



QUESTION WORKBOOK

Handling data: units, scales, rates and uncertainty

Scientific method and quantitative biology · Unit B00

AQA MS 0.1–0.5, 1.1, 1.3, 2.2, 3.1, 3.5, 3.6 · OCR A Module 1.1.3–1.1.4; mathematical requirements
Edexcel A Mathematical skills appendix; core practical analysis
CAIE Papers 3 and 5; mathematical requirements

6 questions · 19 marks

PRINT EDITION

SECTION A · Short, 1 to 2 marks

- A1** State what is meant by the resolution of a measuring instrument, and state the uncertainty carried by a single reading taken from a millimetre rule. [2]

SECTION B · Standard, 3 to 5 marks

- B1** A potato chip is weighed at 5.00 g, left in a sucrose solution for an hour and weighed again at 4.60 g, on a balance reading to plus or minus 0.01 g. Calculate the percentage change in mass, and calculate the percentage uncertainty in that percentage change. [4]

- B2** A bacterial culture is counted every hour for ten hours and the counts are plotted with the logarithm to base 10 of the count on the vertical axis. Explain why a logarithmic axis is used here, and explain what a straight line on such a plot tells you. [4]

- B3** A student collects 24 cm^3 of gas in 20.0 s and writes the rate as $1.2 \text{ cm}^3 \text{ s}^{-1}$. Explain why the answer is given to two significant figures, and explain why counting the decimal places in the measurements is the wrong guide. [3]

- B4** A tangent is drawn at the origin of a curve of volume of oxygen collected against time. The tangent passes through the points $(0 \text{ s}, 2.0 \text{ cm}^3)$ and $(30 \text{ s}, 20.0 \text{ cm}^3)$. Calculate the initial rate of oxygen production and give its unit. [3]

- B5** An osmosis investigation reports a percentage change in the mass of a potato chip carrying a percentage uncertainty of over 30 per cent, even though the balance reads to plus or minus 0.01 g . Suggest why the uncertainty is so large, and suggest one change to the method that would reduce it. [3]
