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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

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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]

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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]

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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]

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