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0809354818

BIOLOGY **0610/62**

Paper 6 Alternative to Practical **February/March 2024**

1 hour

You must answer on the question paper.

No additional materials are needed.

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 [ ].

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

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1 A student investigated the effect of glucose concentration on the rate of anaerobic respiration in yeast.

Anaerobic respiration in yeast breaks down glucose to form ethanol and carbon dioxide.

Anaerobic respiration in yeast causes the blue dye, methylene blue, to become colourless. The time taken for the blue colour to disappear can be used as a measure of the rate of anaerobic respiration in yeast.

The student used this method:

Step 1 Label one test-tube **0.0%**, one test-tube **0.5%** and one test-tube **1.0%**.

Step 2 Put 5.0 cm^3 of water into the test-tube labelled **0.0%**.

Step 3 Put 2.5 cm^3 of 1.0% glucose solution and 2.5 cm^3 of water into the test-tube labelled **0.5%**.

Step 4 Put 5.0 cm^3 of 1.0% glucose solution into the test-tube labelled **1.0%**.

Step 5 Stir the contents of the beaker containing the yeast suspension with the glass rod.

Step 6 Add 5.0 cm^3 of the yeast suspension to each of the test-tubes labelled **0.0%**, **0.5%** and **1.0%**.

Step 7 Put all three test-tubes into a water-bath at 40 °C.

Step 8 Start the stop-clock and wait for three minutes.

Step 9 After three minutes, remove the test-tubes from the water-bath and place them in a test-tube rack.

Step 10 Use a pipette to add **one** drop of methylene blue dye to each of the test-tubes. Carefully mix the contents of each test-tube with the glass rod.

Step 11 Use a second pipette to slowly add a layer of oil to each of the test-tubes.

The layer of oil will float on top of the yeast suspension and methylene blue mixture, as shown in Fig. 1.1.

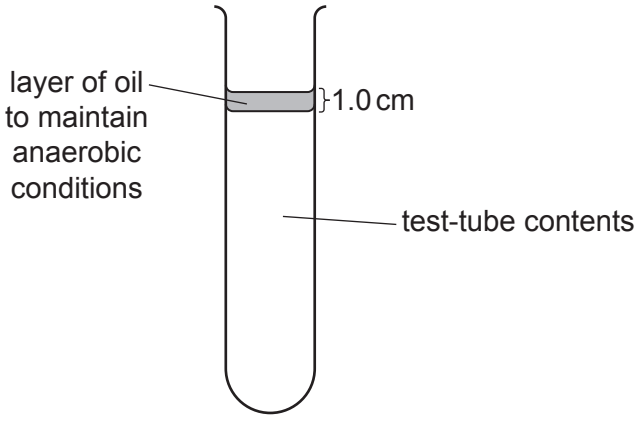

Fig. 1.1

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Step 12 Put the test-tubes back into the water-bath and restart the stop-clock.

Step 13 Measure the time taken for the blue colour in each of the test-tubes to disappear.

Record the time taken in seconds for each test-tube.

The student stopped timing if the blue colour had not disappeared after 10 minutes. They recorded this result as >600 in their table.

The stop-clocks from step 13 are shown in Fig. 1.2.

Fig. 1.2

(a) (i) Prepare a table to record the results of the investigation.

Convert the times on the stop-clocks shown in Fig. 1.2 to seconds and record these times in your table.

[4]

(ii) State a conclusion for the results of this investigation.

.....

.....

..... [1]

(iii) State the independent variable in this investigation.

..... [1]

(iv) State **one** variable that was kept constant in this investigation.

..... [1]

(v) Explain why it was important to stir the yeast suspension in step 5.

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..... [1]

(b) One way to improve this investigation would be to use an increased number of different concentrations of glucose.

(i) Suggest **two** other ways to improve this investigation.

1 .....

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2 .....

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[2]

(ii) Describe how you would make 5.0 cm^3 of 0.25% glucose solution using a 0.50% glucose solution and distilled water.

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..... [2]

(iii) Describe the method you would use to test a solution for the presence of glucose.

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..... [2]

(c) A student investigated the effect of temperature on the rate of respiration in yeast at 25 °C and 35 °C.

In one experiment, the student measured the volume of carbon dioxide produced by the yeast every 5 minutes for a total of 30 minutes.

(i) Describe suitable apparatus that could be used to collect and measure the volume of carbon dioxide produced.

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.....

..... [1]

The student did three experiments at each temperature. They used the results to calculate the mean volume of carbon dioxide produced.

Part of the student's results table for the experiments at 35 °C is shown in Table 1.1.

Table 1.1

time / minutes	volume of carbon dioxide produced at 35 °C / cm^3			
	experiment 1	experiment 2	experiment 3	mean
15	1.8	3.2	2.0	1.9

(ii) The student decided that the result of one of the experiments shown in Table 1.1 was anomalous.

State what is meant by an anomalous result.

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..... [1]

(iii) Describe how the student calculated the mean volume of carbon dioxide produced shown in Table 1.1.

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.....

..... [1]

The results of the whole investigation about the effect of temperature on the rate of respiration in yeast at 25 °C and 35 °C are shown in Table 1.2.

Table 1.2

time / minutes	mean volume of carbon dioxide produced at 25 °C / cm^3	mean volume of carbon dioxide produced at 35 °C / cm^3
5	0.0	0.1
10	0.0	0.8
15	0.1	1.9
20	0.2	2.7
25	0.5	3.2
30	1.1	3.2

(iv) Using the data in Table 1.2, compare the mean volumes of carbon dioxide produced at 25 °C and 35 °C.

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..... [2]

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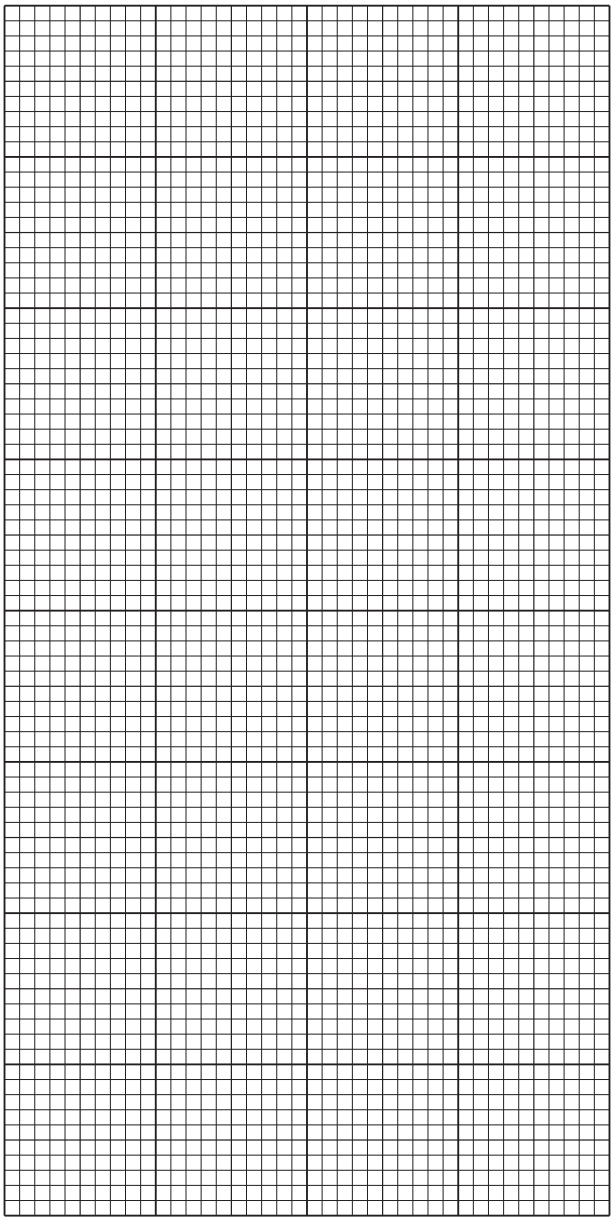
(v) Plot a line graph on the grid of mean volume of carbon dioxide produced against time, using all of the data in Table 1.2.

You will need to plot the data for each temperature as separate lines on your graph.

Include a suitable key.



[5]

(vi) Estimate the time taken to produce 3.0 cm^3 of carbon dioxide at 35 °C.

Show on the graph how you obtained your estimate.

..... minutes

[2]

(d) Carbon dioxide gas was bubbled through hydrogencarbonate indicator solution.

The indicator was red before the gas was bubbled through.

State the colour change that would occur.

..... [1]

[Total: 27]

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2 **(a)** Fig. 2.1 shows epidermal cells from a red onion.

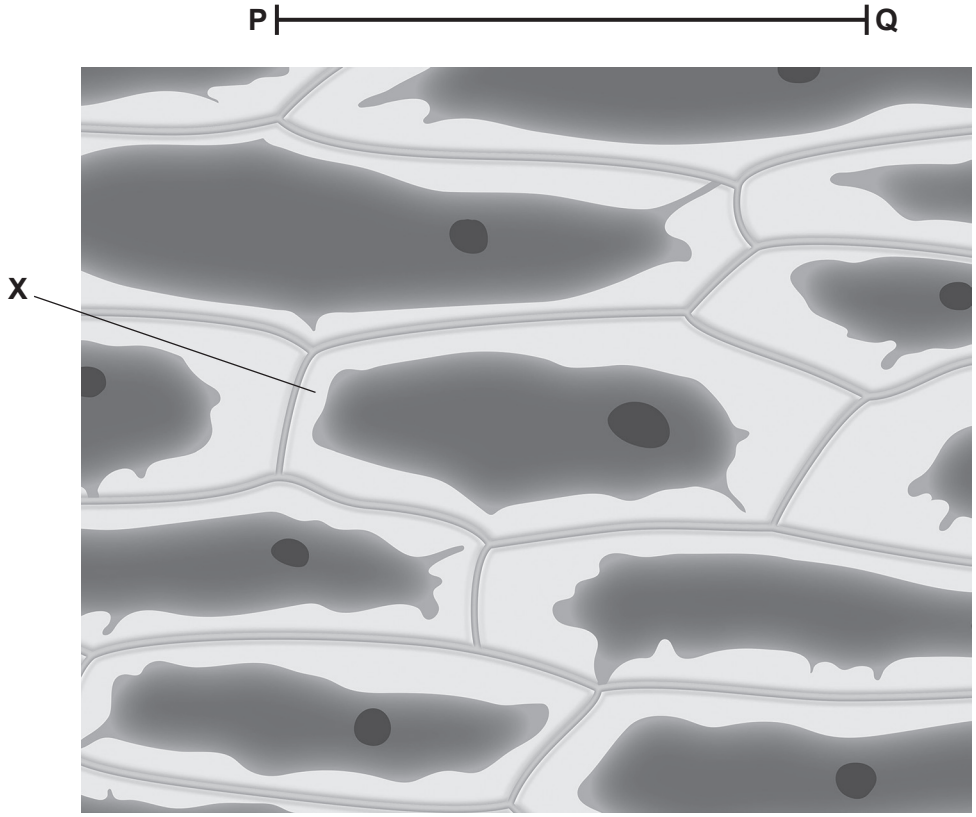

Fig. 2.1

(i) Draw a large diagram of the cell labelled **X** in Fig. 2.1.

[4]

(ii) Line **PQ** on Fig. 2.1 represents the length of cell **X**.

Measure the length of line **PQ** on Fig. 2.1.

length of **PQ** ..... mm

Calculate the actual length of cell **X** using the formula and your measurement.

$$\text{magnification} = \frac{\text{length of line } \mathbf{PQ} \text{ in Fig. 2.1}}{\text{actual length of cell } \mathbf{X}}$$

Give your answer to **three** significant figures.

Space for working.

..... mm
[3]

(b) Water moves into and out of cells by osmosis.

Plan an investigation to determine the effect of the concentration of sodium chloride solution on osmosis in plant tissue.

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..... [6]

[Total: 13]

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