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

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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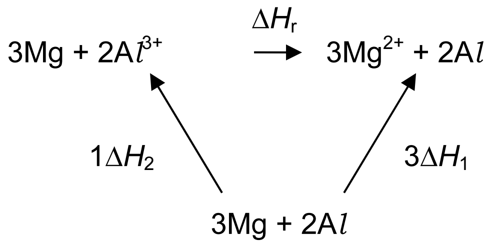
CAMBRIDGE
International Examinations

Question	Expected Answer	Additional Guidance	Mark	
1 (a) (i)	$Mg + H_2SO_4 \rightarrow MgSO_4 + H_2$		1	
(ii)	$2Al + 3H_2SO_4 \rightarrow Al_2(SO_4)_3 + 3H_2$		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]

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

Question	Expected Answer	Additional Guidance	Mark	
2 (a) (i)	Ni^{2+}**(aq)** $+2IO_3^-$**(aq)** ➔ $Ni(IO_3)_2$**(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. Point at 0.1200 either at the same value as 0.1000 or slightly higher value		**1** **1**	**[2]**
(c) (i)	8.174 g		**1**	**[1]**

Question	Expected Answer	Additional Guidance	Mark	
(ii)	0.254 g (from **c(i)** – 7.92) 0.000621 (mol) IO_3^- = 0.00124 (mol)		1 1 1	[3]
(iii)	$[Ni^{2+}]$ = 0.306 **AND** $[IO_3^-]$ = 0.0124 ECF 4.71 x 10^{-5}		1 1	[2]