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Cambridge Assessment International Education

Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

BIOLOGY **9700/34**

Paper 3 Advanced Practical Skills 2 **May/June 2024**

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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[Turn over

1 Salicylic acid acts as a painkiller and is the active ingredient in aspirin.

When a person ingests a dose of aspirin, the salicylic acid enters the blood and circulates in the bloodstream. Most of the salicylic acid is metabolised by the body. Some of the salicylic acid is excreted by the kidneys into the urine.

You will estimate the concentration of salicylic acid in two solutions, **S1** and **S2**. These solutions represent samples of blood and urine taken from a person who has ingested aspirin.

Note: you will **not** be working with real blood or real urine.

You are provided with the materials shown in Table 1.1.

Table 1.1

labelled	contents	hazard	volume / cm^3
A	1.0% salicylic acid	harmful	50
C	iron(III) chloride solution	harmful	30
S1	sample with unknown concentration of salicylic acid	harmful	20
S2	sample with unknown concentration of salicylic acid	harmful	20
W	distilled water	none	50

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

It is recommended that you wear suitable eye protection.

The concentration of salicylic acid can be determined by using iron(III) chloride, **C**, which forms a purple solution when mixed with salicylic acid. The greater the concentration of salicylic acid, the more intense the purple colour formed.

You will need to:

- prepare different concentrations of salicylic acid
- record the intensity of purple colour for each concentration
- estimate the concentration of salicylic acid in **S1** and **S2**.

You will use proportional dilution to make different concentrations of salicylic acid.

You will prepare 10 cm^3 of each concentration, using **A** and **W**.

Table 1.2 shows how to prepare **two** of the concentrations you will use.

Decide which other concentrations of salicylic acid you will use.

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(a) (i) Complete Table 1.2 to show how you will prepare the concentrations of salicylic acid you will use.

Table 1.2

percentage concentration of salicylic acid	volume of A / cm^3	volume of W / cm^3
1.0	10.0	0.0
0.0	0.0	10.0

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Carry out step 1 to step 7.

step 1 In the beakers provided, prepare the concentrations of salicylic acid, as shown in Table 1.2.

step 2 Label the test-tubes with the concentrations of salicylic acid prepared in step 1.

step 3 Put 2 cm^3 of **C** into each of the test-tubes labelled in step 2.

step 4 Put 5 cm^3 of **A** into the test-tube labelled 1.0%. Use a glass rod to mix.

step 5 Repeat step 4 for each of the other concentrations you prepared in step 1.

step 6 Place the white card behind the test-tubes and observe the intensity of colour in each test-tube. You may see the same intensity in more than one test-tube.

step 7 Compare the intensity of colour in each test-tube with the key in Fig. 1.1. Record your observations in **(a)(ii)** using only the symbols shown in the key in Fig. 1.1.

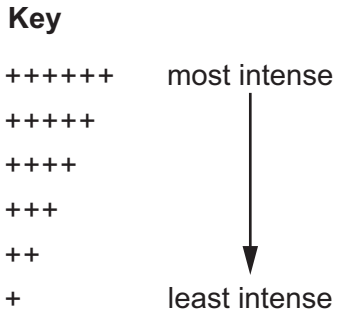


Fig. 1.1

(ii) Record your results in an appropriate table.

[4]

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Carry out step 8 to step 12.

step 8 Label one test-tube **S1** and label another test-tube **S2**.

step 9 Put 2 cm^3 of **C** into each of the test-tubes labelled in step 8.

step 10 Put 5 cm^3 of **S1** into the appropriately labelled test-tube. Use a glass rod to mix.

step 11 Put 5 cm^3 of **S2** into the appropriately labelled test-tube. Use a glass rod to mix.

step 12 Observe the intensity of colour in each test-tube.

(iii) Record your observations for **S1** and **S2** using the symbols shown in the key in Fig. 1.1.

intensity of colour for **S1** .....

intensity of colour for **S2** .....

[1]

(iv) Use your results in **(a)(ii)** and **(a)(iii)** to estimate the concentration of salicylic acid in **S1** and **S2**.

concentration in **S1** .....%

concentration in **S2** .....%

[1]

(v) When a person ingests a dose of aspirin, some of the salicylic acid is excreted by the kidneys into the urine.

State which sample, **S1** or **S2**, is from the person's blood. Explain your answer.

sample ……

explanation .....

.....

.....

[1]

(vi) State the independent variable in this investigation.

..... [1]

(vii) Describe **one** significant source of error when carrying out step 6 and step 7 **and** suggest an improvement to reduce this error.

source of error .....

improvement .....

.....

[2]

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(b) A person was given an oral dose of aspirin and the concentration of salicylic acid in their urine was measured at intervals over a period of four hours.

The results are shown in Table 1.3.

Table 1.3

time / minutes	concentration of salicylic acid in urine / $\mu g\,mL^{-1}$
30	36.0
60	65.5
120	42.5
180	33.0
240	31.5

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

Use a sharp pencil.



Fig. 1.2

[4]

(ii) Use your graph in Fig. 1.2 to estimate the concentration of salicylic acid in the urine at 105 minutes.

Show on your graph how you obtained your answer.

concentration of salicylic acid = ... $\mu g\,mL^{-1}$ [2]

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(iii) The highest concentration of salicylic acid in the urine is detected at 60 minutes.

Using the data in Table 1.3 and your graph in Fig. 1.2, describe the change in concentration of salicylic acid between 60 minutes and 240 minutes.

.....

.....

..... [1]

(iv) Aspirin is also taken to reduce inflammation and blood clotting. Inflammation and blood clotting involve enzyme-controlled reactions.

Suggest how aspirin reduces these enzyme-controlled reactions.

.....

.....

.....

.....

..... [2]

[Total: 22]

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2 **M1** is a slide of a stained transverse section through a plant structure made up of leaves wrapped around a central area.

(a) (i) Observe the region of the section on **M1** indicated by the shaded area in Fig. 2.1.

- Draw a large plan diagram of this region. Use a sharp pencil.
- Include **four** vascular bundles in your drawing.
- Use **one** ruled label line and label to identify **one** vascular bundle.

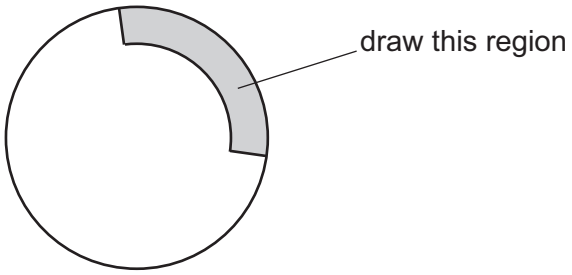


Fig. 2.1

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(ii) Observe the cells in the lower epidermis of the region indicated by the shaded area in Fig. 2.1.

Select a line of four adjacent cells.

Each cell must touch at least **one** of the other cells.

- Make a large drawing of this line of **four** cells.
- Use **one** ruled label line and label to identify a cell wall.

[5]

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Fig. 2.2 is a photomicrograph of a stained transverse section of a stem from a different plant.

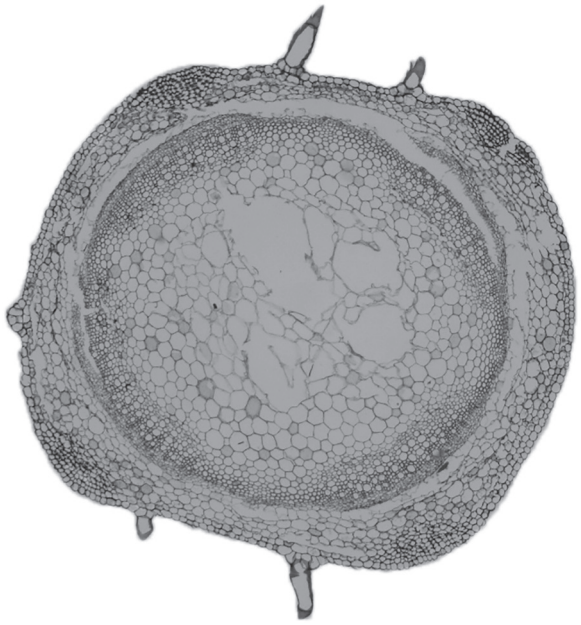


Fig. 2.2

(b) Identify **three** observable features, other than colour, that are different between the section on **M1** and the section in Fig. 2.2.

Record the differences between these **three** observable features in Table 2.1.

Table 2.1

feature	slide M1	Fig. 2.2

[4]

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(c) Fig. 2.3 is the same photomicrograph as that shown in Fig 2.2, with line **X**–**Y** drawn across the section.

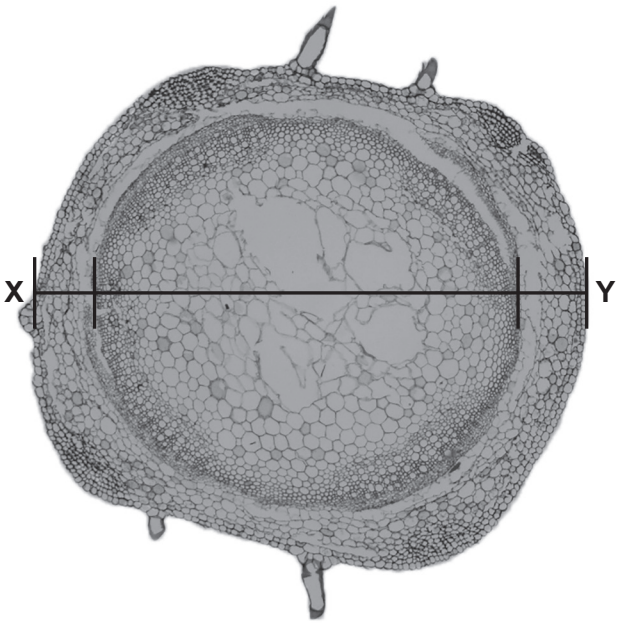


Fig. 2.3

(i) Using the line **X**–**Y,** measure the width of the stem section and the width of the central region.

Use appropriate units.

width of stem section .....

width of central region .....

[2]

(ii) State the ratio of the width of the stem section to the width of the central region.

ratio ..... [1]

(iii) Describe how to determine the mean width of the central region of the stem in Fig. 2.3.

.....

.....

..... [1]

[Total: 18]

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