

CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International Advanced Level

MARK SCHEME for the October/November 2014 series

9701 CHEMISTRY

9701/53

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

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Question	Expected Answer	Additional Guidance	Mark	
1 (a)	(i) $\text{Mg} + \text{H}_2\text{SO}_4 \rightarrow \text{MgSO}_4 + \text{H}_2$		1	
	(ii) $2\text{Al} + 3\text{H}_2\text{SO}_4 \rightarrow \text{Al}_2(\text{SO}_4)_3 + 3\text{H}_2$		1	[2]
(b)	(i) The mass of magnesium		1	[1]
	(ii) The temperature change		1	[1]
(c)	(i) 12.35 cm^3 ECF equation in (a)		1	[1]
	(ii) The sulfuric acid must be in excess OR to ensure all the Mg has reacted / disappeared / dissolved / is the limiting reagent		1	[1]
(d)	mol of Al = 0.011 (mol) AND mol of sulfuric acid = 0.0167 (mol)		1	
	Volume of sulfuric acid = 16.67 cm^3		1	[2]
(e) (i)	The volume / mass of sulfuric acid / solution OR a stated volume of sulfuric acid. AND The initial / start temperature (of the acid) AND The final / end temperature (reached by the acid)		1	[1]
(ii)	Insulate (the reaction mixture) OR Stir (the mixture while the reaction is taking place)		1	[1]

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Question	Expected Answer	Additional Guidance	Mark	
(iii)	Calculate the heat produced in the reaction using (Q=) mc ΔT Convert to 1 mol		1 1	[2]
(f)	$3\text{Mg} + 2\text{Al}^{3+} \rightarrow 3\text{Mg}^{2+} + 2\text{Al}$ $(\Delta H_r =) 3\Delta H_1 - 1\Delta H_2$ Or a suitable Hess' Law cycle $\Delta H_r/3$		1 1 1	[3]

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Question	Expected Answer	Additional Guidance	Mark	
2 (a)	(i) $\text{Ni}^{2+}(\text{aq}) + 2\text{IO}_3^{-}(\text{aq}) \rightarrow \text{Ni}(\text{IO}_3)_2(\text{s})$		1	[1]
	(ii) 0.1000		1	[1]
	(iii) More precipitate will form		1	[1]
(b)	(i) All points plotted correctly Straight line drawn through the origin up to at least exp 7. (If all points do not lie on the line then the net deviation of the non-anomalous points on each side of the best fit line must be approximately the same.)		1 1	[2]
	(ii) Points at 0.0300 mol and 0.0500 mol		1	[1]
(iii)	Loss of precipitate during transfer to filter OR Precipitate not dry OR Not weighing to constant mass OR Precipitate contains ionic materials not removed		1	[1]
(iv)	Point at 0.1000 lies on the extrapolated drawn line of best fit.		1	
	Point at 0.1200 either at the same value as 0.1000 or slightly higher value		1	[2]
(c) (i)	8.174 g		1	[1]

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Question	Expected Answer	Additional Guidance	Mark	
(ii)	0.254 g (from c(i) – 7.92)		1	[3]
	0.000621 (mol)		1	
	$\text{IO}_3^- = 0.00124$ (mol)		1	
(iii)	$[\text{Ni}^{2+}] = 0.306$ AND $[\text{IO}_3^-] = 0.0124$ ECF		1	[2]
	4.71×10^{-5}		1	