

GCSE Biology B (Twenty First Century Science)
J257/04 Depth in biology (Higher Tier)

Question Set 13

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

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

Fig. 1.1 shows four attempts she made at doing this.

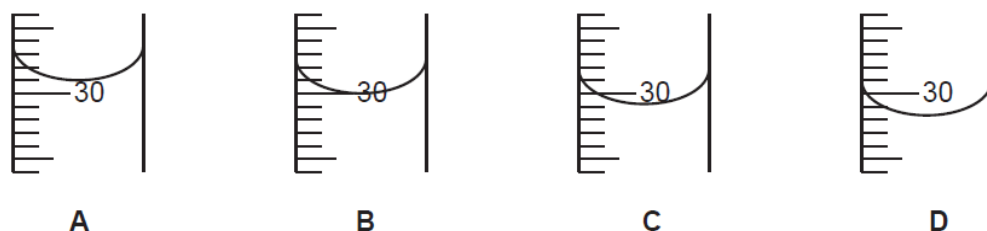


Fig. 1.1

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. 1.2.

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

Beth wants to collect the gas using a **measuring cylinder**.

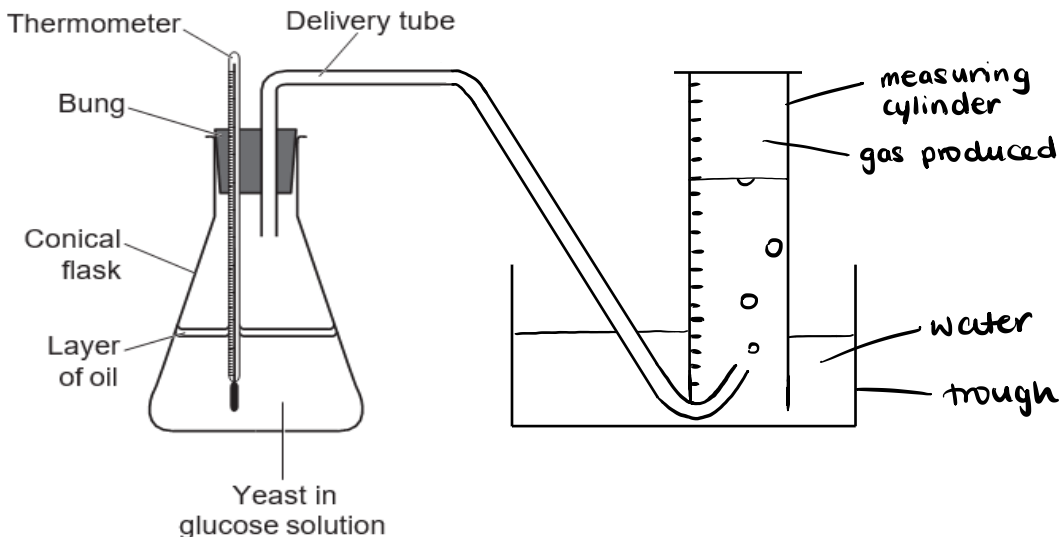


Fig. 1.2

Complete the diagram in Fig. 1.2 to show how Beth should set up the **measuring cylinder** to collect the gas.

Add labels to your diagram.

[3]

- (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 1.1 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 1.1

What result would you expect to see for the gas Beth has collected?

Explain your answer. *The splint would stop glowing since CO₂ is present.*

[2]

- (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.

Energy is released in form of heat.

[1]

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. 1.3.

- 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.

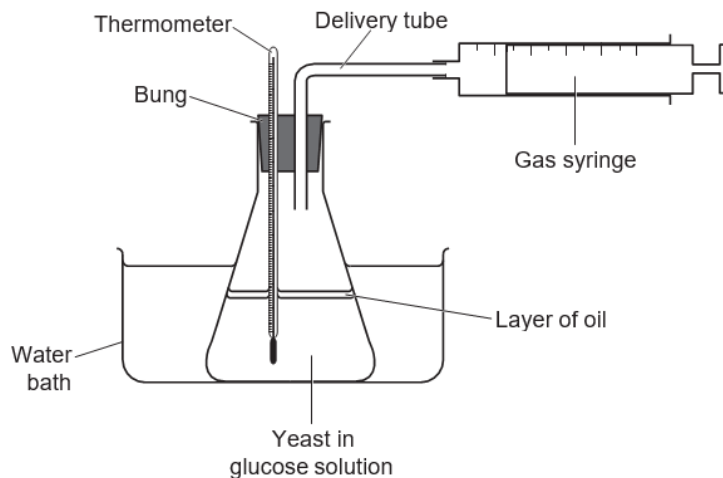


Fig. 1.3

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 more fairly.

Suggest **two** reasons why.

Must maintain same temperature ^{as it is a controlled variable} and temperature ^{must be set to the optimum temperature to ensure enzyme activity is the highest (no enzyme denaturation)} [2]

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

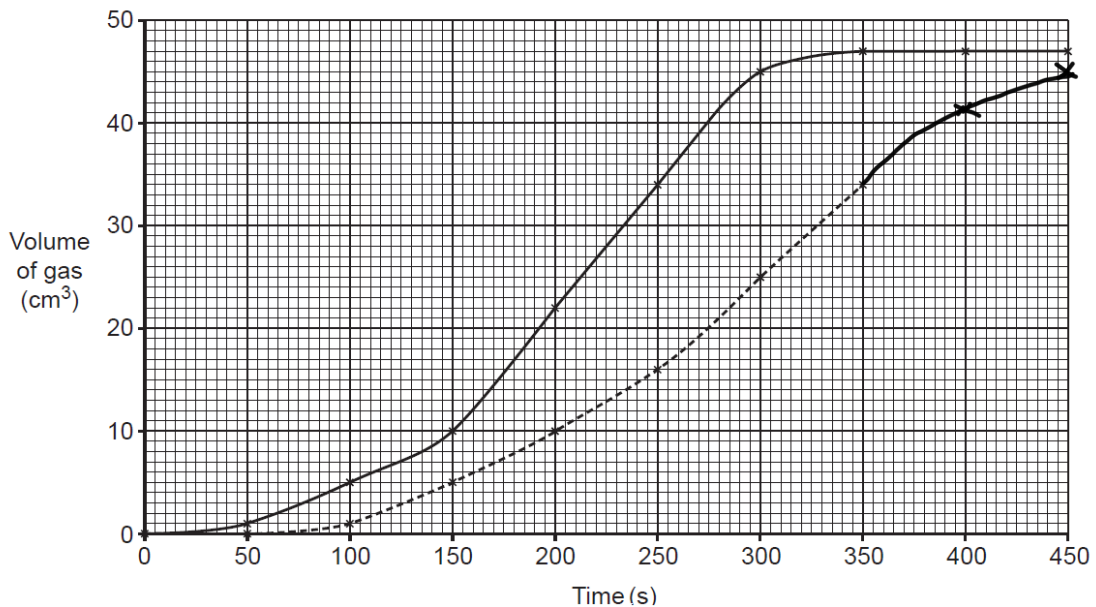


Fig. 1.4

- (f) The final measurements for the yeast with the sucrose solution are shown in **Table 1.2**.

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

Table 1.2

Plot the final measurements on the graph.

[1]

- (g) What volume of gas is collected from the yeast with the sucrose solution after 275 seconds?

Volume = 20 cm³ [1]

- (h) How long did it take for the yeast to use all of the glucose from the glucose solution?

Explain your answer.

This is where the graph levels off.

Time = 340 s

[2]

- (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.

$$\frac{24}{100}$$

Rate = 0.24 units

[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. 1.4 that support Jamal's

conclusion.

> Volume of gas produced after 150s is 10cm³ for glucose and only 5cm³ for sucrose. (greater volume of gas is produced in glucose) [2]

> the rate of gas production is faster in glucose solution. (slope is steeper)

Total Marks for Question Set 13: 18

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