

Multiple Choice Answers

Q1: D

Q3: C

Q9: B

3(a)	M1 2H ₂ O M2 state symbols (aq) and (l)
3(b)	neutralisation
3(c)	$0.0100 \times 1000 \div 40 = 0.25(0)$
3(d)	burette
3(e)	M1 mol H ₂ SO ₄ needed = $0.0100 \div 2 = 0.005(00)$ M2 vol of H ₂ SO ₄ needed = $0.005(00) \div 0.200 \times 1000 = 25 \text{ (cm}^3\text{)}$
3(f)	M1 yellow M2 orange
3(g)	repeat steps 1 and 3 without indicator
3(h)(i)	M1 (a solution containing the) maximum concentration of a solute dissolved in the solvent M2 at a specified temperature
3(h)(ii)	solubility decreases as temperature decreases
3(h)(iii)	none

4(a)	M1 energy level of products below energy level of reactants M2 label of $\text{SO}_2(\text{g}) + 4\text{HF}(\text{g})$ on product line M3 upward arrow labelled E_a from energy level of reactants to the highest point of the curve M4 one downward arrow labelled ΔH AND energy change starting from energy level of reactants and finishing at energy level of products
4(b)	M1 $= (4 \times \text{S-F}) + (4 \times \text{O-H}) = (4 \times 330) + (4 \times 460) = 3160$ M2 bond energy of products $- 3160 = -54$ $= 3160 - (-54) = 3214$ M3 $(2 \times \text{S=O}) + (4 \times \text{H-F}) = 3214$ therefore $2 \times \text{S=O} = 3214 - (4 \times 570) = 934$ M4 $\text{S=O} = \text{M3} \div 2 = 934 \div 2 = 467$
4(c)	increased temperature: M1 (position of) equilibrium moves to left hand side M2 reaction is exothermic increased pressure: M3 (position of) equilibrium moves to left hand side M4 less (gaseous) moles on left hand side M5 no change / catalyst does not affect position of equilibrium
4(d)	M1 kinetic energy of particles decreases M2 frequency of collisions between particles decreases M3 lower percentage/proportion/fraction of collisions / particles have energy greater than / equal to activation energy

3(a)(i)	aluminium oxide
3(a)(ii)	cryolite
3(a)(iii)	carbon
3(a)(iv)	$\text{Al}^{3+} + 3\text{e}^- \rightarrow \text{Al}$ M1 only $\text{Al}^{3+} + 3\text{e}^-$ on the left M2 equation completely correct
3(b)(i)	unreactive coating of aluminium oxide
3(b)(ii)	$2\text{Al} + 3\text{Zn}^{2+} \rightarrow 2\text{Al}^{3+} + 3\text{Zn}$
3(b)(iii)	M1 $\text{Zn}^{2+} = +2$ M2 $\text{Zn} = 0$ / zero
3(b)(iv)	decrease in oxidation number
3(c)(i)	enthalpy change (of reaction)
3(c)(ii)	(forward) reaction is exothermic
3(d)	oxides that react with acids AND with bases to produce a salt and water

3(e)	$2\text{NaOH} + \text{Ga}_2\text{O}_3 \rightarrow 2\text{NaGaO}_2 + \text{H}_2\text{O}$ M1 NaGaO ₂ on the right-hand side of an equation M2 equation fully correct				
3(f)	M1 GaBr ₃ M2 Ga ₂ (SO ₄) ₃				
4(a)(i)	- rates are equal - concentrations are no longer changing				
4(a)(ii)	<table border="1"> <tr> <td>M1 decreases</td><td>M2 decreases</td></tr> <tr> <td></td><td>M3 no change</td></tr> </table>	M1 decreases	M2 decreases		M3 no change
M1 decreases	M2 decreases				
	M3 no change				
4(a)(iii)	forward reaction is exothermic				
4(b)	USUAL METHOD M1 2490 M2 2670 M3 -180 ALTERNATIVE METHOD M1 850 M2 1030 M3 -180				
4(c)	M1 3 dot and cross bonding pairs M2 one lone pair on the N atom (to complete the N octet) M3 three lone pairs on each Cl atom (to complete each Cl octet)				
4(d)(i)	M1 solid disappears M2 effervescence/bubbling/fizzing				
4(d)(ii)	M1 $0.005 \div 5 \times 10^{-3}$ (mol) M2 $0.0025 \div 2.5 \times 10^{-3}$ (mol) M3 60 (cm ³)				

Multiple Choice Answers

Q6: B

Multiple Choice Answers

Q2: D

Multiple Choice Answers

Q1: C

Q3: C

Q4: B

Q9: C

Multiple Choice Answers

Q1: A

Q10: C

Q16: C