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**CHEMISTRY**

**9701/52**

Paper 5 Planning, Analysis and Evaluation

**October/November 2017**

MARK SCHEME

Maximum Mark: 30

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**Published**

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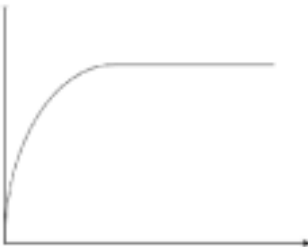
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Question	Answer	Marks
1(a)(i)	$\text{CuCO}_3$ and $\text{Cu}(\text{OH})_2$ both react (with $\text{HCl}$ ) or both form copper(II) chloride	1
1(a)(ii)	(Transfer) $12.5(0) \text{ cm}^3$ of $(10.0 \text{ mol dm}^{-3}) \text{ HCl}$ using a (graduated) pipette or a burette	1
	add to a $250 \text{ cm}^3$ volumetric flask <b>AND</b> make to mark with distilled water	1
1(a)(iii)	Measure a volume of gas from the carbonate reaction <b>or</b> measure the (loss of) mass from the carbonate reaction	1
1(a)(iv)	Suitable apparatus for production of $\text{CO}_2$	1
	Suitable means of measuring $\text{CO}_2$ evolved	1
1(a)(v)	Correct labels on axes y-axis: volume (of gas) or mass loss or mass of 'limewater' <b>and</b> x-axis: time or t	1
	<p>curved line (from origin) to reach a plateau, e.g.</p> 	1

Question	Answer	Marks
1(a)(vi)	<p>Any sensible attempt seen to make the experiment accurate</p> <p>If mass loss Reduce risk of mass loss through spraying Insert cotton wool plug</p> <p>If gas collection Any method to reduce risk of gas loss Check apparatus is sealed Insert bung quickly</p> <p>Any attempt to measure temperature Check apparatus is at room temperature</p> <p>Apparatus accuracy Use an accurate or 2dp (or more) balance / gas syringe / measuring cylinder</p>	1
1(a)(vii)	<p>mol of <math>\text{CuCO}_3 = 0.5 \div 123.5 = 4.05 \times 10^{-3} \text{ mol}</math></p>	1
	<p>moles of <math>\text{HCl} = 2 \times 4.05 \times 10^{-3} = 8.10 \times 10^{-3} \text{ mol}</math> <b>and</b> volume of <math>\text{HCl} = 8.10 \times 10^{-3} \div 0.500 = 0.0162 \text{ dm}^3</math> <math>= 16.2 \text{ cm}^3</math></p>	1

Question	Answer	Marks
1(b)	<p>Any suitable precaution relating to stated hazard of given chemical</p> <p>For HCl Precaution (lab) gloves</p> <p>Explanation (10 mol dm<sup>-3</sup>) HCl is corrosive</p> <p>For CuCO<sub>3</sub> Precaution (lab) gloves / wash hands (after use) / face or mouth mask</p> <p>Explanation Harmful if swallowed</p>	1
1(c)(i)	$\text{moles of H}_2\text{SO}_4 = 0.40 \times \frac{24.15}{1000} = 9.66 \times 10^{-3} \text{ mol}$	1
	$\text{mass of Cu}_3(\text{CO}_3)_2(\text{OH})_2 = 344.5 \times 9.66 \times 10^{-3} \div 3 = 1.11 \text{ g}$	1
	$\% \text{ by mass} = \frac{1.11}{1.50} \times 100\% = 74.0\%$	1

Question	Answer	Marks
1(c)(ii)	<p>Problem 1 titres are not concordant / are too far apart / are 0.5(0) <b>cm</b><sup>3</sup> apart / difference is too large</p> <p>Improvement Repeat until (two) concordant titres have been achieved / two readings within 0.1(0) <b>cm</b><sup>3</sup></p> <p>Problem 2 colour change (of indicator) will be masked</p> <p>Improvement 2 Use an alternative indicator / named indicator</p> <p>[1] for each problem, [1] for an improvement</p>	<b>3</b>

Question	Answer				Marks
2(a)(i)	Difference in conc. $D$	$\frac{D}{m}$	$\log\left(\frac{D}{m}\right)$	$\log[X]$	<b>3</b>
	24.04	120.20	2.08	-0.02	
	24.31	97.24	1.99	-0.16	
	24.40	81.33	1.91	-0.22	
	24.59	70.26	1.85	-0.39	
	24.67	61.68	1.79	-0.48	
	24.73	54.96	1.74	-0.57	
	24.77	49.54	1.69	-0.64	
	24.80	45.09	1.65	-0.70	
	24.83	41.38	1.62	-0.77	
	<p><math>D</math> data correct [1]  <math>\log[X]</math> data correct [1]            All data to 2 dp [1]</p>				
2(a)(ii)	greater adsorption				<b>1</b>
	greater surface area available				<b>1</b>
2(b)	all nine points plotted correctly				<b>1</b>
	best-fit straight line drawn				<b>1</b>
2(c)	Correct point (at -0.22, 1.91) identified				<b>1</b>
	<p>Statement explaining lack of adsorption, e.g.            not enough stirring,            mass of activated charcoal too low,            surface area not high enough / too low / coagulation of charcoal / bulkier particles used            not left long enough</p>				<b>1</b>

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
2(d)(i)	co-ordinates read and recorded correctly	<b>1</b>
	gradient determined <b>and</b> same value for $b$	<b>1</b>
2(d)(ii)	intercept on $y$ -axis read and recorded correctly	<b>1</b>