A Level OCR Chemistry

Chapter 7 – answers

Question	Answers	Extra information	Mark	AO Spec reference
1(a)	$Sr^{2+}(g) \rightarrow Sr^{3+}(g) + e^-$	State symbols for Sr species required.	1	AO1 3.1.1
1(b)	Add (hydrochloric) acid to the mixture Filter	Accept other acids	1 1	AO3 3.1.4
1(c)	Add water Filter the solution Evaporate the filtrate	 Allow any method that would evaporate the water	1 1 1	AO3 3.1.2
1(d)	Add acid to both Carbonate will fizz/effervescence, sulfate will not		1 1	3.1.4 AO1
2(a)	Sodium has metallic bonding Positive metal ions and (a sea of) delocalised electrons Sodium chloride is ionic Strong electrostatic attraction between oppositely charged ions More energy required to break the stronger ionic bonds		1 1 1 1 1	2.2.2 AO3
2(b)	Marks awarded for this answer will be determined by the quality of written communication as well as the standard of the scientific response. Examiners should apply a 'best-fit' approach to the marking. **Additional tests limits to lower mark within a level.** This would include, for example, adding silver nitrate to the already identified sodium carbonate. Use of hydrochloric acid with silver nitrate also limits to lower mark within a level as this would not be a logical sequence/method that would work. Level 3 (5–6 marks): All stages are covered and each stage is generally correct and virtually complete.		6	3.1.4 AO3

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	<table><tr><td></td><td>Answer is communicated coherently and shows a logical progression from Stage 1 to Stages 2 and 3 to identify all three compounds in a logical sequence with results and equations for all compounds stated. **Covers 2 tests with matching observations, conclusions and equations**</td></tr><tr><td>Level 2 3–4 marks</td><td>All stages are covered but stage(s) may be incomplete or may contain inaccuracies OR two stages are covered and are generally correct and virtually complete. Answer is communicated mainly coherently and shows a logical progression from Stage 1 to Stages 2 and 3. **Covers 2 compounds** Isolated tests on named compounds – max LEVEL 2</td></tr><tr><td>Level 1 1–2 marks</td><td>Two stages are covered but stage(s) may be incomplete or may contain inaccuracies OR only one stage is covered but is generally correct and virtually complete. Answer includes isolated statements but these are not presented in a logical order.</td></tr></table>	**Indicative Chemistry Content** **Stage 1:** Suggested tests 1a Add named acid to all 3 1b Add water / make into a solution 1c Add $AgNO_3$ Ignore addition of NH_3 / Ignore additional test for CO_2 produced **Stage 2:** Expected observations - conclusions 2a Na_2CO_3 will fizz with acid 2b NaCl gives white ppt with $AgNO_3$ 2c NaF shows no (visible) change / no ppt Additional incorrect observations loses point **Stage 3:** Equations – state symbols must match method 3a $Na_2CO_3 + 2HNO_3 \rightarrow 2NaNO_3 + CO_2 + H_2O$ … or ionic 3b $AgNO_3 + NaCl \rightarrow AgCl + NaNO_3$ … or ionic 3c correct state symbols		

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3(a)	Insoluble barium sulfate is formed	Allow 'removes barium ions as a precipitate'.	1	3.1.4 AO1
3(b)	Add nitric acid and silver nitrate Cream precipitate Add dilute ammonia No visible change / on dissolves slightly		1 1 1 1	3.1.4 AO1
3(c)	$Ca + Br_2 \rightarrow CaBr_2$ $M_r\ CaBr_2 = 199.9$ Actual mass needed = 500 × 100/93 = 537.6 kg Moles = 537 600/199.9 = 2690 moles Mass of Br_2 = 2690 × (2 × 79.9) = 429 800g (429.8 kg)	Allow e.c.f. for incorrect M_r Allow any suitable rounding.	 1 1 1 1	2.1.3 AO2 M0.0, M0.1, M0.4, M1.1, M2.2, M2.3, M2.4
4(a)	The ability for an atom to attract the pair of electrons in a **covalent** bond. Fluorine is the most electronegative		1 1	2.2.2 AO1
4(b)	Iodine has greater van der Waals forces Because it has more electrons		1 1	2.2.2 AO1
4(c)(i)	Removes/reacts with carbonate ions Which form a precipitate with silver ions	 Allow 'false positive'	1 1	3.1.4 AO1
4(c)(ii)	**Concentrated** ammonia Does not dissolve the ppt of AgI		1 1	3.1.4 AO1
5(a)	$NH_4^+ \rightarrow NH_3 + H^+$		1	5.1.3 AO1
5(b)(i)	Add NaOH and warm Ammonia released Detected via appropriate means (red litmus paper goes blue/UI paper goes blue)		1 1 1	3.1.4 AO3

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5(b)(ii)	$(NH_4)_2SO_4 + 2NaOH \rightarrow Na_2SO_4 + 2NH_3 + 2H_2O$		1	2.1.3 AO1
6(a)	Moles $Cl_2 = 57/71 = 0.803$ $T = 373K$ $V = \frac{nRT}{P}$ $V = \frac{0.803 \times 8.31 \times 373}{100\,000} = 0.02488\,m^3$ $24.88\,dm^3$	E.c.f. from incorrect moles Can be awarded from working Allow answers that rounds to 24.9	1 1 1 1 1	2.1.3 AO2 M0.0, M0.1, M0.4, M1.1, M2.2, M2.3, M2.4
6(b)	This question is marked using levels of response. Refer to the Mark Scheme Instructions for Examiners for guidance on how to mark this question. **Level 3** All stages are covered and the explanation of each stage is generally correct and virtually complete. Stages 1 and 2 are supported by correct equations. Answer communicates the whole process coherently and shows a logical progression from stage 1 to stage 2 and then stage 3. The steps in stage 3 are in a logical order. **5–6 marks** **Level 2** All stages are covered but the explanation of each stage may be incomplete or may contain inaccuracies OR two stages are covered and the explanations are generally correct and virtually complete.		6	3.1.4 AO3
	Answer is mainly coherent and shows a progression through the stages. Some steps in each stage may be out of order and incomplete. **3–4 marks**			

Question	Answers	Extra information	Mark	AO Spec reference
	Level 1 Two stages are covered but the explanation of each stage may be incomplete or may contain inaccuracies, OR only one stage is covered but the explanation is generally correct and virtually complete. Answer includes some isolated statements, but these are not presented in a logical order or show confused reasoning. **1–2 marks** **Level 0** Insufficient correct chemistry to warrant a mark. **0 marks**	**Indicative chemistry content** **Stage 1:** formation of precipitates • Add nitric acid then silver nitrate • to form precipitates of $AgCl$ and $AgBr$ • $AgNO_3 + NaCl \rightarrow AgCl + NaNO_3$ • $AgNO_3 + NaBr \rightarrow AgBr + NaNO_3$ **Stage 2:** selective dissolving of $AgCl$ • Add excess of dilute ammonia to the mixture of precipitates • the silver chloride precipitate dissolves • $AgCl + 2NH_3 \rightarrow Ag(NH_3)_2^+ + Cl^-$ **Stage 3:** separation and purification of $AgBr$ • Filter off the remaining silver bromide precipitate • Wash to remove soluble compounds • Dry to remove water		

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6(c)	$Cl_2 + 2OH^- \rightarrow OCl^- + Cl^- + H_2O$ OCl^- is +1 Cl^- is –1	 Both needed	1 1	2.1.5 AO1
7(a)	Remove undissolved barium hydroxide /excess solid		1	3.1.4 AO1
7(b)	Remove (excess) sulfuric acid		1	3.1.4 AO3
7(c)	$Ba(OH)_2 + H_2SO_4 \rightarrow BaSO_4 + 2H_2O$	Accept multiples. Accept $Ba^{2+} + SO_4^{2-} \rightarrow BaSO_4$ Ignore state symbols.	1	3.1.4 AO1
7(d)	M_r barium sulfate = 233.4 Moles $BaSO_4$ = 4.31/233.4 = 0.0184(6) M_r barium hydroxide = 171.3 Mass barium hydroxide = 0.01846 × 171.3 = 3.16(3) g Mass in 1 dm^3 = 3.16 × 10 = 31.6g	Allow e.c.f. Allow answer the result of rounding to 3 s.f. in earlier stages	1 1 1 1 1	2.1.3 AO2 M0.0, M0.1, M0.4, M1.1, M2.2, M2.3, M2.4

Skills box answers

1. $\frac{0.1}{12} \times 100 = 0.83\ \%$

2. $\frac{0.1}{45} \times 100 = 0.22\ \%$

3. $\Delta V = 36.75 - 12.50 = 24.25\ cm^3$

$\frac{2 \times 0.05}{24.25} \times 100 = 0.41\ \%$

4. $\Delta T = 45.0 - 22.5 = 22.5$

$\frac{2 \times 0.05}{22.5} \times 100 = 0.44\%$