

CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International Advanced Subsidiary and Advanced Level

MARK SCHEME for the May/June 2015 series

9701 CHEMISTRY

9701/31

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.

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Page 2	Mark Scheme	Syllabus	Paper
	Cambridge International AS/A Level – May/June 2015	9701	31

Question	Indicative material	Mark	Total
1 (a)	<p>I Initial and final burette readings and titre unambiguously recorded in rough and accurate titrations. <i>Minimum of 2 × 2 boxes for accurate.</i></p>	1	
	<p>II Headings and units correct for accurate titration and headings match readings. <i>Headings: initial / final (burette) reading / volume or Reading / volume / vol / value at start / finish and Volume / vol / FA 1 added / used or titre [not “difference or “total”] and Units: (cm³) or / cm³ or in cm³ or cm³ by every entry</i></p>	1	
	<p>III All accurate burette readings (initial and final) recorded to nearest 0.05 cm³ <i>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)</i></p>	1	
	<p>IV Has two uncorrected, accurate titres within 0.1 cm³ <i>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 has also been carried out. Do not award the mark if any ‘accurate’ burette readings (apart from initial 0) are given to zero dp.</i></p>	1	
<p>Examiner rounds all all burette readings to the nearest 0.05 cm³ and checks subtractions. Examiner selects the ‘best’ titres using the hierarchy: two (or more) identical, then two (or more) within 0.05 cm³ , then two (or more) within 0.1 cm³, etc.</p>			

Page 3	Mark Scheme	Syllabus	Paper
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Question	Indicative material	Mark	Total
	Award V , VI and VII if $\delta \leq 0.20 \text{ cm}^3$ Award V and VI if $0.20 \leq \delta \leq 0.40 \text{ cm}^3$ Award V if $0.40 \leq \delta \leq 0.60 \text{ cm}^3$ <i>Spread penalty: if the two 'best' titres used by the examiner are more than 0.50 cm^3 apart cancel one of the Q marks.</i>	1 1 1	[7]
(b)	Calculation of mean 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. <i>The mean should normally be quoted to 2 dp rounded to the nearest 0.01. Example: 26.667 must be rounded to 26.67. 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>	1	[1]
(c)(i)(ii)	I Correctly calculates $\frac{0.0200 \times (b)}{1000}$ in step (i) and $\times 5$ in (ii)	1	
(iii)	II Expression (ii) / 0.025	1	
(iv)	III Expression (iii) $\times 392.0$ (or addition of A _r s shown)	1	
	IV Answers to (i) to (iv) given to 3 or 4 sf (min 3 answers needed)	1	[4]
Qn 1	Total		[12]

Page 4	Mark Scheme	Syllabus	Paper
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Question	Indicative material	Mark	Total
2 (a)	I Table with unambiguous headings and correct units All readings must be included.	1	
	II All temperatures recorded to .0 or .5 °C. Must include at least one ending in .0 and one ending in .5.	1	
Examiner calculates candidate's ΔT max from table.			
	III Award if the difference between candidate and Supervisor is within 4.0 °C	1	
	IV Award if the difference between candidate and Supervisor is within 2.0 °C	1	[4]
(b) (i)	Axes labelled temperature or T or °C or temperature and time or minutes or min or t. Linear scales chosen to use more than half of each axis and to include 5 °C more than the maximum temp.	1	
	All points recorded (minimum of 10). Correct plotting – each point accurately plotted (within $\frac{1}{2}$ small square and in the correct square).	1	
	(ii) All three straight lines drawn	1	
	Lines of best fit and extrapolated	1	
	(iii) Correct ΔT from graph to within .2 °C of examiner value using the candidate's lines.	1	[5]

Question	Indicative material	Mark	Total
(c) (i)	Correct answer to $4.2 \times 40 \times \text{ans}(\mathbf{b})(\mathbf{iii})$.	1	
	Allow answers to 2–4 sf		
	(ii) Correct answer to (i) /219000 Allow answers to 2–4 sf	1	
(iii)	Expression (ii) /0.040 Allow answers to 2–4 sf	1	[3]
(d) (i)	Correct answer correct to number of sf shown (min 2 sf): $0.5/\text{highest temp} \times 100$	1	
(ii)	Do not agree as the zinc is in excess	1	
(iii)	Incorrect as temperature rise is the same or Incorrect as (a smaller volume) has a greater % error ORA	1	[3]
Qn 2	Total		[15]

Page 5	Mark Scheme	Syllabus	Paper
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Question	Indicative material	Mark	Total
FA 5 is $(\text{NH}_4)_2\text{Fe}(\text{SO}_4)_2(\text{aq})$; FA 6 is $\text{CuCO}_3 + \text{MgSO}_4 \cdot 7\text{H}_2\text{O}$			
3 (a)	Fizzing	1	[2]
	Acid or any named acid	1	
(b)(i)–(vi)	In (i) (solid goes from green) to black / grey	1	
	In (i) condensation / water / water vapour / steam / steamy fumes	1	
	In (ii) fizzing and forms a (light) blue solution .	1	
	Cloudy with limewater in (i) or (ii) or (a)	1	
	In (ii) blue ppt with sodium hydroxide and insoluble in excess.	1	
	Any 2 from:		
	In (iv) white ppt insoluble in excess	1	
	In (v) white ppt insoluble in excess	1	
	In (vi) white ppt	1	
	(vii)	Cation: Cu^{2+}	
Cation: Mg^{2+}		1	
Anions: CO_3^{2-} and SO_4^{2-} and SO_3^{2-}		1	
(viii)	Selects acid/ named acid to add to test (vi) (not H_2SO_4) or Selects named acid to add to FA 6 and tests with $\text{H}^+/\text{Cr}_2\text{O}_7^{2-}$ or $\text{H}^+/\text{MnO}_4^-$ and SO_4^{2-} insoluble and SO_3^{2-} soluble or SO_4^{2-} no change and SO_3^{2-} (orange) turns green or (purple) turns colourless	1	[11]
	Qn 3	Total	