

CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International Advanced Subsidiary and Advanced Level

MARK SCHEME for the October/November 2014 series**9701 CHEMISTRY****9701/33**

Paper 3 (Advanced Practical Skill 1), maximum raw mark 40

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Page 2	Mark Scheme	Syllabus	Paper
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Question	Indicative material	Mark	Total
1 (a)	I Two balance readings and correct mass of magnesium recorded. Table to show temperature and time. Headings and units – must be temperature /°C, (°C), in °C and time/s, (s), or time in seconds or /min, /minutes, ... and /g, (g), ...	1	
	II Thermometer readings to $\pm 0.5^{\circ}\text{C}$ (at least 1 ending in .5 or .0) (Minimum 8 readings)	1	
	III All specified readings taken and balance readings to the same number of dp	1	
	Difference between temperature at 2 minutes and highest temperature (in table) calculated and compared with ΔT of Supervisor.		
	IV, V and VI ΔT within 10% of Supervisor IV and V ΔT within 15% of Supervisor IV only ΔT within 20% of Supervisor	3	[6]
(b) (i)	I Axes labelled, linear scales chosen so that more than half the available space is used on both axes for plotted points.	1	
	II Plotted points should be drawn clearly with a sharp pencil. Points should be plotted to within half a small square and in the correct square for y-axis and on line for x-axis.	1	
(ii)	III Correctly extrapolated best fit straight lines drawn up to time $2\frac{1}{2}$ minutes and after $2\frac{1}{2}$ minutes.	1	
(iii)	IV Examiner calculates ΔT from graph and checks answer is within 0.25°C of candidate's stated answer	1	[4]
(c) (i)	All the magnesium/solid dissolved/disappeared or all solid/Mg has gone/been used up or no solid/Mg left	1	
	(ii) Correctly calculates $25 \times 4.2 \times \Delta T$	1	
(iii)	Correctly calculates (ii) \div number of moles of magnesium and converts to $\text{kJ} \left(\frac{\text{(ii)} \times 24.3}{1000 \times \text{mass Mg}} \right)$ and final answer to 2–4 sf	1	
	Sign is negative in (c)(iii) and (e)(iv)	1	[4]
(d)	8 readings (in space below printed area) • 4 \times balance readings • 2 \times initial temp • 2 \times highest/max temp with unambiguous headings	1	
	Correctly calculates both masses of Mg and both ΔT s.	1	[2]

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Question	Indicative material	Mark	Total
(e) (i) & (ii)	Correctly calculates <ul style="list-style-type: none"> mean ΔT mean mass 	1	
(iii)	Moles $\text{CuSO}_4 = \frac{25 \times 1}{1000} = 0.025$	1	
	Moles Mg = $\frac{\text{(ii) or max mass Mg}}{24.3}$ so CuSO_4 in excess or <0.025	1	
(iv)	Working to calculate ΔH using mean values of mass Mg and ΔT $\left(\frac{\Delta T(\text{i}) \times 25 \times 4.2 \times 24.3}{(\text{ii}) \times 1000} \right)$ or $\left(\frac{\Delta T(\text{i}) \times 25 \times 4.2}{\text{mol Mg from (iii)} \times 1000} \right)$	1	[4]
(f)	Attempt at use of Hess' law either by cycle or reverse reaction 2 Correctly calculates ΔH reaction 3 = ΔH reaction 1 – ΔH reaction 2	1 1	[2]
(g) (i)	Any 2 of Lower ΔH and so higher % error No correction made for loss of heat on cooling Some bubbles/gas/ H_2 in reaction 2 so wrong reaction taking place Not all Mg reacts/reaction does not go to completion in 2 (so not all energy released) Reaction 2 slower so more heat loss	1 1	
(ii)	No, since (larger volume of solution means) smaller ΔT OR Yes, since there would be a smaller T rise so less heat would be lost.	1	[3]
Qn 1		Total	[25]

Page 4	Mark Scheme	Syllabus	Paper
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Question	Indicative material	Mark	Total
	FA 6 is $\text{NaNO}_3(\text{s})$; FA 7 is $\text{AgNO}_3(\text{aq})$; FA 8 is $\text{ZnCO}_3(\text{s})$		
2 (a) (i)	Chooses $\text{NaOH}(\text{aq})$ (+ heat) (to distinguish NH_4^+ / ammonium) Chooses named (allow name from (ii)) dilute acid / (acidified) KMnO_4 (to distinguish between NO_2^- / nitrite and NO_3^- / nitrate) 2 ions chosen: NH_4^+ & NO_3^- : NaOH (and warm) NO_2^- & NO_3^- : named (dilute) acid NH_4^+ & NO_2^- : either of the above	1 1	
(ii)	Correct obs with relevant tests With NaOH and warming/heating: no ammonia / no change / no reaction With acid(aq): no brown fumes / no change / no reaction <i>'No observation' is not credited anywhere in the observations.</i>	1 1	
(iii)	FA 6 contains NO_3^- (with sufficient obs to eliminate other ion(s) given in (i))	1	[5]
(b)	+ HCl (aq): white ppt + KI : yellow ppt + NH_3 : no effect / ppt insol + glucose: silver mirror / black / (dark) grey ppt	1 1 1 1	[4]
(c) (i)	(Solid is) yellow when heated Goes white / paler on cooling	1 1	
(ii)	effervescence / fizzing / rapid bubbling and limewater turns milky	1	
(iii)	White ppt and soluble in excess NaOH	1	
(iv)	White ppt and soluble in excess NH_3	1	
(v)	Ions present: Zn^{2+} and CO_3^{2-} (from fizz or limewater test correct)	1	[6]
Qn 2		Total	[15]