Cambridge Assessment International Education

Cambridge International AS & A Level

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

9053202669

BIOLOGY **9700/33**

Paper 3 Advanced Practical Skills 1 **October/November 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	

This document has **16** pages. Blank pages are indicated.

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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 cells contain enzymes that break down sugars to release energy. In these reactions carbon dioxide is released. Some of this carbon dioxide dissolves in water forming carbonic acid.

The progress of these enzyme-catalysed reactions can be followed by measuring the time taken for an indicator to change colour as carbonic acid is formed.

You will investigate the effect of changing the concentration of yeast suspension on the time taken for the indicator to change colour.

You are provided with the materials shown in Table 1.1.

Table 1.1

labelled	contents	hazard	volume / cm^3
Y	10% yeast suspension	none	100
H	hydrogencarbonate indicator solution	none	50
W	distilled water	none	100

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

It is recommended that you wear suitable eye protection.

Read step 1 to step 4.

(a) (i) Using Table 1.1 **and** step 1 to step 4, assess the risk of this procedure as **low**, **medium** or **high**. Give **one** reason for your answer.

risk .....

reason .....

.....

[1]

The hydrogencarbonate indicator solution, **H**, will change colour from brown to yellow as carbon dioxide passes through it.

To help you identify the end-point (yellow) carry out step 1 to step 4.

1. Put 5 cm^3 of **H** into a small test-tube.
2. Put a drinking straw into this test-tube.
3. Gently breathe **out** through the straw so that you are blowing air bubbles through **H**.
4. Stop blowing when the colour changes from brown to yellow. This is the end-point.

You will need to use this test-tube for colour comparison in step 14.

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You will use proportional dilution to make different concentrations of yeast suspension, **Y**.

You will need to prepare 20 cm^3 of each concentration of yeast suspension.

(ii) Complete Table 1.2 to show how you will prepare the concentrations of yeast suspension you will use.

Table 1.2

percentage concentration of yeast suspension	volume of **Y** / cm^3	volume of **W** / cm^3
10.0	20.0	0.0

[2]

Carry out step 5 to step 18.

5. Use a glass rod to stir the yeast suspension, **Y**.

6. Prepare the concentrations of yeast suspension as decided in **(a)(ii)** and shown in Table 1.2.

7. Label a small test-tube for each of the concentrations of yeast suspension you have prepared in step 6.

8. Put 5 cm^3 of **H** into each labelled test-tube.

9. Using the beakers labelled **water-bath**, **hot water** and **cold water**, set up and maintain a water-bath with water between 35 °C and 40 °C.

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Fig. 1.1 shows the apparatus you will set up for the investigation.

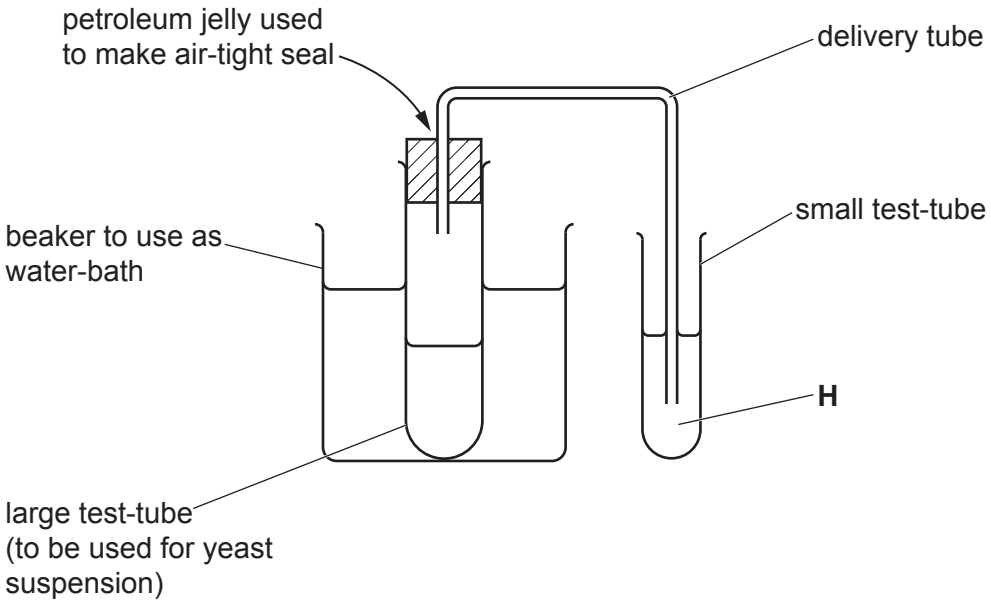


Fig. 1.1

10. Use a glass rod to stir the 10% yeast suspension, then put 20 cm^3 of the 10% yeast suspension into the large test-tube.

11. Put the large test-tube in the water-bath.

12. Put the bung in the large test-tube, and make sure the end of the delivery tube is in **H**, as shown in Fig. 1.1.

13. Start timing.

14. Stop timing when the end-point is reached.

    The test-tube from step 4 can be used to confirm the end-point.

    Record the result in **(a)(iii)**. If the time taken is more than 180 seconds, record the result as 'more than 180'.

15. Put the contents of the large test-tube into the container labelled **For waste**.

16. Rinse the large test-tube using water from the container labelled **For washing**.

17. Put another test-tube of **H**, prepared in step 7, into the apparatus shown in Fig. 1.1.

18. Repeat step 10 to step 17 for the other concentrations of yeast suspension you prepared in step 6.

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(iii) Record your results in an appropriate table.

[5]

(iv) Identify **one** significant source of error in this investigation. Give a reason for your answer.

source of error .....

reason .....

.....

[1]

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(v) A student suggested that collecting the carbon dioxide gas would be a better way to produce quantitative data.

Describe the apparatus and a suitable method the student could use to collect and measure the volume of carbon dioxide. You may use a labelled diagram in the space provided.

.....

.....

.....

space for diagram

[2]

(b) A student carried out an investigation into the effect of temperature on the activity of the enzymes in **Y**.

The student immobilised the yeast cells in alginate beads which were then dropped into a solution of the substrate at different temperatures.

As carbon dioxide collected in the beads they rose to the surface of the solution of the substrate as shown in Fig. 1.2.

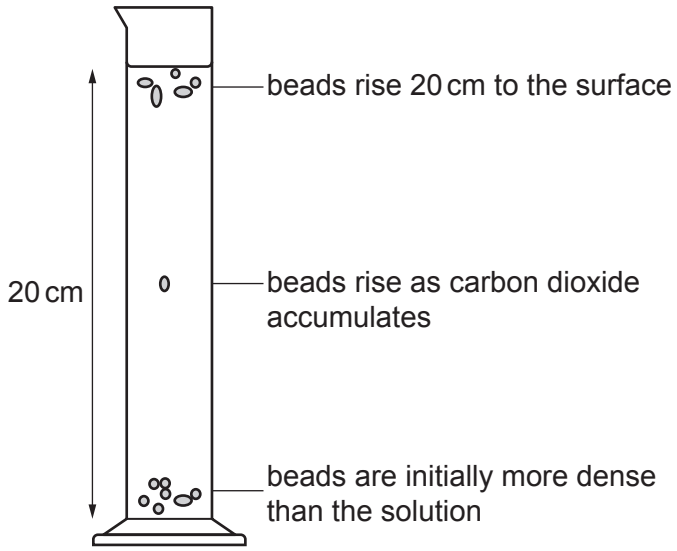


Fig. 1.2

The student measured the time taken for 5 beads to rise to the surface, a distance of 20 cm.

The processed results are shown in Table 1.3

Table 1.3

temperature / °C	**mean time to rise / seconds**
10	72
25	19
40	11
50	36
55	108

(i) Identify the temperature at which the beads rise the fastest. ..... °C

For this temperature calculate the rate at which these beads rise 20 cm.

rate = ...

[2]

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

Use a sharp pencil for drawing graphs.

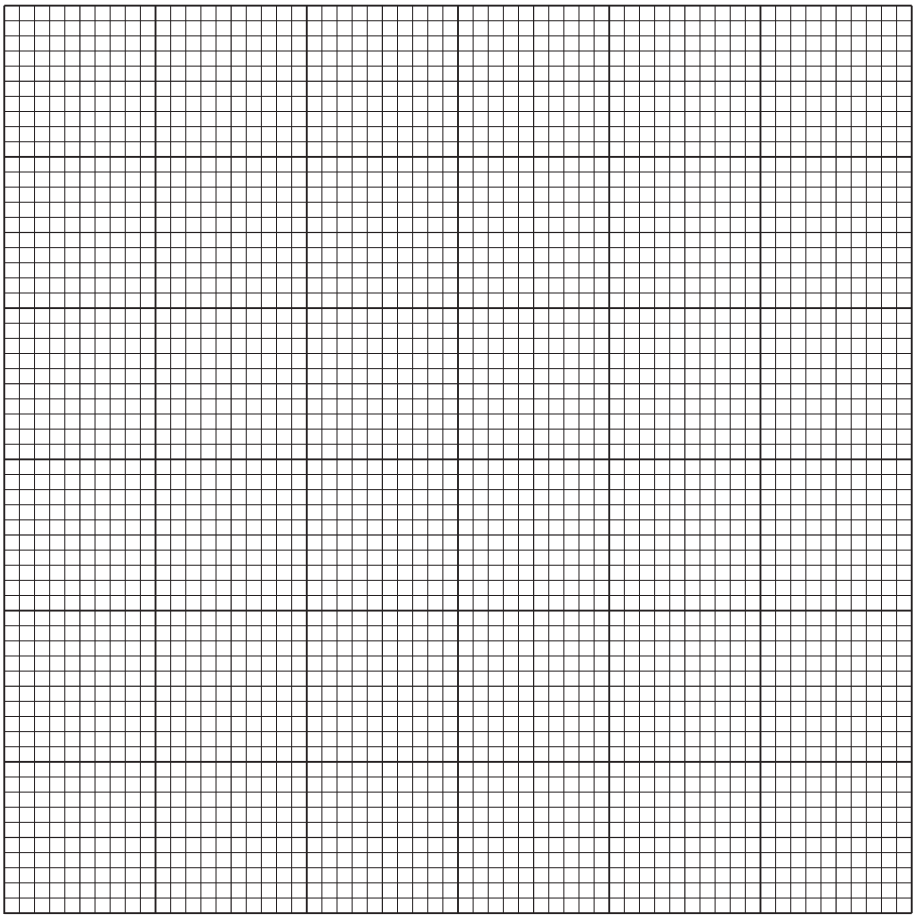


Fig. 1.3

[4]

(iii) Describe the trend shown by the graph in Fig. 1.3.

.....

.....

.....

..... [1]

(iv) Explain the shape of the graph:

between 10 °C and 40 °C

.....

.....

.....

.....

between 40 °C and 55 °C.

.....

.....

.....

.....

[3]

[Total: 21]

Question 2 starts on page 12

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

You are not expected to be familiar with this specimen.

Use a sharp pencil for drawing.

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

(a) **(i)** Draw a large plan diagram of the sector of the stem on **K1**, as shown by the shaded area in Fig. 2.1.

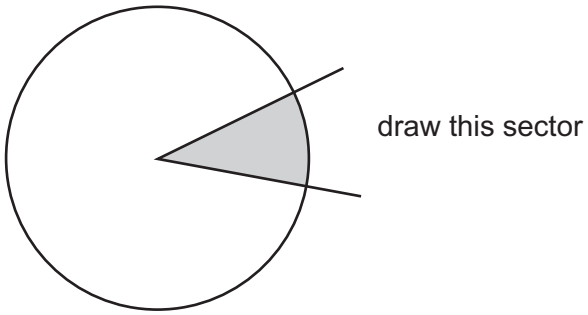


Fig. 2.1

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

[5]

(ii) Observe the central tissue of the stem on **K1**.

Select a **group** of **four** adjacent cells which show observable features of the central tissue.

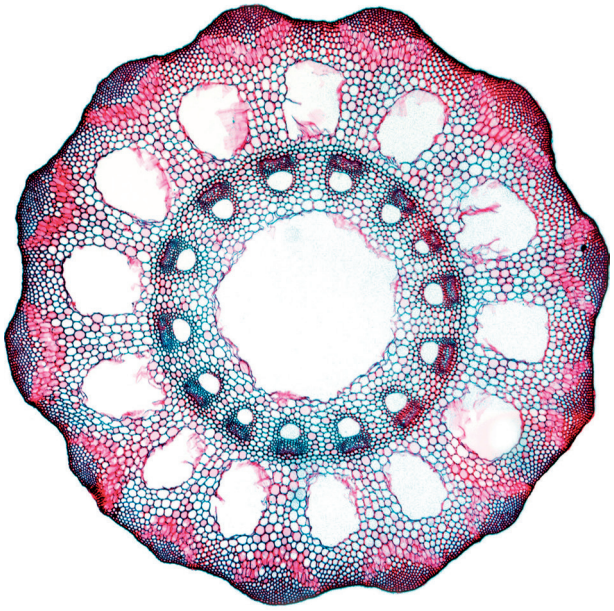
Each cell must touch at least two other cells.

- Make a large drawing of this group 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.

You are not expected to be familiar with this specimen.



magnification ×14

Fig. 2.2

(i) Calculate the ratio of the total width of the stem compared to the width of the central air space.

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

ratio ..... [5]

(ii) Describe how to improve the accuracy of this ratio.

.....

..... [1]

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(iii) Identify observable differences between the stem on **K1** and the stem in Fig. 2.2.

Record the observable differences in Table 2.1.

Table 2.1

feature	K1	Fig. 2.2

[3]

[Total: 19]

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