CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International Advanced Subsidiary and Advanced Level

MARK SCHEME for the May/June 2015 series

9701 CHEMISTRY

9701/34 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.

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 2015 series for most Cambridge IGCSE®, Cambridge International A and AS Level components and some Cambridge O Level components.

® IGCSE is the registered trademark of Cambridge International Examinations.

CAMBRIDGE
International Examinations

Question	Indicative material	Mark	Total
1 (a) (i)	Initial and final burette readings and titre unambiguously recorded in rough and accurate titrations. (2×2 accurate boxes)	1	
(ii)	Headings and units correct for accurate titration and headings match readings. *Initial/final (burette) reading/volume or Reading/volume at start/finish and Titre or Volume/**FB 2** added/used [**not** "difference"]* **and** *Units: (cm^3) or/cm^3 or in cm^3 or cm^3 by every entry*	1	
(iii)	All accurate burette readings to 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	
(iv)	Two accurate titres within 0.10 cm^3. *Do **not** award if 3rd titre > 0.10 cm^3 away from any other unless a further titration is also carried out which is within 0.1 cm^3 of any other.* *Do **not** award the mark if any 'accurate' burette readings (apart from initial 0) are given to **zero** dp.*	1	
Examiner checks and corrects titre subtractions where necessary. Examiner selects the best mean titre using a hierarchy: *two identical titres within 0.05 cm^3, two or more titres within 0.10 cm^3 etc.* *Examiner subtracts (corrected) candidate's titre from Supervisor's titre.*			
	Award **V**, **VI** and **VII** if $\delta < 0.20\,cm^3$. Award **V** and **VI** if $0.20 < \delta < 0.40\,cm^3$. Award **V** if $0.40 < \delta < 0.60\,cm^3$. *Spread penalty: if the two 'best' titres are ⩾ 0.50 cm^3 apart, cancel one of the Q marks*	1 1 1	**[7]**
(b)	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. 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. **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)(ii)	(answer to **(b)** × 0.1)/1000 **and (ii) = (i)** **and** answer to 3 or 4 sf	1	

© Cambridge International Examinations 2015

Question	Indicative material	Mark	Total
(iii)	**(c)(ii)** × 1000 / 25 **and** answer expressed to 3 or 4 sf.	1	
(iv)	Correct expression is shown **(c)(iii)** × 1000 / 5.91	1	**[3]**
(d)	15 – **(c)(iv)** × 100 / 15 **or** 15 – **(c)(iv)** × 100 / **(c)(iv)**	1	**[1]**
Total			**[12]**
2 (a)	**I** (Table of) results with unambiguous headings (**not weight**) showing • 4 balance readings • 4 thermometer readings • 2 × mass **FB 3** added • 2 × ΔT	1	
	II All balance readings recorded to the same number of dp (at least one dp) **and** thermometer readings to .0 or .5 °C (*minimum 2 of each*)	1	
	III Masses of **FB 3** used between the limits given in the question (2.9(0) to 3.1(0) g **and** 4.9(0) to 5.1(0) g)	1	
Examiner corrects thermometer readings to the nearest 0.5 °C, checks subtractions then calculates $\Delta T_1 \times m_2 / \Delta T_2 \times m_1$ where ΔT_1 is the smaller temperature fall.			
	Award **IV** if ratio falls between 0.85 and 1.15 Award **IV** and **V** if ratio falls between 0.95 and 1.05	1 1	**[5]**
(b) (i)	mean mass correctly calculated from weighings to 2 dp	1	
(ii)	mean temperature fall correctly calculated from thermometer readings to 1 dp *Do **not** award if values used for calculating mean are from incorrect subtractions*.	1	**[2]**
(c) (i)	Correctly calculates **(b)(i)** / 53.5	1	

© Cambridge International Examinations 2015

Question	Indicative material	Mark	Total
(ii)	Correct overall expression $25 \times 4.2 \times$ **(b)(ii)** **(c)(i)** $\times$ 1000 • fully correct = 2 marks • one error = 1 mark • two errors = 0 marks (÷ 1000 may be awarded from use to reach final answer)	1 1	
	Sign is **+ and final** answers to **(i)** and **(ii)** are to 2 – 4 sf	1	**[4]**
(d) (ii)	Expression (1.0 / smaller ΔT) $\times$ 100 **or** correct answer	1	**[1]**
(e) (i)	Advantages: any **one** of two values to check concordance / check whether further experiments should be carried out / find out whether mass added is proportional to ΔT / compare the two answers	1	
(ii)	No improvement as T drops so no heat loss (by convection) / as reaction is endothermic **OR** Improvement as prevents heat **gain** from surroundings	1	**[2]**
Total			**[14]**
	FB 4 = $MnCl_2(aq)$; **FB 5** = $MgSO_4(aq)$; **FB 6** = $NH_4Fe(SO_4)_2(s)$		
3 (a)	Correct observations for **FB 4 and FB 5** in **(i)** Correct observations for **FB 4** and **FB 5** in **(ii) and** correct observations for **FB 4** and **FB 5** in **(iii).**	2 1	

© Cambridge International Examinations 2015

test		FB 4	FB 5
(i)	NH_3	off-white / pale brown / beige / buff ppt **and** insoluble in excess / ppt turns (dark) brown/darkens	white ppt insol in excess
(ii)	$AgNO_3$	white ppt (*if excess used then insoluble*)	no change / no ppt / no reaction
(iii)	$BaCl_2$ / $Ba(NO_3)_2$	no change / no ppt / no reaction	white ppt (*if excess used then insoluble*)

Question	Indicative material	Mark	Total
3 (a) (iv)	**FB 4**: manganese(II) / Mn^{2+} **and** chloride / Cl^- (*If cream ppt with Ag^+ allow bromide / Br^-*)	1	
(v)	**FB 5**: Mg^{2+}, Al^{3+}, **and** SO_4^{2-}, SO_3^{2-} (or names)	1	
(vi)	selects NaOH **and** uses it in excess **FB 5**: magnesium / Mg^{2+} from white ppt insoluble in excess	1 1	**[7]**
(b) (i)	Transition metal (as coloured)	1	
(ii)	Any **two** of: • (pale purple) solid / crystals melt / dissolve / turn to liquid / form liquid or solution • any brown or qualified brown (liquid or solid **not** gas) • condensation / liquid / water (further up tube) / water vapour / steamy fumes (***not** white fumes*) • (gas) turns (red) litmus blue (then back to red)	1	
(iii)	yellow / (light) brown (solution) (formed)	1	
(iv)	brown / rust / red-brown ppt **and** gas / NH_3 turns (damp) (red) litmus blue	1	
(v)	(solution darkens) **dark** blue / blue-black / black colour	1	
(vi)	Fe^{3+} **and** NH_4^+	1	
(vii)	redox / oxidation **and** reduction / oxidation of I^- / reduction of Fe^{3+}	1	
			[Total: 14]

© Cambridge International Examinations 2015