

Alcohols, acids, esters and polymers explained

Chemistry grades 9-10 (GCSE · IGCSE · O Level · Class 9-10) · Lab answers

These model answers use the sample data to show the graph shape, the rate calculations and the explanation of enzyme damage. Check that you have used the correct molar volume and that the mole ratio for glucose to carbon dioxide is 1 : 2.

Level: Chemistry grades 9-10 (GCSE · IGCSE · O Level · Class 9-10) · **Curriculum:** GCSE C7

Question 1 Plot and describe

Temperature on the x axis, volume on the y axis. The volume **rises to a maximum at 40 °C** and then falls sharply at 50 and 60 °C, giving a peaked curve.

Question 2 Optimum temperature

The best temperature is **40 °C**. Rate = $36 \text{ cm}^3 \div 10 \text{ min} = \mathbf{3.6 \text{ cm}^3/\text{min}}$.

Question 3 Compare 20 and 40

Rate at 20 °C = $11 \div 10 = 1.1 \text{ cm}^3/\text{min}$. Ratio = $36 \div 11 = \mathbf{3.3 \text{ times faster}}$.

Question 4 Explain the fall

The enzymes in yeast are proteins. At high temperature their shape changes: they are **denatured** and can no longer speed up fermentation, so less carbon dioxide forms.

Question 5 Moles and mass at 40 °C

$\text{CO}_2 = 36 \div 24\,000 = \mathbf{0.0015 \text{ mol}}$. Glucose gives 2 CO_2 , so glucose = 0.00075 mol and mass = $0.00075 \times 180 = \mathbf{0.135 \text{ g}}$. Ethanol = $0.0015 \text{ mol} \times 46 = \mathbf{0.069 \text{ g}}$.

Question 6 Control variables

The **mass of yeast, mass of sugar and volume of water** (also the shaking and the time of 10 minutes) must be the same in every flask.

Question 7 Identify the gas

The gas is **carbon dioxide**. Bubble it through limewater: the limewater turns **cloudy (milky)**.

Question 8 Evaluate the method

Some gas dissolves, so the measured volumes are **slightly too low**. Improve by repeating each temperature three times and taking a mean, and by using a thermostatic water bath to hold the temperature steady.