Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

3601194059

BIOLOGY **9700/34**

Paper 3 Advanced Practical Skills 2 **October/November 2017**

2 hours

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paperclips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiner's Use	
1	
2	
Total	

This document consists of **11** printed pages and **1** blank page.

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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 all the work that you would like to do.

If you have enough time, think about how you can improve the accuracy of your results, for example by obtaining and recording one or more additional measurements.

You will **gain marks** for recording your results according to the instructions.

1 Yeast cells contain enzymes that catalyse metabolic reactions. Some of these reactions release carbon dioxide.

You are required to investigate the progress of enzyme-catalysed reactions by testing for the release of carbon dioxide.

A sample of yeast cells in sucrose solution, **Y**, will be put into a piece of Visking tubing, **V**, as shown in Fig. 1.1.

The Visking tubing membrane is selectively permeable. The carbon dioxide molecules produced by the yeast cells will diffuse through the membrane of the tubing into the water surrounding the Visking tubing.

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

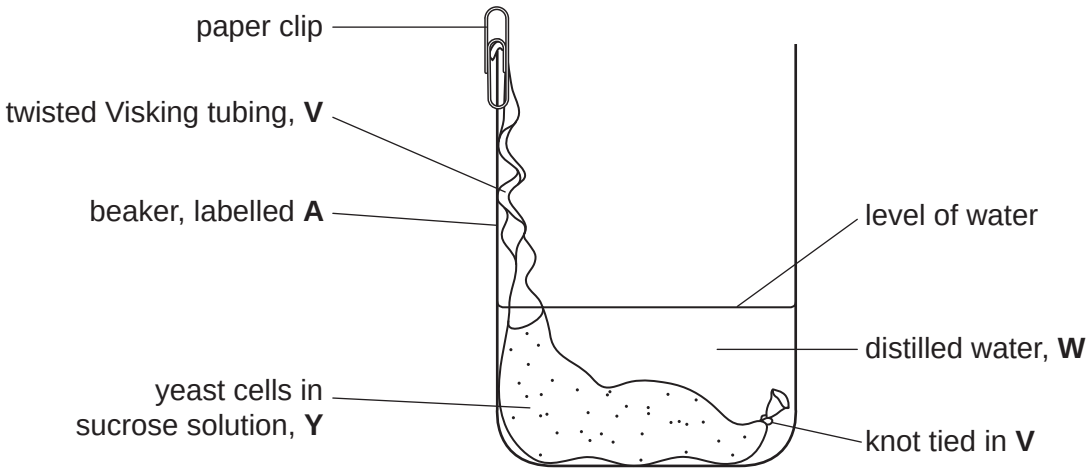


Fig. 1.1

To test for the release of carbon dioxide, a sample of the water surrounding the Visking tubing is added to drops of an indicator, **B**.

As the concentration of carbon dioxide increases, **B** changes from blue to green to yellow.

BLUE → GREEN → YELLOW

no carbon dioxide — increasing concentration — highest concentration of carbon dioxide

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To follow the progress of this reaction you will need to take samples from the water surrounding the Visking tubing at different times for a total of 10 minutes.

(a) (i) Decide how often you will take these samples, including a final sample at 10 minutes.

State the times when you will remove the samples.

..... [1]

You are provided with:

labelled	contents	hazard	volume / cm^3
Y	yeast cells in sucrose solution	none	20
B	bromothymol blue indicator solution	harmful	10
W	distilled water	none	100

labelled	details
V	15 cm length of Visking tubing in a beaker containing distilled water

If any liquids come into contact with your skin, wash off immediately under cold water.
It is recommended that you wear suitable eye protection.

Proceed as follows:

Read step 1 to step 18.

1. Label the tile with the sampling times you decided in **(a)(i)** and 0 (zero) for a sample removed at the start of timing.

2. Put one drop of **B** onto the tile for each of the sampling times.

3. Tie a knot in the Visking tubing as close as possible to one end so that it seals the end.

4. To open the other end, wet the Visking tubing and rub the tubing gently between your fingers.

5. Stir **Y** and put approximately 6 cm^3 of **Y** into the open end of the Visking tubing.

*note: remove the liquid **not** the froth.*

6. Rinse the outside of the Visking tubing by dipping it into the water in the container labelled **V**.

7. Hold the Visking tubing close to the liquid so there is as little air in the tubing as possible. Twist the open end of the Visking tubing.

Look carefully at Fig. 1.1. This has been set up so that the volume of water is as small as possible to cover the Visking tubing. The part of the Visking tubing containing **Y** is on the bottom of the beaker.

8. Put the Visking tubing into the beaker, labelled **A**, as shown in Fig. 1.1.

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9. Make sure the twisted end of the Visking tubing is held in place by a paperclip.

10. Put **W** into the beaker up to the level shown on Fig. 1.1, using a syringe so that you can measure the volume of **W**.

(ii) State the volume of **W** you have decided to use.

volume of **W** = ... cm^3 [1]

11. Start timing.

12. Immediately remove a sample of the water with a glass rod.

13. Mix the sample on the glass rod into the drop of **B** labelled 0 and record the colour in **(a)(iii)**.

14. Gently shake the beaker to mix the water. Repeat step 12 and step 13 at each of the sampling times, gently shaking the beaker before step 12 each time. Continue until the final sample is removed at 10 minutes.

15. After the final sample at 10 minutes, clean off the tile and dry it. Repeat step 1 and step 2.

16. Holding the twisted end of the Visking tubing, pour the water from the beaker into the container labelled **for waste**.

17. Put the volume of fresh water stated in **(a)(ii)** into the beaker with the Visking tubing.

18. Repeat step 11 to step 14.

(iii) Record your results in an appropriate table.

[6]

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(iv) Describe **and compare** the results for the first 10 minutes with the results for the second 10 minutes.

.....

.....

.....

.....

.....

.....[2]

(b) A student set up the apparatus as in Fig. 1.1 to investigate the hydrolysis (breakdown) of sucrose into reducing sugar by yeast cells.

These reducing sugar molecules are able to pass through the Visking tubing into the surrounding water.

The student removed a sample of the surrounding water after 20 minutes and carried out a Benedict's test on the sample. The time taken to the first colour change was measured.

(i) Think about how the student would estimate the concentration of reducing sugar in this sample.

Describe how to prepare a range of concentrations of reducing sugar, using a 4% reducing sugar solution.

.....

.....

.....

.....[2]

(ii) The student tested a range of concentrations of reducing sugar with Benedict's solution and measured the time taken to the first colour change for each test.

Using the results the student collected, describe how you would estimate the concentration of reducing sugar in the sample removed after 20 minutes.

.....

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.....

.....

.....[1]

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[Turn over

(c) A student investigated the effect of different sugars on the metabolic reactions in yeast.

Yeast cells in different types of sugar solution were prepared. All other variables were standardised.

The rate of metabolic reactions was measured by a sensor which recorded the concentration of carbon dioxide released in 5 minutes.

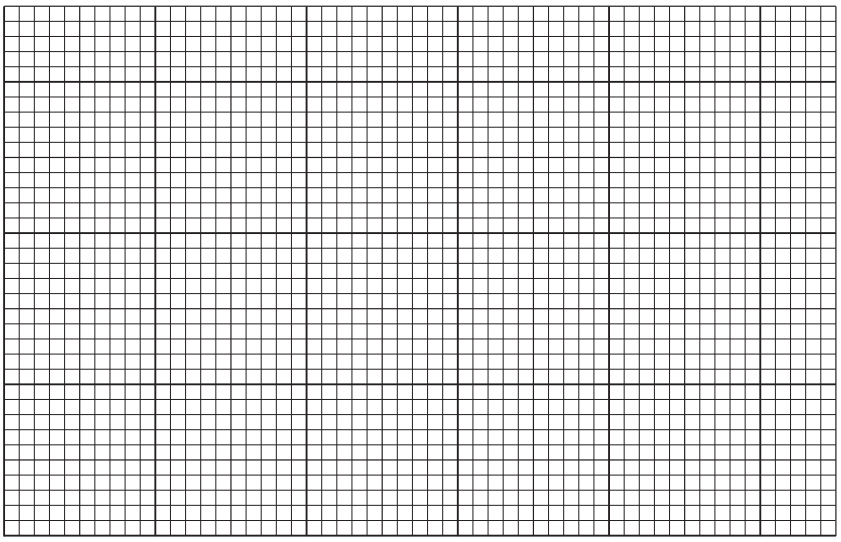
Table 1.1 shows the results for this investigation.

Table 1.1

type of sugar	rate of metabolic reactions / arbitrary units (au)
fructose (**F**)	0.16
glucose (**G**)	0.31
lactose (**L**)	0.01
maltose (**M**)	0.17
sucrose (**S**)	0.20

Use a sharp pencil for drawing charts.

(i) Draw a chart of the data shown in Table 1.1.



[4]

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(ii) Describe the difference in the rate of metabolic reactions in yeast between sucrose and glucose. Using your knowledge of enzymes and carbohydrates, suggest an explanation for this difference.

description .....

.....

explanation .....

.....

.....

.....

.....

.....[4]

[Total: 21]

2 **L1** 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.

(a) **(i)** The transverse section of this stem has an irregular shape.

Select a field of view so that you can observe a sector that includes:

- a structure as shown by the shaded area, labelled **R** in Fig. 2.1
- at least one large vascular bundle.

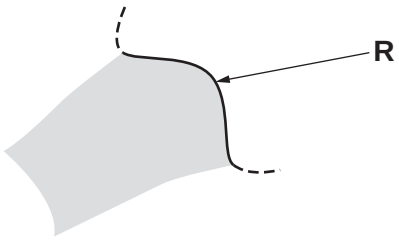


Fig. 2.1

Draw **one** large plan diagram of the different tissues shown in the field of view to show:

- the tissues making up **R**
- the tissues in the vascular bundle
- any other observable tissues.

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

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

[5]

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(ii) Observe the cells in the epidermis of the stem on **L1** and the cells touching these cells. These cells are not identical.

Select **one** group of **four** adjacent (touching) cells made up of:

- two epidermis cells
- two cells which touch these epidermis cells in the layer underneath.

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

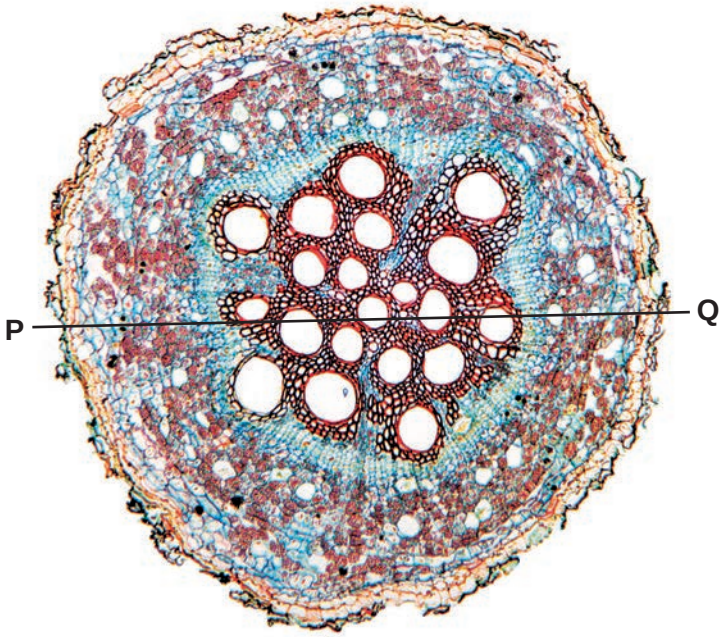
Make a large drawing of this group of **four** cells.

Use **one** ruled label line and label to identify a cell wall of **one** cell.

[6]

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

You are not expected to be familiar with this specimen.



magnification ×14

Fig. 2.2

(i) Use the line **P–Q** to determine the simplest whole number ratio of the diameter of the root to the diameter of the vascular tissue (stele).

You may lose marks if you do not show your working.

simplest whole number ratio ..... [4]

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(ii) Observe the stem on **L1** and the root in Fig. 2.2 and identify the differences between them.

Record the observable differences in Table 2.1.

Table 2.1

feature	L1	Fig. 2.2

[4]

[Total: 19]

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