Cambridge Assessment International Education

Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

BIOLOGY **9700/35**

Paper 3 Advanced Practical Skills 1 **May/June 2020**

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	

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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 Yeast contains an enzyme that will break down hydrogen peroxide into oxygen and water. The oxygen can be collected.

You will investigate the effect of the inhibitor copper sulfate on the breakdown of hydrogen peroxide and the volume of oxygen collected.

You are provided with the materials shown in Table 1.1.

Table 1.1

labelled	contents	hazard	volume / cm^3	risk
Y	yeast suspension	none	40	
H	hydrogen peroxide solution	harmful irritant	50	
C	1.0% copper sulfate solution	harmful irritant	40	
W	distilled water	none	100	low

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

It is recommended that you wear suitable eye protection.

(a) (i) Think about the hazards of using the materials in Table 1.1.

Decide whether the risk of using **Y**, **H** and **C** is **low**, **medium** or **high**.

Complete Table 1.1, using the words **low**, **medium** or **high**, to state the risk of using **Y**, **H** and **C**. You may use each word once, more than once or not at all.

The risk for **W** has been completed for you.

[1]

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[Turn over

You will need to make a **serial** dilution of 1.0% copper sulfate solution, **C**, which reduces the concentration by half between each successive dilution.

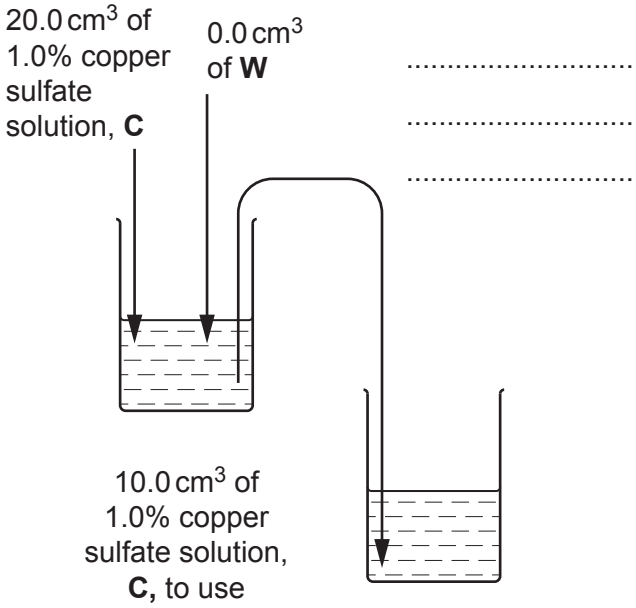
Fig. 1.1 shows the first two beakers you will use to make your serial dilution.

(ii) Complete Fig. 1.1 by drawing as many extra beakers as you need for your serial dilution.

For each beaker:

- state, under the beaker, the volume and concentration of copper sulfate solution available for use in the investigation
- use one arrow with a label, above the beaker, to show the volume and concentration of copper sulfate solution added to prepare the concentration
- use another arrow with a label, above the beaker, to show the volume of **W** added to prepare the concentration.

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20.0 cm3 of 1.0% copper sulfate solution, C
0.0 cm3 of W
10.0 cm3 of 1.0% copper sulfate solution, C, to use

.....

.....

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.....

.....

[3]

Fig. 1.1

Carry out step 1 to step 14.

1. Prepare the concentrations of copper sulfate solution as you decided in **(a)(ii)** and as shown in Fig. 1.1.
   Use a glass rod to mix the copper sulfate solutions and water.

2. Label the large test-tubes with the concentrations of copper sulfate solution prepared in step 1.

3. Put 5 cm^3 of 1.0% copper sulfate solution into the appropriately labelled test-tube.

4. Repeat step 3 with the other concentrations you prepared in step 1.

5. Label another large test-tube **W**. Put 5 cm^3 of **W** into this test-tube using a clean syringe.

6. Use the marker pen to draw one line on the **small** test-tube 8 cm from the bottom, as shown in Fig. 1.2.

   This test-tube will be used to collect the oxygen from the reaction.

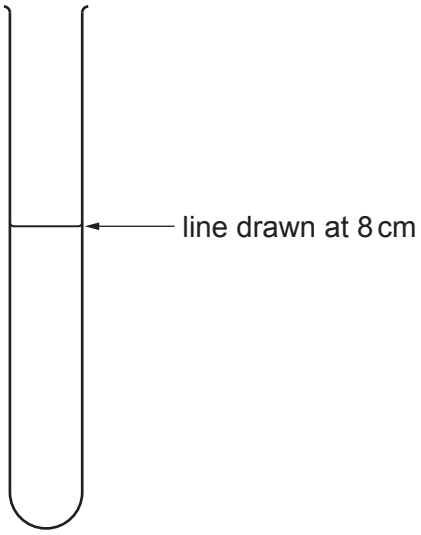


Fig. 1.2

7. Use the beakers labelled **hot water** and **cold water** to set up and maintain a water-bath with water between 30 °C and 35 °C.

8. Stir **Y** and put 5 cm^3 of **Y** into the test-tube labelled **W**. Mix thoroughly with a glass rod.

   Put this test-tube into the water-bath.

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9. Put the test-tube you prepared in step 6 into the container of water labelled **T**. Make sure that the test-tube is fully immersed and that there is no air in it, as shown in Fig. 1.3.

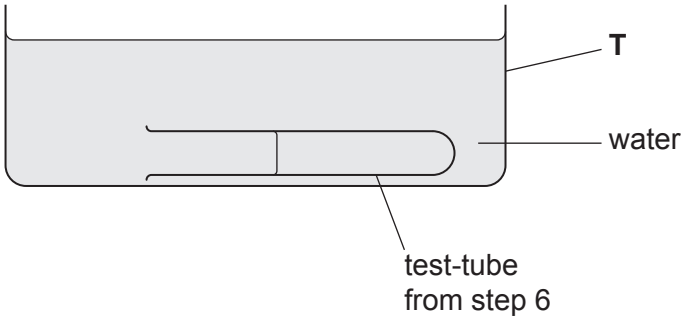


Fig. 1.3

Fig. 1.4 shows the apparatus you will set up for collecting the oxygen from the reaction.

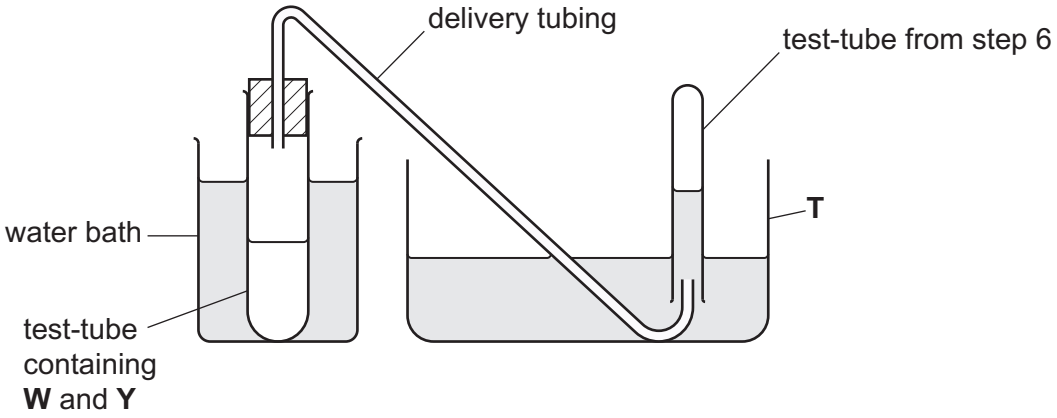


Fig. 1.4

10. Set up the apparatus as shown in Fig. 1.4.

    The reaction will start as soon as you add **H** in step 12. The oxygen produced in this reaction will collect in the small test-tube, displacing the water from this test-tube. The water level in this test-tube will start to fall.

11. Take the bung out of test-tube **W**.

12. Put 2 cm^3 of **H** into this test-tube and replace the bung and immediately start timing.

13. When the level of water in the small test-tube reaches the line, stop timing and record the result in **(a)(iii)**. If the time taken is more than 180 seconds, record the result as 'more than 180'.

14. Repeat step 8 to step 13 using the test-tubes of copper sulfate solution prepared in step 3 and in step 4, instead of test-tube **W**. Start with the test-tube with the lowest concentration of copper sulfate.

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(iii) Record your results in an appropriate table.

[5]

(iv) State the independent variable in this experiment.

..... [1]

(v) Think about how you would modify this procedure to investigate the effect of temperature on the breakdown of hydrogen peroxide.

Describe how the independent variable will be changed to investigate temperature.

.....

.....

..... [2]

(b) A student used a different method to measure the loss of oxygen from the breakdown of hydrogen peroxide.

The student measured the loss of mass after 5 minutes using the apparatus shown in Fig. 1.5.

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Fig. 1.5

Table 1.2 shows the student's results.

Table 1.2

initial mass of reaction mixture / g	final mass of reaction mixture / g	change in mass of reaction mixture / g	percentage change in mass of reaction mixture
249.55	243.31		

(i) Complete Table 1.2 by calculating the percentage change in mass of the reaction mixture.

You may use the space below for your working.

[2]

(ii) State how the student can increase the confidence in the result for percentage change in mass.

..... [1]

(c) A scientist carried out an investigation into the effect of several different inhibitors on the breakdown of hydrogen peroxide.

All other variables were kept constant.

The results are shown in Table 1.3.

Table 1.3

inhibitor	volume of oxygen after 5 minutes / cm^3
N	8.6
P	8.2
Q	4.3
R	7.8
S	3.9

(i) Draw a bar chart of the data in Table 1.3 on the grid in Fig. 1.6.

Use a sharp pencil for drawing graphs.

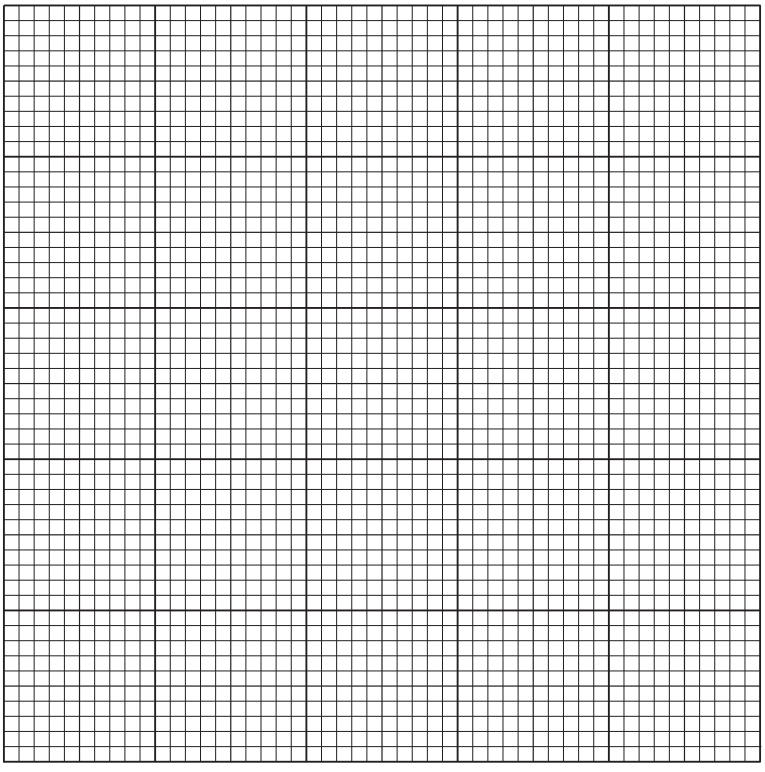


Fig. 1.6

[4]

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(ii) One of the inhibitors in Table 1.3 is a competitive inhibitor.

Explain how competitive inhibitors affect an enzyme-controlled reaction.

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.....

..... [3]

[Total: 22]

2 **L1** is a slide of a stained transverse section through a plant leaf.

You are not expected to be familiar with this specimen.

(a) Select a field of view so that you can observe the different tissues as shown by the shaded area in Fig. 2.1.

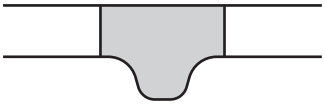


Fig. 2.1

Use a sharp pencil for drawing.

You are expected to draw the correct shape and proportions of the different tissues.

(i) Draw a large plan diagram of the part of the leaf on **L1** shown by the shaded area in Fig. 2.1.

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

[5]

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(ii) Observe the upper epidermis of the leaf on **L1**.

Select a **line** of **four** adjacent, touching cells in the upper epidermis.

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.

[4]

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

You are not expected to be familiar with this specimen.

An eyepiece graticule scale is shown on Fig. 2.2.

The calibration of the eyepiece graticule scale is:

1 eyepiece graticule division = 22.7 μm

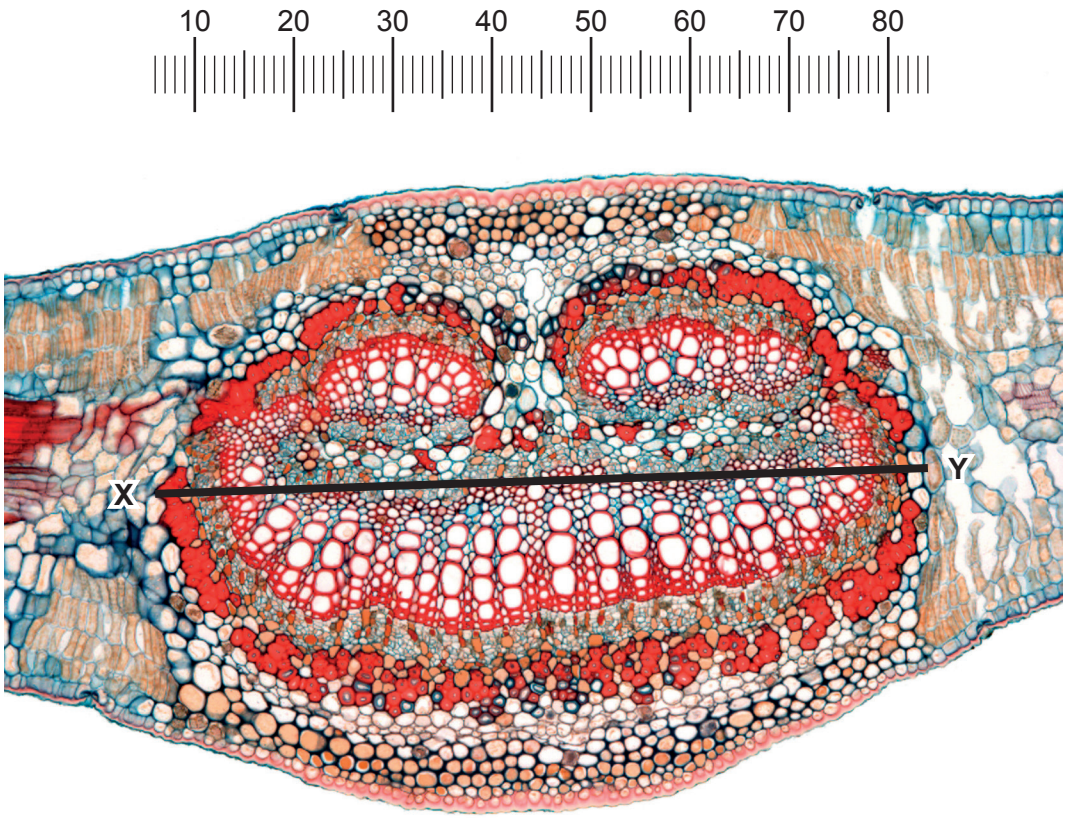


Fig. 2.2

(i) Use the calibration of the eyepiece graticule on Fig. 2.2 to calculate the actual width of the vascular tissue, shown by line **X**–**Y**.

Show all the steps in your working and use appropriate units.

actual width of vascular tissue = ... [3]

A student calculated the actual width of five xylem vessel elements in the vascular bundle of this leaf.

The results are shown in Table 2.1.

Table 2.1

xylem vessel element	width / μm
1	70.8
2	72.4
3	69.1
4	71.3
5	65.7

(ii) Use the information in Table 2.1 to calculate the mean width of these xylem vessel elements.

Show all the steps in your working.

mean width = ... [2]

(c) Fig. 2.3 is the same photomicrograph as in Fig. 2.2 but without line **X**–**Y** and the eyepiece graticule scale.

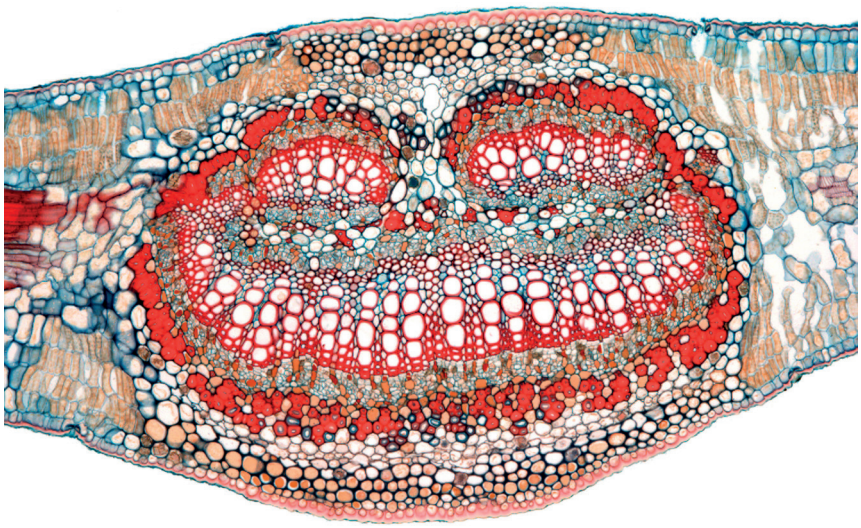


Fig. 2.3

Prepare an appropriate table so that it is suitable for you to record the observable differences between the midrib of the leaf on **L1** and Fig. 2.3.

Record the observable differences in your table.

[4]

[Total: 18]

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