Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

CHEMISTRY **9701/52**

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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Question	Expected answer	Marks
1(a)	the reaction produces (more) H^+ ions	**1**
1(b)(i)	volumetric flask 250 cm^3 pipette 25 cm^3 burette 50 cm^3 3 correct pieces and volumes = 2 marks 2 correct pieces and volumes = 1 mark	**2**
1(b)(ii)	372.2 × 0.100 × 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**

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**

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

Question	Expected answer	Marks
2(a)(i)	$(V_f - V)$ 252 220 190 165 142 123 106 92 79 68 59	**1**
2(a)(ii)	all eleven points plotted correctly best-fit **curved** line drawn	1 1 **2**

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 $t_{½}$ 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_{final} – V) will be lower (at the same time value)	1 1 **2**
2(c)(i)	Reading was taken too late	**1**

Question	Expected answer	Marks
2(c)(ii)	draws tangent at t = 200 s	1
	both sets of co-ordinates read and recorded correctly	1
	correctly calculated values of the gradient given to minimum of 2 sf and using the candidate's figures	1
	($V_{final} - V$) at 200s = 158 ± 1 ($cm^3\ s^{-1}$)	1 **4**
2(c)(iii)	reaction is first order with respect to benzenediazonium chloride	1
	candidate uses numerical data in the table to prove order stated e.g. Demonstrates that as ($V_{final} - V$) doubles rate doubles **OR** Demonstrates that as ($V_{final} - V$) doubles, time halves	1 **2**
	Total:	**17**