Cambridge International AS & A Level

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CHEMISTRY **9701/52**

Paper 5 Planning, Analysis and Evaluation **March 2017**

MARK SCHEME

Maximum Mark: 30

Published

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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 / HC*l* measured every minute	**1**
	M3 reactants mixed at 4 minutes	**1**
1(c)	5.3 °C	**1**
1(d)	**M1** q = 50 × 4.18 × 5.3 = 1107.7	**1**
	M2 mol Na_2CO_3 = 3.18/106.0 = 0.03(00)	**1**
	M3 ΔH = –[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 × 100) = 1%	**1**
1(g)(ii)	HC*l* is in excess	**1**
1(g)(iii)	decrease the volume of HC*l* (aq) used **OR** increase the mass of the Na_2CO_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 $Fe(NO_3)_3.9H_2O$ 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** *dissolving of solid / making of a solution* 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 *making it into a standard solution* (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: Fe^{3+} = 3.3 cm^3; 2-hydroxybenzoate = 6.7 cm^3)	**1**
2(b)(iii)	2	**1**
2(b)(iv)	$[Fe(H_2O)_2(HO–C_6H_4–CO_2)_2]^+$	**1**
2(b)(v)	burette(s)	**1**
2(c)	$23 \pm 1\%$	**1**
2(d)	$dm^3\ cm^{-1}\ mol^{-1}$	**1**

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