

Multiple Choice Answers

Q21: B

Q22: D

Q23: B

1(a)(i)	(halogens can) remove electron(s) (from a reactant)																
1(a)(ii)	$2Al + 3Cl_2 \rightarrow 2AlCl_3$																
1(a)(iii)	purple (gas) disappears																
1(b)(i)	M1 Br—Br is weaker (than Cl—Cl) AND Br atoms are larger M2 less (significant) overlap of orbitals (in Br-Br)																
1(b)(ii)	HCl is more thermally stable																
1(b)(iii)	M1 (enthalpy change / energy change) when one mole of a compound / substance is formed M2 from its (constituent) elements in their standard state(s)																
1(b)(iv)	M1 $(6 \times -92) - (2 \times -46) =$ M2 $-460 \text{ (kJ mol}^{-1}\text{)}$																
1(b)(v)	M1 (trigonal) pyramidal M2 three bonding pairs AND one lone pair (of electrons)																
1(c)(i)	<table><tr><td></td><td>NaCl</td><td>NaBr</td><td>NaI</td></tr><tr><td>with Ag⁺(aq)</td><td>white precipitate</td><td>M1 cream / off-white ppt</td><td>M2 yellow ppt</td></tr><tr><td>with conc. H₂SO₄</td><td>acid – base</td><td>acid – base, then redox</td><td>acid – base, then redox</td></tr><tr><td>observations with conc. H₂SO₄</td><td>M3 steamy fumes OR fizzing</td><td>M4 brown liquid OR fizzing</td><td> • black solid • yellow solid • effervescence </td></tr></table>		NaCl	NaBr	NaI	with Ag ⁺ (aq)	white precipitate	M1 cream / off-white ppt	M2 yellow ppt	with conc. H ₂ SO ₄	acid – base	acid – base, then redox	acid – base, then redox	observations with conc. H ₂ SO ₄	M3 steamy fumes OR fizzing	M4 brown liquid OR fizzing	• black solid • yellow solid • effervescence
	NaCl	NaBr	NaI														
with Ag ⁺ (aq)	white precipitate	M1 cream / off-white ppt	M2 yellow ppt														
with conc. H ₂ SO ₄	acid – base	acid – base, then redox	acid – base, then redox														
observations with conc. H ₂ SO ₄	M3 steamy fumes OR fizzing	M4 brown liquid OR fizzing	• black solid • yellow solid • effervescence														
1(c)(ii)	M1 black solid = iodine / I ₂ AND yellow solid = sulfur / S ₈ M2 effervescence = hydrogen sulfide / H ₂ S(g)																
1(d)(i)	M1 MgCl ₂ (is ionic and) has mobile ions M2 SiCl ₄ is covalent AND no charge carriers OR (no ions and) no delocalised electrons OR no mobile / moving ions																
1(d)(ii)	M1 MgCl ₂ pH = 7 M2 SiCl ₄ pH 0 – 4																

3(a)(i)	M1 Heat (solid FA 5) AND observe condensation, droplets, steam, water vapour M2 Make an aqueous solution of FA 5 / dissolve in water to use for tests M3 (To portion of the solution) add aqueous NH ₃ AND white ppt AND insoluble in excess NH ₃ M4 (To portion of the solution) add aqueous barium chloride or barium nitrate AND white precipitate M5 to distinguish sulfate / sulfite (white precipitate from M4) insoluble in hydrochloric OR nitric acid OR KMnO ₄ is not decolourised / remains purple (added after M4 or directly to FA 5 (aq))																									
3(a)(ii)	<table><tr><td>Zn²⁺</td><td>X</td></tr><tr><td>SO₄²⁻</td><td>✓</td></tr><tr><td>H₂O</td><td>✓</td></tr></table>			Zn ²⁺	X	SO ₄ ²⁻	✓	H ₂ O	✓																	
Zn ²⁺	X																									
SO ₄ ²⁻	✓																									
H ₂ O	✓																									
3(b)(i)	• (FA 6) starting colour purple • solid jumps / moves around • black residue • test with glowing splint • splint relights / glows more brightly																									
3(b)(ii)	(dark) Green																									
3(c)(i)	'No change' 2 correct = *, 3 correct = ** 2* = 1 mark Max mark = 4 <table><tr><th rowspan="2">test</th><th colspan="3">observations</th></tr><tr><th>FA 7</th><th>FA 8</th><th>FA 9</th></tr><tr><td>Test 1 Add hydrogen peroxide</td><td>Bubbles/ effervescence * Purple / FA 7 (solution) to colourless (solution) * (Gas / oxygen) relights glowing splint *</td><td>No change</td><td>Bubbles / effervescence * (Gas/ oxygen) relights glowing splint *</td></tr><tr><td>Test 2 Add sodium hydroxide, then</td><td></td><td>Off-white ppt*</td><td>No change</td></tr><tr><td>leave to stand</td><td></td><td>brown ppt on standing*</td><td></td></tr><tr><td>Test 3 Add aqueous iron(II) sulfate</td><td>Turns colourless / yellow OR colourless / yellow solution formed*</td><td>No change</td><td></td></tr></table>			test	observations			FA 7	FA 8	FA 9	Test 1 Add hydrogen peroxide	Bubbles/ effervescence * Purple / FA 7 (solution) to colourless (solution) * (Gas / oxygen) relights glowing splint *	No change	Bubbles / effervescence * (Gas/ oxygen) relights glowing splint *	Test 2 Add sodium hydroxide, then		Off-white ppt*	No change	leave to stand		brown ppt on standing*		Test 3 Add aqueous iron(II) sulfate	Turns colourless / yellow OR colourless / yellow solution formed*	No change	
test	observations																									
	FA 7	FA 8	FA 9																							
Test 1 Add hydrogen peroxide	Bubbles/ effervescence * Purple / FA 7 (solution) to colourless (solution) * (Gas / oxygen) relights glowing splint *	No change	Bubbles / effervescence * (Gas/ oxygen) relights glowing splint *																							
Test 2 Add sodium hydroxide, then		Off-white ppt*	No change																							
leave to stand		brown ppt on standing*																								
Test 3 Add aqueous iron(II) sulfate	Turns colourless / yellow OR colourless / yellow solution formed*	No change																								
3(c)(ii)	manganese / Mn																									

3(c)(iii)		FA 6 / FA 7	FA 8
	oxidation state	(+)7	(+)2