



Cambridge
International
AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

CHEMISTRY

9701/51

Paper 5 Planning, Analysis and Evaluation

October/November 2016

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.

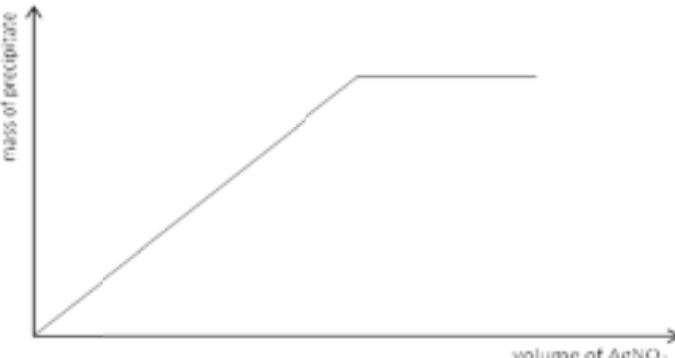
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This document consists of **7** printed pages.

Page 2	Mark Scheme	Syllabus	Paper
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Question	Answer	Mark
1(a)(i)	silver chromate(VI) / silver chromate $2\text{Ag}^+ + \text{CrO}_4^{2-} \rightarrow \text{Ag}_2\text{CrO}_4$ OR $2\text{Ag}^+ + \text{K}_2\text{CrO}_4 \rightarrow \text{Ag}_2\text{CrO}_4 + 2\text{K}^+$ OR $2\text{AgNO}_3 + \text{K}_2\text{CrO}_4 \rightarrow \text{Ag}_2\text{CrO}_4 + 2\text{KNO}_3$	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

Page 3	Mark Scheme	Syllabus	Paper
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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)	$0.0128 \times 208.3 = 2.67 \text{ g of BaCl}_2$ AND $3.13 - 2.67 = 0.46 \text{ g of H}_2\text{O}$ $x = (0.46 / 18.0) \div 0.0128 = 2$	1 1 2

Page 4	Mark Scheme	Syllabus	Paper
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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

Page 5	Mark Scheme	Syllabus	Paper
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Question	Answer	Mark																																				
2(a)	Column C data correct Column D data correct and given to 2 dp <table border="1"> <thead> <tr> <th>C</th><th>D</th><th></th></tr> </thead> <tbody> <tr> <td>$(\alpha - \alpha_{\infty})$</td><td>$\log_{10}(\alpha - \alpha_{\infty})$</td><td>time</td></tr> <tr> <td>51.9</td><td>1.72</td><td>0</td></tr> <tr> <td>41.1</td><td>1.61</td><td>300</td></tr> <tr> <td>33.3</td><td>1.52</td><td>600</td></tr> <tr> <td>27.5</td><td>1.44</td><td>900</td></tr> <tr> <td>22.6</td><td>1.35</td><td>1200</td></tr> <tr> <td>18.2</td><td>1.26</td><td>1500</td></tr> <tr> <td>14.4</td><td>1.16</td><td>1800</td></tr> <tr> <td>11.7</td><td>1.07</td><td>2100</td></tr> <tr> <td>9.5</td><td>0.98</td><td>2400</td></tr> <tr> <td>7.5</td><td>0.88</td><td>2700</td></tr> </tbody> </table>	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	1 1 2
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Page 6	Mark Scheme	Syllabus	Paper
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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)	$k = \text{candidate's gradient} \times (-2.30)$ 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 $t_{1/2}$ correctly determined from candidate's co-ordinates values provided $y_1 = y_2 / 2$	1 1 2
2(d)(iii)	Correctly calculated value for $k' = \frac{0.693}{t_{1/2}}$	1 1

Page 7	Mark Scheme	Syllabus	Paper
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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 concentration OR the reaction is first order (with respect to sucrose)	1 1
	Total:	15