



1 Sugars are a source of energy in the diet.

A student wanted to estimate the concentration of glucose in an energy drink (**D**).

Step 1 Three test-tubes were labelled **A**, **B** and **C**.

Step 2 Three different concentrations of glucose solution were prepared as shown in Table 1.1.

(a) (i) Complete Table 1.1 by calculating and writing in the volume of 4% glucose solution used in test-tube **B**.

**Table 1.1**

test-tube	volume of 4% glucose solution /cm <sup>3</sup>	volume of distilled water /cm <sup>3</sup>	percentage concentration of glucose solution
<b>A</b>	10.0	0.0	4
<b>B</b>		5.0	2
<b>C</b>	2.5	7.5	1

[1]

Step 3 5 cm<sup>3</sup> of Benedict's solution was added to each of the glucose solutions in test-tubes **A**, **B** and **C**. Each test-tube was gently shaken for 3 seconds to mix the contents.

Step 4 5 cm<sup>3</sup> of Benedict's solution was added to test-tube **D** which contained 10 cm<sup>3</sup> of energy drink **D**. The test-tube was gently shaken for 3 seconds to mix the contents.

Step 5 Hot water was put into a beaker that was used as a water-bath.

Step 6 The temperature of the hot water in the water-bath (initial temperature) was measured.

Step 7 Test-tube **A** was put into the water-bath and a stop-clock was started.

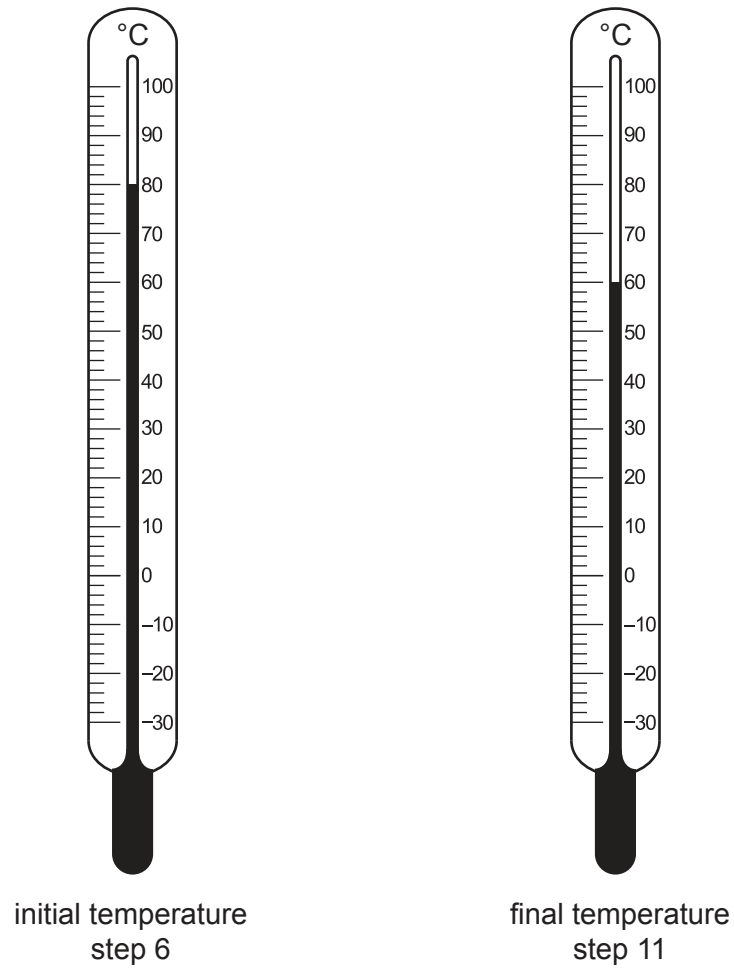
Step 8 Test-tube **A** was observed and the stop-clock was stopped when the contents of the test-tube **first** changed colour.

Step 9 Test-tube **A** was removed from the water-bath.

Step 10 Steps 7, 8 and 9 were repeated with test-tubes **B**, **C** and **D**.

Step 11 The final temperature of the water in the water-bath was measured at the end of the investigation.

(ii) Fig. 1.1 shows the appearance of the thermometer in step 6 and in step 11.



**Fig. 1.1**

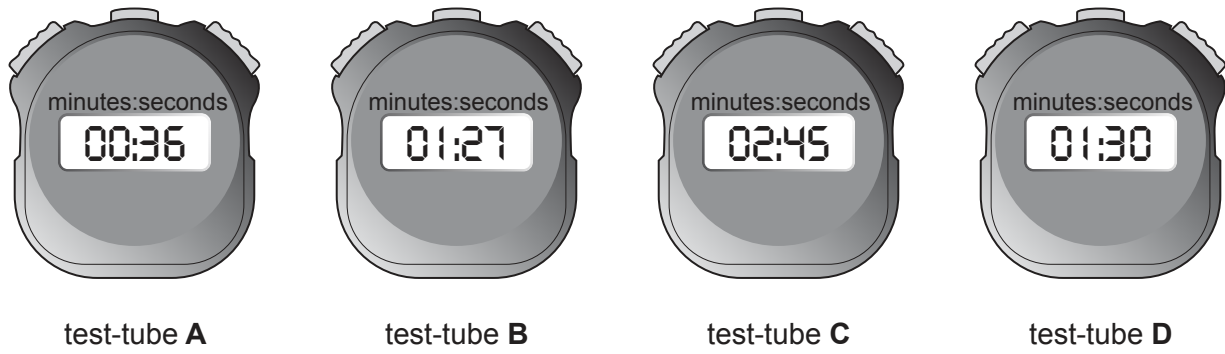
Record the temperatures shown in Fig. 1.1 in Table 1.2.

**Table 1.2**

step 6 initial temperature / °C	step 11 final temperature / °C

[1]

(iii) Fig. 1.2 shows the stop-clock readings for each test-tube in step 8.



**Fig. 1.2**

Convert the times shown in Fig. 1.2 to seconds.

Prepare a table and record these times in your table.

[3]

(iv) Estimate the concentration of glucose in energy drink **D** using the information in Table 1.1 and the results in your table in **1(a)(iii)**.

.....% [1]

(v) Explain how you estimated the concentration of glucose in energy drink **D** in **1(a)(iv)**.

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

(b) Fig. 1.1 and Table 1.2 may indicate that there is a source of error in this investigation.

(i) Identify the possible source of error **and** suggest **one** way the method could be improved to reduce this error.

source of error .....

.....

improvement .....

.....

..... [2]

(ii) Explain how the error identified in **1(b)(i)** could affect the results and the estimation of the concentration of glucose in energy drink **D**.

.....

.....

..... [1]

(c) (i) State **two** variables that were kept constant in the investigation in **1(a)**.

1 .....

2 .....

..... [2]

(ii) State **one** reason why the student should wear eye protection when carrying out this investigation.

.....

.....

..... [1]

- (d) Barley grains are used in the food industry as a source of sugars. Barley grains contain starch. Starch can be broken down into sugars by enzymes.

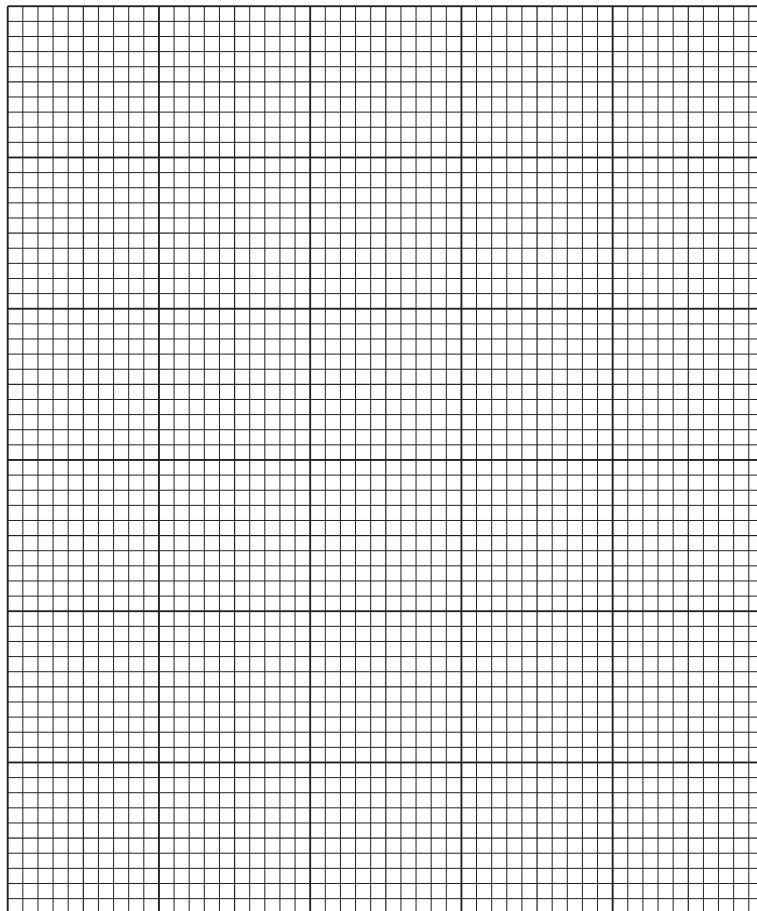
Students made a starch suspension from barley grains to investigate the breakdown of starch by enzymes. The starch suspension contained 100g of starch. They mixed the starch suspension with enzymes and recorded the mass of starch remaining in the mixture at different times.

The results are shown in Table 1.3.

**Table 1.3**

time / minutes	mass of starch remaining / g
0	100
5	58
10	40
20	32
40	28

- (i) Plot a line graph on the grid of the data in Table 1.3.



[4]

(ii) Describe the trend shown in your graph.

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

(iii) Estimate the mass of starch remaining at 15 minutes.

Show on your graph how you obtained your answer.

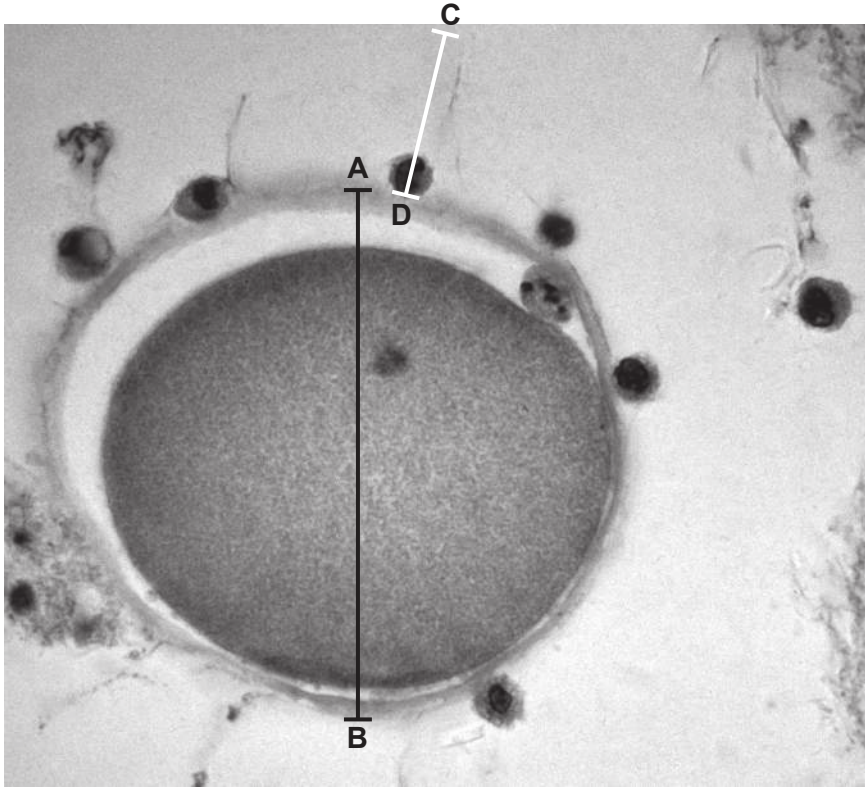
..... g  
[2]

(iv) Calculate the rate of starch breakdown in the first five minutes using the information in Table 1.3 or your graph.

..... g per minute [1]







**Fig. 2.1**

(i) Measure the lengths of lines **AB** and **CD** on Fig. 2.1. Include the unit.

length of line **AB** ..... length of line **CD** ..... [1]

(ii) The actual diameter of the ovum is 0.10 mm.

Calculate the magnification of the ovum in Fig. 2.1 using the formula:

$$\text{magnification} = \frac{\text{length of line AB on Fig. 2.1}}{\text{actual diameter of ovum}}$$

..... [1]

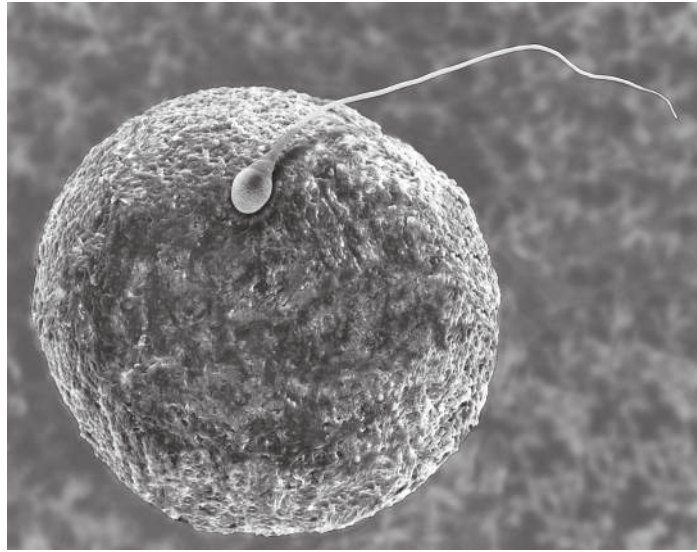
(iii) Calculate the actual length of the sperm cell using the magnification you calculated in 2(a)(ii) and the formula:

$$\text{magnification} = \frac{\text{length of line CD on Fig. 2.1}}{\text{actual length of sperm cell}}$$

Give your answer to two decimal places.

..... mm  
[3]

(b) Fig. 2.2 is a different photomicrograph of an ovum and one sperm cell.



**Fig. 2.2**

- (i) Make a large drawing of the ovum and the sperm cell shown in Fig. 2.2.  
Label the ovum on your drawing.

(ii) State **three** visible differences between the ovum and the sperm cell that can be seen in Fig. 2.2.

1 .....

.....

2 .....

.....

3 .....

.....

[3]

[Total: 13]

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