decide which other concentrations of salt solution you will use.

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

Table 1.2

final concentration of salt solution / mol dm^{-3}	volume of **S** / cm^3	volume of distilled water, **W** / cm^3
1.00	40	0
0.00	0	40

[2]

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Carry out step 1 to step 11.

step 1 Prepare the concentrations of salt solution, as shown in Table 1.2, in the beakers provided.

step 2 Cut 10 discs of potato for each of the concentrations prepared in step 1.

Each disc should be approximately 3 mm thick.

step 3 Place 10 discs in a line as shown in Fig. 1.1.

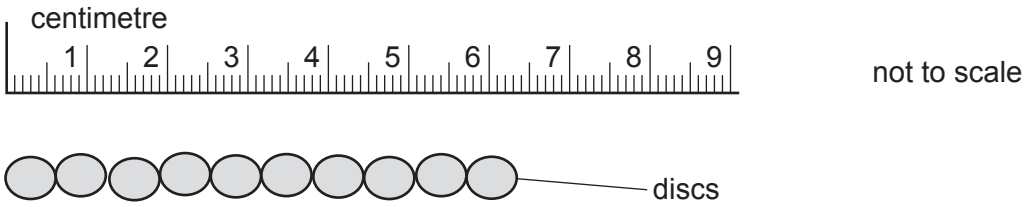


Fig. 1.1

step 4 Measure the total length of the 10 discs and record this value in **1(a)(ii)**.

step 5 Put the 10 discs into the beaker containing 1 mol dm^{-3} salt solution.

step 6 Repeat step 3 to step 5 with the other discs and the salt solutions you prepared in step 1.

step 7 Start timing and leave for 30 minutes.

Use this time to continue with other parts of Question 1.

step 8 After 30 minutes (step 7), discard the 1 mol dm^{-3} salt solution from around the discs and tip the discs onto some paper towel.

step 9 Place the 10 discs in a line as in Fig. 1.1 and measure their total length. Record this value in **1(a)(ii)**.

step 10 Repeat step 8 and step 9 for the other salt concentrations.

step 11 Calculate the **change** in length for each line of 10 discs.

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(ii) Record your results in an appropriate table, including raw results **and** processed results.

[5]

(iii) Explain your results for the 0.0 mol dm^{-3} salt solution (distilled water).

.....

.....

.....

.....

..... [2]

(iv) Suggest why a line of 10 discs was measured instead of a single disc.

.....

.....

..... [1]

(v) Identify **one** significant source of error in this investigation.

.....

.....

..... [1]

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(vi) Use your results to estimate a salt concentration where there is **no net movement** of water into or out of the potato.

salt concentration ..... $mol\,dm^{-3}$ [1]

(vii) Describe **two** improvements to your procedure that would make the estimate in **1(a)(vi)** more accurate.

1 .....

.....

.....

2 .....

.....

.....

[2]

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(b) The salt content of unprocessed food was measured.

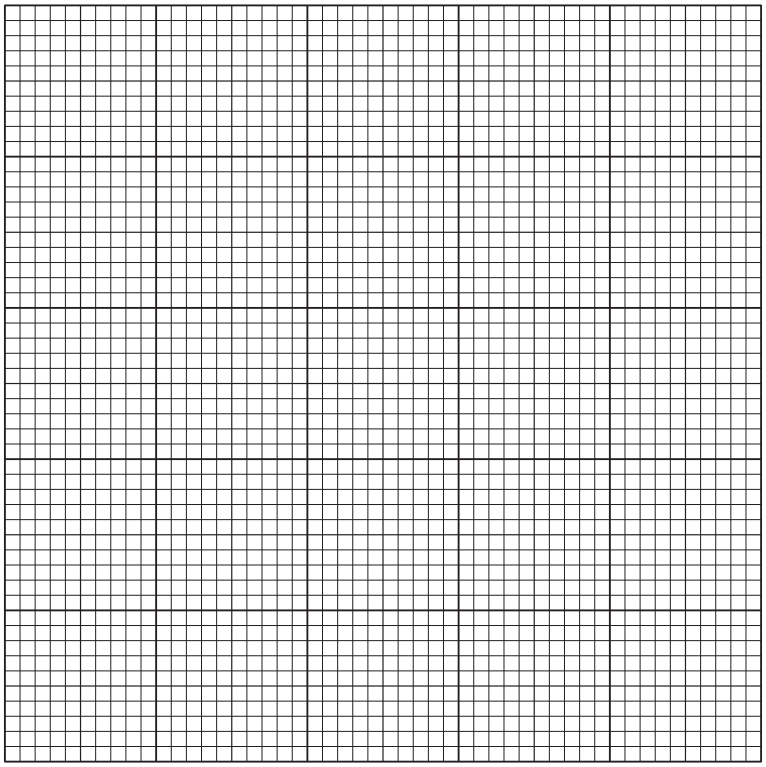
The values are shown in Table 1.3.

Table 1.3

food type	salt content of unprocessed food / mg per 100 g food
potatoes (P)	10.0
tuna (T)	40.0
bran (B)	25.0
chicken (C)	50.0
salmon (S)	95.0

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

Use a sharp pencil.



[4]

Fig. 1.2

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The salt content of the same foods that had been processed was also measured.

The values are shown in Table 1.4.

Table 1.4

food type	salt content of processed food / mg per 100 g food
potatoes (P)	200.0
tuna (T)	300.0
bran (B)	1000.5
chicken (C)	350.5
salmon (S)	1800.0

(ii) Calculate the percentage increase in salt content when salmon is processed.

Show your working and write your answer to **two** significant figures.

increase in salt content ..... % [2]

(iii) State the independent variable in this study.

.....

..... [1]

[Total: 21]

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

(a) **(i)** Draw a large plan diagram of the region of the leaf on **M1** indicated by the shaded region in Fig. 2.1. Use a sharp pencil.

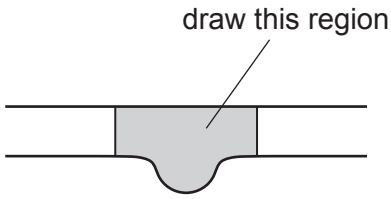


Fig. 2.1

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

[5]

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(ii) Observe one of the central vascular bundles of the leaf on **M1**.

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 wall of **one** xylem vessel element.

[5]

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(b) Fig. 2.2 shows a photomicrograph of a stage micrometer scale that is being used to calibrate an eyepiece graticule.

The length of one division on this stage micrometer is 1 mm.

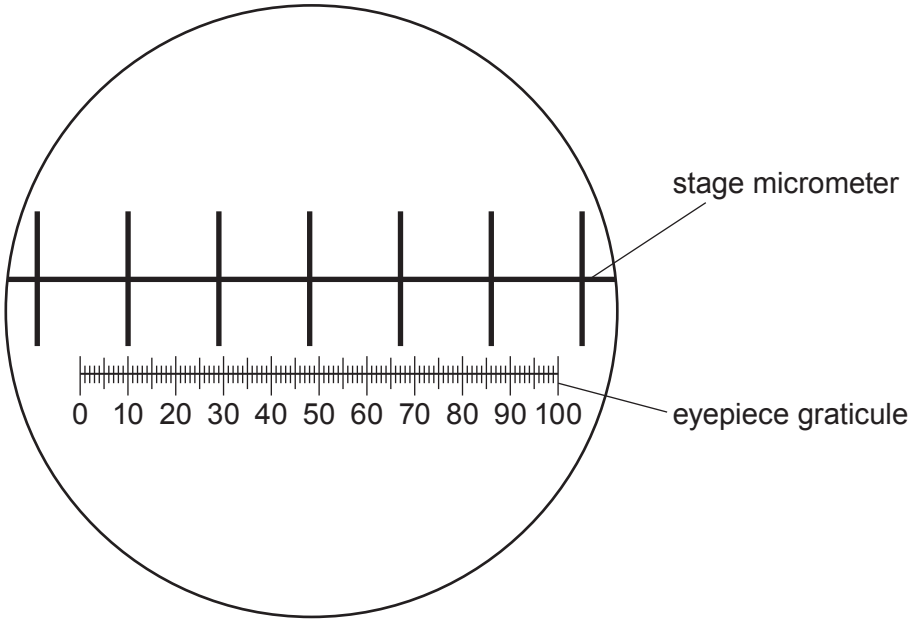


Fig. 2.2

(i) Use Fig. 2.2 to calculate the actual length of one eyepiece graticule unit.

Show your working and include appropriate units.

actual length = ... [3]

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Fig. 2.3 shows a photomicrograph of a transverse section through a different leaf. This was taken with the same microscope and the same lenses used to take the photomicrograph in Fig. 2.2.

The eyepiece graticule has been placed across the leaf section to measure its thickness.

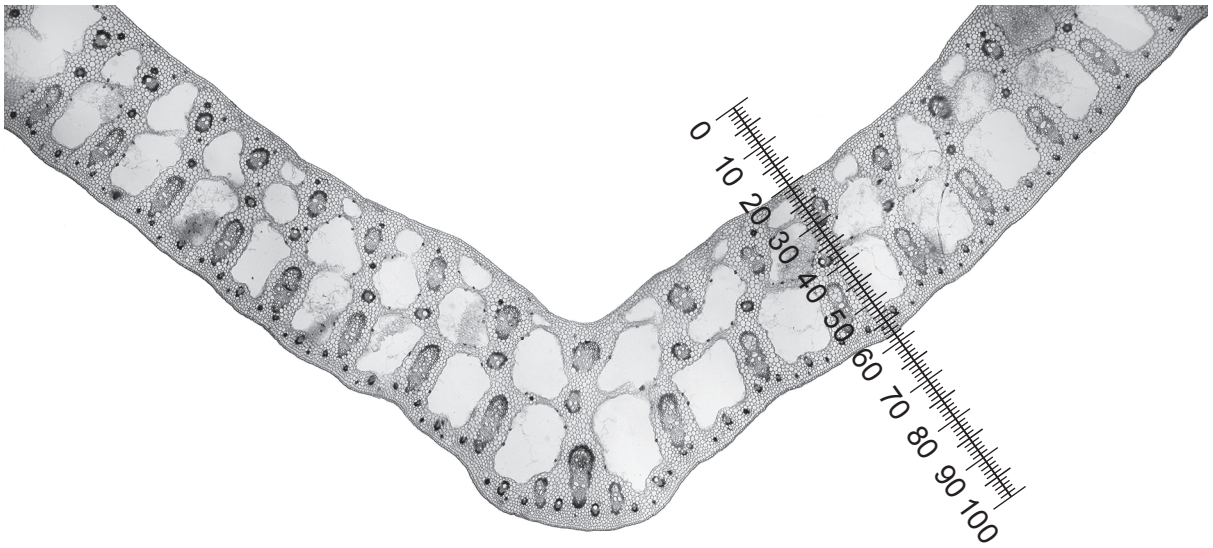


Fig. 2.3

(ii) Use the calibration of the eyepiece graticule from **2(b)(i)** to calculate the actual thickness of the leaf section in Fig. 2.3.

Show your working and write your answer to **two** significant figures.

actual thickness = ... [2]

(iii) The presence of large air spaces in the leaf shown in Fig. 2.3 is one adaptation of the plant for living in water.

Suggest a function of these air spaces.

.....

.....

..... [1]

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(iv) Identify **three** observable differences, other than colour and the presence of air spaces, between the leaf section on **M1** and the leaf section in Fig. 2.3.

Record these observable differences in Table 2.1.

Table 2.1

feature	M1	Fig. 2.3

[3]

[Total: 19]

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