

APOLLO

Electron-pair sharing reactions

HL

Chemistry

First assessment 2025

16 questions | mark schemes

Mark-scheme answers

Chemistry HL | Paper 1A | May 2025 TZ1 | Q36 | 1 marks

36. B

Chemistry HL | Paper 1A | May 2025 TZ1 | Q37 | 1 marks

37. C

Chemistry HL | Paper 1A | May 2025 TZ1 | Q38 | 1 marks

38. D

Chemistry HL | Paper 1A | May 2025 TZ1 | Q40 | 1 marks

40. C

Chemistry HL | Paper 1A | May 2025 TZ2 | Q11 | 1 marks

11. C

Chemistry HL | Paper 1A | May 2025 TZ3 | Q38 | 1 marks

38. A

Chemistry HL | Paper 1A | May 2025 TZ3 | Q40 | 1 marks

40. C

Chemistry HL | Paper 1A | Nov 2025 TZ1 | Q35 | 1 marks

35. B

Chemistry HL | Paper 1A | Nov 2025 TZ1 | Q38 | 1 marks

38. C

Chemistry HL | Paper 1A | Nov 2025 TZ1 | Q40 | 1 marks

40. A

Chemistry HL | Paper 1A | Nov 2025 TZ3 | Q38 | 1 marks

38. B

Chemistry HL | Paper 1A | Nov 2025 TZ3 | Q40 | 1 marks

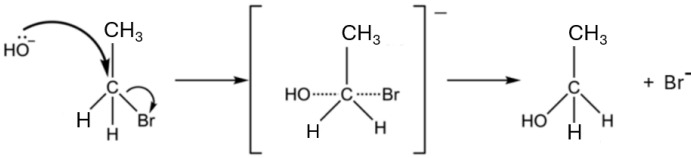
40. A

4.	(a)	(i)	electrophilic addition ✓		1
4.	(a)	(ii)	high electron density of C=C/pi bond ✓	<i>Do not accept only "presence of C=C".</i>	1

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4.	(b)	(i)	ALTERNATIVE 1: «bonds broken» C=C + H–Br / 614 + 366 / 980 «kJ mol ⁻¹ » AND «bonds formed» C–C + C–H + C–Br / 346 + 414 + 285 / 1045 «kJ mol ⁻¹ » ✓ «ΔH = 980 – 1045 ⇒ –65 «kJ mol ⁻¹ » ✓ ALTERNATIVE 2: «bonds broken» 1C=C + 4C–H + 1H–Br / 614 + 4×414 + 366 / 2636 «kJ mol ⁻¹ » AND «bonds formed» 1C–C + 5C–H + 1C–Br / 346 + 5×414 + 285 / 2701 «kJ mol ⁻¹ » ✓ «ΔH = 2636 – 2701 ⇒ –65 «kJ mol ⁻¹ » ✓	Award [2] for correct final answer. Award [1 max] for +65 «kJ mol ⁻¹ ».	2
4.	(b)	(ii)	Any two of: bond enthalpies are average values ✓ enthalpies of formation are specific to the compounds ✓ bond enthalpies apply to gases AND this reaction involves a liquid ✓ bond enthalpies do not account for the change of state ✓		2 max
4.	(b)	(iii)	two moles/molecules of reactants form one mole/molecule of product OR gaseous reactants form liquid product ✓		1

4.	(b)	(iv)	$\Delta S = 199 - 220 - 199 = -220 \text{ J K}^{-1} \text{ mol}^{-1}$ ✓ $\Delta G^\ominus = -65\,000 \text{ J mol}^{-1} - (298 \text{ K} \times -220 \text{ J K}^{-1} \text{ mol}^{-1})$ $\Delta G^\ominus = +560 \text{ J mol}^{-1}$ / «+»0.56 «kJ mol ⁻¹ » AND non-spontaneous ✓	Award [2] for correct final answer ($\Delta G^\ominus$ value and spontaneity). If $\Delta H = -58 \text{ kJ mol}^{-1}$ used, answer is «+»7600 «J mol ⁻¹ » / «+»7.6 «kJ mol ⁻¹ ».	2
4.	(c)	(i)	nucleophilic substitution ✓	Accept S_N2 , but not S_N1 .	1
4.	(c)	(ii)	 curly arrow from lone pair/negative charge on O in HO ⁻ to C ✓ curly arrow from C–Br bond to Br ✓ transition state showing negative charge AND partial bonds ✓	Award [2 max] for correct S_N1 mechanism if not stated in (i). Accept curly arrow going from C–Br bond to Br either in bromoethane or in the transition state for M2. Do not penalize if HO and Br are not at 180°, or the square bracket is missing, in M3. Do not award M3 if OH ---- C connection is seen.	3
4.	(c)	(iii)	primary halogenoalkane ✓	Accept reasons why, such as lack of steric hindrance or less stable carbocation.	1
4.	(c)	(iv)	2 / second ✓		1

4.	(c)	(v)	iodoethane AND «C–I» bond weaker/easier to break ✓	Accept "iodoethane AND I is a better leaving group".	1
4.	(c)	(vi)	quartet / quadruplet / 4 ✓		1
4.	(c)	(vii)	bromoethane AND absence of O–H «peak» AND in 3200–3600 «cm ⁻¹ range» OR bromoethane AND C–Br «peak» AND 500–600 «cm ⁻¹ » ✓	Accept specific value in 500 – 600 «cm ⁻¹ » range.	1

Question	Answers	Notes	Total
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Mark-scheme answers

Chemistry HL | Paper 1A | Specimen 2025 | Q38 | 1 marks

38. D

Chemistry HL | Paper 1A | Specimen 2025 | Q39 | 1 marks

39. C

Chemistry HL | Paper 1A | Specimen 2025 | Q40 | 1 marks

40. A