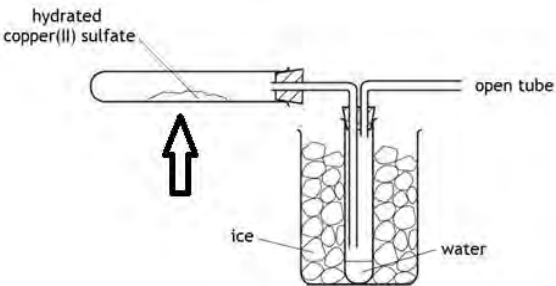
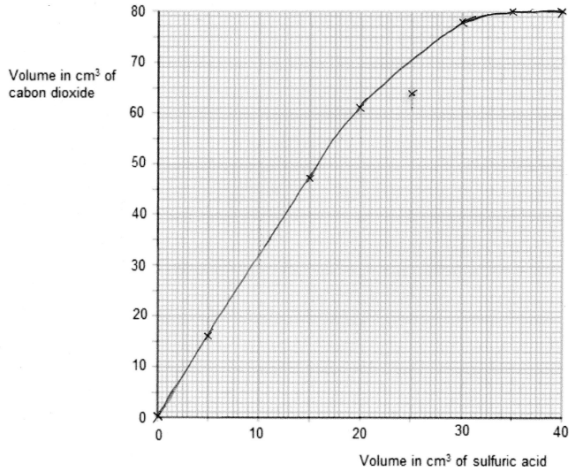


Question number	Answer	Notes	Marks
1 (a)	 <p>NB the arrow must point to the solid</p>	<p>ACCEPT a flame</p> <p>if >1 arrow drawn, all must be correct</p>	1
(b)	to condense the (water) vapour / steam	<p>ACCEPT to cool the water vapour</p> <p>ACCEPT to cool/condense the gas (given off)</p> <p>IGNORE to condense the water</p> <p>IGNORE to stop the water escaping as water vapour</p> <p>IGNORE to condense the product</p>	1
(c)	<p>M1 $n(\text{CuSO}_4 \cdot 5\text{H}_2\text{O}) = 2.50 \div 250$ OR 0.01 (mol)</p> <p>M2 $n(\text{H}_2\text{O}) = 0.01 \times 5$ OR 0.05 (mol)</p> <p>M3 mass of water = $(0.05 \times 18) = 0.9(0)$ (g)</p> <p>OR</p> <p>M1 5×18 OR 90</p> <p>M2 $250 \text{ (g)} \rightarrow 90 \text{ (g)}$</p> <p>M3 $2.50 \text{ (g)} \rightarrow 0.9(0) \text{ (g)}$</p> <p>OR</p> <p>M1 5×18 OR 90</p> <p>M2 $90 \div 250 \times 100 \text{ (\%)} \rightarrow 36 \text{ (\%)}$</p> <p>M3 $36 \text{ (\%)} \times 2.50 \text{ (g)} \rightarrow 0.9(0) \text{ (g)}$</p>	<p>mark csq throughout</p> <p>correct final answer (with no working) scores 3</p> <p>ACCEPT calculations that use A_r of Cu as 63.5 (giving $0.9(05) \text{ (g)}$ as a final answer)</p> <p>M2 subsumes M1 for all methods</p>	3

Question number	Answer		Notes	Marks
2 (a)	Solid	Amount	ALLOW values (corrected rounded) from 1 sf up to calculator value	2
	KHCO ₃	0.080		
	K ₂ O	0.059		
	KOH	0.099		
	K ₂ CO ₃	0.040		
	all four correct = 2 marks three correct = 1 mark			
(b)	M1 equation 3 M2 the (mole) ratio of KHCO ₃ to K ₂ CO ₃ /reactant to product is 2:1		mark csq on amounts given in part (a)	2

Question number	Answer	Notes	Marks
3 (a) i	cross in box A (zinc sulfate)		1
ii	cross in box B (iron) cross in box C (magnesium)	Apply list principle - 3 crosses = max 1 4 or 5 crosses = 0 marks	1 1
3 (b)	burns with a pop/squeak OR use burning/lit splint/flame to see if pop/squeak	Must be reference to test and result Reference to splint/match with no indication of flame is not enough Reject reference to glowing splint Ignore flame extinguished 'Squeaky pop test' on its own is not sufficient	1
3 (c)	2 (1) 2	Accept multiples and fractions	1
3 (d) i	cross in box 3		1
ii	reversible / can go in both directions / can go backwards and forwards	Ignore references to equilibrium Ignore references to other reaction types (e.g. hydration / oxidation / exothermic) Accept either equation with \rightleftharpoons	1
		Total	7

Question number	Answer	Accept	Reject	Marks
4 (a)	(i) measuring cylinder			1
	(ii) M1 44	answers in other correct units, e.g. 0.044 dm ³ ml 0.44 for 1 mark only correct answer with no working for 2 marks	0.0004	1
	M2 cm ³			1
	(iii) M1 $\frac{44 \times 0.01(0)}{1000}$			1
	M2 0.00044(0) Mark csq on answer to (a)(ii)			1
(b)	<u>zinc</u> because			
	M1 1 mol zinc reacts with 2 mol HCl			1
	M2 only 0.005 mol of zinc are needed			1
	M1 is standalone M2 is dep on zinc given as being in excess			
(c)	(i) (rate) increases/faster reaction	less time for reaction to take place	faster time	1
	(ii) no effect/same volume (of hydrogen) produced	none/no change		1
			Total	9

Question number	Answer	Notes	Marks
5 (a)	<div data-bbox="424 263 989 733" data-label="Figure">  <p>Volume in cm³ of carbon dioxide</p> <p>Volume in cm³ of sulfuric acid</p> </div> <p>M1 & M2 all points correctly plotted to nearest gridline</p> <p>M3 suitable curve of best fit, from the origin</p>	<p>deduct one mark for each incorrectly plotted point do not penalise missing (0, 0) if points are not visible, but graph goes through that point, then do not penalise</p>	3

Question number		Answer	Notes	Marks
(b)	(i)	25 (cm ³)	accept anomalous point based on graph drawn	1
	(ii)	M1 the volumes (of gas) are the same M2 therefore the reaction has finished / <u>all</u> of the solid/MgCO ₃ has reacted / the solid/MgCO ₃ has been used up	accept 'no more gas is being produced/collected (after 35 cm ³)' reject 'all of the reactants have reacted' reject 'all of the acid has reacted' ignore refs to MgCO ₃ dissolving accept refs to MgCO ₃ being limiting reagent	2
	(iii)	value correctly read to nearest gridline from candidate's graph		1
	(iv)	value correctly read to nearest gridline from candidate's graph		1

Question number	Answer	Notes	Marks
6 (a) (i)	$2\text{HgO} \rightarrow 2\text{Hg} + \text{O}_2$	accept halves and multiples	1
(ii)	redox	accept '(thermal) decomposition' ignore 'oxidation' allow 'reduction'	1
(b) (i)	(tap / dropping / separating) funnel	reject 'filter / thistle funnel'	1
(ii)	(the gas / it) contains air (from the conical flask)	accept 'contains impurities' or ref to possible named impurity eg nitrogen reject 'water vapour' allow 'contains less <u>oxygen</u> '	1
(c)	<p>M1 perform reaction with and without catalyst</p> <p>M2 keep remaining variables (eg concentration or volume of hydrogen peroxide / temperature) the same</p> <p>M3 measure time (to fill the gas jar with oxygen)</p> <p>M4 <u>oxygen produced</u> more quickly/at a faster rate/in a shorter time (in experiment) with catalyst</p> <p>OR</p> <p>M1 weigh a sample of manganese(IV) oxide</p>	<p>accept:</p> <p>M1 perform reaction with and without catalyst</p> <p>M2 <u>oxygen produced</u> more quickly/at a faster rate/in a shorter time (in experiment) with catalyst</p> <p>M3 weigh a sample of manganese(IV) oxide (before putting it into the conical flask)</p> <p>M4 the mass at the end of the reaction should be the same as at the start</p>	4

	<p>(before putting it into the conical flask)</p> <p>M2 filter (to remove the solid)</p> <p>M3 dry the solid (and re-weigh it)</p> <p>M4 the mass should be the same as before</p>		
(d) (i)	$\text{SO}_2 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{SO}_3$	<p>accept $\text{SO}_2 + \text{H}_2\text{O} + \frac{1}{2}\text{O}_2 \rightarrow \text{H}_2\text{SO}_4$</p> <p>allow products shown as correct ions</p>	1
(ii)	<p>M1 (Universal Indicator turns) orange/yellow</p> <p>M2 (the solution/it) is acidic / contains hydrogen ions / contains H^+ ions</p>	<p>accept 'red'</p> <p>allow 'contains sulfurous / sulfuric acid'</p>	2