Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

0028233108

BIOLOGY **9700/34**

Paper 3 Advanced Practical Skills 2 **May/June 2018**

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 **14** printed pages and **2** blank pages.

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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 confidence in 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 which catalyse the breakdown of glucose to produce ethanol and carbon dioxide. When dissolved, the carbon dioxide forms a weak acid.
The activity of the yeast cells is determined by measuring the change in pH using Universal Indicator paper.

As the yeast continues to break down the glucose, the concentration of ethanol becomes toxic and the yeast cells are killed.

You will need to investigate the effect of different concentrations of ethanol on the activity of yeast cells.

You are provided with the materials shown in Table 1.1.

Table 1.1

labelled	contents	hazard	volume/cm^3
E	15% ethanol	flammable harmful	50
W	distilled water	none	100
U	unknown concentration of ethanol	flammable harmful	20
Y	beaker and 6 test-tubes, with 1 g of dried yeast in each tube	none	–
G	glucose solution	none	100
P	Universal Indicator paper with pH colour chart	none	3 lengths

It is recommended that you wear suitable eye protection.

Ethanol is harmful and highly flammable. If any comes into contact with your skin, wash off immediately under cold water.
Keep the ethanol covered when you are not using it.

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[Turn over

A student found that, at concentrations of ethanol greater than 15%, there was no activity of the yeast cells.

The student suggested the hypothesis:

Concentrations of ethanol below 15% will continue to cause the death of yeast cells.

You will need to investigate this hypothesis by measuring the activity of the yeast cells using different concentrations of ethanol.

(a) You will need to make a serial dilution of 15% ethanol, **E**, which reduces the concentration by half between each successive dilution.

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

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

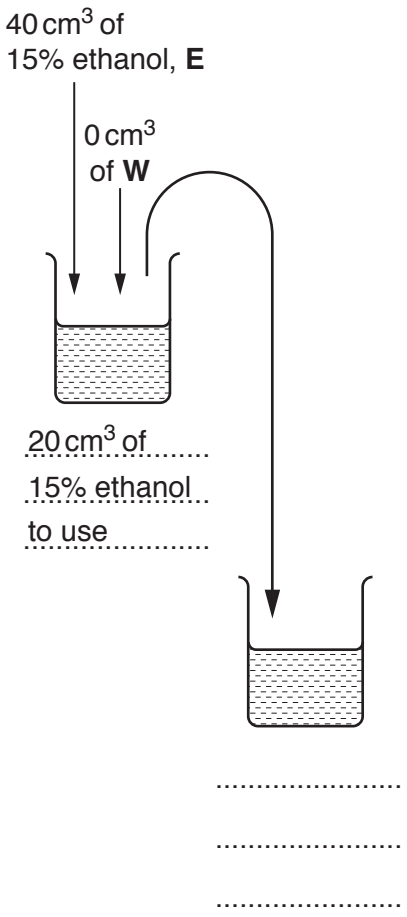
(i) Complete Fig. 1.1 by drawing as many extra beakers as you need for your serial dilution.

For each beaker:

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

The first beaker in Fig. 1.1 has been labelled for you.

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.....

.....

.....

[3]

Fig. 1.1

Read step 1 to step 16 before proceeding.

1. Prepare the concentrations of ethanol as shown in Fig. 1.1.

   Use a glass rod to mix the ethanol and water.

2. Label the test-tubes from beaker **Y** with the concentrations of ethanol prepared in step 1 **and** label one test-tube as **U**.

3. Using the beakers labelled **hot water** and **cold water** set up a water-bath with water between 45 °C and 50 °C.

4. Put 10 cm^3 of **G** into each of the labelled test-tubes, including **U**.

5. Use a glass rod to mix the contents.

6. Put the test-tubes into the water-bath (set up in step 3) for 5 minutes.

7. Cut the Universal Indicator paper, **P**, into approximately 0.5 cm lengths. You will need 2 pieces for **each** of the ethanol concentrations prepared in step 1 **and** 2 pieces for **U**.

8. After 5 minutes (step 6) put 10 cm^3 of 15% ethanol into the test-tube labelled 15%. Shake gently to mix then return it to the water-bath.

9. Repeat step 8 with the other concentrations of ethanol made in step 1 **and** with **U**.

10. Start timing.

11. Put pieces of **P** onto the white tile.

You will need to sample the mixtures in each of the test-tubes at 3 minutes and at 9 minutes.

12. At 3 minutes, use the glass rod to remove a drop from the test-tube containing 15% ethanol and touch one piece of **P** with the end of the glass rod.

13. Observe the colour of **P** and record the colour in **(a)(ii)**.

14. Compare the colour with the pH colour chart and record the pH in **(a)(ii)**.

    Note: if there are several colours on the paper (e.g. dark green and light green) record the pH as a range (e.g. pH 8–pH 7).

15. Wipe the end of the glass rod with a paper towel to clean it and repeat step 12 to step 15 with the other mixtures, including **U**.

16. Repeat step 12 to step 15 at 9 minutes.

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(ii) Record your results in an appropriate table, including:
- colour
- pH.

[5]

(iii) State the colour and pH for **U** at 9 minutes.

colour .....

pH .....

Complete Fig. 1.2 to show:
- the percentage concentrations of ethanol prepared in step 1
- the estimated percentage concentration of ethanol in **U**, using the letter **U**.



percentage concentration of ethanol

Fig. 1.2

[1]

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[Turn over

(iv) The student's hypothesis stated that:

Concentrations of ethanol below 15% will continue to cause the death of yeast cells.

State whether you **support** or you **reject** this hypothesis.
Explain how your results provide evidence for this decision.

support or reject .....

explanation .....

.....

.....

.....[2]

(v) Identify **one** significant source of error in this investigation.

.....

.....

.....[1]

(b) A student investigated the activity of a yeast cell suspension and glucose by measuring the release of carbon dioxide given off over a period of 11 minutes.
The carbon dioxide was measured by recording the volume of gas collected in a graduated test-tube.
The temperature was kept constant at 25 °C. All other variables were standardised.

The results are shown in Table 1.2.

Table 1.2

time / minutes	volume of CO_2 / arbitrary units (au)
0	0.18
3	0.23
6	0.38
8	0.55
11	0.84

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

Use a sharp pencil for drawing graphs.

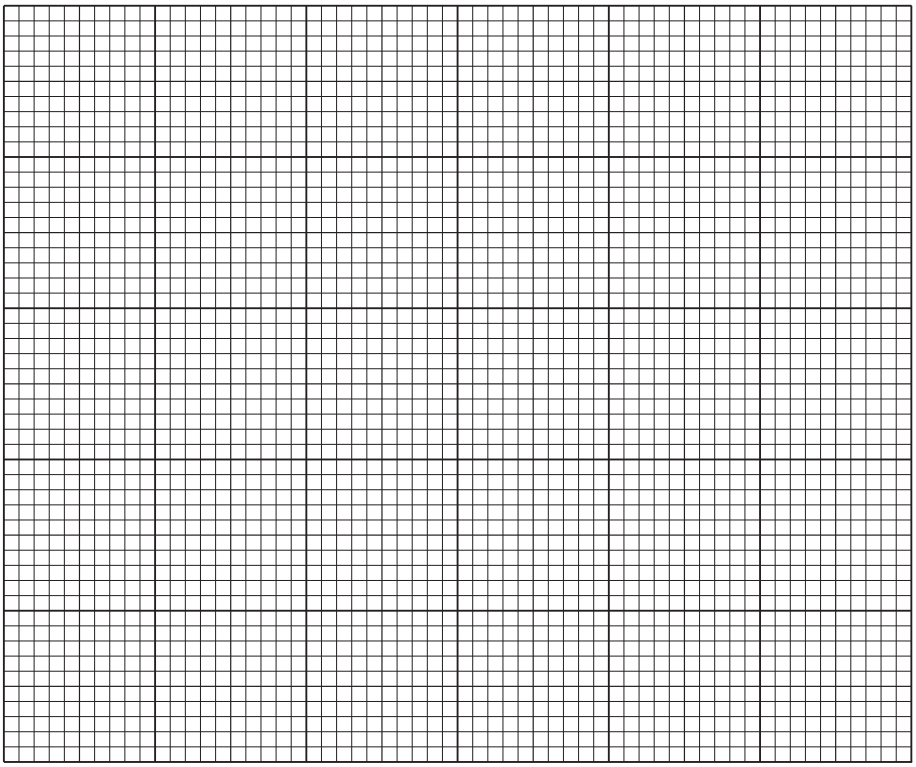


Fig. 1.3

[4]

(ii) Use your graph to calculate the rate of carbon dioxide given off between 7 minutes and 10 minutes.

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

rate = ... au min^{-1} [2]

(iii) The student investigated the release of carbon dioxide from a yeast cell suspension using the apparatus shown in Fig. 1.4.

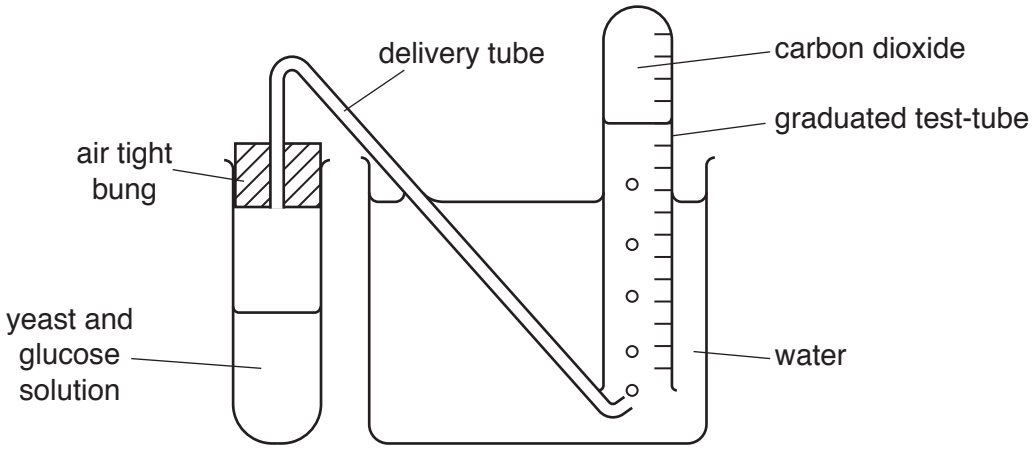


Fig 1.4

Describe how you would modify this investigation to determine the effect of **temperature** on the release of carbon dioxide from a yeast cell suspension.

.....

.....

.....

.....

.....

.....

.....[3]

[Total: 21]

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2 In order to observe yeast cells using a light microscope, they are often stained.
You will need to observe the effects of two stains, methylene blue solution and iodine solution.

You are provided with the material shown in Table 2.1.

Table 2.1

labelled	contents	hazard	volume/cm^3
Y	suspension of yeast cells	none	20
M	methylene blue solution	none	10
I	iodine solution	none	10

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

You will need to use the microscope to observe the colour of the yeast cells both before and after adding the stains, **M** and **I**. You will record your observations using annotated drawings.

Read step 1 to step 12 before proceeding.

1. Label 3 clean, dry microscope slides with the letters **Y**, **M** and **I**.

2. Put the slide labelled **Y** on a paper towel.

3. Put a few drops of yeast cell suspension **Y** onto the slide.

4. Cover the yeast cells with a coverslip and use a paper towel to remove any excess liquid that is outside the coverslip.

5. Use the microscope to view the yeast cells on the slide.

You may need to reduce the amount of light entering the microscope to observe the cells clearly.

(a) (i) Select 3 whole yeast cells from slide **Y**.
Make a large drawing of these yeast cells in **box Y** in Fig. 2.1.

Use a sharp pencil for drawings.

6. Remove the slide from the microscope and place on a paper towel.

7. Put the slide labelled **M** on a paper towel.

8. Put a few drops of yeast cell suspension **Y** onto the slide.

9. Put a drop of **M** onto the slide in order to stain the yeast cells.

10. Cover the yeast cells with a coverslip and use a paper towel to remove any excess liquid that is outside the coverslip.

11. Use the microscope to view the yeast cells on the slide.

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[Turn over

(ii) Select 3 whole yeast cells from slide **M**.
Make a large drawing of these yeast cells in **box M** in Fig. 2.1.

12. Repeat step 6 to step 11 using **I** instead of **M**.

(iii) Select 3 whole yeast cells from slide **I**.
Make a large drawing of these yeast cells in **box I** in Fig. 2.1.

box Y

box M

box I

Fig. 2.1

[3]

(iv) Annotate your drawings in Fig. 2.1 to describe:

- **one** observable difference between the yeast cells on slide **Y** compared to yeast cells stained with **M**
  and
- **one** observable difference between the yeast cells on slide **Y** compared to yeast cells stained with **I**.

[2]

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(b) Fig. 2.2 is a photomicrograph of yeast cells.

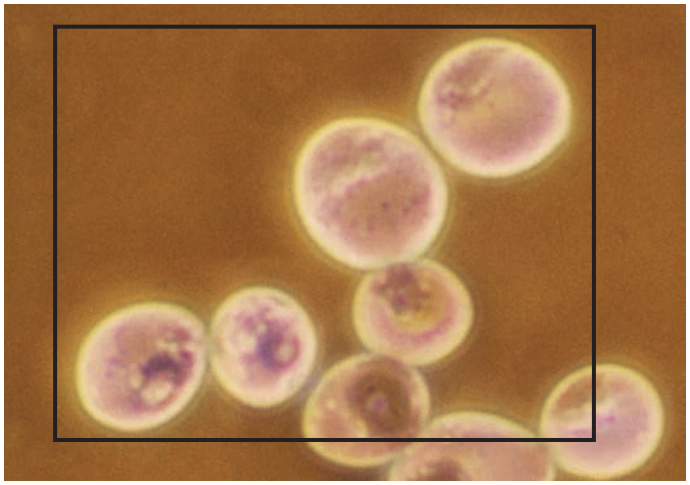


Fig. 2.2

Use a sharp pencil for drawings.

Make a large drawing of the 5 whole cells shown in the area on Fig. 2.2.

[4]

(c) Fig. 2.3 is a photomicrograph of a stained transverse section through two blood vessels, **B1** and **B2**.

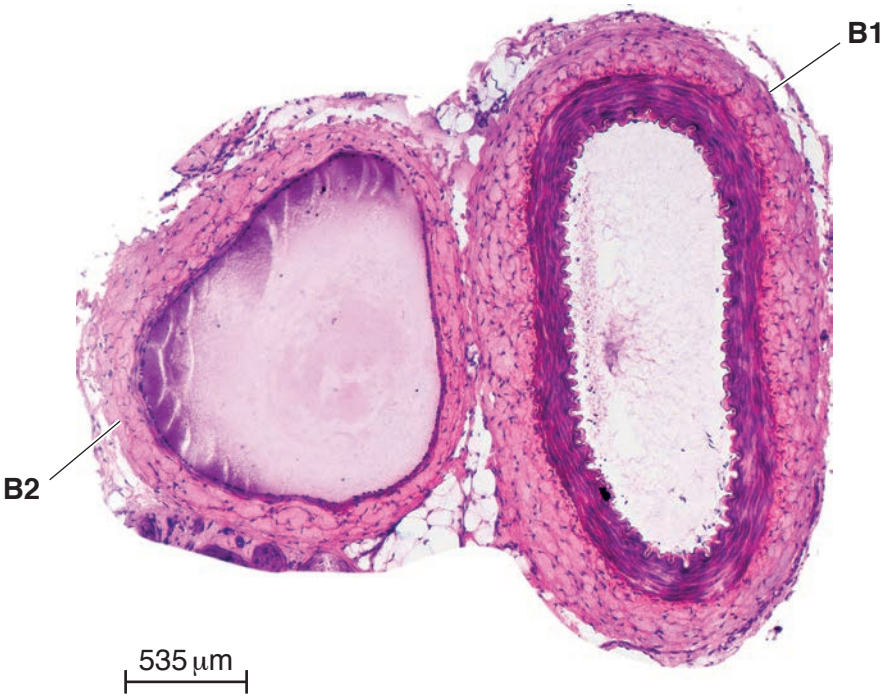


Fig. 2.3

(i) Draw large plan diagrams of the two blood vessels, **B1** and **B2**, shown in Fig. 2.3.

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

[4]

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(ii) Annotate your drawings in **(c)(i)** to describe **three** observable differences between **B1** and **B2** by:

- drawing label lines to **B1** and to **B2** that show these differences
- describing next to each line how each feature is different. [3]

(iii) State which blood vessel, **B1** or **B2**, carries blood under high pressure.
Give **one** reason for your choice.

blood vessel .....

reason .....
[1]

(iv) Use the scale bar in Fig. 2.3 to calculate the magnification of Fig. 2.3.

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

magnification × .....[2]

[Total: 19]

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