Question number	Answer	Mark
1(a)	<table><tr><th>salt</th><th>soluble</th><th>insoluble</th></tr><tr><td>ammonium chloride</td><td>✓</td><td></td></tr><tr><td>lithium sulfate</td><td>✓</td><td></td></tr><tr><td>magnesium carbonate</td><td></td><td>✓</td></tr></table> • All three correct (2) • Any two correct (1)	**(2)**

Question number	Answer	Additional guidance	Mark
1(b)	• mass values in correct places (1) • multiplication by 100 (1) • correct final answer to two significant figures (1)	$\frac{2.53}{2.85} \times 100 = 88.8\%$ 89% (to 2 s.f.) Award full marks for correct numerical answer without working.	**(3)**

Question number	Answer	Mark
1(c)	An explanation that combines identification – improvement of the experimental procedure (maximum 2 marks) and justification/reasoning, which must be linked to the improvement (maximum 2 marks): • add excess sodium sulfate solution rather than a few drops (1) • so more reaction occurs to form more lead sulfate (1) • filter the reaction mixture rather than pour off the liquid(1) • so none of the lead sulfate is lost on separation(1) • wash the lead sulfate (1) • so the impurities are removed (1) • place the lead sulfate in an oven/warm place (1) • so the lead sulfate is dry (1)	**(4)**

Question number	Answer	Mark
1(d)	• volumes of solution too large for titration method (1) • large volumes of liquid need to be heated and then allowed to crystallise (1)	**(2)**

Question Number	Answer	Acceptable answers	Mark
2(a)	D a salt and water only		**(1)**

Question Number	Answer	Acceptable answers	Mark
2(b)(i)	A description including two of • (acid) colourless (liquid/solution) (1) • (carbonate) green (solid) (1) • disappears (1) • effervesces/fizzes/bubbles (1) • blue (solution) (forms) (1)	 Ignore clear dissolves Ignore gas/carbon dioxide given off	**(2)**

Question Number	Answer	Acceptable answers	Mark
2(b)(ii)	$CuCO_3 + 2HNO_3 \rightarrow Cu(NO_3)_2 + H_20 + CO_2$ reactants (1) products (1) balancing of correct formulae (1)	multiples	**(3)**

Question Number	Answer	Acceptable answers	Mark
2(c)(i)	An explanation linking • decomposition (of compound/substance) (1) M1 • (by) (direct electric) current (1) M2	 splitting up/breaking down/breaking up (of compound/substance) Reject splitting of atoms/elements for M1 Ignore separating (by) electricity/electrical energy/direct current Reject alternating current/ac	**(2)**

Question Number	Answer	Acceptable answers	Mark
2(c)(ii)	A description linking • glowing splint (1) M1 • relights (1) M2	smouldering splint Reject unlit (splint) Ignore blown out (splint) M2 dependent on M1 but lighted splint burns brighter = 2	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(a)(i)	electrical (energy) / electricity / direct (electric) current	**Reject** {ac/ alternating current}	**(1)**

Question Number	Answer	Acceptable answers	Mark
3(a)(ii)	hydrogen	H_2	**(1)**

Question Number	Answer	Acceptable answers	Mark
3(a)(iii)	A description including (damp blue or red) litmus (paper)) ((turns red and) bleached / white))	**Allow** use of any suitable indicator (1) with correct result (1) eg Universal Indicator (1) is bleached (1) starch-iodide paper (1) turns blue-black (1) **Allow** bleaches indicator (1) **Do not allow** colourless for {bleached/white} if indicator paper is used **Ignore** indicator gets lighter **Ignore** any incorrect middle colour mentioned **Ignore** smells of swimming pools	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(b)	**B** electrolysis		**(1)**

Question Number	Answer	Acceptable answers	Mark
3(c)	carbon dioxide	CO_2	**(1)**

Question Number	Answer	Acceptable answers	Mark
3(d)	$CuO + \mathbf{2}\ HCl \rightarrow CuCl_2 + \mathbf{H_2O}$ 2 (1) H_2O (1) Maximum 1 mark if additional incorrect balancing	**Reject** obvious incorrect symbols and subscripts eg h_2O (0) H^2O (0) H_2o (0) H2O (0) **Ignore** state symbols	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(a)(i)	A carbonate ion CO_3^{2-}		**(1)**

Question Number	Answer	Acceptable answers	Mark
4(a)(ii)	A description including warm / heat / boil (1) {**gas/ammonia**} turns (damp red/pink) litmus blue / (damp red/pink) litmus turns blue when held above (the mixture)(1)	maximum (1) if additional reagents added ignore any ppt allow pungent smell / smell of {ammonia/wet nappies} /alkaline **gas /** effect of ammonia on other named indicators /dense white fumes with conc hydrochloric acid ignore litmus turns blue in ammonium ions/sodium hydroxide/mixture do not allow gas/ammonia if blue litmus turns red/pink	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(b)	$Al^{3+} + 3OH^- \rightarrow Al(OH)_3$ OH^- (1) $Al(OH)_3$ (1) balancing 3, conditional on correct formulae (1)	allow multiples allow HO^- (1) allow $Al(HO)_3$ (1) do not allow $Al(HO)^3$/lower case h ignore state symbols/$3Na^+$ on both sides	**(3)**

Question Number		Indicative Content	Mark
QWC	***4(c)**	An explanation including some of the following points **test for cation** • flame test • if the flame is yellow/not lilac, sodium ions are present • if the flame is lilac/not yellow, potassium ions are present **test for iodide ions** • make a solution of the crystals in water • add dilute nitric acid • add silver nitrate solution • if there is a yellow precipitate, iodide ions are present • if there is no precipitate, sulfate ions are present • $Ag^+ + I^- \rightarrow AgI$ OR • make a solution of the crystals in water • add chlorine water • then cyclohexane • if the cyclohexane/top layer turns purple, iodide ions were present • if there is no colour change, sulfate ions are present • $Cl_2 + 2I^- \rightarrow 2Cl^- + I_2$ **test for sulfate ions** • make a solution of the crystals in water • add dilute {hydrochloric/nitric} acid • add barium {chloride/nitrate} solution • if there is a white precipitate, sulfate ions are present • if there is no precipitate, iodide ions are present • $Ba^{2+} + SO_4^{2-} \rightarrow BaSO_4$	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited description of test for any 1 ion e.g. flame test, yellow flame, sodium ions are present. • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple description to identify a cation and an anion e.g. if the substance is sodium sulfate, it will give a yellow flame in a flame test and a white precipitate with barium chloride solution. • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed description to identify at least 3 ions e.g. carry out a flame test, yellow flame, sodium ions present, lilac flame, potassium ions present, add silver nitrate solution to solution of substance, yellow precipitate, iodide ion. • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	