
CHEMISTRY

9701/52

Paper 5 Planning, Analysis and Evaluation

October/November 2017

MARK SCHEME

Maximum Mark: 30

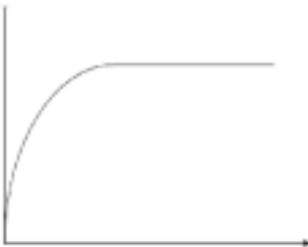
Published

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Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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Question	Answer	Marks
1(a)(i)	CuCO_3 and Cu(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
	curved line (from origin) to reach a plateau, e.g. 	1

Question	Answer	Marks
1(a)(vi)	<p>Any sensible attempt seen to make the experiment accurate</p> <p>If mass loss</p> <p>Reduce risk of mass loss through spraying</p> <p>Insert cotton wool plug</p> <p>If gas collection</p> <p>Any method to reduce risk of gas loss</p> <p>Check apparatus is sealed</p> <p>Insert bung quickly</p> <p>Any attempt to measure temperature</p> <p>Check apparatus is at room temperature</p> <p>Apparatus accuracy</p> <p>Use an accurate or 2dp (or more) balance / gas syringe / measuring cylinder</p>	1
1(a)(vii)	mol of $\text{CuCO}_3 = 0.5 \div 123.5 = 4.05 \times 10^{-3} \text{ mol}$	1
	<p>moles of $\text{HCl} = 2 \times 4.05 \times 10^{-3} = 8.10 \times 10^{-3} \text{ mol}$</p> <p>and</p> <p>volume of $\text{HCl} = 8.10 \times 10^{-3} \div 0.500 = 0.0162 \text{ dm}^3$</p> <p>$= 16.2 \text{ cm}^3$</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⁻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) cm^3 apart / difference is too large</p> <p>Improvement Repeat until (two) concordant titres have been achieved / two readings within 0.1(0) cm^3</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	$\frac{D}{m}$	$\log(\frac{D}{m})$	$\log[X]$	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	
	D data correct [1] $\log[X]$ data correct [1] All data to 2 dp [1]				
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