A Level OCR Chemistry

Chapter 6 – answers

Question	Answers	Extra information	Mark	AO Spec reference
1(a)	Al^{3+}: $1s^2$, $2s^2$,$2p^6$ Cl^-: $1s^2$,$2s^2$,$2p^6$,$3s^2$,$3p^6$		1 1	2.2.1 AO1
1(b)	Both have outermost electrons in p block		1	3.1.1 AO1
1(c)	Aluminium Less nuclear charge Same shielding		1 1 1	3.1.1 AO1
1(d)	Add nitric acid Add silver nitrate solution Observe white and cream precipitates Add dilute ammonia Chloride: white precipitate will dissolve Bromide: cream precipitate will not dissolve	Allow other strong acid that is not hydrochloric Allow 'ammonia solution'	1 1 1 1 1 1	3.1.3 AO3
2(a)	Decreases Nuclear charge increases But increasing shielding makes electron easier to remove		1 1 1	3.1.1 AO1
2(b)	Increased van der Waals More energy needed to separate **molecules**	 Not atoms	1 1	2.2.2 AO1
2(c)	Fluorine has 7 outer shell electrons/needs 1 electron so very reactive Fluoride has a full outer shell so unreactive	Accept configuration of a noble gas Must at least once connect electron shells to reactivity	1 1	3.1.3 AO1
2(d)	$Xe(g) + 2F_2(g) \rightarrow XeF_4(s)$		1	2.1.2 AO1

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2(e)	XeF_4: Square planar shape 2 lone pairs and 4 bonding pairs 90° KrF_2: linear 3 lone pairs and 2 bonding pairs 180°		1 1 1 1 1 1	2.2.2
2(f)	van der Waals		1	2.2.2 AO1
2(g)	M_r XeF_2 = 131.3 + 19 + 19 = 169.3 4500/169.3 = 26.58 moles Mass = 38 × 26.58 = 1010.4 g (1.01 kg)		1 1 1	2.1.3 AO2
3(a)	Silicon has highest melting point macromolecular /giant covalent Lots of strong (covalent) bonds need to be broken		1 1 1	2.2.2 AO1
3(b)	Argon/Ar Largest nuclear charge Same shielding		1 1 1	3.1.1 AO1
3(c)	Increases as you go down Van der Waals increase As diatomic molecules/covalent molecules have more electrons		1 1 1	3.1.3 AO1
3(d)	Fluorine Lowest shielding Strong attraction to electrons	Allow smallest atomic radius if qualified	1 1 1	3.1.3 AO1
4(a)(i)	$Cl_2 + 2I^- \rightarrow 2Cl^- + I_2$	Ignore state symbols	1	2.1.2 AO1

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4(a)(ii)	Iodide		1	3.1.3 AO1
4(b)	$Cl_2 + H_2O \rightarrow 2HCl + HOCl$ Disproportionation		1 1	3.1.3 AO1
4(c)	$Cl_2 + H_2O \rightarrow HCl + ½O_2$ Lowers pH	Allow multiples must be reversible	1 1	3.2.3 AO3
4(d)	Low concentration So low risk		1 1	3.1.3 AO3
5(a)	Lithium		1	2.2.2 AO3
5(b)	Larger ionic radius More shells Weaker attraction/bonds between metal ions and delocalised electrons / weaker metallic bonds		1 1 1	2.2.2 AO3
5(c)	$Mg(OH)_2$		1	3.1.2 AO1
5(d)(i)	$Ba^{2+} + SO_4^{2-} \rightarrow BaSO_4$	Ignore state symbols	1	2.1.3
5(d)(ii)	(Moles $BaCl_2 = 0.25 \times 0.011 = 0.00275$) (Moles $Na_2SO_4 = 0.35 \times 0.006 = 0.0021$) $BaCl_2$ in excess Vol $Na_2SO_4 = 0.00275/0.35 = 0.00785\ dm^3 = 7.85\ cm^3$	Must have some sort of calculation to prove excess Accept rounding to 7.9 cm^3	1 1	3.1.2 AO2
6(a)	Oxidising agent		1	2.1.5 AO3

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6(b)	$PV = nRT$ $P = 100\,000$ $T = 298$ 1000 g I_2 = 1000/126.9 = 7.8802… mol (mol of I_2 = mol of SO_2) $V = \frac{7.8802 \times 8.31 \times 298}{100\,000} = 0.195\ m^3$ 195 dm^3	Or rearrangement	1 1 1 1 1	2.1.3 AO2
7(a)(i)	$Ca(s) + 2H_2O(l) \rightarrow Ca^{2+}(aq) + 2OH^-(aq) + H_2(g)$ Oxidising agent	1st mark equation 2nd mark state symbols	2 1	3.1.2 AO1
7(a)(ii)	Accept any pH between 8 and 12		1	3.1.2 AO1
7(b)	$BaCl_2$ / $Ba(OH)_2$ / $Ba(NO_3)_2$ / BaX_2 or names Nitrate = colourless solution / no (visible) change (nvc) / no ppt / no (visible) reaction Sulfate = white precipitate $Ba^{2+}(aq) + SO_4^{2-}(aq) \rightarrow BaSO_4(s)$		1 1 1 1	3.1.2 AO3
7(c)	Increases		1	3.1.2 AO1
7(d)	$Mg(OH)_2 + 2HCl \rightarrow MgCl_2 + 2H_2O$		1	3.1.2 AO1

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Skills box answers:

1. Ignore rough and 1st $\frac{32.00 + 32.55 + 32.50}{3} = 32.35\,cm^3$

2. $\frac{(20.52 \times 70) + (27.45 \times 72) + (7.76 \times 73) + (36.52 \times 74) + (7.75 \times 76)}{100} = 72.7$

3. Ignore rough and 4th $\frac{15.0 + 14.0 + 14.5}{3} = 14.5\,cm^3$