19 What is produced by anaerobic respiration in human muscles?

	carbon dioxide	lactic acid	water
A	✓	✓	✗
B	✓	✗	✓
C	✗	✓	✗
D	✗	✗	✓

key

✓ = substance is produced

✗ = substance is **not** produced

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**.

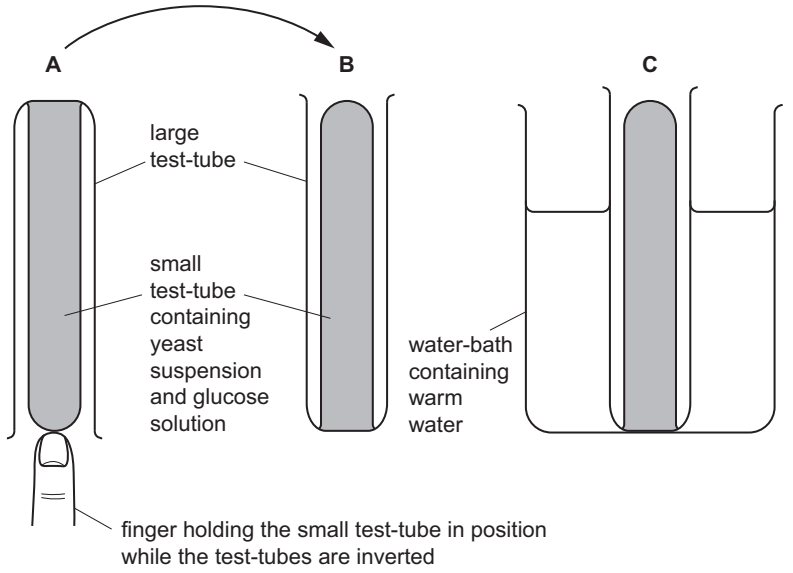

Fig. 1.1

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.

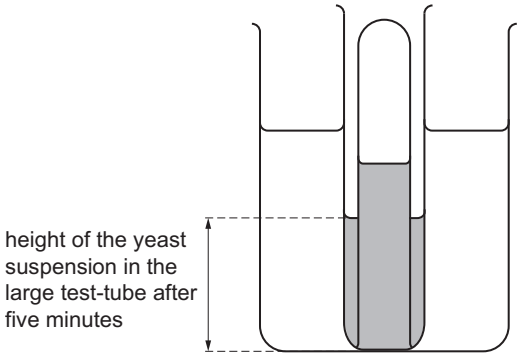

Fig. 1.2

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.

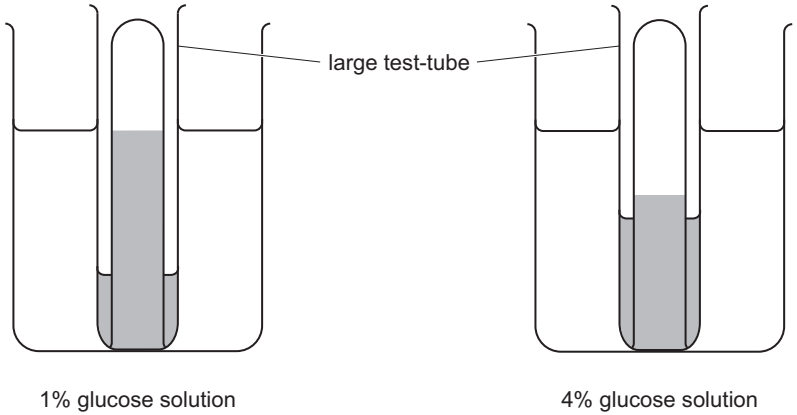

Fig. 1.3

(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 Plan an investigation to determine the effect of exercise intensity on heart rate in humans.

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..... [6]

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.

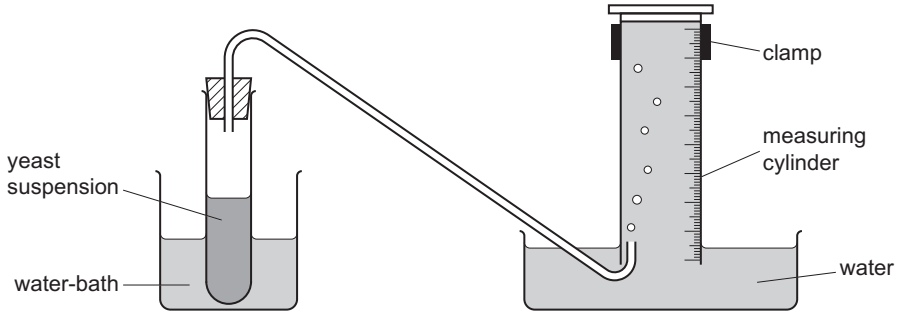


Fig. 2.1

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

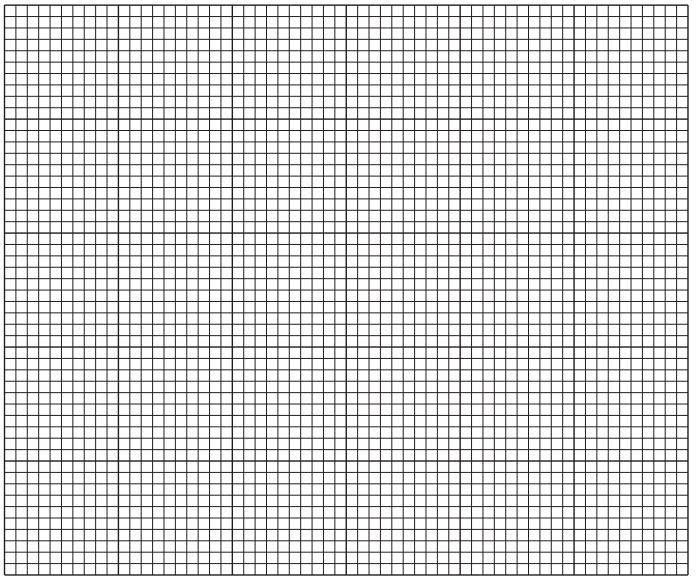
(i) Calculate the rate of bubble production at 30 °C.

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.

.....

.....

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..... [2]

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

.....

.....

..... [2]

[Total: 14]

2 **(a)** Alveoli are the gas exchange surface in humans.

State **three** features of alveoli that make them an effective gas exchange surface.

1 .....

2 .....

3 .....

[3]

(b) Fig. 2.1 is a diagram of the human breathing system.

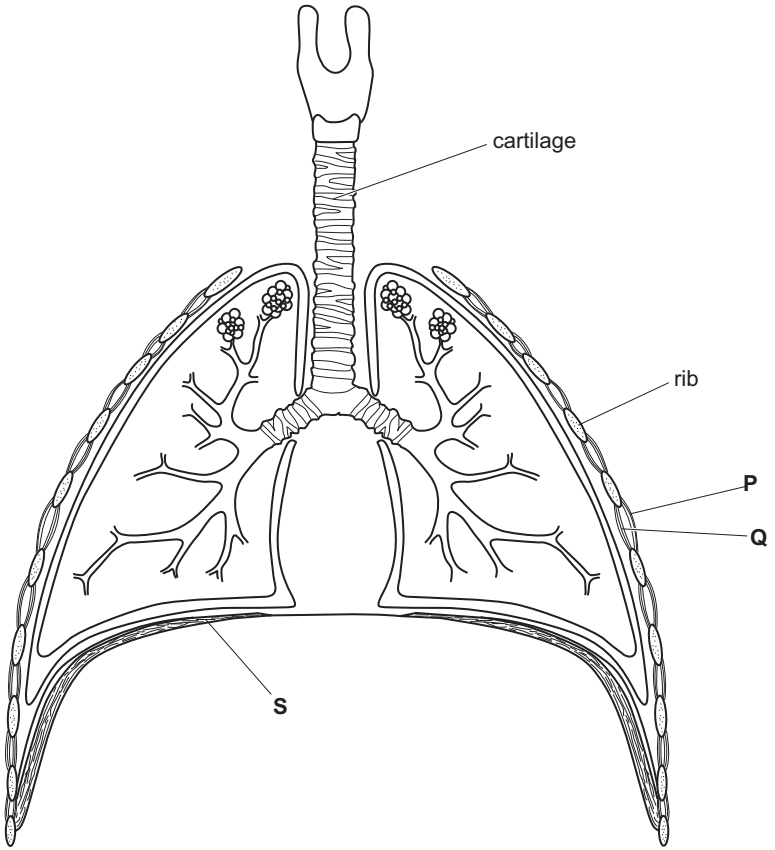

Fig. 2.1

(i) Three muscles involved in inspiration are labelled **P**, **Q** and **S** in Fig. 2.1.

Identify the letters in Fig. 2.1 that label the muscles which contract during inspiration.

..... [1]

(ii) State the function of cartilage in the breathing system.

.....

.....

..... [1]

(c) **(i)** State the balanced chemical equation for aerobic respiration.

..... [2]

(ii) During physical activity breathing changes.

Explain the mechanism that links the increase in physical activity to the changes in breathing.

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..... [3]

[Total: 10]