Cambridge International AS & A Level

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CHEMISTRY **9701/51**

Paper 5 Planning, Analysis and Evaluation **May/June 2017**

MARK SCHEME

Maximum Mark: 30

Published

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Question	Answer	Marks
1(a)	diagram of a labelled insulated container containing a liquid	**1**
	labelled timing device and a labelled thermometer in / touching the liquid	**1**
1(b)	to ensure temperature of water / experiment / apparatus is at room temperature / constant temperature	**1**
1(c)	the (anhydrous) calcium chloride is added at this point	**1**
1(d)	not all the $CaCl_2$ has dissolved (in the first minute) OR dissolving / reaction was not complete	**1**
1(e)	the cooling curve has a straight line of best fit that extrapolates to 3.0 minutes (or beyond) AND a straight line connecting all the points from 0–2.5 minutes that extrapolates to 3.0 minutes (or beyond)	**1**
	theoretical temperature rise **to 1dp**	**1**
1(f)	**8.5 min** AND not enough time to reach solution temperature OR it takes time for the thermometer to reach equilibrium with the water temperature	**1**
1(g)	ensure uniformity of heating (of solution)	**1**
1(h)	wear gloves OR wear (face) mask	**1**

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Question	Answer	Marks
1(i)	$75.0 \times 4.18 \times 30.0$ **=** 9405 (J) OR 9.405 kJ	**1**
	(1 mol of $CaCl_2$ = 111.1 g) Mass $CaCl_2$ required = $\frac{9.405}{82.5} \times 111.1 = 12.7$ g	**1**
	Total:	**12**

Question	Answer	Marks
2(a)(i)	points plotted correctly from table	**1**
	line through origin	**1**
2(a)(ii)	point at 0.045 g cm^{-3}	**1**
2(a)(iii)	two sets of coordinates shown.	**1**
	gradient correctly calculated expected value = 66–67(^{o}) value must be to **2 dp**	**1**
2(b)(i)	0.0750×250 = **18.75** (g)	**1**
2(b)(ii)	dissolve the sucrose / mass of sucrose given in **2(b)(i)** / weighed mass in a stated volume of (distilled) water, less than 250 cm^3, or if not stated but then later made up to 250 cm^3 / up to the mark	**1**
	transfer solution to (a 250 cm^3) volumetric flask AND Make up the solution to the mark / flask volume with (distilled) water	**1**

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Question	Answer	Marks
2(c)(i)	$\left(\frac{0.0350}{0.0750} \times 15.00 = 7.00\,\text{cm}^3\right)$ Volume of standard solution = **7.00** (cm^3) Volume of distilled water = **8.00** (cm^3)	**1**
2(c)(ii)	burette / graduated pipette	**1**
2(c)(iii)	solution was more dilute than expected	**1**
2(d)	3.75 correctly read off graph (0.056–0.057)($g\,cm^{-3}$) or correctly calculated from 3.75 = **2(a)(iii)** × concentration	**1**
	conc of sucrose = (56–57)($g\,dm^{-3}$) or multiplying a concentration by 1000 correctly	**1**
	conc of sucrose = (0.164–0.167)($mol\,dm^{-3}$) or dividing a concentration by M_r / (342) correctly	**1**
2(e)	wash out with small volume of solution of concentration to be used	**1**
2(f)	predicted value: (+)10.10 / 10.1 or twice value at 0.075 taken from graph	**1**
	explanation: (The plane polarised light encounters) more (twice) molecules / moles / amount of sucrose	**1**
2(g)	To calibrate the instrument / to set the polarimeter to 0 degrees	**1**
	Total:	**18**

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