Cambridge International AS & A Level

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CHEMISTRY **9701/52**

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

MARK SCHEME

Maximum Mark: 30

Published

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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**

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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**

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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**

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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	**1**
2(a)(ii)	all eleven points plotted correctly best-fit **curved** line drawn	1 1 **2**

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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 $t_{½}$ 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**

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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**

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