
CHEMISTRY

9701/51

Paper 5 Planning, Analysis and Evaluation

October/November 2016

MARK SCHEME

Maximum Mark: 30

Published

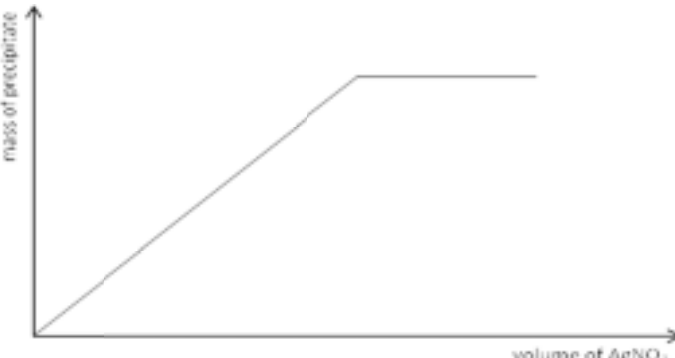
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Page 2	Mark Scheme	Syllabus	Paper
	Cambridge International AS/A Level – October/November 2016	9701	51

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)	 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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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

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																																				
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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
	Cambridge International AS/A Level – October/November 2016	9701	51

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

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Page 2	Mark Scheme	Syllabus	Paper
	Cambridge International AS/A Level – October/November 2016	9701	52

Question	Expected answer	Marks
1(a)	the reaction produces (more) H ⁺ ions	1
1(b)(i)	volumetric flask 250 cm³ pipette 25 cm³ burette 50 cm³ 3 correct pieces and volumes = 2 marks 2 correct pieces and volumes = 1 mark	2
1(b)(ii)	$372.2 \times 0.100 \times \text{volumetric flask volume from (i)} / 1000$	1
1(b)(iii)	Dissolve / stir / mix (answer to 1(b)(ii)) / all of hydrated salt in (a container with) (distilled water) (Transfer / add to a) volumetric flask (of size given in 1(b)(i) or allowed in 1(b)(ii)), make to mark (or volume used for volumetric flask) (with distilled water) 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(b)(iv)	Add solution dropwise (close to the endpoint)	1
1(b)(v)	experiment / titration is repeated to get concordant titres	1

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Question	Expected answer	Marks
1(c)(i)	(NaOH(aq) is) corrosive and Wear gloves OR (Solochrome black solution or ethanol is) flammable and Keep away from naked flames OR (Solochrome black solution) is (health hazard) in context of: Irritating to respiratory system and Fume cupboard OR Face mask OR Nose mask OR Mouth mask OR Breathing mask OR Irritating to skin and Gloves	1

Page 4	Mark Scheme	Syllabus	Paper
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Question	Expected answer	Marks
1(c)(ii)	concentration of $\text{Ca}^{2+} = 6.64 \times 10^{-3} \text{ mol dm}^{-3}$ concentration of $\text{Mg}^{2+} = 2.44 \times 10^{-3} \text{ mol dm}^{-3}$ OR subtraction of Ca^{2+} value from total value, either cm^3 or calculated moles 2 x calculations for 'no of mol' of edta reacting in the titration use of M^{2+} ion 1 : 1 edta stoichiometry two conversions of moles to concentrations in mol dm^{-3}	4 1 1 1 1
	Total	13

Page 5	Mark Scheme	Syllabus	Paper
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Question	Expected answer	Marks
2(a)(i)	(V _f -V)	
	252	
	220	
	190	
	165	
	142	
	123	
	106	
	92	
	79	
	68	
	59	
2(a)(ii)	all eleven points plotted correctly	1
	best-fit curved line drawn	1
		2

Page 6	Mark Scheme	Syllabus	Paper
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Question	Expected answer	Marks
2(a)(iii)	(Yes), the data is reliable because most of the points are on the line OR only a few points are not on the line.	1
2(a)(iv)	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 values	1 1 2
2(b)(i)	use of labelled gas syringe OR collection over water using inverted labelled 'measuring cylinder' etc apparatus will work (must be closed system)	1 1 2
2(b)(ii)	(Increased rate of reaction) means harder to read syringe / measuring cylinder / volume / values (at precise time) OR Gas given off is (initially) hot (then cools) AND Volume will be greater ($V_{\text{final}} - V$) will be lower (at the same time value)	1 1 2
2(c)(i)	Reading was taken too late	1

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Question	Expected answer	Marks
2(c)(ii)	draws tangent at $t = 200$ s both sets of co-ordinates read and recorded correctly correctly calculated values of the gradient given to minimum of 2 sf and using the candidate's figures $(V_{\text{final}} - V)$ at 200s = 158 ± 1 ($\text{cm}^3 \text{s}^{-1}$)	1 1 1 1 4
2(c)(iii)	reaction is first order with respect to benzenediazonium chloride candidate uses numerical data in the table to prove order stated e.g. Demonstrates that as $(V_{\text{final}} - V)$ doubles rate doubles OR Demonstrates that as $(V_{\text{final}} - V)$ doubles, time halves	1 1 2
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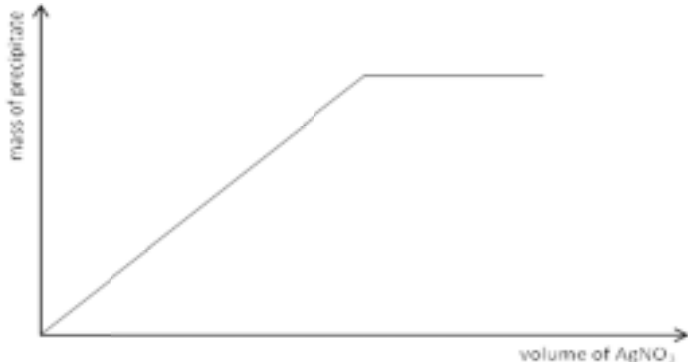
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