

Question	Answer	Marks	AO Element	Notes	Guidance
1	D	1			
2(a)	condensation (at mouth of tube)	1			
2(b)	add (aqueous) sodium hydroxide / (aqueous) ammonia (1) green precipitate (1)	2			
3	<i>(copper(II) ions)</i> add sodium hydroxide (solution) (1) blue ppt. (1) <i>(nitrate ions)</i> add aluminium AND aqueous sodium hydroxide AND warm (1) ammonia given off / gas turns damp (red) litmus blue (1)	4			
4	flame test (1) yellow (1)	2			
5	add (nitric acid then aqueous) silver nitrate (1) yellow precipitate (1)	2			

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6	(damp) red litmus paper (1) turns blue (1)	2			
7	(aqueous) sodium hydroxide / aqueous ammonia (1) green precipitate (1)	2			
8	flame test (1) lilac colour (1)	2			
9(a)	hydrogen / H ₂	1			
9(b)	gas syringe connected to flask OR this described in words (1) closed apparatus / workable apparatus OR this described in words (1) timer / stop-watch OR this described in words (1)	3			allow measuring cylinder inverted in water
10(a)	hydrogen / H ₂	1			

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10(b)	gas syringe <u>connected to a flask</u> OR this described in words (1) closed apparatus / workable apparatus OR this described in words (1) timer or stopwatch OR this described in words (1)	3			
11(a)	copper + nitric acid → copper nitrate + nitrogen dioxide + water	2			1 mark if one / two errors
11(b)	any three from: <ul style="list-style-type: none"> • blue (solution) / blue (precipitate) ; • precipitate / ppt ; • in excess the precipitate redissolves ; • dark blue solution (above precipitate) ; 	3			
11(c)	car engines / car exhausts / lightning / high temperature furnaces ;	1			
12(a)	yellow flame	1			

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12(b)	solid dissolves / disappears (1) blue solution (1)	2			
13	add barium chloride / barium nitrate;	1			
	white precipitate; (both required)	1		note: second mark dependent on correct reagent	
14(a)	white precipitate	1			
14(b)	$\text{Ba}^{2+}(\text{aq}) + \text{SO}_4^{2-}(\text{aq}) \rightarrow \text{BaSO}_4(\text{s})$ correct ionic equation (1) state symbols (1)	2			
15(a)	iron(II) hydroxide	1			
15(b)	any two from: • it (iron(II) hydroxide) is oxidised • to form iron(III) (hydroxide) / (oxide) • by (iron(II) hydroxide reacting with) air / oxygen	2			
15(c)	(green ppt) remains	1			

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16	(nitric) acid reacts with / removes carbonate ions (1)	1			
17(a)(i)	cobalt carbonate	1			
17(a)(ii)	lead iodide	1			
17(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			
17(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			
18(a)	M1 same number of electrons M2 (same number of) electrons in outer shell	2			
18(b)	$\text{Mg} + 2\text{HCl} \rightarrow \text{MgCl}_2 + \text{H}_2$ M1 MgCl_2 as product M2 fully correct equation	2			

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18(c)	M1 test: lighted / burning splint M2 result: (squeaky) pop	2			
19(a)	hydrogen	1			
19(b)	hydroxide / OH ⁻	1			
19(c)	7 < pH ≤ 12	1			
19(d)	Ca + 2H ₂ O → Ca(OH) ₂ + H ₂ Ca(OH) ₂ (1) rest of equation (1)	1			
20(a)	Cu(OH) ₂	1			

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20(b)	<p>Any three from:</p> <p>1 zinc more reactive than copper</p> <p>2 displacement / redox reaction OR zinc displaces copper OR zinc reacts with copper ions</p> <p>3 copper is solid / copper is brown</p> <p>4 zinc nitrate is colourless (solution)</p> <p>OR blue colour disappears because Cu^{2+} ions removed (from solution)</p>	3			
20(c)	<p>sodium hydroxide / NaOH (1)</p> <p>aluminium / Al (1)</p>	2			
21	<p>$\text{Ag}^+(\text{aq}) + \text{Cl}^-(\text{aq}) \rightarrow \text{AgCl}(\text{s})$</p> <p>species (1)</p> <p>states (1)</p>	2			
22(a)	<p>glowing splint (1)</p> <p>relights / rekindles (1)</p>	2			
22(b)	<p>nitrogen dioxide / nitrogen(IV) oxide (1)</p> <p>brown (gas) (1)</p>	2			

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22(c)	$2\text{Cu}(\text{NO}_3)_2 \rightarrow 2\text{CuO} + 4\text{NO}_2 + \text{O}_2$	1			allow multiples / fractions
23(a)	white precipitate	1			
23(b)	to ensure all sodium nitrate / NaNO_3 was collected	1			
23(c)	M1 evaporation M2 crystallisation	2			
23(d)	(moles of $\text{NaCl} = 0.20 \times 20 \div 1000 = 4(.00) \times 10^{-3}$ or 0.004(00)	1			
23(e)	M1 (Mr of $\text{NaNO}_3 = 85$ M2 ($85 \times 4(.00) \times 10^{-3} = 0.34$ (g) M3 ($0.34 \times 90 / 100 = 0.306$ (g) OR 0.31 (g)	3			
23(f)	$2\text{NaNO}_3 \rightarrow 2\text{NaNO}_2 + \text{O}_2$ M1 = NaNO_2 M2 = rest of equation	2			allow fractions and multiples

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24(a)	the breakdown (into elements) (1) of an (ionic) compound by (the passage of) electricity (1)	2			
24(b)(i)	oxygen	1			
24(b)(ii)	glowing splint (1) relights (1)	2			
24(b)(iii)	$2\text{H}^+ + 2\text{e}^- \rightarrow \text{H}_2$ M1 gain of electrons by H^+ M2 rest of equation	1			
24(c)	<i>the wires</i> : electrons (1) <i>the electrolyte</i> : ions (1)	2			
24(d)	any two from: • green gas at positive electrode • bulb is brighter • rate of bubbles increases	2			

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25	reagent	aqueous iron(II) sulfate	aqueous iron(III) sulfate	4			
	aqueous sodium hydroxide		M3 brown precipitate				
	aqueous potassium iodide	M1 no change	M4 brown solution / black solid				
	aqueous acidified potassium manganate (VII)	M2 (pink / purple to) colourless / decolourised					
[Total: 98]							