**1** A student investigated the rate of respiration in yeast using different concentrations of glucose.

They used a 5% glucose solution to make a 1% glucose solution and a 4% glucose solution.

The student used this method:

Step 1 Label two small test-tubes **1%** and **4%**.

Step 2 Use a syringe to put 1 $cm^3$ of 5% glucose solution into the small test-tube labelled **1%**.

Put 4 $cm^3$ of 5% glucose solution into the small test-tube labelled **4%**.

Step 3 Use a clean syringe to put 4 $cm^3$ of distilled water into the small test-tube labelled **1%**.

Put 1 $cm^3$ of distilled water into the small test-tube labelled **4%**.

Step 4 Pour yeast suspension into the small test-tube labelled **1%** until it is completely full.

Step 5 Keep the small test-tube upright and carefully place a large test-tube over the top of the small test-tube labelled **1%**. Push the small test-tube up to the top of the large test-tube, as shown in Fig. 1.1**A**. Quickly invert the test-tubes, as shown in Fig. 1.1**B**.

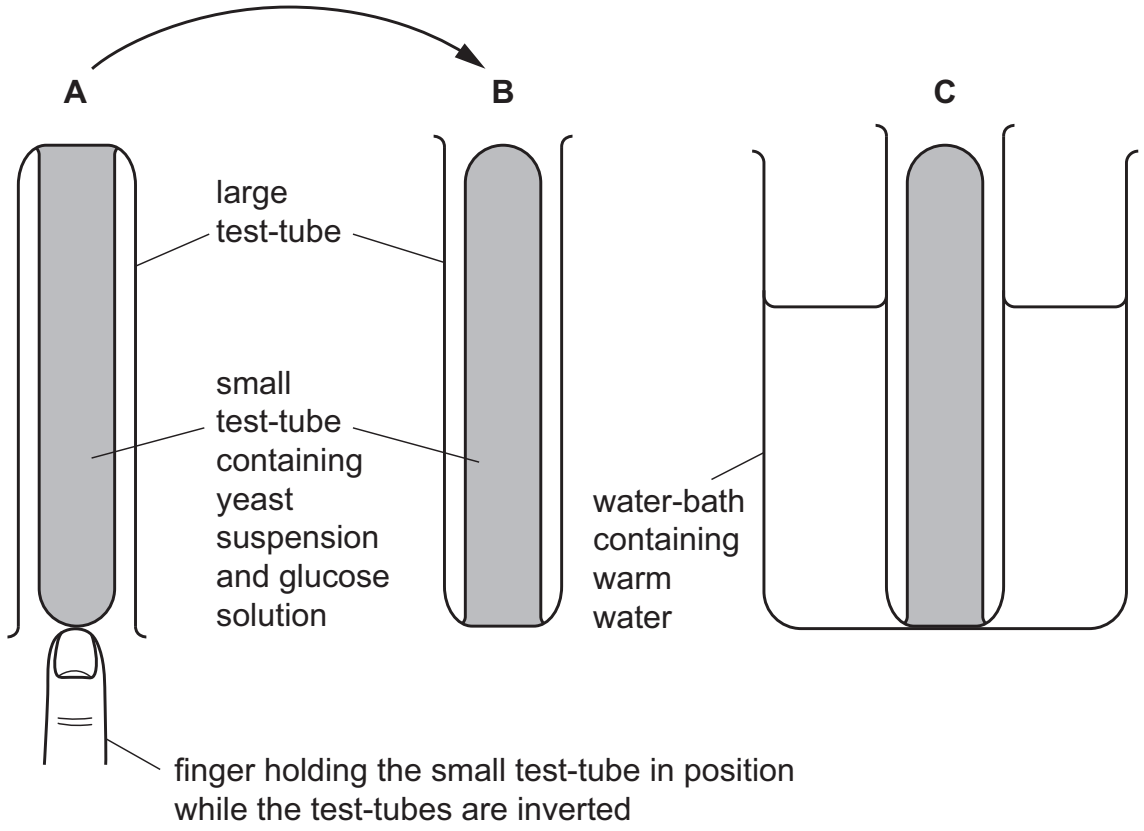



**Fig. 1.1**

Step 6 Put the large test-tube and the small test-tube labelled **1%** into a warm water-bath, as shown in Fig. 1.1**C**.

Step 7 Start the stop-clock and wait for five minutes.

Step 8 After five minutes, stop the stop-clock and use a ruler to measure the height of the yeast suspension in the **large** test-tube, as shown in Fig. 1.2.

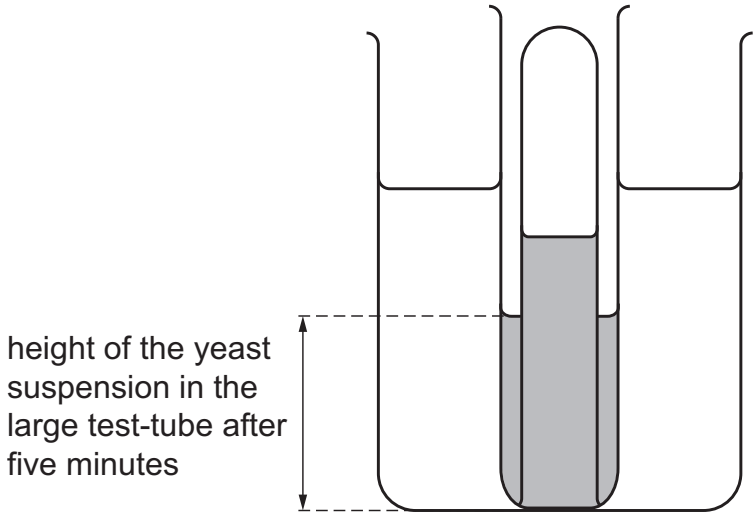



**Fig. 1.2**

Step 9 Remove the test-tubes from the warm water-bath and discard them.

Step 10 Pour yeast suspension into the small test-tube labelled **4%** until it is completely full.

Step 11 Repeat steps 5 to 8 with the small test-tube labelled **4%**.

**(a)** Fig. 1.3 is a diagram of the water-baths in steps 8 and 11.

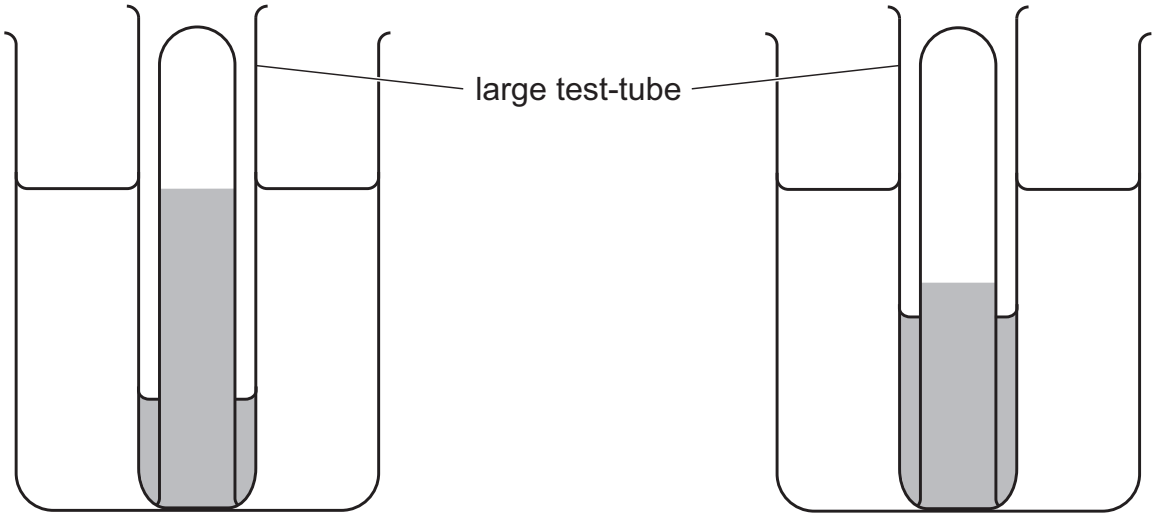



**Fig. 1.3**

**(i)** Measure the height of the yeast suspension in each of the **large** test-tubes shown in Fig. 1.3.

Prepare a table for the results and record your measurements from Fig. 1.3.

[4]

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

.....

.....

..... [1]

**(iii)** State the independent and dependent variables in this investigation.

independent variable .....

.....

dependent variable .....

.....

[2]

**(iv)** Describe how the temperature of the water-bath could be maintained.

.....

.....

..... [1]

**(v)** Explain why a clean syringe was used in step 3.

.....

.....

..... [1]

**(b)** A student extended the investigation by using more concentrations of glucose solution.

Calculate the volumes of 5% glucose solution and distilled water that are needed to make 5 $cm^3$ of a 3% glucose solution.

volume of 5% glucose solution ..... $cm^3$

volume of distilled water ..... $cm^3$

[1]

**(c)** Sports drinks often contain glucose, which is a reducing sugar.

State how you could test a sample of a sports drink for reducing sugar.

.....

.....

.....

.....

..... [2]

**(d)** **(i)** The ethanol emulsion test can be used to show that a sample of food contains fat.

State the result of a positive test.

..... [1]

**(ii)** Suggest **one** safety precaution that should be followed when using ethanol.

.....

.....

..... [1]

[Total: 14]

**2** A student investigated the effect of temperature on the rate of respiration in yeast cells.

They used the apparatus shown in Fig. 2.1.

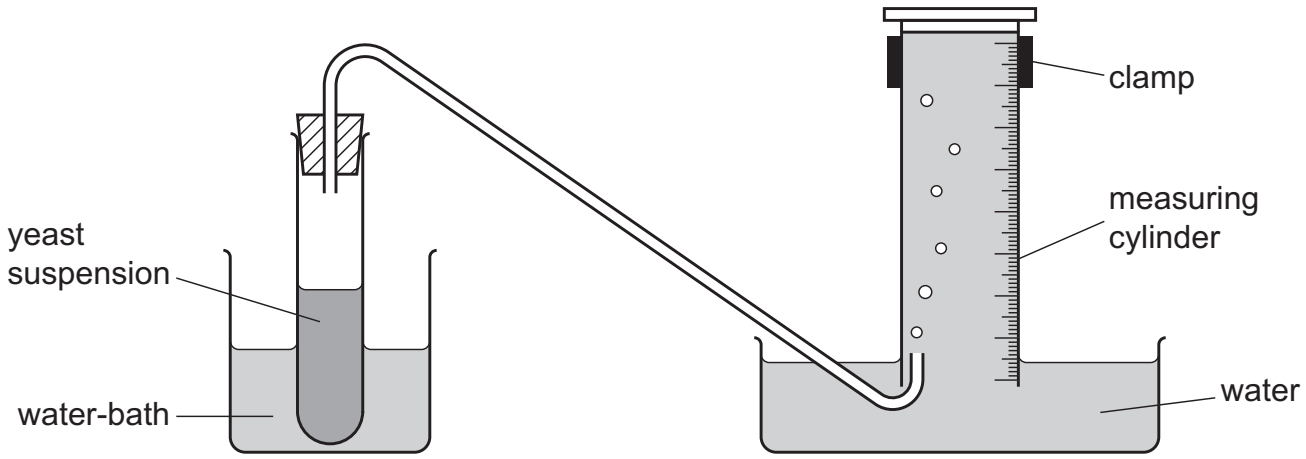



**Fig. 2.1**

The student used this method:

- Put 25 $cm^3$ of yeast suspension into a test-tube.
- Put the test-tube into a water-bath and add water at 10 °C to the water-bath.
- Leave the apparatus for five minutes before moving on to the next step.
- Start a stop-clock and count the number of bubbles produced by the respiring yeast cells in three minutes.
- Repeat the procedure using a water-bath maintained at different temperatures.

**(a) (i)** State **two** variables that the student kept constant in this investigation.

1 .....

.....

2 .....

.....

[2]

**(ii)** State **one** possible source of error when measuring the dependent variable **and** suggest an improvement to this method of measuring.

error .....

.....

improvement .....

.....

.....

[2]

**(b)** Table 2.1 shows the results of the investigation.

**Table 2.1**

| water-bath temperature / °C | number of bubbles produced in 3 minutes | rate of bubble production / bubbles per minute |
|---|---|---|
| 10 | 33 | 11 |
| 20 | 45 | 15 |
| 30 | 79 | |
| 40 | 112 | 37 |
| 50 | 124 | 41 |
| 60 | 37 | 12 |

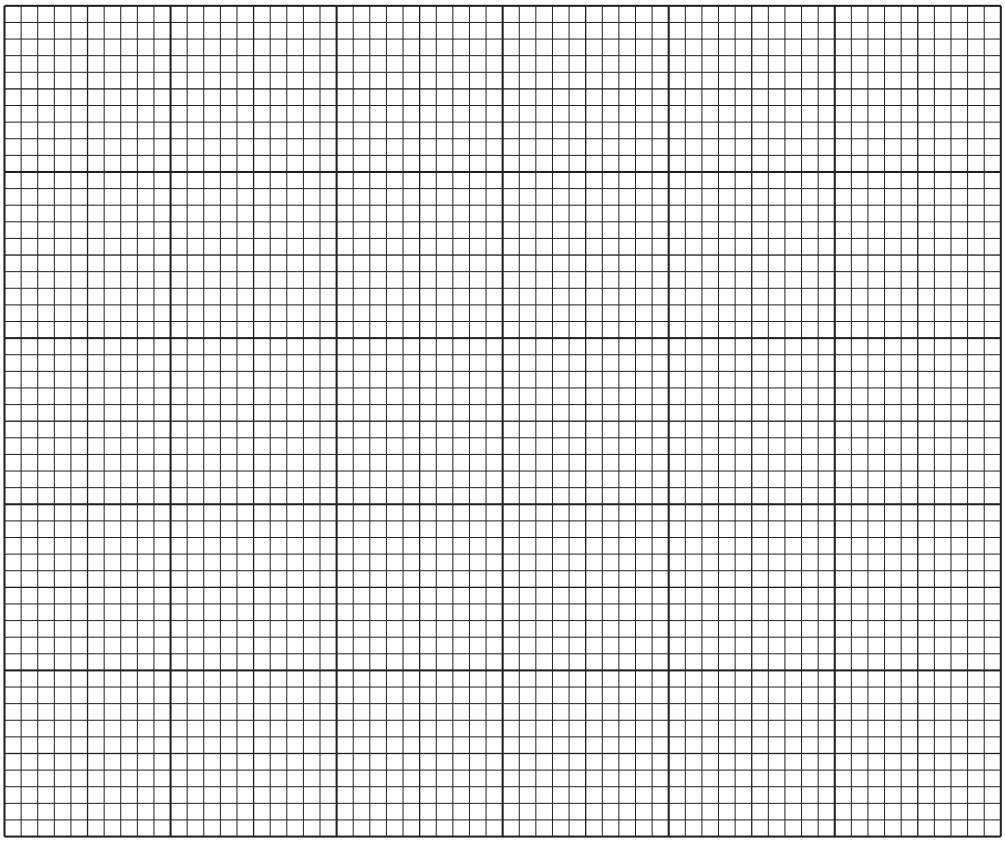
**(i)** Calculate the rate of bubble production at 30 °C.

Give your answer to an appropriate number of significant figures.

Space for working.

..... bubbles per minute [2]

**(ii)** Plot the data in Table 2.1 on the grid to show the effect of temperature on the **rate** of bubble production.



[4]

**(iii)** Describe the results of this investigation.

.....

.....

.....

.....

..... [2]

**(c)** Describe how the student could confirm that the gas produced is carbon dioxide.

.....

.....

..... [2]

[Total: 14]

**19** The processes listed occur in living organisms.

1 cell division

2 diffusion

3 muscle contraction

4 osmosis

Which processes require energy from respiration?

**A** 1, 2, 3 and 4 **B** 1 and 3 only **C** 2 and 3 only **D** 3 and 4 only