CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International Advanced Level

MARK SCHEME for the October/November 2015 series

9701 CHEMISTRY

9701/53 Paper 5 (Planning, Analysis and Evaluation), maximum raw mark 30

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.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the October/November 2015 series for most Cambridge IGCSE®, Cambridge International A and AS Level components and some Cambridge O Level components.

Question	Expected Answer	Mark
1 (a) (i)	chlorobutane, bromobutane, iodobutane	[1]
	decreasing electronegativity of chlorine, bromine and iodine	[1]
(ii)	iodobutane, bromobutane, chlorobutane	[1]
	decreasing size of atoms of iodine, bromine and chlorine/decreasing bond length of the C-Hal bond	[1]
(b) (i)	The halogenoalkane(s) AND the amount of precipitate	[1]
(ii)	Equal moles / amounts are not being used	[1]
	Use same number of moles / amounts of halogenoalkane	[1]
(iii)	• Use the same amount of sodium hydroxide each time	[1]
	• heat water / oil bath / heating mantle (to 50 °C)	[1]
	• mix reagents / mix halogenoalkane and hydroxide **and** immediately start timer	[1]
	• add nitric acid	[1]
	• allow precipitate to settle	[1]
(iv)	The precipitates should be filtered and dried	[1]
	The precipitates should be weighed	[1]
(c)	Avoid the use of flames / keep away from flames / use a fume cupboard/wear a face mask / well ventilated room	[1]
		[15]

Question	Expected Answer	Mark
2 (a)	$K = \frac{[NO_2]^2}{[N_2O_4]}$	[1]
(b)	$[NO_2(g)]^2 / mol^2\,dm^{-6}$: 0.00531; 0.00472; 0.00413; 0.00354; 0.00300; 0.00236; 0.00152; 0.00118; 0.000590	[1]
	All sig figs correct	
	All results for $[NO_2(g)]^2$ are correct	[1]
(c) (i)	All points plotted correctly	[1]
	Appropriate straight line drawn through the origin	[1]
(ii)	Points read correctly from the graph	[1]
	Gradient calculated correctly	[1]
	K_c given to 3 sig figs with correct units: $mol\,dm^{-3}$	[1]
(d)	Point at $[N_2O_4] = 0.3\,mol\,dm^{-3}$ chosen or other valid anomalous point	[1]
	Equilibrium has not been properly established / the temperature was lower than (25 °C)/ temperature was too low	[1]

Question	Expected Answer	Mark
(e) (i)	Straight line through the origin(± ½) with steeper gradient.	[1]
(ii)	Reaction is endothermic.	[1]
(i)	Value of K_c will be higher	[1]
(iv)	No change	[1]
(f)	0.9 + (0.0729/2) = 0.9 + 0.03645 0.93645 mol dm^{-3}	[1]
		[15]