CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level and GCE Advanced Level

MARK SCHEME for the May/June 2014 series

9701 CHEMISTRY

9701/33 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.

CAMBRIDGE
International Examinations

Question	Sections	Indicative material	Mark	Total
1 (a)	PDO Layout	**I** 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	
	MMO Collection	**II** Appropriate headings and units for all accurate data. **and** volume **FA 1** 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 *(**not** "difference")* unit: /cm^3 **or** (cm^3) **or** in cm^3 **or** cm^3 for **each** entry	1	
	PDO Recording	**III 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)* • *any burette reading is greater than 50.(00).*	1	
	MMO Decisions	**IV** Has two uncorrected, accurate titres within 0.1 cm^3. *Do not include a reading labelled 'rough'.* *Do **not** award this mark if, having performed two titres within 0.1 cm^3, a further titration is performed that is more than 0.1 cm^3 from the closer of the two initial titres unless further titrations within 0.1 cm^3 of any other have also been carried out.* *Do **not** award the mark if any 'accurate' burette readings (apart from initial 0) are given to **zero** dp.*	1	
All burette readings should be rounded to the nearest 0.05 cm^3. Subtractions should be checked. The 'best' titres should be selected using the hierarchy: two (or more) identical, then two (or more) within 0.05 cm^3 , then two (or more) within 0.1 cm^3, etc. Examiner compares candidate mean titre with Supervisor mean titre.				
(a)	MMO Quality	**V, VI** and **VII** Award **V**, **VI** and **VII** for a difference from Supervisor, $\delta \leq 0.20\ cm^3$ Award **V** and **VI** for $0.20 < \delta \leq 0.30\ cm^3$ Award **V** only for $0.30 < \delta \leq 0.50\ cm^3$ *Spread penalty: if the two 'best' titres used by the Examiner are ≥ 0.50 cm^3 apart cancel one of the Q marks.*	3	[7]

© Cambridge International Examinations 2014

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)	PDO Display	**I** Uses the expression $\frac{0.0200 \times \textbf{(b)}}{1000}$ in **(i)** (or answer correct to 3 or 4 sf)	1	
	ACE Interpretation	**II** Correctly evaluates $\frac{0.0530 \times 25}{1000}$ in **(ii)** (to 3 or 4 sf)	1	
		III $\frac{\text{answer to } \textbf{(ii)}}{\text{answer to } \textbf{(i)}}$ in **(iii)** **and** correct answer to 2, 3 or 4 sf	1	
		IV Equation 2 as ratio is 5:2 or 2½ **and** reference to their answer in **(iii)** *Allow ecf*	1	
	ACE Conclusion	**V** Oxidation state = (+)4 in **(v)** from equation 2 *Allow ecf ((+)3)*	1	[5]
Qn 1	**Total**		**[13]**	

© Cambridge International Examinations 2014

Question	Sections	Indicative material	Mark	Total
2 (a)	PDO Recording	Four thermometer readings and two masses tabulated with correct headings and units. (mass/g or (g) or in g; temperature/temp/T/°C, etc.) *If units are omitted from the headings then they must appear next to each entry in the table.*	1	
	Display	Consistent dp for balance readings and (*minimum 3*) thermometer readings to ×.0/×.5.	1	
Correct temperatures to nearest 0.5 °C. Examiner calculates ΔT for longer piece of magnesium for Supervisor and candidate.				
(a)	MMO Quality	Award one mark if the difference between candidate and Supervisor is ≤ 2.0 °C.	1	
		Award second mark if the difference between candidate and Supervisor is ≤ 1.0 °C.	1	[4]
(b)	ACE Interpretation	**I** $\frac{\text{mass longer Mg}}{24.3} < \frac{50 \times 1.00}{1000}$ in **(i)**	1	
	MMO Collection	**II** No solid/metal left/**all** Mg disappeared/dissolved in **(ii)**	1	
	ACE Interpretation	**III** Expression $50 \times 4.3 \times \Delta T$ **or** correct answers in **(iii)** and **(v)**	1	
	PDO Display	**IV** Uses $\frac{\text{answer to (iii)}}{\text{mass shorter Mg}/24.3}$ in **(iv)** **and** $\frac{\text{answer to (v)}}{\text{mass longer Mg}/24.3}$ in **(vi)** *Allow ecf from **(i)***	1	
	ACE Interpretation	**V** Correct answers given to 2–4 sf in kJ **and** minus signs in **(iv)** and **(vi)**	1	[5]
(c)	ACE Interpretation	(2 × 0.5/smaller ΔT) × 100 for shorter piece of Mg in **(iii)**	1	[1]
(d)	ACE Interpretation	Mass of/weighing Mg (ribbon) **or** volume of H_2SO_4 used **or** corrosion on Mg	1	
	Improvements	Use greater mass/balance to more dp **or** use burette/pipette (to measure volume) **or** use sand paper or emery paper **or** use lid or taller beaker or taller cup to prevent acid spray	1	[2]
Qn 2	**Total**		**[12]**	

© Cambridge International Examinations 2014

Question	Sections	Indicative material	Mark	Total
FA 4 is $FeCl_3(aq)$ **FA 5** is $MnSO_4(aq)$ **FA 6** is $(NH_4)_2Fe(SO_4)_2(aq)$				
3 (a) (i)	MMO Collection	**I** (Solution) turns pink/pink-brown/brown/purple **or** no reaction/no change	1	
		II (Purple decolourised and) (dark) brown ppt	1	
		III (Purple) decolourised	1	
(ii)	ACE Conclusion	**IV** (**FA 5** and) **FA 6**	1	[4]
(b) (i)	PDO Layout	**I** NaOH on answer line and unambiguous table of results including observations for excess NaOH with all three	1	
	MMO Collection	**II** Brown/orange/red-brown/rust ppt (insoluble in excess NaOH with **FA 4**)	1	
		III Off-white/buff/**light** brown ppt (insoluble in excess NaOH with **FA 5**)	1	
		IV Green/dirty green ppt (insoluble in excess NaOH with **FA 6**)	1	
		V ppt with **FA 5** darkens/turns dark(er) brown **and ppt** with **FA 6** darkens/turns green-brown/brown/orange-brown/ red-brown on standing	1	
		VI On warming/heating with NaOH **gas** evolved turns (damp) red litmus (paper) blue with **FA 6 only**	1	
(ii)	ACE Conclusion	**VII FA 4** contains Fe^{3+} **and FA 5** contains Mn^{2+} **and FA 6** contains Fe^{2+}	1	
		VIII FA 6 contains NH_4^+	1	[8]
(c) (i)	MMO Decisions	Selects $AgNO_3$ **or** $BaCl_2/Ba(NO_3)_2$	1	
	MMO Collection	$AgNO_3$: **FA 4** white ppt **and** no ppt/reaction with **FA 5** and **FA 6** **or** $BaCl_2/Ba(NO_3)_2$: white ppt with **FA 5** and **FA 6 and** no ppt/reaction with **FA 4**	1	
(ii)	ACE Conclusion	**FA 4** (contains the chloride ion)	1	[3]
Qn 3	**Total**		**[15]**	

© Cambridge International Examinations 2014