

01. 0620_s21_ms_41 Q: 5

Question	Answer	Marks
(a)	(add) water (to both salts) (1) dissolve both salts / make solutions (1) filter (lead(II) iodide)(1) wash (residue of lead(II) iodide) with water AND dry e.g. with filter paper / description of washing and drying (1) $\text{Pb}(\text{NO}_3)_2 + 2 \text{NaI} \rightarrow 2\text{NaNO}_3 + \text{PbI}_2$ OR $\text{Pb}^{2+} + 2\text{I}^- \rightarrow \text{PbI}_2$ (1)	5
(b)(i)	glowing splint (1) relights / rekindles (1)	2
(b)(ii)	2ZnO(s) and 4NO₂(g) (1) 12H₂O(g) (1)	2
(c)(i)	heat again and weigh again / repeat steps 2 and 3 (1) until mass is constant (1)	2
(c)(ii)	0.005 (1) 0.9 (1) (0.9 ÷ 18 =) 0.05 (1) (0.05 ÷ 0.005 =) 10 (1)	4

02. 0620_s21_ms_43 Q: 5

Question	Answer	Marks
(a)	add zinc carbonate to sulfuric acid until <ul style="list-style-type: none"> it stops dissolving OR <ul style="list-style-type: none"> no more effervescence (1) filter (zinc carbonate) (1) evaporation of filtrate to form dry crystals (1) $\text{ZnCO}_3 + \text{H}_2\text{SO}_4 \rightarrow \text{ZnSO}_4 + \text{CO}_2 + \text{H}_2\text{O}$ CO_2 product in equation (1) rest of equation correct (1)	5
(b)(i)	acidified aqueous potassium manganate(VII) (1) purple to colourless (1)	2
(b)(ii)	2 FeSO₄·7H₂O (1) 14 H₂O (1)	2
(c)(i)	heat + weigh + repeat (1) until mass is constant (1)	2
(c)(ii)	M1 0.02 (1) M2 0.72 (1) M3 $\text{M}_2 \div 18 = 0.72/18 = 0.04$ (1) M4 $\text{M}_3 \div \text{M}_1 = 0.04 \div 0.02 = 2$ (1)	4

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03. 0620_w21_ms_43 Q: 5

Question	Answer	Marks
(a)(i)	too many colour changes	1
(a)(ii)	Any acid-base indicator, e.g. methyl orange or phenolphthalein	1
(b)	<p>M1 repeat without indicator using same volumes OR remove indicator by adding charcoal or carbon and filtering (1)</p> <p>M2 evaporate / heat / warm / boil/leave in hot place (1)</p> <p>M3 until most of the water is gone / some water left / saturation(point) / crystallisation (point) / evaporate some of the water (1)</p> <p>M4 cool / leave to crystallise(1)</p> <p>M5 description of drying (1)</p>	5
(c)(i)	yellow flame	1
(c)(ii)	<p>M1 solid dissolves / disappears(1)</p> <p>M2 blue solution(1)</p>	2
(c)(iii)	white precipitate	1

04. 0620_w19_ms_41 Q: 4

(a)(i)	cobalt carbonate	1
(a)(ii)	lead iodide	1
(b)	$2 \text{AgNO}_3 + \text{Na}_2\text{CO}_3 \rightarrow \text{Ag}_2\text{CO}_3 + 2 \text{NaNO}_3$ formula of silver carbonate correct (1) fully correct equation (1)	2
(c)	$\text{Pb}^{2+} + 2 \text{I}^- \rightarrow \text{PbI}_2$ Pb^{2+} and I^- on left of equation (1) fully correct equation (1)	2
(d)	(nitric) acid reacts with / removes carbonate ions	1

05. 0620_w19_ms_43 Q: 6

(a)	strong = exists entirely as ions in solution / fully dissociated 100% dissociated in solution (1) acid = proton donor (1)	2
(b)	50.0 (cm ³)	1
(c)(i)	yellow flame	1
(c)(ii)	solid dissolves / disappears (1) blue solution (1)	2
(d)(i)	white precipitate	1
(d)(ii)	$\text{Ba}^{2+}(\text{aq}) + \text{SO}_4^{2-}(\text{aq}) \rightarrow \text{BaSO}_4(\text{s})$ correct ionic equation (1) state symbols (1)	2

06. 0620_m18_ms_42 Q: 2

(a)(i)	M1 correct orientation of '+' and '-' on front four ions M2 rest of structure	2
(a)(ii)	18	1
(a)(iii)	Ne or Neon	1
(b)(i)	M1 breakdown of an ionic compound when molten or in aqueous solution M2 (by the passage of) electricity / electric current / electrical energy	2
(b)(ii)	hydrogen chlorine sodium hydroxide	3
(b)(iii)	$2\text{H}^+(\text{aq}) + 2\text{e}^- \rightarrow \text{H}_2(\text{g})$ M1 H^+ on left hand side with e^- added M2 fully correct equation	2
(c)(i)	white precipitate	1
(c)(ii)	to ensure all sodium nitrate / NaNO_3 was collected	1
(c)(iii)	M1 evaporation M2 crystallisation	2
(c)(iv)	M1 (moles of $\text{NaCl} = 0.20 \times 20 \div 1000 = 4.00 \times 10^{-3}$ or 0.004(00)) M2 (M_r of $\text{NaNO}_3 = 85$) M3 ($85 \times 4.00 \times 10^{-3} = 0.34$ (g)) M4 ($0.34 \times 90 / 100 = 0.306$ (g) OR 0.31 (g))	4
(c)(v)	$2\text{NaNO}_3 \rightarrow 2\text{NaNO}_2 + \text{O}_2$ M1 = NaNO_2 M2 = rest of equation	2

07. 0620_w17_ms_42 Q: 4

(a)	the breakdown (into elements)	1
	of an (ionic) compound by (the passage of) electricity	1
(b)(i)	oxygen	1
(b)(ii)	glowing splint	1
	relights	1
(b)(iii)	$2\text{H}^+ + 2\text{e}^- \rightarrow \text{H}_2$ M1 gain of electrons by H^+ M2 rest of equation	2
(c)	the wires: electrons	1
	the electrolyte: ions	1
(d)	any 2 from: <input type="checkbox"/> green gas at positive electrode <input type="checkbox"/> bulb is brighter <input type="checkbox"/> rate of bubbles increases	2
(e)(i)	anode made of: impure copper	1
	cathode made of: (pure) copper	1
	electrolyte of: (aqueous) copper sulfate	1
(e)(ii)	silver (impurities) fall to the bottom of the cell	1
	zinc (impurities) (dissolve) into solution (as ions)	1
	because zinc is more reactive than copper AND silver is less reactive than copper	1

08. 0620_s16_ms_42 Q: 4

(a)	M1 substance that speeds up a reaction/increases rate; M2 unchanged (chemically) at the end/not used up/lowers activation energy/provides alternative pathway;	1 1	2
(b)	M1 too slow/slower; M2 lower yield/less product(s)/equilibrium shifts to left/equilibrium shifts in direction of reactants/backward reaction favoured/reverse reaction favoured;	1 1	2
(c)	faster/increase rate;		1
(d)	lower yield/less product(s)/equilibrium shifts to left/equilibrium shifts in direction of reactants/backward reaction favoured/reverse reaction favoured; OR higher cost/expensive; OR safety risks;		1
(e)(i)	M1 breakdown of an ionic compound when molten or in aqueous solution; M2 (using) electricity/electric current/electrical energy;	1 1	2
(e)(ii)	carbon/graphite/platinum;		1

(e)(iii)	$2\text{H}^+ + 2\text{e}^- \rightarrow \text{H}_2$; OR $2\text{H}_3\text{O}^+ + 2\text{e}^- \rightarrow \text{H}_2 + 2\text{H}_2\text{O}$;		1
(e)(iv)	cathode/negative electrode;		1
(e)(v)	M1 damp blue litmus paper; M2 bleaches/loses colour/turns white/turns colourless;	1 1	2
(f)	$2\text{NaCl} + 2\text{H}_2\text{O} \rightarrow 2\text{NaOH} + \text{H}_2 + \text{Cl}_2$ all formulae correct; balancing;		2
(g)	M1 chlorine: treating (drinking) water/treating water in swimming pools/kill bacteria in water/chlorination of water/ (manufacture of) paper products/plastics/PVC/dyes/textiles/medicines/antiseptics/insecticides/herbicides/ fungicides/solvents/paints/disinfectant/bleach/hydrochloric acid; M2 sodium hydroxide: drain cleaner/oven cleaner/extraction of aluminium/purification of bauxite/(manufacture of) biodiesel/paper/ soap/detergents/washing powder/textiles/dyes; M3 hydrogen: fuel/rocket fuel/fuel cells/in welding/(manufacture of) ammonia/ NH_3 /margarine/methanol/hydrochloric acid/ refrigerants;	1 1 1	3

09. 0620_w16_ms_43 Q: 3

(a)	331		1
(b)(i)	M1 mol = $6.62/331$ OR 0.02 M2 $0.02 \times 223 = 4.46$ (g)		1 1
(b)(ii)	M1 mol $\text{O}_2 = 0.02 \div 2$ OR 0.01 M2 vol = $0.01 \times 24 = 0.24$ (dm^3)		1 1
(c)	<i>test:</i> glowing splint <i>result:</i> relights/rekindles		1 1
(d)(i)	more than enough to react (with all the acid) OR some lead oxide remains after the reaction OR (nitric) acid is limiting		1
(d)(ii)	solid stops dissolving		1
(d)(iii)	$\text{PbO} + 2\text{HNO}_3 \rightarrow \text{Pb}(\text{NO}_3)_2 + \text{H}_2\text{O}$ OR $\text{PbO} + 2\text{H}^+ \rightarrow \text{Pb}^{2+} + \text{H}_2\text{O}$		1