

GCSE Biology B (Twenty First Century Science)
J257/02 Depth in Biology (Foundation)

Question Set 20

1 Beth is investigating the rate of anaerobic cellular respiration in yeast. She tests different sugar solutions to see what effect they have on the respiration of yeast. One of the solutions contains glucose.

(a) Beth starts by measuring out 30 cm^3 of glucose solution using a measuring cylinder.

Fig. 8.1 shows four attempts she made at doing this.

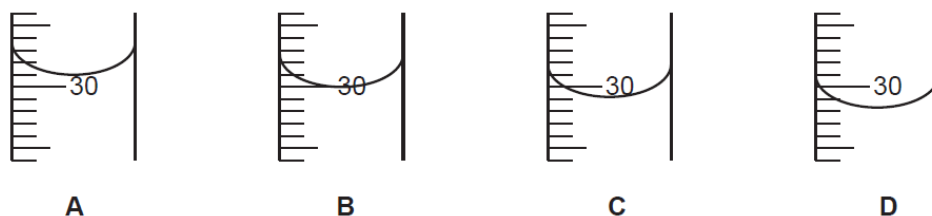


Fig. 8.1

In which attempt, A, B, C or D, did Beth have 30 cm^3 of glucose solution?

Attempt **B** [1]

(b) Beth sets up her materials and apparatus as shown in Fig. 8.2.

Anaerobic cellular respiration takes place in the yeast. This makes a gas.

Beth wants to collect the gas using a measuring cylinder.

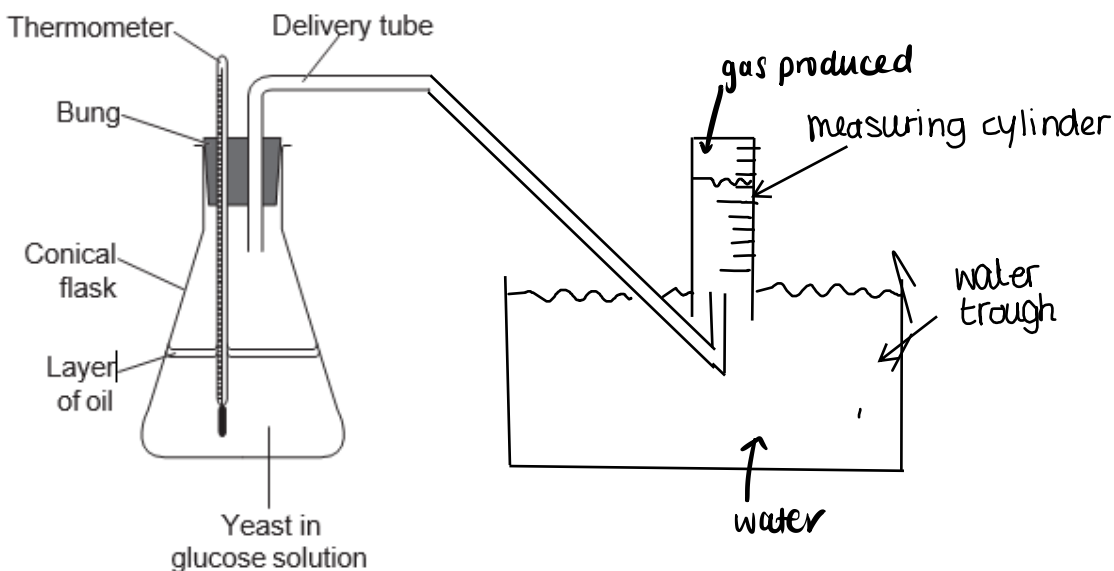


Fig. 8.2

Complete the diagram in Fig. 8.2 to show how Beth should set up the measuring cylinder to collect the gas.

Add labels to your diagram.

[3]

because ^{the splint stops glowing} CO_2 is a product
of anaerobic respiration

anaerobic respiration releases energy as heat

- (c) Beth collects some of the gas made by the anaerobic cellular respiration. She tests the gas by putting a glowing splint into it.

Table 8.1 describes the results she would see for different gases.

Gas	Result of the test
Air	The splint would continue glowing.
Carbon dioxide	The splint would stop glowing.
Hydrogen	There would be a squeaky pop.
Oxygen	The splint would start burning with a flame.

Table 8.1

What result would you expect to see for the gas Beth has collected? Explain your answer.

[2]

the splint stops glowing because CO_2 is a product of anaerobic respiration

- (d) Beth noticed that the reading on the thermometer increased during the experiment.

The temperature in the room did not increase.

Explain why the glucose solution containing yeast warmed up.

[1]

anaerobic respiration releases energy as heat

Another student, Jamal, is also investigating the rate of anaerobic cellular respiration in yeast.

Jamal sets up his materials and apparatus differently to Beth, as shown in Fig. 8.3.

- He places the conical flask in a water bath at room temperature.
- He uses a gas syringe to collect the gas made by anaerobic cellular respiration.

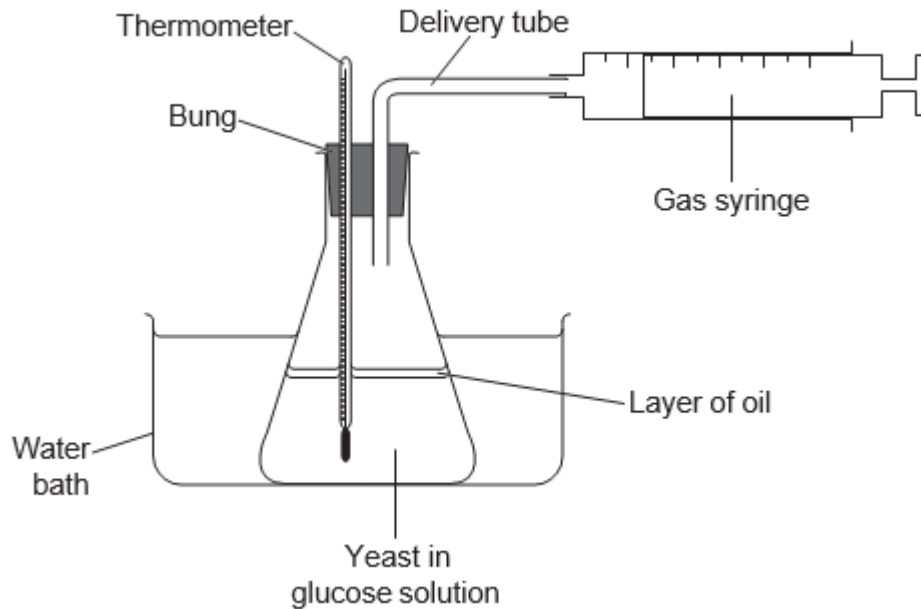


Fig. 8.3

Jamal wants to find out what effect different sugar solutions have on the rate of anaerobic cellular respiration in the yeast.

Jamal collects data from the yeast in the glucose solution and then from the yeast in sucrose solution.

- (e) Using the water bath at room temperature will help Jamal to compare his results from the glucose and sucrose solutions more fairly.

Suggest **two** reasons why.

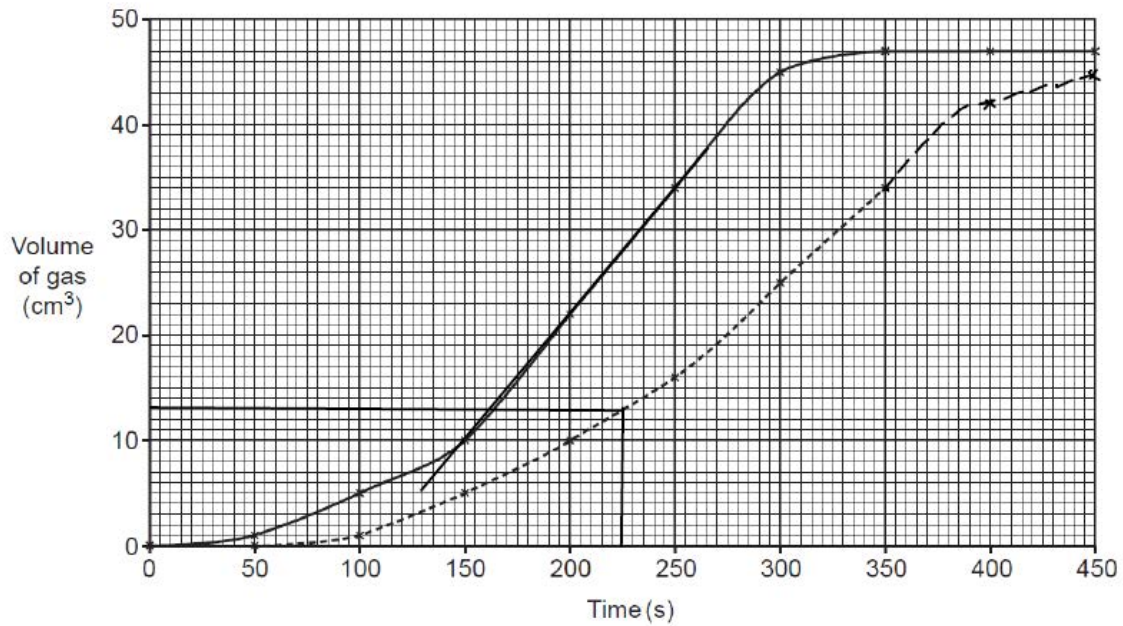
[2]

the water acts as an insulator of the beaker to prevent it from changing temperature too much during the experiment.
This allows only variable to change ensuring fair test.

Maintaining a constant temperature via water bath also ensures the rate of enzyme activity in yeast is same for each glucose and sucrose solutions.

Jamal plots his results on a graph, as shown in Fig. 8.4.

Key	
—	Yeast in glucose solution
- - - -	Yeast in sucrose solution



(f) The final measurements for the yeast with the sucrose solution are shown in **Table 8.2**.

Time (s)	Volume of gas (cm ³)
400	42
450	45

(g) Plot the final measurements on the graph. [1]
 What volume of gas is collected from the yeast with the sucrose solution after 275 seconds?

Volume = 13 cm³ [1]

(h) How long did it take for the yeast to use all of the glucose from the glucose solution? Explain your answer. [2]
 350s is where the curve for glucose levels off

(i) Calculate the rate of anaerobic respiration in the yeast with glucose solution between 150 seconds and 250 seconds.

Give the appropriate units in your answer.

$\frac{34-10}{100} = \frac{24 \text{ cm}^3}{100 \text{ s}}$ Rate = 0.24 units cm³/s [3]

- (j) Jamal concludes that the rate of anaerobic cellular respiration is faster when yeast is in glucose solution.

Describe **two** pieces of evidence from the graph in **Fig. 8.4** that support Jamal's conclusion.

[2]

- curve for glucose levels off earlier
- curve for glucose has a steeper gradient from 100-250s

Total Marks for Question Set 20: 18

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