Cambridge International AS & A Level

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CHEMISTRY **9701/53**

Paper 5 Planning, Analysis and Evaluation **October/November 2016**

MARK SCHEME

Maximum Mark: 30

Published

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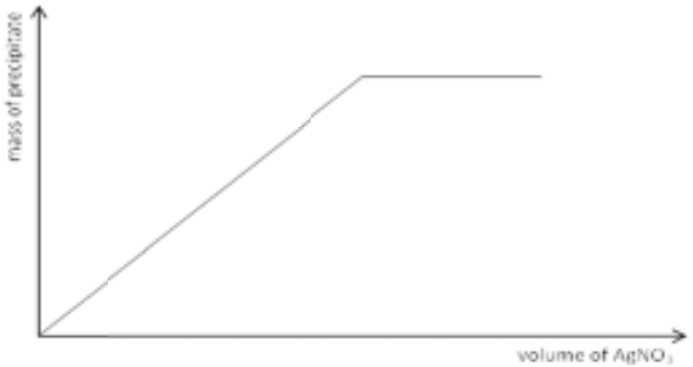
Question	Answer	Mark
1(a)(i)	silver chromate(VI) / silver chromate $2Ag^+ + CrO_4^{2-} \rightarrow Ag_2CrO_4$ OR $2Ag^+ + K_2CrO_4 \rightarrow Ag_2CrO_4 + 2K^+$ OR $2AgNO_3 + K_2CrO_4 \rightarrow Ag_2CrO_4 + 2KNO_3$	1 1 **2**
1(a)(ii)	insoluble / solid barium chromate(VI) / barium chromate would form	1 **1**
1(a)(iii)	insoluble / solid barium sulfate is formed	1 **1**
1(b)	 correctly labelled axes straight line through origin **AND** reaches a plateau	 1 1 **2**
1(c)(i)	Volumetric/graduated flask 250 cm^3 pipette (graduated) 25 cm^3 burette 50 cm^3	 **2**

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Question	Answer	Mark
1(c)(ii)	Dissolve / stir / mix known mass / all of hydrated salt in (a container with) (distilled water) (Transfer / add to a) volumetric flask, make to mark (with distilled water) or to the volume of the stated volumetric flask (in **1(c)(i)** or **1(c)(ii)**) NOTE: Water must be mentioned at least once for one mark to be awarded. Distilled/deionised/purified water must be mentioned for 2 marks to be awarded.	1 1 **2**
1(c)(iii)	first = sulfuric acid second = potassium chromate(VI) third = silver nitrate	1 **1**
1(c)(iv)	experiment / titration is repeated to get concordant titre	1 **1**
1(c)(v)	$0.0128 \times 208.3 = 2.67$ g of $BaCl_2$ **AND** $3.13 - 2.67 = 0.46$ g of H_2O **x** = $(0.46 / 18.0) \div 0.0128 = 2$	1 1 **2**

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Question	Answer	Mark
1(d)	Potassium chromate (solution) – (health hazard in context of) respiratory irritation **AND** fume cupboard / face / nose / mouth mask ..... **OR** Potassium chromate – (health hazard in context of) skin irritation **AND** (chemical resistant) gloves …… **OR** barium chloride (solid) as toxic **AND** (chemical resistant) gloves / large dilution on disposal …… **OR** Sulfuric acid as irritant / skin irritant **AND** (chemical resistant) gloves	1 **1**
	Total:	**15**

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Question	Answer	Mark
2(a)	Column **C** data correct Column **D** data correct and given to 2 dp	1 1

C	**D**	
$(\alpha - \alpha_\infty)$	$\log_{10}(\alpha - \alpha_\infty)$	time
51.9	1.72	0
41.1	1.61	300
33.3	1.52	600
27.5	1.44	900
22.6	1.35	1200
18.2	1.26	1500
14.4	1.16	1800
11.7	1.07	2100
9.5	0.98	2400
7.5	0.88	2700

2

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Question	Answer	Mark
2(b)(i)	All ten points plotted correctly Best-fit **straight** line drawn	1 1 **2**
2(b)(ii)	(Yes) most of the points are on the line **OR** only a few points are not on the line	1 **1**
2(c)(i)	Co-ordinates read and recorded correctly Correctly calculated value of the gradient given to **3sf** and using the candidate's co-ordinates correctly	1 1 **2**
2(c)(ii)	k = candidate's gradient $\times (-2.30)$ Correct answer	1 1 **2**
2(d)(i)	Reading / value of α was read / taken / recorded too early	1 **1**
2(d)(ii)	Two co-ordinates on line correctly read and stated **AND** One y value must be half the other $t_{½}$ correctly determined from candidate's co-ordinates values provided $y_1 = y_2 / 2$	1 1 **2**
2(d)(iii)	Correctly calculated value for $k' = \frac{0.693}{t_{\frac{1}{2}}}$	1 **1**

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Question	Answer	Mark
2(d)(iv)	Second reaction took place at <u>higher</u> temperature **AND** because *k*' (second *k* value) is larger	1 **1**
2(d)(v)	No **OR** the half-life would not change **AND** half-life is independent of cencentration **OR** the reaction is first order (with respect to sucrose)	1 **1**
	Total:	**15**

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