
CHEMISTRY

9701/51

Paper 5 Planning, Analysis and Evaluation

October/November 2016

MARK SCHEME

Maximum Mark: 30

Published

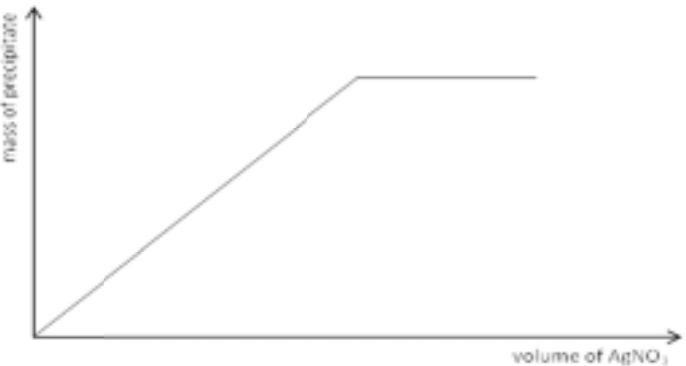
This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, 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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Cambridge is publishing the mark schemes for the October/November 2016 series for most Cambridge IGCSE[®], Cambridge International A and AS Level components and some Cambridge O Level components.

Page 2	Mark Scheme	Syllabus	Paper
	Cambridge International AS/A Level – October/November 2016	9701	51

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)	 <p>correctly labelled axes straight line through origin AND reaches a plateau</p>	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
	Cambridge International AS/A Level – October/November 2016	9701	51

Question	Answer	Mark
1(c)(ii)	<p>Dissolve / stir / mix known mass / all of hydrated salt in (a container with) (distilled water)</p> <p>(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))</p> <p>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.</p>	<p>1</p> <p>1</p> <p>2</p>
1(c)(iii)	<p>first = sulfuric acid</p> <p>second = potassium chromate(VI)</p> <p>third = silver nitrate</p>	<p>1</p> <p>1</p>
1(c)(iv)	experiment / titration is repeated to get concordant titre	<p>1</p> <p>1</p>
1(c)(v)	<p>$0.0128 \times 208.3 = 2.67$ g of BaCl_2</p> <p>AND $3.13 - 2.67 = 0.46$ g of H_2O</p> <p>$x = (0.46 / 18.0) \div 0.0128 = 2$</p>	<p>1</p> <p>1</p> <p>2</p>

Page 4	Mark Scheme	Syllabus	Paper
	Cambridge International AS/A Level – October/November 2016	9701	51

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

Page 5	Mark Scheme	Syllabus	Paper
	Cambridge International AS/A Level – October/November 2016	9701	51

Question	Answer	Mark																																				
2(a)	<p>Column C data correct Column D data correct and given to 2 dp</p> <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	<p>1 1</p> <p>2</p>
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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 $t_{\frac{1}{2}}$ correctly determined from candidate's co-ordinates values provided $y_1 = y_2 / 2$	1 1 2
2(d)(iii)	Correctly calculated value for $k' = \frac{0.693}{t_{\frac{1}{2}}}$	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