

Cambridge International Examinations

Cambridge International Advanced Subsidiary and Advanced Level

CHEMISTRY 9701/33

Paper 3 Advanced Practical Skills 1

October/November 2016

MARK SCHEME
Maximum Mark: 40

Published

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Page 2	Mark Scheme	Syllabus	Paper
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Question	Answer	Marks
1(a)	Initial and final readings and titre value for rough and initial and final reading for two (or more) accurate titrations	1
	Appropriate headings and units and the volume of FA 2 added is recorded for each accurate titration. Headings must match readings Initial/start (burette) and reading/volume Final/end (burette) and reading/volume Titre or volume/vol/FA 2 and used/added (not "difference", "total", "V") Units: /cm³ or (cm³) or in cm³ or cm³ for each volume.	1
	All accurate burette readings (initial and final) recorded to nearest 0.05 cm ³ 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
	Final uncorrected titre is within 0.10 cm ³ of any previous uncorrected accurate titre.	1

Examiner rounds any accurate burette readings to the nearest 0.05 cm³, checks subtractions and then selects the 'best' accurate titres using the hierarchy: identical titres; titres within 0.05 cm³; titres within 0.1 cm³; etc., to calculate mean correct to 0.01 cm³.

Examiner compares candidate's titre value with that of the Supervisor.

V , VI and VII Award V , VI and VII for $\delta \le 0.30\mathrm{cm}^3$ Award V and VI for $0.30 < \delta \le 0.50\mathrm{cm}^3$ Award V only for $0.50 < \delta \le 0.80\mathrm{cm}^3$	1 1 1
Award V Only 101 0.30 < 0 \(\text{0} \(\text{0} \) 0.60 Cm	7

Page 3	Mark Scheme	Syllabus	Paper
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Question	Answer	Marks
1(b)	Calculation of the mean Check mean titre is correctly calculated from clearly selected values (ticks or working) • Candidate must average two (or more) titres where the total spread is ≤ 0.20 cm³. • 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. [e.g. 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 (ignoring initial given as 0) 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.] Do not award this mark if: • 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 the calculation of the mean) are integers. 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)(i)	I Correctly calculates: $\frac{(b)}{1000} \times 0.0200$	1
1(c)(ii) and 1(c)(iii)	II Correctly uses: (i) × 5/2 and (ii)/0.025 or (ii) × 1000/25	1
1(c)(iv)	Correctly calculates: (iii) × 10 or (ii) × 1000/25 ×10	1

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Question	Answer	Marks
	3 or 4 significant figures in final answers to all parts (minimum 3 parts attempted)	1 4
	Total:	12

Question	Answer	Marks
2(a)	Examiner to calculate 10% and 20% of Supervisor's time and round this to nearest second. Candidate's time compared with supervisor's time. Award 2 marks if time within 10% of supervisor	
	Award 1 mark if time within 20% of supervisor	2
2(b)(i)	Correctly calculates: $2.61 \times 10^{-5} \times \text{reaction time from (a)}$	1

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Question	Answer	Marks
2(b)(ii)	Correctly uses: (i) × 0.080 or (i) × 80/1000 and no additional working	1
2(b)(iii) and 2(b)(iv)	Correctly uses: 2 × ans (ii) and (iii)/0.020 or (iii) × 1000/20 Time recorded to nearest second in (a) and (c) and 2 - 4 sf in all answers in (b) (minimum 3 parts attempted)	1 4
2(c)	Examiner calculates ratio of reaction time (a)/reaction time (b) Award if $1.80 \le \text{ratio} \le 2.80$	1 1
2(d)(i)	Time is less/shorter because the amount/volume/concentration of thiosulfate/FA 6 is less (ora) Time is approximately half because (the amount/no. of moles/concentration of) the thiosulfate/FA 6 is half.	1

Page 6	Mark Scheme	Syllabus	Paper
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Question	Answer	Marks
2(d)(ii)	(No because) the error is greater in (c) with some explanation e.g. because more readings taken/water added	1
	The measuring cylinder is used more times in (c) or smaller volumes/10 cm³ instead of 20 cm³ are measured in (c) or 6 rather than 5 readings taken/more reagents used/water also added/added in addition or	1
	smaller volumes therefore greater percentage error	4
	Total:	11

Page 7	Mark Scheme	Syllabus	Paper
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Question	Answer					Marks	
FA	7 is ZnSO ₄ ; F	A 8 is (NH4) ₂ Fe	e(SO4) ₂ ; FA 9	is CrK(SO ₄) ₂ ;	FA 10 is MnSO	; FA 11 is NaNO ₂	1
3(a)	Selects NaOl	H and NH₃					1
	Single table to show results with both NaOH and NH ₃ . No repeat headings. At least two of the FA s tested						1
		FA 7	FA 8	FA 9	FA 10		
	NaOH	white ppt	green ppt	grey-green ppt	off-white/ pale brown/ buff ppt		1
	excess	soluble	insoluble	soluble	insoluble		1
	NH ₃	white ppt	green ppt	grey-green ppt	off-white/ pale brown/ buff ppt		1
	excess	soluble	insoluble	insoluble	insoluble		1
	FA 9 ppt diss	ing brown in air olves to form (onestook)	dark) green so	lution with exce	ess NaOH		1 1 1

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Question	Answer					Ма	ırks
	FA 7	FA 8	FA 9	FA 10			
	Zn ²⁺	Fe ²⁺	Cr ³⁺	Mn ²⁺			
	Award 1 mark for Award 2 marks fo		1			1	11
3(b)	(dark) brown ppt/ and effervescence/bu	•	deposit			1	
	positive test for ox	kygen – (gas/ O ₂)	relights glowing s	olint		1	2
3(c)(i)	blue solution and effervescence/bubbling/fizzing or brown fumes/gas					1	
3(c)(ii)	NO ₂ ⁻ or nitrite from either blue solution or brown gas				1		

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Question	Answer	Mar	ks
3(c)(iii)	selects NaOH and A l (for nitrite or nitrate) or selects (acidified) potassium manganate(VII)/ potassium permangate/ KMnO $_4$ If carbonate in (ii) (from bubbling without brown gas in (i)) then allow use of limewater to test gas If halide from no reaction then allow use of AgNO $_3$ and NH $_3$ If sulfate/sulfite from no reaction then allow use of BaC l_2 /Ba(NO $_3$) $_2$ and HC l /HNO $_3$ Warming (with NaOH and A l) and gas/ammonia turns (damp red) litmus (paper) blue or Decolourises MnO $_4$	1	4
	Total:		17