

A Level AQA Chemistry

Chapter 10 – answers

Question	Answers	Extra information	Mark	AO Spec reference
01.1	Al ³⁺ : 1s ² , 2s ² , 2p ⁶ Cl ⁻ : 1s ² , 2s ² , 2p ⁶ , 3s ² , 3p ⁶		1 1	3.1.1.3 AO1
01.2	Both have outermost electrons in p shells		1	3.2.1.1 AO1
01.3	Aluminium Less nuclear charge / fewer protons Same shielding		1 1 1	3.2.1.2 AO3
01.4	Add nitric acid Add silver nitrate solution Observe white for chloride and cream for bromide precipitates Add <u>dilute</u> ammonia solution White Chloride precipitate will dissolve Cream Bromide will not	Allow other strong acid that is not hydrochloric Allow 'ammonia solution'	1 1 1 1 1 1	3.2.3.1 AO1
02.1	The energy required to remove 1 mole of electrons From 1 mole of gaseous +1 ions Under standard conditions		1 1 1	3.1.1.3 AO1
02.2	S ⁺ (g) → S ²⁺ (g) + e ⁻		1	3.1.1.3 AO3
02.3	Sulfur/S Because outer electron is in 3p ⁴ Paired electron easier to remove due to repulsion		1 1 1	3.2.1.2 AO3
02.4	Less nuclear charge BUT Much less shielding / less distance between the nucleus and outer electron Harder to remove outer electron	The answer must clearly indicate that shielding is the more important factor in this case. Allow reverse augment	1 1 1	3.2.2 AO1

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03.1	Silicon has highest melting point Macromolecular /giant covalent Lots of Strong (covalent) bonds need to be broken		1 1 1	3.2.1.2 AO3
03.2	Argon/Ar Largest nuclear charge Same shielding		1 1 1	3.2.1.2 AO1
03.3	Increases as you go down Van der Waals forces increase As diatomic molecules/covalent molecules have more electrons	Allow reverse augment	1 1 1	3.2.3.1 AO1
03.4	Fluorine Lowest shielding Strong attraction to electrons	Allow smallest atomic radius if qualified	1 1 1	3.2.3.1 AO1
04.1	$\text{Cl}_2 + 2 \text{I}^- \rightarrow 2\text{Cl}^- + \text{I}_2$	Ignore state symbols	1	3.2.3.1 AO1
04.2	I^- , iodide		1	3.1.7 AO3
04.3	$\text{Cl}_2 + \text{H}_2\text{O} \rightarrow 2\text{HCl} + \text{HOCl}$ Disproportionation		1 1	3.2.3.2 AO1
04.4	$\text{Cl}_2 + \text{H}_2\text{O} \rightleftharpoons \text{HCl} + \frac{1}{2} \text{O}_2$ Lowers pH	Allow multiples must be reversible	1 1	3.2.3.2 AO1
04.5	Low concentration so low risk		1 1	3.2.3.2 AO3

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05.1	Lithium		1	3.2.1.1 AO1
05.2	More shells (in Ca) SO Larger ionic radius Weaker attraction/bonds between metal ions and delocalised electrons	Allow reverse augment	1 1 1	3.2.2 AO1
05.3	Mg(OH) ₂		1	3.2.2 AO1
05.4	Ba ²⁺ (aq) + SO ₄ ²⁻ (aq) → BaSO ₄ (s) (Moles BaCl ₂ = 0.25 × 0.011 = 0.00275) (Moles Na ₂ SO ₄ = 0.35 × 0.006 = 0.0021) BaCl ₂ in excess Vol Na ₂ SO ₄ = 0.00275/0.35 = 0.00785 dm ³ = 7.85 cm ³	State symbols required Must have some sort of calculation to prove excess Accept rounding to 7.9 cm ³	1 1 1	3.2.2/3.1.2.5 AO2/3
06.1	Oxidising agent		1	3.1.7 AO1
06.2	$pV = nRT$ $p = 100000$ $T = 298$ $\text{mol (I}_2) \frac{1000}{2 \times 126.9} = 3.9401\dots = \text{mol (SO}_2)$ $V = \frac{3.9401\dots \times 8.31 \times 298}{100000} = 9.757 \times 10^{-2} \text{ m}^3$ 97.6 dm ³	Or rearrangement This equation scores 4	1 1 1 1 1	3.1.2.3 AO2 MS2.2, 2.3, 2.4

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06.3	$6\text{KI} + 7\text{H}_2\text{SO}_4 \rightarrow 6\text{KHSO}_4 + 3\text{I}_2 + \text{S} + 4\text{H}_2\text{O}$ Purple fumes Brown solution	Ignore state symbols 1st mark for correct products 2nd mark for balancing	2 1 1	3.2.3.2 AO1
06.4	Nitric acid Silver nitrate Both precipitates seen (cream Br^- / yellow I^-) Addition of <u>concentrated</u> ammonia Br^- ppte dissolves	Allow any strong acid except hydrochloric	1 1 1 1	3.2.3.1 AO3
07.1	$\text{Ca(s)} + 2\text{H}_2\text{O(l)} \rightarrow \text{Ca}^{2+}(\text{aq}) + 2\text{OH}^-(\text{aq}) + \text{H}_2(\text{g})$ Oxidising agent		1 1	3.2.2, 3.1.7 AO1
07.2	any number between 8–12		1	3.2.2 AO1
07.3	BaCl_2 / Ba(OH)_2 / $\text{Ba(NO}_3)_2$ / BaX_2 or names Nitrate = colourless solution / no (visible) change / no precipitate / no (visible) reaction Sulfate = white precipitate $\text{Ba}^{2+}(\text{aq}) + \text{SO}_4^{2-}(\text{aq}) \rightarrow \text{BaSO}_4(\text{s})$		1 1 1 1	3.2.2 AO3
07.4	Increases		1	3.2.2 AO1
07.5	$\text{Mg(OH)}_2 + 2\text{HCl} \rightarrow \text{MgCl}_2 + 2\text{H}_2\text{O}$	Allow other acids as long as balanced. Must be magnesium	1	3.2.2 AO1

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08.1	Base		1	3.1.12.1 AO1
08.2	$2\text{NaBr} + 2\text{H}_2\text{SO}_4 \rightarrow \text{Na}_2\text{SO}_4 + \text{Br}_2 + \text{SO}_2 + 2\text{H}_2\text{O}$ Reducing agent Bromide ions are bigger So easier to lose an electron/be oxidised	Ignore state symbols	1 1 1 1	3.2.3.2, 3.1.7 AO1/3
08.3	Equilibrium shifts to the right H^+ ions are used up Equilibrium shifts to replace them		1 1 1	3.1.6.1 AO3

Skills box answers:

- It would be difficult to determine which compound is causing which result.
- MgI₂ magnesium iodide
 $\text{Mg}^{2+}(\text{aq}) + \text{OH}^{-}(\text{aq}) \rightarrow \text{Mg}(\text{OH})_2(\text{s})$
 $\text{Mg}^{2+}(\text{aq}) + \text{SO}_4^{2-}(\text{aq}) \rightarrow$ no reactions as MgSO₄ is soluble
 $\text{Ag}^{+}(\text{aq}) + \text{I}^{-}(\text{aq}) \rightarrow \text{AgI}(\text{s})$
- CaCO₃ calcium carbonate
 $\text{CO}_3^{2-}(\text{s}) + 2\text{H}^{+}(\text{aq}) \rightarrow \text{CO}_2(\text{g}) + \text{H}_2\text{O}(\text{l})$
 $\text{Ca}^{2+}(\text{aq}) + \text{SO}_4^{2-}(\text{aq}) \rightarrow \text{CaSO}_4(\text{s})$
 $\text{Ca}^{2+}(\text{aq}) + \text{OH}^{-}(\text{aq}) \rightarrow \text{Ca}(\text{OH})_2(\text{s})$