

CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International Advanced Subsidiary and Advanced Level

MARK SCHEME for the October/November 2014 series

9701 CHEMISTRY

9701/36

Paper 3 (Advanced Practical Skills 2),
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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(b)	<p>Calculation of mean Candidate must average two (or more) accurate titres with total spread of no more than 0.2 cm³</p> <p>Working must be shown or ticks must be put next to the two (or more) accurate readings selected.</p> <p><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.</i></p> <p><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></p> <p><i>Do not award this mark if: any selected titre is not within 0.20 cm³ of any other selected titre; the rough titre was used to calculate the mean; the candidate carried out only 1 accurate titration; burette readings were incorrectly subtracted to obtain any of the accurate titre values; all burette readings (resulting in titre values used in calculation of mean) are integers.</i></p> <p><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></p>	1		[1]
(c) (i)	$M_r \text{KIO}_3 = 214$	1		
	$\text{Moles dm}^{-3} = \frac{3.60}{40 \times 214} = 4.205/4.206/4.21/4.21 \times 10^{-4}$	1		
(ii)	$\text{Moles S}_2\text{O}_3^{2-} = (\text{i}) \times 6 = (2.52 \times 10^{-3})$	1		
(iii)	$\frac{(\text{ii}) \times 1000}{\text{vol from (b)}}$	1		
	Answers given to 3 or 4 sf	1		[5]
[Total: 12]				
2 (a)	<p>Round times to nearest second. Supervisor calculates time with 10 cm³ / time with 20 cm³ (to 1 dp) and</p> <p>awards 3 marks if within 1.9 to 2.1 awards 2 marks if within 1.8 to 2.2 (but not within 1.9 to 2.1) awards 1 mark if within 1.6 and 2.4 (but not within 1.8 to 2.2)</p>	1 1 1		[3]
(b)	I 3 additional volumes chosen with intervals not less than 2 cm ³ . These must include 1 of < 10 cm ³ and 1 of > 10 cm ³ and have none < 4 cm ³ .	1		

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	<p>II In all 3 additional experiments water is added to make a total of 20 cm³.</p> <p>III Tables in (a) and (b) to show volume FB 5, volume water and reaction time. All volumes measured to 0.05 cm³.</p> <p>IV All times recorded to nearest second.</p>	1	
		1	
		1	[4]
(c)	Completes table correctly.	1	
	Correct headings and units including cm ³ s.	1	[2]
(d)	Agree: product FB5 × reaction time is (approx) constant	1	
	Or		
	Disagree: product of FB5 × reaction time is not constant		[1]
(e)	sodium thiosulfate is in excess – all the iodine reacts with the thiosulfate so no iodine produced (to turn blue-black).	1	[1]
(f)	(Carry out a series of reactions) keeping volume S₂O₈²⁻ (FB5) constant (and timing to blue-black)	1	
	Alter volume I ⁻ (FB4) but keep total volume (I ⁻ and water) constant / keep I ⁻ and water volumes constant but change concentration of I ⁻ .	1	[2]
			[Total: 13]

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FB 7 is $MnCl_2$, FB 8 is $KMnO_4$, FB 9 is $CuCO_3$, FB 10 is $CuSO_4$

3	(a) (i)	White ppt	1	
	(ii)	Off-white / buff / beige / light brown ppt and darkens on standing / insoluble in excess.	1	
	(iii)	Brown / black colour	1	
	(iv)	Effervescence / bubbling / fizzing and relights glowing splint	1	
		(Colour change) purple / pink to colourless	1	[5]
(b)	Manganese	1	[1]	
3	(c) (i)	(Solid goes) black	1	
	(ii)	Fizz / effervescence / bubbling and blue solution.	1	
		Limewater turns milky	1	
	(iii)	Any three from	2	
		Solution goes paler Pink / black / brown solid formed Solution gets warmer Fizz Pop with lighted splint		
		3 correct answers scores 2 2 correct answers scores 1		
(iv)	Solution turns / goes yellow / green	1		
(v)	Copper / Cu^{2+}	1		
(vi)	0 to (+)2	1	[8]	
(e)	Transition (elements) / d-block	1	[1]	
			[Total: 15]	