

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.

Page 2	Mark Scheme	Syllabus	Paper
	GCE AS/A LEVEL – May/June 2014	9701	33

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 (<i>minimum of 2×2 box</i>)	1	
	MMO Collection	II Appropriate headings and units for all accurate data. and volume FA 1 added recorded for each accurate titre. <i>Headings should match readings.</i> - initial/start (burette) reading/volume - final/end (burette) reading/volume - titre or volume/FA 1 used/added (not “difference”) unit: /cm³ or (cm³) or in cm³ or cm³ for each entry	1	
	PDO Recording	III All accurate burette readings recorded to 0.05 cm ³ . <i>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:</i> 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 . <i>Do not include a reading labelled ‘rough’. Do not award this mark if, having performed two titres within 0.1 cm³, a further titration is performed that is more than 0.1 cm³ from the closer of the two initial titres unless further titrations within 0.1 cm³ 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.</i>	1	
All burette readings should be rounded to the nearest 0.05 cm³. Subtractions should be checked. The ‘best’ titres should be selected using the hierarchy: two (or more) identical, then two (or more) within 0.05 cm³, then two (or more) within 0.1 cm³, 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, $\delta \leq 0.20 \text{ cm}^3$ Award V and VI for $0.20 < \delta \leq 0.30 \text{ cm}^3$ Award V only for $0.30 < \delta \leq 0.50 \text{ cm}^3$ <i>Spread penalty: if the two ‘best’ titres used by the Examiner are $\geq 0.50 \text{ cm}^3$ apart cancel one of the Q marks.</i>	3	[7]

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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 cm³. Working must be shown or ticks must be put next to the two (or more) accurate readings selected. <i>The mean should normally be quoted to 2 dp rounded to the nearest 0.01.</i> <i>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.</i> <i>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.</i>	1	[1]
(c)	PDO Display ACE Interpretation ACE Conclusion	I Uses the expression $\frac{0.0200 \times (\mathbf{b})}{1000}$ in (i) (or answer correct to 3 or 4 sf) II Correctly evaluates $\frac{0.0530 \times 25}{1000}$ in (ii) (to 3 or 4 sf) III $\frac{\text{answer to (ii)}}{\text{answer to (i)}}$ in (iii) and correct answer to 2, 3 or 4 sf IV Equation 2 as ratio is 5:2 or 2½ and reference to their answer in (iii) <i>Allow ecf</i> V Oxidation state = (+)4 in (v) from equation 2 <i>Allow ecf ((+)3)</i>	1 1 1 1 1	[5]
Qn 1	Total		[13]	

Page 4	Mark Scheme	Syllabus	Paper
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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.) <i>If units are omitted from the headings then they must appear next to each entry in the table.</i>	1	
	Display	Consistent dp for balance readings and (<i>minimum</i> 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. Award second mark if the difference between candidate and Supervisor is ≤ 1.0 °C.	1 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) <i>Allow ecf from (i)</i>	1	
	ACE Interpretation	V Correct answers given to 2–4 sf in kJ and minus signs in (iv) and (vi)	1	
(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 ₂ SO 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	
Qn 2	Total			[12]

Page 5	Mark Scheme	Syllabus	Paper
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Question	Sections	Indicative material	Mark	Total
FA 4 is $\text{FeCl}_3(\text{aq})$ FA 5 is $\text{MnSO}_4(\text{aq})$ FA 6 is $(\text{NH}_4)_2\text{Fe}(\text{SO}_4)_2(\text{aq})$				
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	
(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	
(c) (i)	MMO Decisions	Selects AgNO_3 or $\text{BaCl}_2/\text{Ba}(\text{NO}_3)_2$	1	
	MMO Collection	AgNO_3 : FA 4 white ppt and no ppt/reaction with FA 5 and FA 6 or $\text{BaCl}_2/\text{Ba}(\text{NO}_3)_2$: 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]	