
CHEMISTRY

9701/52

Paper 5 Planning, Analysis and Evaluation

March 2017

MARK SCHEME

Maximum Mark: 30

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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)	external heat is being applied (from the Bunsen burner) OR the reaction is not taking place in a solvent/water OR it is impossible to know when reaction is complete	1
1(b)	M1 diagram indicating a labelled insulated container and a labelled thermometer in the liquid	1
	M2 temperature of mixture/HCl measured every minute	1
	M3 reactants mixed at 4 minutes	1
1(c)	5.3 °C	1
1(d)	M1 $q = 50 \times 4.18 \times 5.3 = 1107.7$	1
	M2 $\text{mol Na}_2\text{CO}_3 = 3.18/106.0 = 0.03(00)$	1
	M3 $\Delta H = -[1107.7/0.03]/1000 = -36.9$	1
1(e)(i)	to allow the acid to reach room temperature	1
1(e)(ii)	the reaction was not complete	1
1(f)	weighing by mass difference ensures that the exact mass of solid transferred is known	1
1(g)(i)	$(0.5/50 \times 100) = 1\%$	1
1(g)(ii)	HCl is in excess	1
1(g)(iii)	decrease the volume of HCl (aq) used OR increase the mass of the Na ₂ CO ₃ used	1

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Question	Answer	Marks
1(h)	M1 two lines one (horizontal) before 4 minutes and one starting below the first line after 4 minutes	1
	M2 second line shows an increase in temperature and does not increase above the first line	1
1(i)	M1 use of $2 \times 24.2 = 48.4$	1
	M2 $2 \times 24.2 - (-36.9) = (+) 85.3$ / correct cycle	1

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Question	Answer	Marks
2(a)(i)	M1 mol of $\text{Fe}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O}$ needed = $0.05 \times 100/1000 = 0.005(00)$ mol	1
	M2 $0.0005 \times 403.8 = 2.02$ g	1
2(a)(ii)	M1 <i>dissolving of solid / making of a solution</i> dissolve (2.02 g / answer to 2(a)(i) of) hydrated salt in (a container with) distilled water / less than 100 cm^3 of water	1
	M2 <i>making it into a standard solution</i> (transfer / add to) a (100 cm^3) volumetric flask; make to mark (with (distilled) water) (and shake)	1
2(b)(i)	M1 all points plotted	1
	M2 two lines which are extrapolated to meet	1
2(b)(ii)	correct reading of volume of Fe^{3+} and volume of 2-hydroxybenzoate ions from graph combined to make 10.0 cm^3 (expected values: $\text{Fe}^{3+} = 3.3 \text{ cm}^3$; 2-hydroxybenzoate = 6.7 cm^3)	1
2(b)(iii)	2	1
2(b)(iv)	$[\text{Fe}(\text{H}_2\text{O})_2(\text{HO}-\text{C}_6\text{H}_4-\text{CO}_2)_2]^+$	1
2(b)(v)	burette(s)	1
2(c)	$23 \pm 1\%$	1
2(d)	$\text{dm}^3 \text{ cm}^{-1} \text{ mol}^{-1}$	1