Cambridge Assessment International Education

Cambridge International AS & A Level

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

7798341146

BIOLOGY **9700/35**

Paper 3 Advanced Practical Skills 1 **October/November 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. Any blank pages are indicated.

1 The enzyme amylase catalyses the hydrolysis (breakdown) of starch to reducing sugars, as shown in Fig. 1.1.

Fig. 1.1

A student investigated the effect of temperature on the hydrolysis of starch by the enzyme amylase.

The student:

- put 2 cm^3 of amylase into a test-tube
- put 18 cm^3 of starch solution into a different test-tube
- put the test-tubes into a water-bath at 0 °C
- left the test-tubes for 3 minutes
- put the starch solution into the test-tube containing the amylase
- left the test-tube for 2 minutes
- immediately determined the relative amount of reducing sugars in the test-tube
- repeated this procedure at 40 °C and at 100 °C.

You are provided with three beakers, **S1**, **S2** and **S3**. These three beakers contain the same products of the reaction between starch and amylase as the test-tubes prepared by the student.

You will determine:

- the relative amount of reducing sugar present in each beaker
- the presence or absence of starch in each beaker.

You are provided with the materials shown in Table 1.1.

Table 1.1

labelled	contents	hazard	volume / cm^3
S1	products of the reaction between starch and amylase at 0 °C	none	20
S2	products of the reaction between starch and amylase at 40 °C	none	20
S3	products of the reaction between starch and amylase at 100 °C	none	20
U	products of the reaction between starch and amylase at an unknown temperature	none	20
B	Benedict's solution	irritant	30
iodine	iodine solution	irritant	15

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

It is recommended that you wear suitable eye protection.

To investigate the effect of temperature on the hydrolysis of starch by the enzyme amylase you will need to:

- carry out the test for reducing sugars on **S1**, **S2** and **S3**
- determine the relative amount of reducing sugar in each solution
- carry out the test for starch on **S1**, **S2**, and **S3**
- determine the presence or absence of starch in each solution.

(a) **(i)** Explain why the student left the test-tubes in the water-bath for 3 minutes before adding the starch solution.

.....

..... [1]

To determine the relative amount of reducing sugar in each solution, the time to the first colour change will be measured using 5 cm^3 of each solution.

(ii) Decide how you will test each solution to show the relative amount of reducing sugar present.

State the reagent you will use.

reagent .....

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

.....

.....

.....

State how you will determine which solution has the **highest amount** of reducing sugar present.

.....

[2]

Carry out step 1 to step 5.

step 1 Label one test-tube, **S1**.

step 2 Put 5 cm^3 of **S1** into the test-tube.

step 3 Repeat step 1 and step 2 for **S2** and **S3**.

step 4 Carry out the test for reducing sugars as you described in **(a)(ii)**.

If the time taken to the first colour change is longer than 120 seconds then record as 'more than 120'.

step 5 Record in **(a)(iv)** the time taken to the first colour change for each solution.

Carry out step 6 to step 11 to test for the presence of starch.

step 6 Label a clean test-tube, **S1**.

step 7 Put 5 cm^3 of **S1** into the test-tube.

step 8 Repeat step 6 and step 7 for **S2** and **S3**.

step 9 Put 2 drops of iodine solution into each test-tube. Shake gently to mix.

If any starch is present the solution will change to a blue colour.

step 10 Observe the colour in each test-tube.

step 11 Record in **(a)(iv)** the colour for each solution.

(iii) State the independent variable in this investigation.

..... [1]

(iv) Record your results in an appropriate table.

[4]

(v) Complete Table 1.2 using your results in **(a)(iv)**.

For reducing sugar content use only the words: **none**, **low**, **medium** or **high**.

For presence of starch use only the words: **present** or **absent**.

You may use each word once, more than once or not at all.

Table 1.2

	reducing sugar content	presence of starch
S1	.....	.....
S2	.....	.....
S3	.....	.....

[2]

(vi) Explain the results for **S1**, **S2** and **S3**.

.....

.....

.....

.....

.....

..... [3]

U contains the products of the reaction between starch and amylase solution in a water-bath at an unknown temperature.

You need to:

- carry out the test for reducing sugars and the test for starch on **U**
- compare the results for **U** with the results for **S1**, **S2** and **S3**
- estimate the temperature of the water-bath used for **U**.

Carry out step 12 and step 13.

step 12 Repeat the test for reducing sugars and the test for starch on **U**.

step 13 Record your results in **(a)(vii)**.

(vii) Record the result of the test for reducing sugars for **U**.

time taken to first colour change ..... s

Record the result of the test for starch for **U**.

colour .....
[1]

(viii) Use your results in **(a)(iv)** and **(a)(vii)** to estimate the temperature of the water-bath used for **U**.

temperature of water-bath ..... °C [1]

(ix) Describe how the student could obtain a **quantitative** estimate of the concentration of reducing sugar in a solution.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [4]

(b) A student investigated the effect of temperature on the action of an enzyme that digests protein.

The results are shown in Table 1.3.

Table 1.3

temperature / °C	rate of reaction / arbitrary units
20	8
25	46
30	74
40	59
45	42

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

Use a sharp pencil.

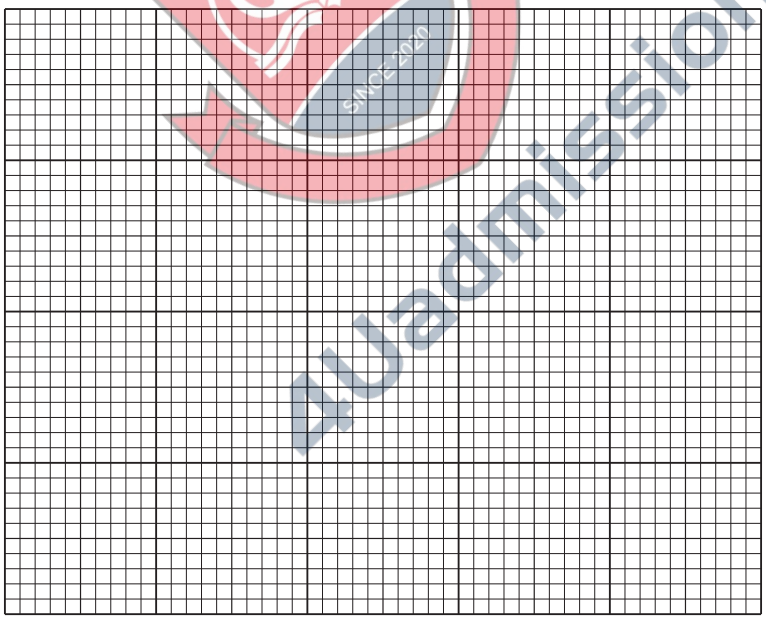

Fig. 1.2

[4]

[Total: 23]

[Turn over

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

(a) **(i)** Draw a large plan diagram of the whole section on **M1**.

Use a sharp pencil.

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

[5]

(ii) Observe the upper epidermis of the leaf on **M1** and the layer of cells beneath it. The large bulge on the mid-rib is located on the upper epidermis.

Select a group of four adjacent cells. This group must include **two** cells from the epidermis and **two** cells from below the epidermis.

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

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

Use a sharp pencil.

[6]

(b) Fig. 2.1 is a photomicrograph of a stained transverse section of a different leaf from **M1**.

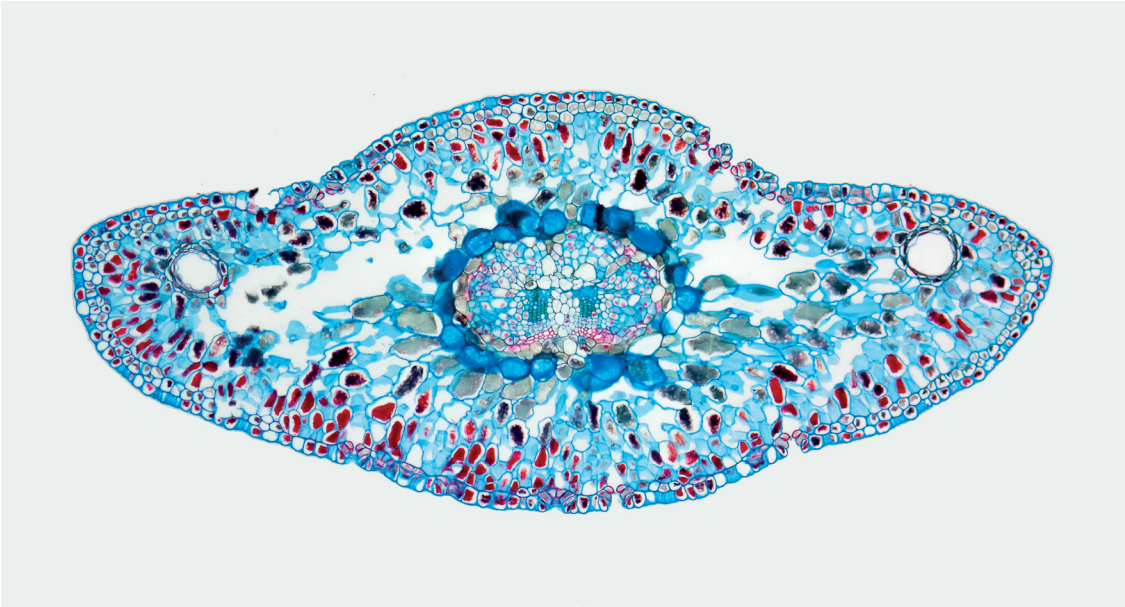

Fig. 2.1

Identify **three** observable differences, other than colour, between the leaf section on **M1** and the leaf section in Fig. 2.1.

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

Table 2.1

feature	M1	Fig. 2.1

[3]

(c) Fig. 2.2 is the same photomicrograph as that shown in Fig. 2.1.

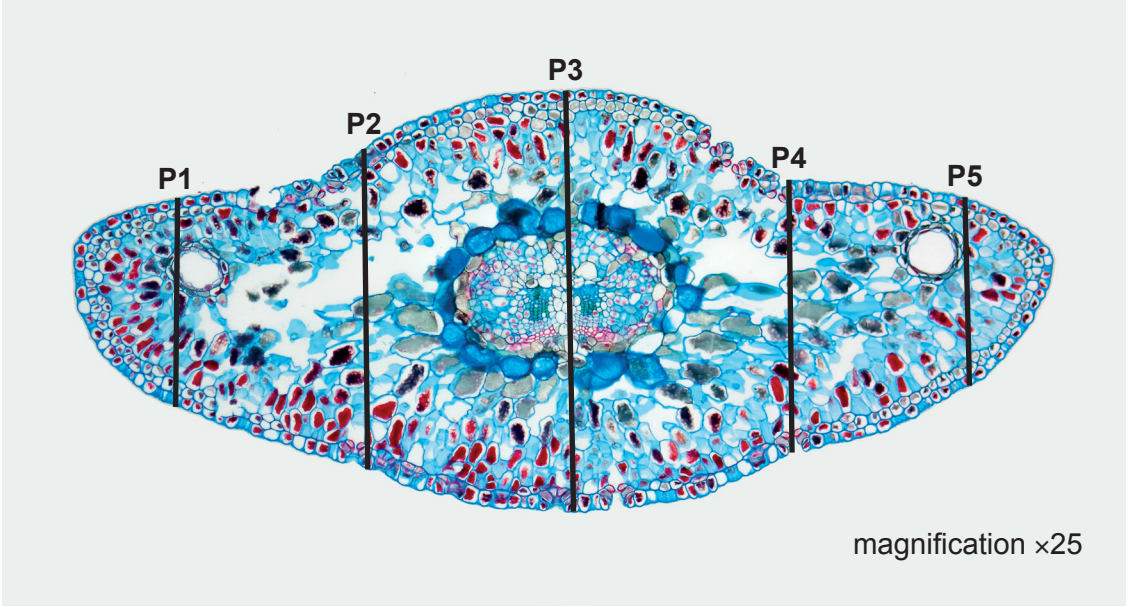

Fig. 2.2

Measure the thickness of the leaf using the lines **P1**, **P2**, **P3**, **P4** and **P5** in Fig. 2.2 and calculate the mean length of the lines.

Show your working, including units.

P1 = **P2 =** **P3 =** **P4 =** **P5 =**

mean length of lines = ...

Using the magnification and the mean length of lines, calculate the actual mean thickness of the leaf.

actual mean thickness = ...

[3]

[Total: 17]

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