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Cambridge Assessment International Education

Cambridge O Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

* 7 4 2 4 1 1 3 6 7 6 *

BIOLOGY **5090/31**

Paper 3 Practical Test **October/November 2024**

1 hour 30 minutes

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	
3	
Total	

This document has **12** pages. Any blank pages are indicated.

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In order to plan the best use of your time, read through all the questions on this paper carefully before starting work.

1 Yeast breaks down sugar (glucose) to provide energy for growth and reproduction by respiring anaerobically:

glucose ⟶ carbon dioxide + alcohol

Sugar is used in human food to make it taste sweet. Too much sugar in the diet can cause diseases. Sugar substitutes are available which taste as sweet as sugar.

You are going to investigate whether yeast can use a sugar substitute for respiration.

You are provided with three 1 g portions of dried yeast, 1 g of sugar, 1 g of sugar substitute, distilled water and three large test-tubes.

Read through the following procedure carefully and decide how to label your test-tubes.

Do not carry out the procedure yet.

- Add 15 cm^3 of distilled water to each of the three large test-tubes.
- Use the beaker or similar container as a water-bath to keep the test-tubes at a temperature of between 35 °C and 45 °C throughout this investigation. Put your hand up when you require hot water. You are supplied with a container labelled 'cold water' to help control the temperature.
- Add 1 g of sugar to the test-tube you have labelled.
- Use the stirring rod to stir this to dissolve the sugar.
- Clean the stirring rod.
- Add 1 g of sugar substitute to another test-tube you have labelled.
- Use the stirring rod to stir this to dissolve the sugar substitute.
- Add 1 g of yeast to each of the three test-tubes.
- Use the stirring rod to mix the yeast with the liquid in each test-tube for 30 seconds, cleaning it between use in each test-tube.
- Mark the level of the top of the mixture on the outside of each test-tube. This will be the starting level.

(a) (i) Label your three test-tubes. State the labels that you have used.

test-tube containing sugar: .....

test-tube containing sugar substitute: .....

test-tube with no addition: .....

[1]

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(ii) Explain why it is important to clean the stirring rod after using it in each test-tube.

.....

..... [1]

Now carry out the procedure. Place your test-tubes in the water-bath and immediately start your timer.

If the yeast in the mixtures respires, it will produce bubbles of gas that will be trapped in the mixture, making it rise up the test-tube.

(iii) Measure the distance that the yeast mixtures have moved from the marked starting levels at 5 minutes, 10 minutes and 15 minutes and record them, together with the temperature of the water in the water-bath, in Table 1.1.

Table 1.1

time / minutes	distance of yeast mixture above starting level / mm			temperature of water-bath / °C
	sugar	sugar substitute	no addition	
5				
10				
15				

[5]

(iv) Explain how the test-tube with no addition acted as a control in your investigation.

.....

..... [1]

(v) State what conclusion you can make from your results in Table 1.1.

.....

.....

.....

..... [1]

(vi) Describe **one** source of error in your investigation and explain how it might have affected your results.

source of error .....

.....

effect on results .....

.....

[2]

(b) In a similar investigation, the yeast's activity was measured by recording any increase in the volume of the mixtures in the test-tubes.

Fig. 1.1 shows a test-tube with sugar, yeast and distilled water mixture as seen from above.

The line between **A** and **B** indicates the diameter of the mixture within the test-tube.

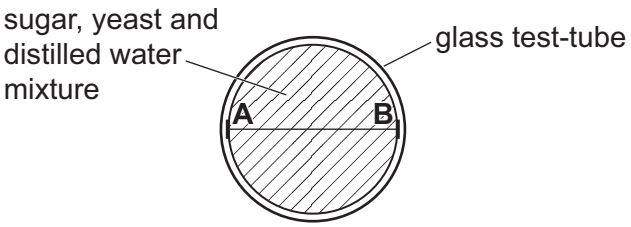

Fig. 1.1

In this investigation a different mass of sugar was used. Fig. 1.2 shows a result recorded in a student's notebook.

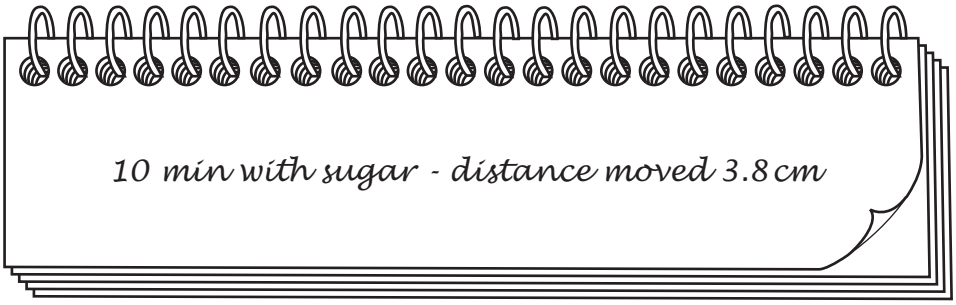

Fig. 1.2

(i) Measure and record the length of the line between **A** and **B**.

diameter of mixture within test-tube ..... cm

Calculate the increase in volume of the mixture in this test-tube after 10 minutes.

Use 3.14 as the value of π. Give your answer to 1 decimal place.

Show your working.

volume increase ..... cm^3
[4]

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(ii) Suggest a piece of apparatus that could have been used in this investigation to directly measure the volume of the mixture. Describe how you would determine the increase in volume at each time interval using this apparatus.

apparatus .....

determination of increase in volume .....

.....

.....

[2]

[Total: 17]

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2 When organisms respire aerobically they use oxygen and produce carbon dioxide.

Some students investigated the rate at which germinating seeds respired, using the apparatus in Fig. 2.1.

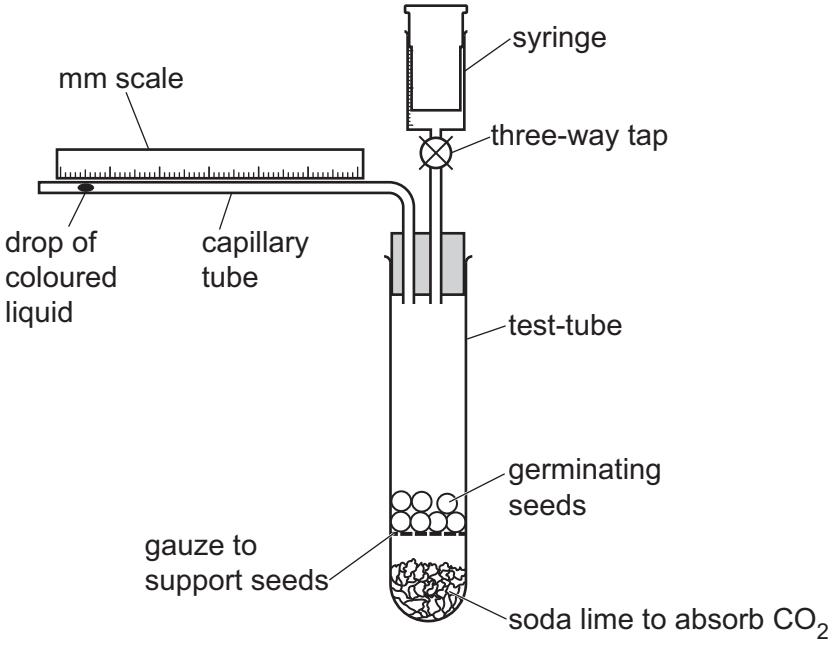

Fig. 2.1

Carbon dioxide produced by the germinating seeds was absorbed by the soda lime. As oxygen was used the volume of gas in the apparatus reduced and the drop of coloured liquid moved along the capillary tube towards the seeds.

The students moved the drop of coloured liquid in the capillary tube to the beginning of the scale (0 mm) by opening the three-way tap and using the syringe to carefully push air into the apparatus. They then closed the tap.

This was the starting position for the drop of coloured liquid. Its position on the scale was recorded over the next four minutes. The movement of the drop of coloured liquid indicates the rate of respiration of the seeds.

The students' results are shown in Table 2.1.

Table 2.1

time / minutes	position of drop of coloured liquid / mm
0	0
1	18
2	36
3	54
4	72

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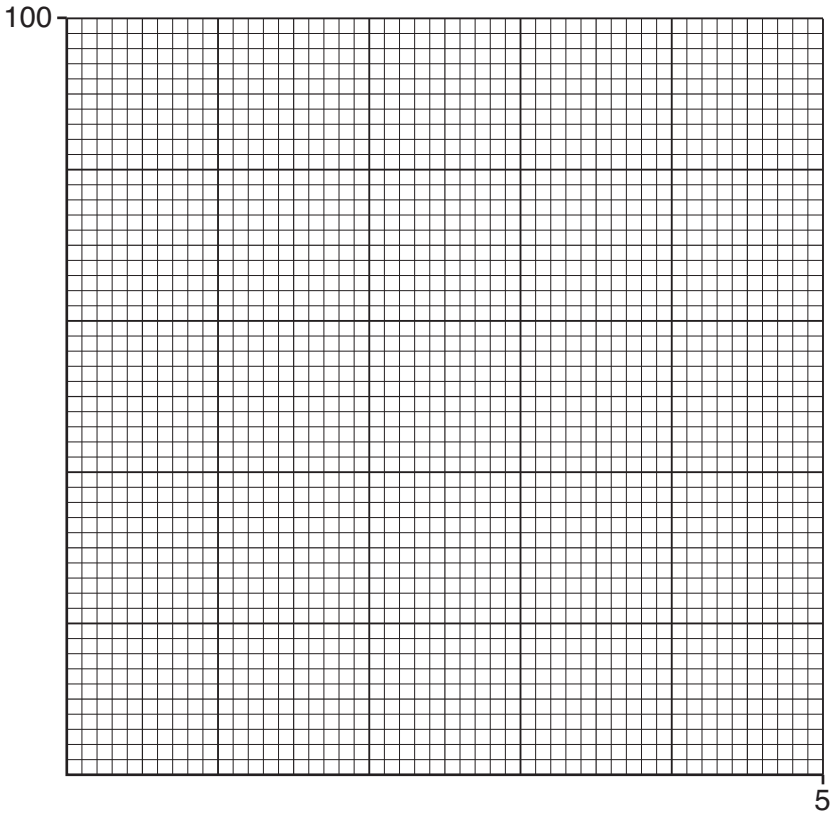
(a) (i) Construct a line graph of the data in Table 2.1 on the grid. The values for the end points of the axes are shown on the grid. Draw a straight line of best-fit to connect the points.



[4]

(ii) Use your graph to predict the position of the drop of coloured liquid at 5 minutes. Show your working on the graph.

position .....mm
[2]

(iii) Use the result at 4 minutes in Table 2.1 to calculate the rate of movement of the drop of coloured liquid caused by the respiration of the seeds.

Space for working.

rate of movement .....
[2]

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(b) Plan an investigation to determine the effect of temperature on the rate of respiration in germinating seeds. Use the apparatus in Fig. 2.1 in your plan.

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..... [6]

[Total: 14]

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3 Fig. 3.1 shows the whole of a one-seeded fruit of a dandelion flower. A single dandelion flowerhead can produce up to 200 of these one-seeded fruits. The mass of a single fruit is 0.0005 g.

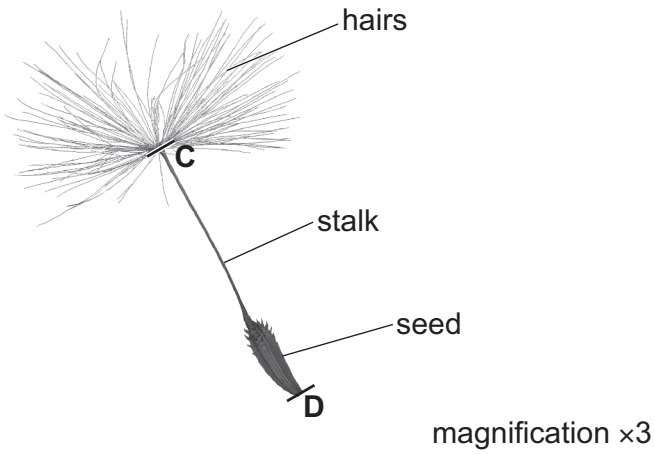

Fig. 3.1

(a) (i) In the space below make a large drawing of the whole fruit as it appears in Fig. 3.1.

[4]

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(ii) The lines **C** and **D** indicate the total length of the seed and stalk. Draw a straight line on Fig. 3.1 to join **C** and **D**. Measure the length of the line and record it.

.....

Calculate the **actual** length of the seed and stalk and record it to the nearest whole number.

Space for working.

..... mm
[3]

(b) Identify **two** features of this fruit that show it is adapted for dispersal by wind. Explain your answers.

1 .....

.....

2 .....

.....
[2]

[Total: 9]

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