
CHEMISTRY

9701/52

Paper 5 Planning, Analysis and Evaluation

October/November 2017

MARK SCHEME

Maximum Mark: 30

Published

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This document consists of **7** printed pages.

Question	Answer	Marks
1(a)(i)	CuCO_3 and $\text{Cu}(\text{OH})_2$ both react (with 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 cm^3 volumetric flask AND make to mark with distilled water	1
1(a)(iii)	Measure a volume of gas from the carbonate reaction or measure the (loss of) mass from the carbonate reaction	1
1(a)(iv)	Suitable apparatus for production of CO_2	1
	Suitable means of measuring CO_2 evolved	1
1(a)(v)	Correct labels on axes y-axis: volume (of gas) or mass loss or mass of 'limewater' and 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)	Any sensible attempt seen to make the experiment accurate If mass loss Reduce risk of mass loss through spraying Insert cotton wool plug If gas collection Any method to reduce risk of gas loss Check apparatus is sealed Insert bung quickly Any attempt to measure temperature Check apparatus is at room temperature Apparatus accuracy Use an accurate or 2dp (or more) balance / gas syringe / measuring cylinder	1
1(a)(vii)	$\text{mol of CuCO}_3 = 0.5 \div 123.5 = 4.05 \times 10^{-3} \text{ mol}$	1
	$\text{moles of HCl} = 2 \times 4.05 \times 10^{-3} = 8.10 \times 10^{-3} \text{ mol}$ and $\text{volume of HCl} = 8.10 \times 10^{-3} \div 0.500 = 0.0162 \text{ dm}^3$ $= 16.2 \text{ cm}^3$	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⁻³) HCl is corrosive</p> <p>For CuCO₃ 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) cm³ apart / difference is too large</p> <p>Improvement Repeat until (two) concordant titres have been achieved / two readings within 0.1(0) cm³</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>	3

Question	Answer				Marks
2(a)(i)	Difference in conc. D	$\frac{D}{m}$	$\log\left(\frac{D}{m}\right)$	$\log[X]$	3
	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>D data correct [1] $\log[X]$ data correct [1] All data to 2 dp [1]</p>				
2(a)(ii)	greater adsorption				1
	greater surface area available				1
2(b)	all nine points plotted correctly				1
	best-fit straight line drawn				1
2(c)	Correct point (at -0.22, 1.91) identified				1
	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				1

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