CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level and GCE Advanced Level

MARK SCHEME for the May/June 2014 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 2014 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** Burette readings and correct volume given for dilution **and** volume between 24.00 and 26.00 cm^3	1	
	PDO Layout	**II** Initial and final readings and titre value given for rough titre **and** initial and final readings for two (or more) accurate titrations (*minimum of 2 × 2 box*)	1	
	PDO Recording	**III** Appropriate headings and units for accurate titration. **and** volume **FA 3** added recorded for each accurate titre. *Headings should match readings.* • initial/start (burette) reading/volume • final/end (burette) reading/volume • titre **or** volume/**FA 1** used/added *(but not "difference")* unit: /cm^3 **or** (cm^3) **or** in cm^3 **or** cm^3 for **each** entry	1	
		IV All accurate burette readings recorded to 0.05 cm^3. *The need to record to 0.05 applies only to the burette readings and **not** to the recorded titres.* *Do **not** award this mark if:* • *50(.00) is used as an initial burette reading* • *more than one final burette reading is 50.(00)*	1	
	MMO Decisions	**V** Has two uncorrected, accurate titres within 0.1 cm^3 *Do not consider the rough even if ticked.* *Do **not** award this mark if having performed two titres within 0.1 cm^3 a further titration is performed which is more than 0.10 cm^3 from the closer of the initial **two** titres, unless a further titration, within 0.1 cm^3 of any other titration has also been carried out.* *Do **not** award the mark if any 'accurate' burette readings (apart from initial 0) are given to **zero** dp.*	1	
Round any burette readings to the nearest 0.05 cm^3. Check and correct subtractions in the dilution and titre tables. Examiner then selects the "best" titre using the hierarchy: two identical; titres within 0.05 cm^3; titres within 0.1 cm^3; etc. Candidate scaled titre = Cand vol diluted × Cand mean titre/Sup vol diluted Examiner compares candidate scaled titre with Supervisor's titre.				
(a)	MMO Quality	**VI**, **VII** and **VIII** Award **VI**, **VII** and **VIII** for $\delta \leq 0.20\ cm^3$ Award **VI** and **VII** for $0.20\ cm^3 < \delta \leq 0.40\ cm^3$ Award **VI only** for a difference of $0.40 < \delta \leq 0.60\ cm^3$ *If the "best" titres are ≥ 0.50 cm^3 apart cancel one of the Q marks.*	3	[8]

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Question	Sections	Indicative material	Mark	Total
(b)	ACE Interpretation	Candidate must average two (or more) titres that are all within 0.20 cm^3. Working must be shown or ticks must be put next to the two (or more) accurate readings selected. *The mean should normally be quoted to 2 dp rounded to the nearest 0.01.* *Two special cases where the mean may not be to 2 dp:* *allow mean to 3 dp only for 0.025 or 0.075 e.g. 26.325;* *allow mean to 1 dp if **all** accurate burette readings were given to 1 dp and the mean is exactly correct. e.g. 26.0 and 26.2 = 26.1 is correct but 26.0 and 26.1 = 26.1 is incorrect.* *Note: the candidate's mean will sometimes be marked as correct even if it is different from the mean calculated by the Examiner for the purpose of assessing accuracy.*	1	[1]
(c)	ACE Interpretation	**I** Correctly evaluates $\frac{0.500 \times \text{vol diluted}}{250}$ in **(i)**	1	
		II Correctly calculates **(i)** $\times \frac{\textbf{(b)}}{1000}$ in **(ii)**	1	
		III Correctly calculates **(ii)** ÷ 2 in **(iii)**	1	
		IV Correctly calculates **(iii)** $\times \frac{1000}{25}$ in **(iv)**	1	
	PDO Display	**V All** answers given to 3 or 4 sf *minimum 3 steps attempted to access this mark*	1	[5]
(d)	ACE Interpretation	**(i)** smallest = 24.70, largest = 24.90	1	
	Conclusion	**(ii)** lower conc **FA 3** leads to greater titre therefore greater conc. of $Ca(OH)_2$	1	[2]
(e)	ACE Conclusion	limewater reacts with carbon dioxide in air	1	[1]
Qn 1	**Total**		**[17]**	

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Question	Sections	Indicative material	Mark	Total
2 (a)	PDO Layout	**I** Headings with units **and** three balance readings and two correctly calculated masses of solid are tabulated clearly. Mass /g, (g), in g, in grams *If units are omitted from the headings then they must appear next to each entry in the table.*	1	
	MMO Collection	**II** White solid turns yellow/green-yellow on heating and white/becomes paler on cooling	1	
On Supervisor script calculate mass **FA 4** ÷ mass loss to 1 dp. Calculate **FA 4** ÷ mass loss for the candidate to 1 dp and calculate difference from Supervisor.				
(a)	MMO Quality	**III** and **IV** Award **III** and **IV** if $\delta \leq 0.5$.	1	
		Award **IV only** if $0.5 < \delta \leq 1.0$.	1	[4]
(b)	ACE Interpretation	**I** Correctly calculates mass loss from results in **(a)** in **(i)**	1	
		II Correctly calculates M_r: $ZnCO_3$ = 125.4 **and** CO_2 = 44(.0) in **(ii)**	1	
	PDO Display	**III** Uses $\frac{\textbf{(i)} \times 125.4}{44}$ in **(ii)** (allow ecf)	1	
		IV Uses $\frac{\textbf{(ii)} \times 100}{\text{correct mass } \textbf{FA 4}}$ in **(iii)**	1	[4]
(c)	ACE Improvement	Heat to constant mass/ use larger mass	1	
	Interpretation	All decomposes/all CO_2 given off smaller % error	1	[2]
Qn 2	**Total**		**[10]**	

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Question	Sections	Indicative material	Mark	Total
FA 5 is $ZnCO_3(s) + Al_2(SO_4)_3(s)$ **FA 7** is $NH_4Cl(s) + NaHCO_3(s)$				
3 (a) (i)	MMO Collection	**I** Effervescence (and colourless solution)	1	
(ii)		**II** White ppt with NaOH soluble in excess	1	
(iii)		**III** White ppt with NH_3 insoluble/partially soluble in excess	1	
(iv)		**IV** No reaction/no change/no ppt	1	
(v)		**V** White ppt (if additional HCl/HNO_3 added then ppt must remain)	1	
(vi)	ACE Conclusion	**VI** Al^{3+}	1	
		VII SO_4^{2-} as white ppt with Ba^{2+}	1	[7]
(b) (i)	MMO Collection	**I** Condensation **or** sublimation (*allow misty/white fumes*) (on gentle heating) **and** (gas/NH_3) turns (damp) red litmus blue	1	
(ii)		**II** White/off-white/cream ppt soluble in NH_3	1	
(iii)		**III** No reaction or white ppt in 1st box (allow no ppt) **and** effervescence in 2nd box	1	
	MMO Decisions	**IV** Uses limewater in either 3rd test or in **(a)(i)**	1	
(iv)	ACE Conclusion	**V** and **VI** Identifies NH_4^+, Cl^- and CO_3^{2-} or SO_3^{2-} with appropriate evidence.	1	
		V only Identifies all three ions without evidence **or** identifies two ions with evidence.	1	
		ion / **minimum evidence** NH_4^+ / gas turning litmus blue/NH_3 (provided correct litmus result in obs) Cl^- / white ppt with $AgNO_3$ CO_3^{2-}, SO_3^{2-} / (rapid) effervescence with acid white ppt with Ba^{2+} and effervescence/ppt dissolves in acid		[6]
Qn 3	**Total**		**[13]**	

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