Cambridge Assessment International Education

Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

6238188355

BIOLOGY **9700/32**

Paper 3 Advanced Practical Skills 2 **May/June 2021**

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.

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.

1 The enzyme amylase breaks down starch to form reducing sugars.

It has been found that drinking tea affects the activity of amylase.

You will investigate the effect of different concentrations of tea extract on the breakdown of starch by amylase.

You are provided with the materials shown in Table 1.1.

Table 1.1

labelled	contents	hazard	volume / cm^3
E	amylase solution	harmful irritant	50
T	100% tea extract	none	20
S	starch solution	none	50
W	distilled water	none	150
iodine	iodine solution	irritant	20

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

It is recommended that you wear suitable eye protection.

You will need to carry out a **serial** dilution of the 100% tea extract, **T**, to reduce the concentration by **half** between each successive dilution.

Fig. 1.1 shows the first two beakers you will use to make your serial dilution.

(a) (i) Complete Fig. 1.1 by drawing as many extra beakers as you need for your serial dilution of **T**.

For each beaker add labelled arrows to show:

- the volume of tea extract transferred
- the volume of water, **W**, added.

Under each beaker state the concentration of tea extract.

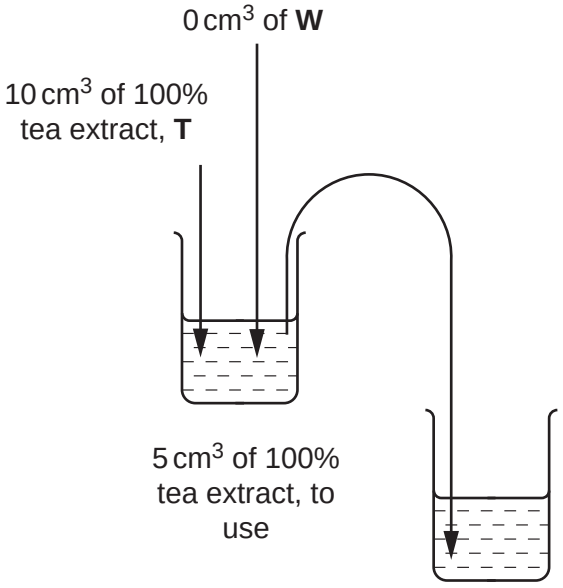
0 cm3 of W
10 cm3 of 100% tea extract, T
5 cm3 of 100% tea extract, to use

Fig. 1.1

[3]

Carry out step 1 to step 12.

1. Prepare the concentrations of tea extract as shown in Fig. 1.1.

2. Label the test-tubes with the concentrations you prepared in step 1.

3. Put 1 cm^3 of each concentration of tea extract into the appropriately labelled test-tube.

4. Put 5 cm^3 of **E** into each of the labelled test-tubes. Shake gently to mix.

5. Using the beakers labelled **hot water** and **cold water**, set up and maintain a water-bath with water between 30 °C and 40 °C.

6. Put the test-tubes from step 4 into the water-bath.

7. Label a white tile, as shown in Fig. 1.2, with:

   - the times 2, 4, 6, 8 and 10 (minutes)
   - the percentage concentrations of tea extract you prepared in step 1.

8. Put drops of iodine solution onto the white tile as shown in Fig. 1.2.

You will need one row of drops of iodine solution for each of the concentrations of tea extract you prepared in step 1.

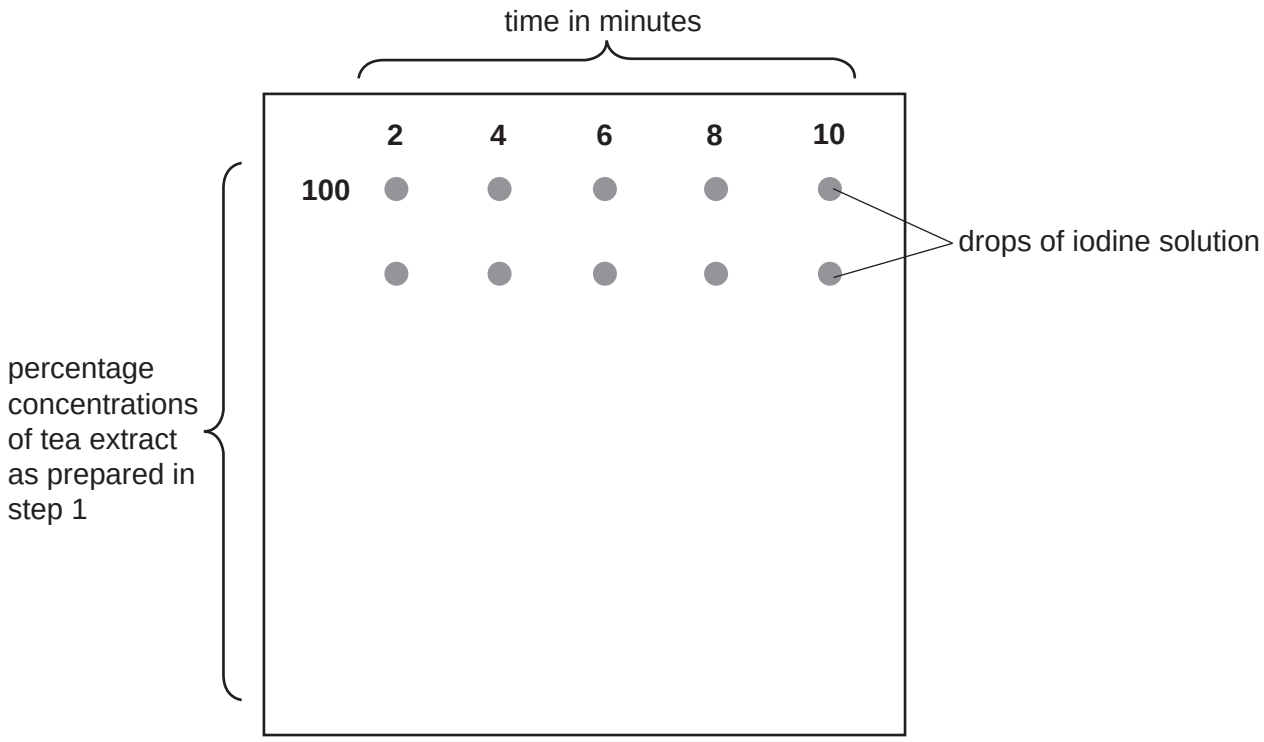

Fig. 1.2

Read step 9 to step 12 before continuing.

9. Put 2 cm^3 of starch solution **S** into each test-tube (in the water-bath). Shake gently to mix. Start timing.

10. After 2 minutes:

    - use a pipette to remove a sample of the solution from the test-tube labelled 100%
    - put 1 drop of the solution onto the spot of iodine solution labelled 2 (minutes) on the row labelled 100 (%)
    - put 1 drop of the next solution onto the spot of iodine solution labelled 2 (minutes) on the row labelled with your next concentration of tea extract
    - repeat for the other concentrations of tea extract you prepared in step 1, so that all of the drops of iodine solution in the 2 minute column have been used.

11. Repeat step 10 at intervals of 2 minutes until there is no blue-black colour. This is the end-point.

Note: you will not see the original colour of the iodine due to the presence of the tea.

If the iodine continues to turn blue-black at 10 minutes, stop sampling and record this as 'more than 10'.

12. Record in **(a)(ii)** the time taken to reach the end-point.

(ii) Record your results in an appropriate table.

[5]

(iii) State the trend for your results.

.....

..... [1]

(iv) Tea is a competitive inhibitor of amylase.

Explain how tea can act as a competitive inhibitor of amylase.

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..... [3]

(v) The volume of the drops of iodine solution in step 8 was not standardised.

Suggest **one** improvement to step 8.

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..... [1]

(vi) Identify **two** possible sources of error in step 9 **and** suggest improvements to reduce the effect of these errors.

error .....

.....

improvement .....

.....

.....

error .....

.....

improvement .....

.....

.....

[4]

(b) Caffeine is a chemical found in tea and many other drinks.

A student investigated the concentration of caffeine in different types of drink.

Table 1.2 shows the student's raw data and processed data.

Table 1.2

type of drink	raw data		processed data
	volume of one serving / cm^3	mass of caffeine per serving / mg	concentration of caffeine / mg cm^{-3}
black tea (BT)	220	40	0.18
filter coffee (FC)	350	195	
decaffeinated tea (DT)	220	5	0.02
cola light (CL)	330	33	0.10
espresso coffee (EC)	30	48	1.60
green tea (GT)	220	18	0.08

(i) Complete Table 1.2 by calculating the concentration of caffeine in filter coffee.

[1]

(ii) Plot a bar chart on the grid in Fig. 1.3 to show the concentration of caffeine (processed results) in the different types of drink shown in Table 1.2.

Use a sharp pencil for drawing bar charts.

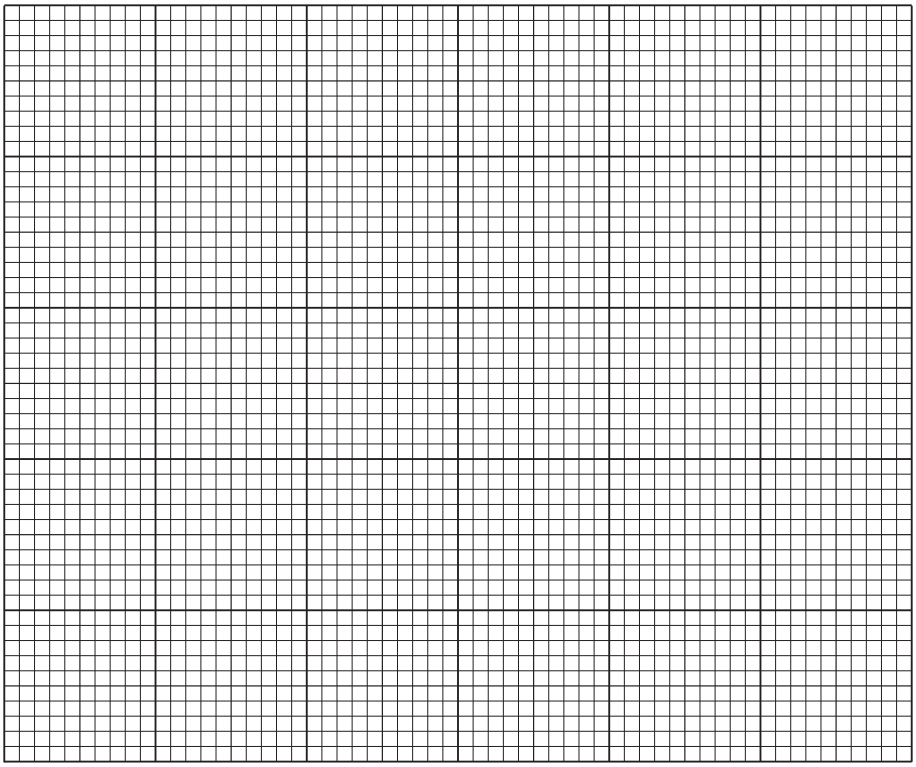

Fig. 1.3

[4]

(c) An energy drink contains a mixture of caffeine and reducing sugars.

State the reagent you would use to determine the concentration of reducing sugar in the energy drink.

..... [1]

[Total: 23]

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

(a) Set up the microscope so that you can observe the section on **K1**.

Observe the different tissues in the area on **K1** shown by the shaded region in Fig. 2.1.

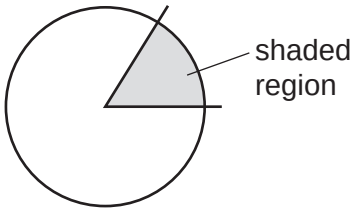

Fig. 2.1

Use a sharp pencil for drawing.

(i) Draw a large plan diagram of the area of the section on **K1** shown by the shaded region in Fig. 2.1, to include **two** large vascular bundles.

Your drawing should show the correct shapes and proportions of the different tissues.

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

[5]

(ii) Observe the epidermis of the section on **K1**.

Select a line of **four** adjacent epidermal cells. Each cell in the line must touch at least one other cell.

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

[5]

(b) Fig. 2.2 is a photomicrograph of a stained transverse section through a stem of a different type of plant.

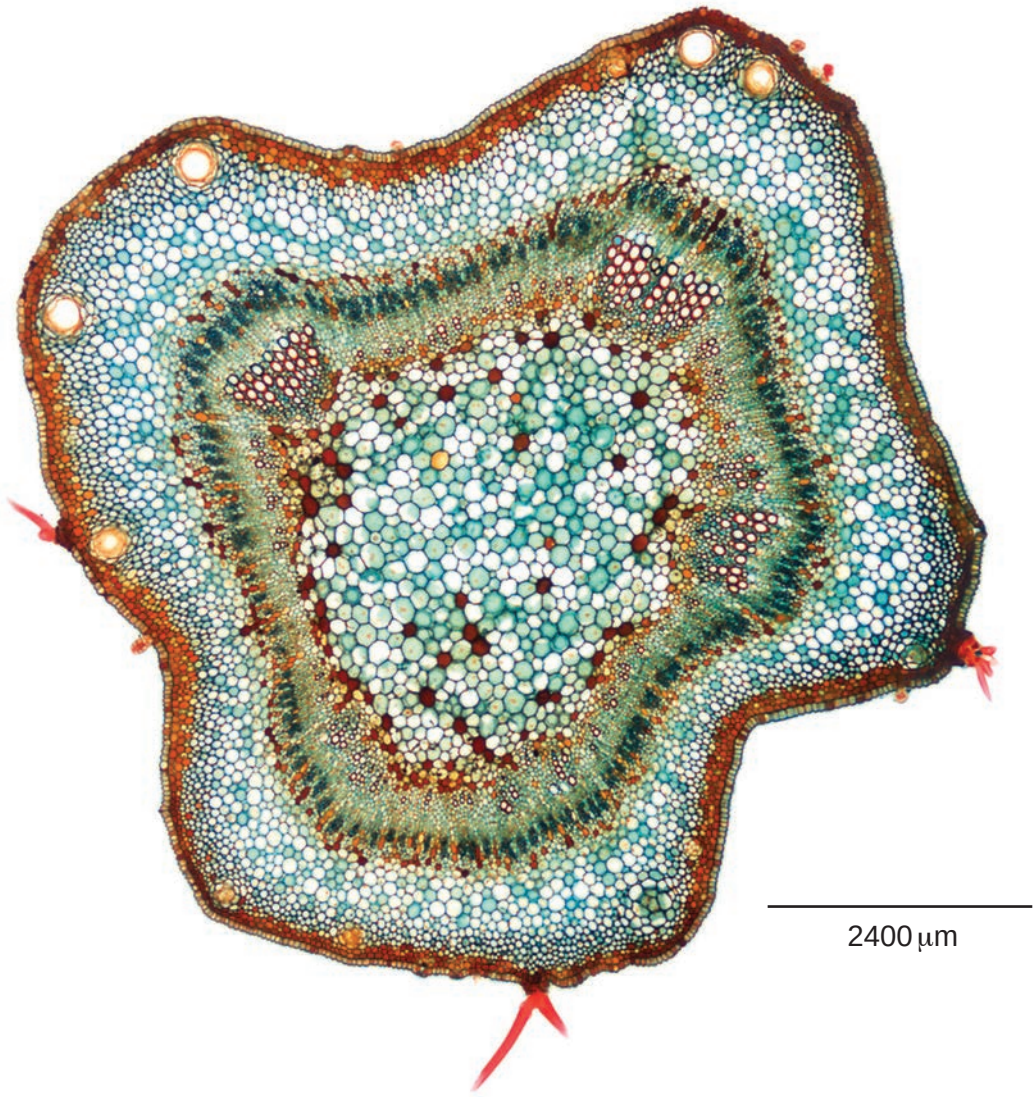

Fig. 2.2

(i) Use the scale bar on Fig. 2.2 to calculate the magnification of Fig. 2.2.

Show your working.

magnification = ... [3]

(ii) Identify the observable differences between the section on **K1** and the section in Fig. 2.2.

Record the observable differences in Table 2.1.

Table 2.1

feature	K1	Fig. 2.2

[4]

[Total: 17]

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