IQM3012 A3 Teacher marking exercise

IQM3012 A3 Synthetic Chemistry Paper 2 Responses

The selected synthetic extracts below form an unmarked exercise. Apply the supplied assessment criteria, record evidence and propose marks or bands before consulting the separate teacher reference.

Controlling sources: IQM3012 Chemistry Paper 2 Sample 2026–27 Candidate Question Paper, Candidate Answer Booklet, supplied Chemistry Data and Formulae Booklet, and current Staff Mark Scheme and Marking Map v3. All 20 Section A items and five Section B questions are compulsory; the paper is 70 marks in two hours.

Selected extracts only; unmarked exercise. Internal staff use.

Teacher practice instructions

This internal exercise uses four selected extracts from fictional synthetic response scripts. Apply the stated source criteria and record evidence and proposed marks before consulting the separate reference. Excerpts are unmarked here; complete scripts and full proposed decisions remain in the restricted internal response and marking materials.

Controlling sources: IQM3012 Chemistry Paper 2 Sample 2026–27 Candidate Question Paper, Candidate Answer Booklet, supplied Chemistry Data and Formulae Booklet, and current Staff Mark Scheme and Marking Map v3. All 20 Section A items and five Section B questions are compulsory; the paper is 70 marks in two hours.

Extract A S1 B1 b rate constant

Initial-rate data from the source paper: Experiment 1 [A]=0.100 mol dm^{-3}, [B]=0.100 mol dm^{-3}, rate=2.00×10^{-3} mol dm^{-3} s^{-1}; Experiment 2 [A]=0.200, [B]=0.100, rate=8.00×10^{-3}; Experiment 3 [A]=0.100, [B]=0.200, rate=4.00×10^{-3}. S1's preceding response gives rate = $k[A]^2[B]$. Q1(b) asks for k and units. Maximum 2 marks. Criteria: k = 2.00 (1); units dm^6 mol^{-2} s^{-1} (1).

Student response extract (verbatim native working):

$$k = \frac{2.00 \times 10^{-3}}{(0.100)^2(0.100)} = 2.00$$

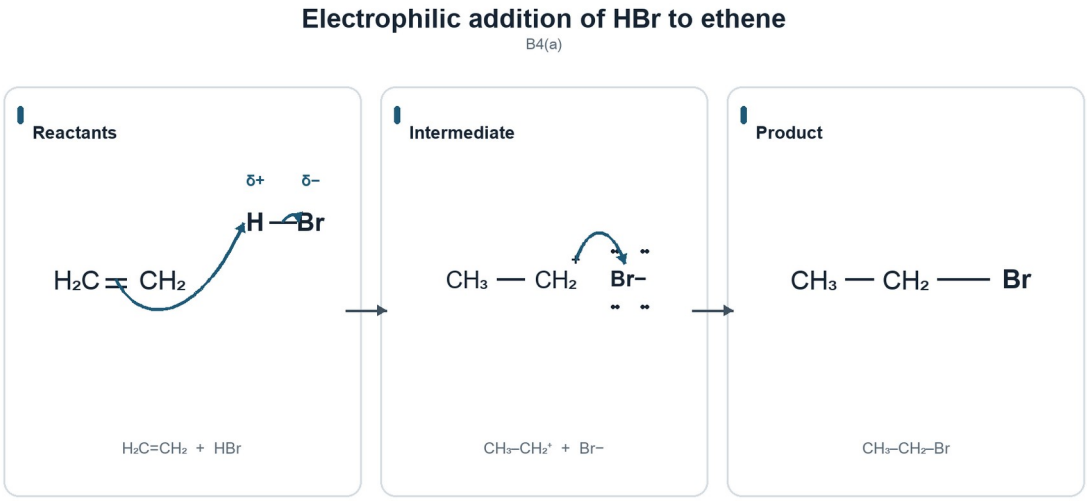
$$\mathrm{dm^6\ mol^{-2}\ s^{-1}}$$

Extract B S2 B4 a mechanism

B4(a): draw the electrophilic addition mechanism for ethene and HBr. Maximum 4 marks. Available points: Hδ+–Brδ− and π arrow to H; H–Br arrow to Br and Br−; CH_3CH_2+ intermediate; Br− lone-pair arrow to C+ and CH_3CH_2Br product.

Student response extract (verbatim):

The electrophilic addition mechanism is shown in the drawing.



Synthetic student mechanism drawing.

Extract C S3 B2 c pH

B2(c): calculate pH of 0.0200 mol dm^{-3} NaOH at 25 °C. Maximum 3 marks. Available points: [OH−] and pOH; pH/pOH relation or Kw method; final pH 12.30.

Student response extract:

$$\mathrm{pOH} = 1.70$$

$$\mathrm{pH} = 1.70$$

Extract D S1 B5 c NMR

Compound X is known to be either propanal or propanone. Its singly charged molecular ion has m/z 58. Its IR spectrum has a strong absorption near 1720 cm^{-1}. Its high-resolution proton NMR spectrum shows a singlet integrating to six hydrogen atoms. Ignore trace impurities. B5(c) asks for identification and explanation. Maximum 3 marks. Available points: propanone; two equivalent methyl groups give one six-H environment; no H on the carbonyl carbon adjacent to each methyl group, so singlet.

Student response extract (verbatim):

X is propanone, CH_3COCH_3. Its two equivalent CH_3 groups give one environment integrating to six H. Each methyl carbon is directly adjacent to the carbonyl carbon, which has no attached H; there is no neighbouring H on that adjacent carbon to split the methyl protons, so the signal is a singlet.