Cambridge Assessment International Education

Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

2722710068

BIOLOGY **9700/35**

Paper 3 Advanced Practical Skills 1 **May/June 2025**

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.

1 Catalase is an enzyme found in plant tissues. It catalyses the breakdown of hydrogen peroxide, releasing oxygen gas.

When a mixture of catalase and hydrogen peroxide is put into a syringe, oxygen gas is produced and drops of the mixture come out of the nozzle of the syringe.

You will investigate the effect of different concentrations of catalase on the breakdown of hydrogen peroxide.

You are provided with the materials shown in Table 1.1.

Table 1.1

labelled	contents	hazard	volume / cm^3
E	100.0% catalase solution	irritant	50
H	hydrogen peroxide solution	irritant	30
W	distilled water	none	100

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

You should wear suitable eye protection.

You will need to make different concentrations of the catalase using proportional dilution of the 100.0% catalase solution, **E**.

You will need to prepare 20 cm^3 of each concentration, using **E** and **W**.

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

Decide which other concentrations of catalase you will use.

(a) (i) Complete Table 1.2 for the other concentrations you will use.

Table 1.2

percentage concentration of catalase	volume of E / cm^3	volume of W / cm^3
100.0	20.0	0.0
0.0	0.0	20.0

[2]

Carry out step 1 to step 8.

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

step 2 Label large test-tubes with the concentrations of catalase prepared in step 1.

step 3 Fill a 10 cm^3 syringe to the 5 cm^3 mark with hydrogen peroxide solution, **H**.

step 4 Fill the same syringe to the 10 cm^3 mark with the **100.0%** catalase solution.

step 5 Place the syringe in the large test-tube labelled **100.0%**, as shown in Fig. 1.1.

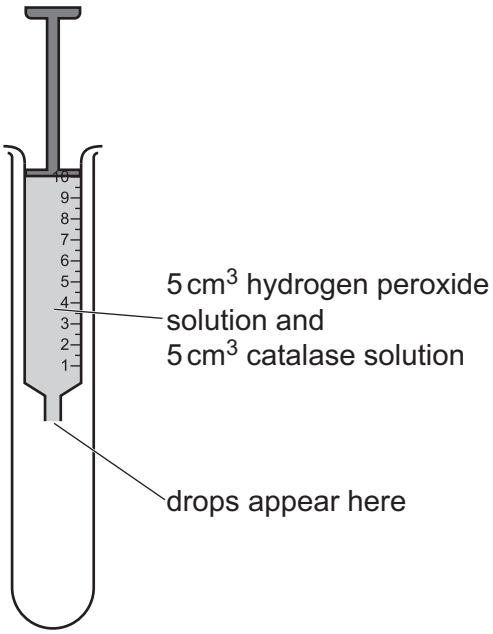

Fig. 1.1

step 6 Start the timer.

step 7 Count the number of drops produced in 60 seconds.
Record your results in **(a)(ii)**.

step 8 Repeat step 3 to step 7 using the other concentrations of catalase prepared in step 1.

(ii) Record your results in an appropriate table.

[5]

(iii) Describe the trend in your results.

.....

.....

..... [1]

(iv) Use your results in **(a)(ii)** to explain the effect of catalase concentration on the breakdown of hydrogen peroxide.

.....

.....

.....

.....

..... [2]

(v) State the independent variable in this investigation.

..... [1]

(vi) State **one** variable that was kept constant in the investigation.

.....

..... [1]

(vii) Identify **two** sources of error in step 7.

1 .....

.....

.....

2 .....

.....

.....

[2]

(viii) Describe how you would modify the procedure to investigate the effect of substrate concentration on catalase activity.

.....

.....

.....

.....

..... [2]

(b) The catalase activity of germinating hyacinth seeds was measured when the seeds were placed in different concentrations of salt solution.

Table 1.3 shows the results of the investigation.

Table 1.3

concentration of salt solution / mmol dm^{-3}	catalase activity / arbitrary units
0	72
100	35
200	28
300	23
400	20
500	14

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

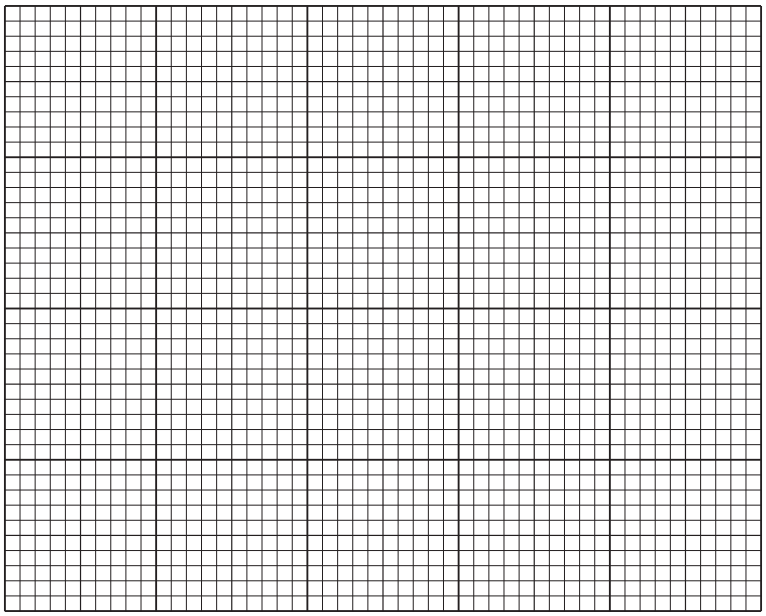

Fig. 1.2

[4]

(ii) A germinating hyacinth seed was placed in a salt solution of unknown concentration. The catalase activity was found to be 54 arbitrary units.

Estimate the concentration of salt solution at which the seed was germinated.

Show on your graph how you obtained your estimate.

concentration = ... mmol dm^{-3} [2]

[Total: 22]

2 **N1** is a slide of a stained transverse section through a plant leaf.

(a) **(i)** Draw a large plan diagram of the leaf section on **N1** shown by the shaded region in Fig. 2.1 (midrib).

Use a sharp pencil.

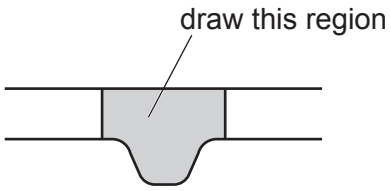

Fig. 2.1

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

[5]

(ii) Observe the cells in the lower epidermis surrounding the midrib on the section of the leaf on **N1**.

Select a line of **four** adjacent lower epidermal cells.

- 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 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 Fig. 2.2 is **1.0 mm**.

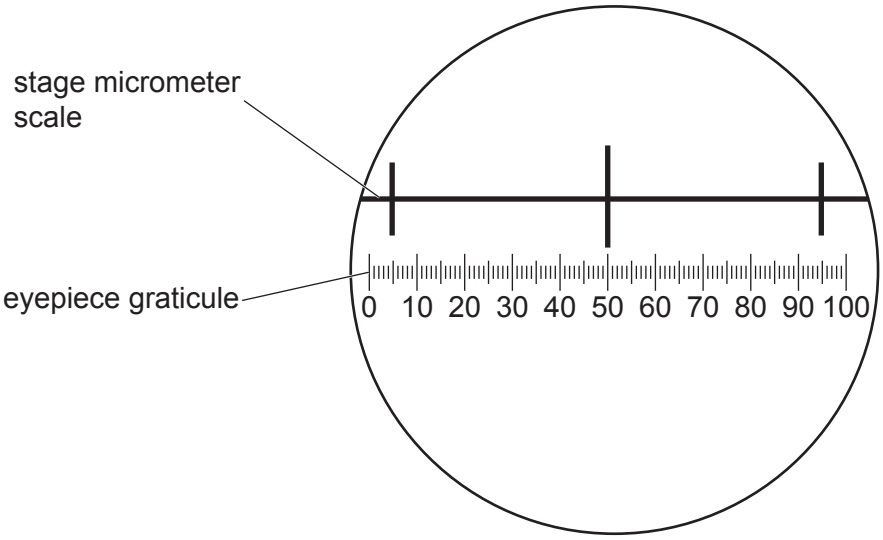

Fig. 2.2

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

Give your answer in micrometres (μm).

Show your working.

actual length = ... μm [2]

(ii) Fig. 2.3 is a photomicrograph of a transverse section of a leaf from another plant of the same species as **N1**.

Fig. 2.3 was taken with the same microscope and the same lenses used to take the photomicrograph in Fig. 2.2.

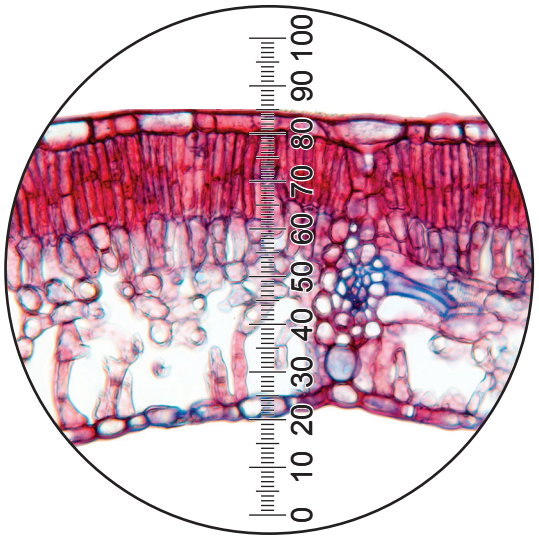

Fig. 2.3

Use the calibration of the eyepiece graticule unit from **(b)(i)** to calculate the actual width of the leaf in Fig. 2.3.

Show your working.

actual width = ... [2]

(iii) Identify **three** observable differences, other than colour, between the leaf section on **N1** and the leaf section in Fig. 2.3.

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

Table 2.1

feature	N1	Fig. 2.3

[4]

[Total: 18]