

Question	Answer	Marks	AO Element	Notes	Guidance
1	any three from: <ul style="list-style-type: none"> <li>• filter (off the iron);</li> <li>• evaporate water / heat gently;</li> <li>• to crystallisation point / leave to cool (after heating);</li> <li>• filter off / pick out crystals;</li> <li>• dry crystal between filter papers;</li> </ul>	<b>3</b>			
2	Any 3 of (1 mark each) <ul style="list-style-type: none"> <li>- add citric acid from burette to sodium hydroxide / titrate citric acid with sodium hydroxide</li> <li>- use of indicator / titrate until indicator changes colour</li> <li>- repeat without indicator / remove indicator with charcoal</li> <li>- evaporate to crystallisation point / leave to crystallise / partially evaporate</li> <li>- dry crystals with filter paper / heat gently / put in an oven</li> </ul>	<b>3</b>			

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3	<p><i>Any three of:</i></p> <ul style="list-style-type: none"> <li>- evaporation / heat solution / leave the solution</li> <li>- to crystallisation point / to form crystals</li> <li>- filter off crystals / pick out crystals</li> <li>- dry crystals between filter papers / heat gently / heat to just above 100 °C</li> </ul>	<b>3</b>			
4	magnesium nitrate	<b>1</b>			
5	calcium chloride	<b>1</b>			
6(a)	H <sub>2</sub> O	<b>1</b>			
6(b)	filtration / filter	<b>1</b>			
7	zinc chloride	<b>1</b>			
8	D - filtration	<b>1</b>			
9	<p>(B), A, E, C, D, F (2)</p> <p>If 2 marks not scored: 1 mark for 1 consecutive pair reversed</p>	<b>2</b>			

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10	(D), F, A, C, E, B (2) if 2 marks not scored: 1 mark for 1 consecutive pair of letters reversed	2			
11	(C), A, F, D, B, E (2) if 2 marks not scored 1 mark for 1 consecutive pair reversed	2			
12	any <b>three</b> from: <b>heat</b> cobalt carbonate with sulfuric acid filter off (excess) cobalt carbonate heat <b>filtrate</b> to point of crystallisation / heat (cobalt sulfate) solution to point of crystallisation dry between filter papers / dry in drying oven	3			

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13	any <b>three</b> from: <ul style="list-style-type: none"> <li>• heat zinc with sulfuric acid</li> <li>• filter off (excess) zinc</li> <li>• heat <b>filtrate</b> to point of crystallisation / heat (zinc sulfate) <b>solution</b> to point of crystallisation</li> <li>• dry between filter papers / dry in drying oven</li> </ul>	<b>3</b>			
14	any <b>three</b> from: <ul style="list-style-type: none"> <li>• <b>heat</b> copper oxide with sulfuric acid</li> <li>• filter off (excess) copper oxide</li> <li>• heat <b>filtrate</b> to point of crystallisation / heat (copper sulfate) <b>solution</b> to point of crystallisation</li> <li>• dry between filter papers / dry in drying oven</li> </ul>	<b>3</b>			
15(a)	to remove the acid / make sure all the acid is used up / no acid is left over	<b>1</b>			
15(b)	to make sure all the filtrate / $MgCl_2$ / salt goes through / no $MgCl_2$ left behind	<b>1</b>			

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15(c)	evaporation mark (1) the starting of crystallisation mark (1) drying the crystals mark (1)	3			
16	<b>M1</b> no more bubbling / fizzing / effervescence <b>M2</b> solid or powder stops dissolving	2			
17(a)	solid (1) which forms when two solutions are mixed / reacted / added (1)	2			
17(b)	$\text{BaCl}_2 + 2\text{AgNO}_3 \rightarrow 2\text{AgCl} + \text{Ba}(\text{NO}_3)_2$ formulae (1) balance(1) (silver) nitrate (1)	3			
18(a)	(volumetric) pipette	1			
18(b)	to show when the acid has been neutralised	1			
18(c)	red / pink (1) (to) blue (1)	2			

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19	sodium sulfate (1) water (1)	2			
20	add excess copper(II) carbonate to ethanoic acid (1) filter (1) heat to point of crystallisation <b>AND</b> leave (to cool)(1)	3			
21	C - sodium hydroxide	1			
22	hydrochloric (acid) / $HCl$ ;	1			
	calcium hydroxide / calcium oxide;	1			
23(a)	burette;	1			
23(b)	sodium hydroxide;	1			
23(c)	indicator in flask / reference to indicator;	1			
	run liquid from burette (until indicator changes colour);	1			
24(a)(i)	cobalt carbonate	1			

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24(a)(ii)	lead iodide	1			
24(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			
24(c)	$\text{Pb}^{2+} + 2\text{I}^- \rightarrow \text{PbI}_2$ Pb <sup>2+</sup> and I <sup>-</sup> on left of equation (1) fully correct equation (1)	2			
25(a)	N <sub>3</sub> <sup>-</sup>	1			
25(b)	<b>M1</b> state symbols on right correct (s) then (aq) <b>M2</b> $(\text{Pb}(\text{NO}_3)_2 + 2 (\text{NaN}_3) \rightarrow (\text{Pb}(\text{N}_3)_2 + 2\text{NaNO}_3$	2			
25(c)	<b>M1</b> filter <b>M2</b> wash with water	2			

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26	some copper(II) sulfate remains in solution / some copper(II) sulfate does not form crystals <b>OR</b> some of the crystals decomposed <b>OR</b> some crystals lost in transfer	1			
27(a)	copper(II) oxide or copper(II) hydroxide	1			
27(b)	filtration	1			
27(c)(i)	<b>M1</b> containing the maximum amount of dissolved solute / no more solute can dissolve <b>M2</b> at any given temperature	2			
27(c)(ii)	when crystals form on a glass rod withdrawn from solution / on a sample of solution placed on microscope slide etc.	1			
27(c)(iii)	(heating to dryness) would remove water <b>of crystallisation</b>	1			



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28(a)	measuring cylinder	<b>1</b>			
28(b)	no more fizzing (1) (ZnCO <sub>3</sub> ) stops dissolving or a (white) solid remains / is visible	<b>2</b>			
28(c)	to use up all the acid / H <sup>+</sup> ions	<b>1</b>			
28(d)	a solution that can hold no more solute (1) at the specified temperature (1)	<b>2</b>			
28(e)	(aq)	<b>1</b>			
28(f)	zinc oxide <b>or</b> zinc hydroxide	<b>1</b>			
28(g)	barium sulfate is insoluble	<b>1</b>			
29(a)	(Mol KOH =) 0.00125 / 1.25 × 10 <sup>-3</sup>	<b>1</b>			
29(b)	(Mol H <sub>2</sub> SO <sub>4</sub> =) 0.000625 / 6.25 × 10 <sup>-4</sup>	<b>1</b>			<b>ecf from (a)</b>
29(c)	(Conc H <sub>2</sub> SO <sub>4</sub> =) 0.03125 / 3.125 × 10 <sup>-2</sup> (mol / dm <sup>3</sup> )	<b>1</b>			<b>ecf from (b)</b>

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29(d)	<p><b>M1</b> repeat without indicator using same volumes</p> <p><b>M2</b> evaporate/heat/warm/oil/leave in sun</p> <p><b>M3</b> until most of the water is gone/some water left/saturation(point)/crystallisation point/evaporate <b>some</b> of the water</p> <p><b>M4</b> leave/(allow to) cool/allow to crystallise</p> <p><b>M5</b> details of drying</p>	5			

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30	<p>(mix) sodium carbonate <b>AND</b> barium nitrate / barium chloride (1)</p> <p>in solution / aqueous / dissolved (in water) (1)</p> <p>filter / centrifuge (barium carbonate) (1)</p> <p>wash (residue) <b>AND</b> dry / description of washing and drying (1)</p> <p><math>\text{Ba}(\text{NO}_3)_2 + \text{Na}_2\text{CO}_3 \rightarrow \text{BaCO}_3 + 2\text{NaNO}_3</math> / <math>\text{Ba}^{2+} + \text{CO}_3^{2-} \rightarrow \text{BaCO}_3</math></p> <p><b>OR</b></p> <p><math>\text{BaCl}_2 + \text{Na}_2\text{CO}_3 \rightarrow \text{BaCO}_3 + 2\text{NaCl}</math> (1)</p>	5			
31	ethanoic acid + copper carbonate → copper ethanoate + carbon dioxide + water	1			
32(a)	white precipitate	1			
32(b)	to ensure all sodium nitrate / $\text{NaNO}_3$ was collected	1			
32(c)	<p><b>M1</b> evaporation</p> <p><b>M2</b> crystallisation</p>	2			

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32(d)	(moles of NaCl = $0.20 \times 20 \div 1000 =$ $4(.00) \times 10^{-3}$ or 0.004(00)	1			
32(e)	<b>M1</b> (Mr of NaNO <sub>3</sub> =) 85 <b>M2</b> ( $85 \times 4(.00) \times 10^{-3} =$ ) 0.34 (g) <b>M3</b> ( $0.34 \times 90 / 100 =$ ) 0.306 (g) OR 0.31 (g)	3			
32(f)	$2\text{NaNO}_3 \rightarrow 2\text{NaNO}_2 + \text{O}_2$ <b>M1</b> = NaNO <sub>2</sub> <b>M2</b> = rest of equation	2			<b>allow</b> fractions and multiples
33	D	1			
34	A - aqueous barium chloride	1			
					[Total: 111]