

- 1 A student investigated the effect of temperature on the rate of respiration in yeast cells. When yeast cells respire they produce carbon dioxide gas.

In this investigation the gas was collected in a balloon that was attached to a test-tube containing a yeast suspension.

- Step 1 The student prepared a hot water-bath and a cold water-bath.
- Step 2 The student measured the temperature of the water in the hot water-bath and in the cold water-bath.
- Step 3 A yeast suspension was stirred with a glass rod. 25 cm^3 of the yeast suspension was put into each of two test-tubes.
- Step 4 A balloon was stretched over the top of each test-tube.
- Step 5 One test-tube and balloon was put into the hot water-bath and the other test-tube and balloon was put into the cold water-bath, as shown in Fig. 1.1.

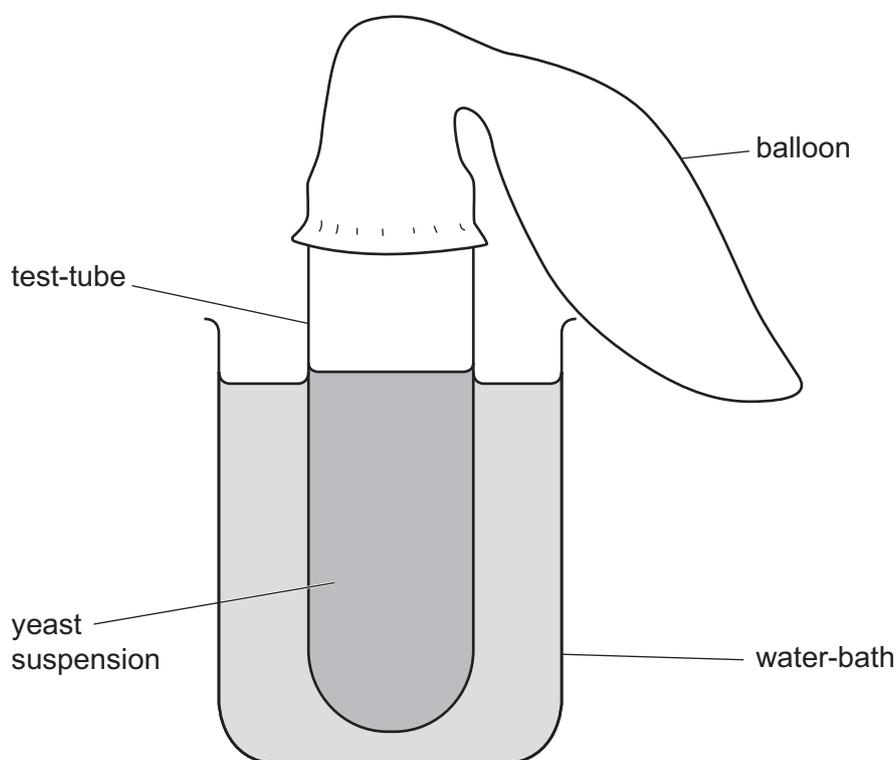


Fig. 1.1

- Step 6 The circumference of each balloon was measured by placing a piece of string around the widest part of the balloon, as shown in Fig. 1.2. A ruler was then used to measure the length of the string that wrapped around each balloon once.

3

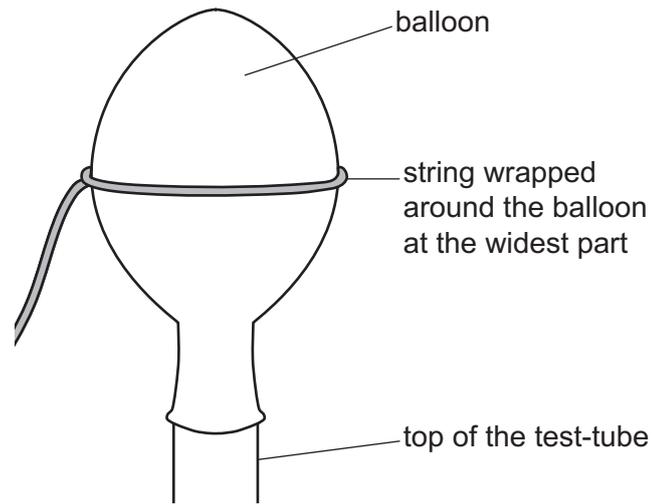


Fig. 1.2

Step 7 The circumference of each balloon was measured at 0 minutes, 5 minutes, 10 minutes and 15 minutes.

The student's results are shown in Fig. 1.3.

A drawing of a spiral-bound notebook with the following text written on it:

Cold	0 minutes - 120 mm	Hot	0 minutes - 120 mm
	5 minutes - 125 mm		5 minutes - 135 mm
	10 minutes - 132 mm		10 minutes - 145 mm
	15 minutes - 137 mm		15 minutes - 147 mm

Fig. 1.3

(a) (i) Prepare a table and record the results shown in Fig. 1.3.

[3]

(ii) State a conclusion for the results shown in Fig. 1.3.

.....
.....
..... [1]

(iii) Suggest why it was important to stir the yeast suspension in step 3.

.....
.....
..... [1]

(iv) State **two** variables, other than stirring, that should be kept constant in this investigation.

1

2

..... [2]

(b) (i) Balloons and string were used to collect and measure the gas produced by the yeast cells.

Suggest another, more accurate, method of collecting and measuring the gas.

.....
.....
..... [1]

(ii) State the name of an indicator which could be used to show that the gas produced by the yeast is carbon dioxide and give the result of a positive test.

indicator

positive test result

[2]

- (c) (i) The temperatures of the water in the hot water-bath and in the cold water-bath were measured again at the end of the investigation. Fig. 1.4 is a diagram of the thermometers showing the temperatures in the two water-baths.

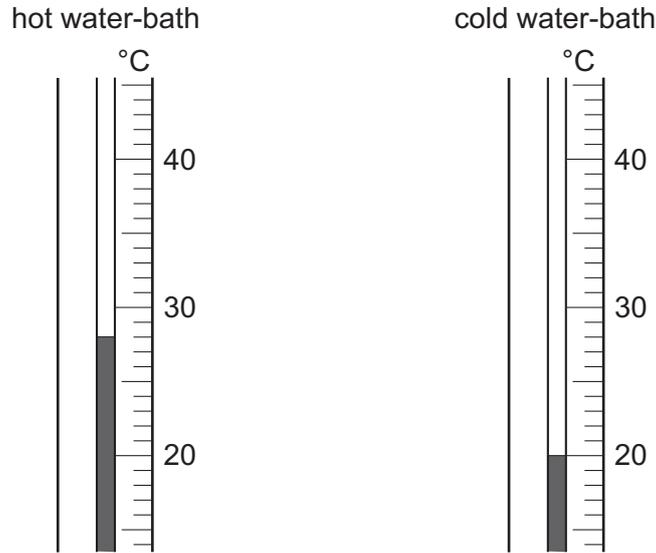


Fig. 1.4

Complete Table 1.1 by recording the temperatures from Fig. 1.4 and calculating the change in temperature.

Table 1.1

water-bath	temperature in step 2/°C	temperature at the end of the investigation/°C	change in temperature/°C
hot	40		
cold	20		

[2]

- (ii) Describe how the method could be modified to prevent a change in the temperature of a water-bath.

.....

.....

..... [1]

[Total: 13]

2 Fig. 2.1 is a photograph of a flower from the wind-pollinated grass plant, *Briza maxima*.



Fig. 2.1

(a) (i) Draw a large diagram of the flower in Fig. 2.1.

(ii) Fig. 2.2 is a photomicrograph of grass pollen grains.

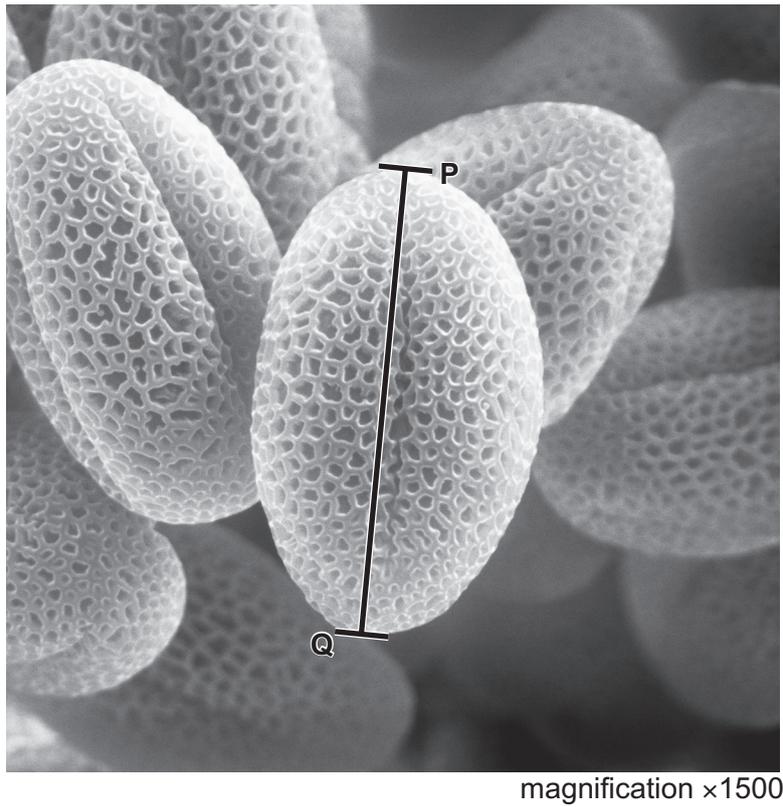


Fig. 2.2

Measure the length of line **PQ** on Fig. 2.2.

length of **PQ** mm

Calculate the actual length of the pollen grain using the formula and your measurement.

$$\text{magnification} = \frac{\text{length of line PQ}}{\text{actual length of the pollen grain}}$$

Give your answer in millimetres and to **two** decimal places.

Space for working.

..... mm
[3]

- (b) Scientists investigated the effect of wind speed on the average distance travelled by single pollen grains and groups of five pollen grains joined to form a clump. The pollen grains were dropped from a height of 2 m.

The results of the investigation are shown in Table 2.1.

Table 2.1

wind speed /m per s	average distance travelled by single pollen grains /m	average distance travelled by clumps of five pollen grains /m
0.0	0	0
0.2	38	21
0.4	81	39
0.6	118	55
0.8	154	70

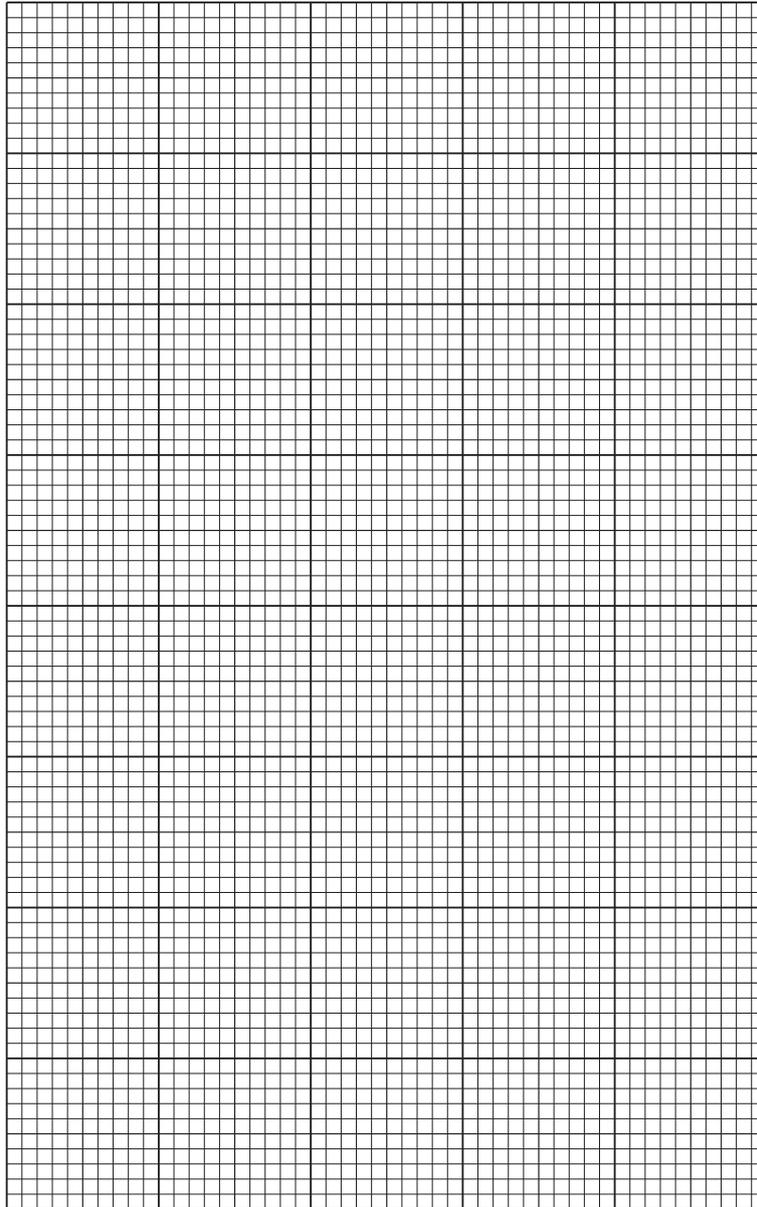
- (i) Calculate the percentage decrease in the average distance travelled when the pollen grains fell as a clump compared to a single pollen grain, at a wind speed of 0.6 m per s.

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

Space for working.

..... %
[3]

- (ii) Plot a line graph on the grid of the data in Table 2.1. Include both sets of data and a key.



[5]

- (iii) Use your graph to estimate the average distance travelled by **single** pollen grains at a wind speed of 0.5 m per s.

Show on your graph how you obtained your estimate.

..... m
[2]

(iv) Successful pollination results in fertilisation and the production of seeds.

Describe how you could test the seeds to show that they contain reducing sugars.
Include the result of a positive test.

method

.....

.....

.....

positive test result

[3]

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