CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level and GCE Advanced Level

MARK SCHEME for the May/June 2013 series

9701 CHEMISTRY

9701/35 Paper 3 (Advanced Practical Skills 1), maximum raw mark 40

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 May/June 2013 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.

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Question	Sections	Indicative material	Mark	Total
1 (a)	MMO Collection	**I** All thermometer readings recorded **and** two weighings + correct mass of **FA 1** recorded.	1	
	PDO Recording	**II** Correct headings and units in **both** tables in **(a)** (Mass) and **(c)** (Mass and temperature). *Must use solidus, brackets or describe unit fully in words. If units not included in column headings every entry must have the correct unit shown.*	1	
		III Temperature recorded to 0.5 °C *(must have at least one at 0.5 °C and one to 0.0 °C)* and weighings to same number of dp (on page 2).	1	
		Examiner to calculate Supervisor – candidate $\Delta T/m$ (ΔT *from table*).		
	MMO Quality	Award **IV** and **V** if $\delta \leq 0.20$ °C g^{-1}	1	
		Award **IV** if $0.20 < \delta \leq 0.50$ °C g^{-1}	1	[5]
(b)	PDO Layout	**I** Uniform scales chosen to use more than half of each axis. Axes labelled, ignore units.	1	
		II All points correctly plotted within ½ small square and in correct small square on *y*-axis and on the line on *x*-axis.	1	
		III Appropriate lines of best fit are drawn.	1	
	ACE Interpretation	**IV** Correct value of ΔT (or to nearest 0.5 °C) from extrapolated lines (ignore sf).	1	[4]
(c)	PDO Recording	**I** Table drawn to include weighings, correct mass of **FA 2**, initial and final thermometer readings.	1	
		Examiner to calculate Supervisor – candidate ΔT		
	MMO Quality	Award **II** and **III** if $\delta \leq 0.5$ °C	1	
		Award **II** only if $0.5 < \delta \leq 1.0$ °C	1	[3]

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(d) (i) & (iii)	ACE Interpretation	**I** Correctly calculates 25 x 4.3 × ΔT for step 1 **and** for step 2.	1	
(ii)		**II** Correctly calculates $\frac{answer\ to\ (i)\ x\ 120.4}{mass\ \boldsymbol{FA\ 1}\ x\ 1000}$ (if number of moles calculated, value used must be to at least 2 sf).	1	
(iv)		**III** Correctly calculates $\frac{answer\ to\ (iii)\ x\ 246.4}{mass\ \boldsymbol{FA\ 2}\ x\ 1000}$ (do not penalise incorrect sign a second time).	1	
(v)		**IV** Correctly calculates ΔH from answers to **(ii)** and **(iv)** with correct sign (**(ii)** – **(iv)**) (allow ecf for sign)	1	
	PDO Display	**V** Working in the right direction shown in parts **(i)** – **(iv)**. **(i)** and **(iii)** use of $mc\Delta T$; **(ii)** use of 120.4; **(iv)** use of 246.4	1	
		VI All final answers given to 3 or 4 sf (minimum of 3 answers).	1	[6]
1 (e) (i)	ACE Interpretation	Single thermometer reading ± 0.5 °C (or ±0.1 °C if candidate recorded T to 0.1 °C). ΔT ± 1.0 °C (or ± 0.2 °C)	1	
(ii)		Calculates {1.0/ΔT} × 100 (or {0.2/ΔT} × 100) for step 2 to 2 or more sf. Allow ecf.	1	[2]
(f) (i)	ACE Improvements	Student incorrect as smaller temp change or % error in temp change increased.	1	[1]
(ii)	MMO Interpretation	Calculates $\Delta T/m$ or $m/\Delta T$ or Q/m for **each** result. Allow mass of solid × c × ΔT.	1	
	MMO Decisions	Yes, values concordant/consistent (shown:– $\Delta T/m$:1.2/1.20/1.198 and 1.2/1.20/1.196 or $m/\Delta T$: 0.84/0.835 and 0.84/0.836 or Q/m: 128.7 and 128.6 respectively).	1	[2]
				[Total: 23]

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FA 3 is $CrCl_3$; **FA 4** is $(NH_4)_2Fe(SO_4)_2$; **FA 5** is $Pb(NO_3)_2$				
2 **(a)**	MMO Collection	**FA 3** gives grey-green ppt soluble in NaOH/ giving dark green solution in excess **and** grey-green ppt insoluble in excess NH_3	1	
		FA 4 gives green/dirty green ppt insoluble in excess of both **and** turning brown/darkening in at least one	1	
		FA 5 gives white ppt soluble in excess NaOH **and** white ppt insoluble in excess NH_3 **or** Award 1 mark if all NaOH observations, including in excess, are correct. Award 1 mark if all NH_3 observations, including in excess, are correct.	1	[3]
(b)	MMO Decisions	Selects products with excess NaOH in **(i) and** warms the product in **(ii)**.	1	
		Tests **gas**/ammonia with (damp) red litmus and turns blue in **(ii)**. (Stand-alone mark irrespective of reagent chosen.)	1	
	MMO Collection	**FA 4** gives (gas) turning red litmus blue	1	
		Neither of the others give a positive result.	1	[4]
(c)	MMO Decisions	**I** Selects any 2 from: $AgNO_3$, $BaCl_2$ or $Ba(NO_3)_2$, $Pb(NO_3)_2$ (full reagent names or formulae needed)	1	
		II NaOH + Al and warm do not penalise OH^- + Al and warm if full names not given above	1	
	MMO Collection	**III** and **IV** Any 2 of: only **FA 3** gives (white) ppt with Ag^+; only **FA 4** gives white ppt with Ba^{2+} (allow off-white); **FA 3** and **FA 4** give white ppt with Pb^{2+}	2	
		V FA 5 and **FA 4** (if tested) form gas/ammonia on warming (or warm in reagent column) which turns (damp) red litmus paper blue	1	[5]

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(d)	ACE Conclusions	**I FA 3**	contains Cr^{3+} and $C\ell^-$	1	
		II FA 4	contains Fe^{2+} and SO_4^{2-}	1	
		III	Only **FA 4** contains NH_4^+	1	
		IV FA 5	contains either Pb^{2+} or $A\ell^{3+}$ (**both** given)	1	
		V	Only **FA 5** contains NO_3^-	1	[5]
					[Total: 17]

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