

Question number	Answer	Marks	Guidance
1 (a)	NaBr ONLY	1	Penalise incorrect case or additional formulae. Ignore names
1 (b)	NaF ONLY	1	Penalise incorrect case or additional formulae. Ignore names
1 (c)	<u>ONLY one</u> from either NaF OR NaCl	1	Penalise incorrect case or additional formulae. Ignore names
1 (d)	NaI ONLY	1	Penalise incorrect case or additional formulae. Ignore names
2 (a)	M1 Used in a barium meal / barium swallow / barium enema OR (used to absorb) X-rays M2 <u>BaSO₄ / barium sulfate / it is insoluble</u>	2	Credit a correct reference to M1 written in the explanation in M2 unless contradictory. For M2 penalise obvious reference to barium or to barium ions being insoluble.
2 (b)	$\text{Mg(OH)}_2 + 2\text{HCl} \rightarrow \text{MgCl}_2 + 2\text{H}_2\text{O}$	1	Or multiples. Ignore state symbols.
2 (c)	It / magnesium hydroxide is insoluble / insufficiently soluble / sparingly soluble / less soluble than barium hydroxide / forms low concentration solutions	1	Weak alkali alone is insufficient. Formation of a precipitate needs explanation.
2 (d)	$\text{TiCl}_4 + 2\text{Mg} \rightarrow 2\text{MgCl}_2 + \text{Ti}$	1	Or multiples. Ignore state symbols.'
2 (e)	M1 Hydrogen / H ₂ produced OR an equation to produce hydrogen / H ₂ (eg $\text{Mg} + 2\text{H}_2\text{O} \rightarrow \text{Mg(OH)}_2 + \text{H}_2$) (eg $\text{Mg} + \text{H}_2\text{O} \rightarrow \text{MgO} + \text{H}_2$) M2 requires correct M1 risk of explosion OR forms explosive mixture (with air) OR (highly) flammable	2	For M1 Do not penalise an incorrect equation; the mark is for H ₂ or hydrogen. Award one mark only for 'exothermic reaction with steam / H ₂ O' for a student who has not scored M1 Ignore 'violent' reaction.
3 (a) (i)	M1 (+) 4 OR IV	2	

	M2 (+) 6 OR VI		
3 (a) (ii)	It / Chlorine has gained / accepted electron(s) OR Correctly balanced half-equation eg $\text{Cl}_2 + 2\text{e}^- \rightarrow 2\text{Cl}^-$	1	Credit 1 or 2 electrons but not lone pair. The idea of 'reduction' alone is not enough.
3 (b) (i)	$6\text{KI} + 7\text{H}_2\text{SO}_4 \rightarrow 6\text{KHSO}_4 + 3\text{I}_2 + \text{S} + 4\text{H}_2\text{O}$	1	
3 (b) (ii)	$2\text{I}^- \rightarrow \text{I}_2 + 2\text{e}^-$ OR $8\text{I}^- \rightarrow 4\text{I}_2 + 8\text{e}^-$	1	Ignore charge on the electron unless incorrect. Or multiples. Credit the electrons being subtracted on the LHS. Ignore state symbols.
3 (b) (iii)	$\text{H}_2\text{SO}_4 + 8\text{H}^+ + 8\text{e}^- \rightarrow \text{H}_2\text{S} + 4\text{H}_2\text{O}$ OR $\text{SO}_4^{2-} + 10\text{H}^+ + 8\text{e}^- \rightarrow \text{H}_2\text{S} + 4\text{H}_2\text{O}$	1	Ignore charge on the electron unless incorrect. Or multiples. Credit the electrons being subtracted on the RHS. Ignore state symbols.
3 (c) (i)	$\text{Ag}^+ + \text{I}^- \rightarrow \text{AgI}$ ONLY	1	Ignore state symbols. Not multiples.
3 (c) (ii)	The precipitate / solid / it does not dissolve / is insoluble / remains OR a <u>white / cream / yellow solid / precipitate</u> OR stays the same OR no (visible / observable) change OR no effect / no reaction	1	Ignore 'nothing (happens)'. Ignore 'no observation'.
3 (c) (iii)	The silver nitrate is acidified to • react with / remove <u>(an)ions that would interfere with the test</u> • prevent the formation of other <u>silver precipitates / insoluble silver compounds</u> that would interfere with the test • remove (other) <u>ions that react with the silver nitrate</u> • react with / remove carbonate / hydroxide / sulfite (ions)	1	Credit a correct reference to ions that give a 'false positive'. Do not penalise an incorrect formula for an ion that is written in addition to the name. If only the formula of the ion is given, it must be correct. Ignore 'sulfate'.
3 (c) (iv)	HCl would <u>form a (white) precipitate / (white) solid</u> (with silver nitrate and this would interfere with the test)	1	It is not sufficient simply to state either that it will interfere or simply that the ions / compounds react to form AgCl
3 (d) (i)	Any one from • to sterilise / disinfect water • to destroy / kill microorganisms / bacteria / microbes / pathogens	1	Ignore 'to clean water'. Ignore 'water purification' and 'germs'. Credit 'remove bacteria etc' / prevent algae.

3 (d) (ii)	The (health) benefit outweighs the risk OR a clear statement that once it has done its job, little of it remains OR used in (very) dilute concentrations / small amounts / low doses	1	
3 (d) (iii)	$\text{Cl}_2 + \text{H}_2\text{O} \rightarrow \text{HClO} + \text{HCl}$ OR $\text{Cl}_2 + \text{H}_2\text{O} \rightarrow 2\text{H}^+ + \text{ClO}^- + \text{Cl}^-$ OR $2\text{Cl}_2 + 2\text{H}_2\text{O} \rightarrow 4\text{HCl} + \text{O}_2$	1	Credit HOCl or ClOH Or multiples. Credit other ionic or mixed representations. Ignore state symbols.
3 (e)	In either order - Both required for one mark only NaClO (OR NaOCl) and NaCl	1	Credit correct ionic formulae. Give credit for answers in equations unless contradicted.
4 (a) (i)	<p>Si: cross = 1200</p> <p>Cl: cross below S</p> <p>Ar: cross below Cl</p>	1 1 1	
4 (a) (ii)	Si is macromolecular covalent bonds need to be broken a covalent bond is strong and requires much energy to break	1 1 1	You must say broken bonds not just weakened bonds. Silicon has a giant structure with many covalent bonds that need to be broken. If van der Waals or other forces are mentioned you lose the marks! You also lose them if you mention ions because they are not there!
4 (a) (iii)	intermolecular force = van der Waals/ induced this is greater with greater M_r	1	

	sulfur has greater M_r	1	
4 (b)	<i>trend:</i> decreases increase in size of atom weaker attraction for delocalised electrons/ weaker metallic bonding	1 1 1	If the trend is wrong you lose the explanation marks too.