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International
AS & A Level

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Cambridge International Advanced Subsidiary and Advanced Level

CHEMISTRY

9701/36

Paper 3 Advanced Practical Skills 2

October/November 2016

MARK SCHEME

Maximum Mark: 40

Published

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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This document consists of **8** printed pages.

Question	Answer	Marks
1(a)	Three masses and all temperatures recorded in a table with unambiguous headings (<i>no need to include the word mass but do not allow weight, allow t for time</i>) and correctly displayed units: /g, (g), in g (allow time in mins or minutes).	1
	Temperatures recorded to 0.5 °C.	1
	Examiner checks Supervisor's and candidate's subtraction for mass of FB2 . Examiner calculates Supervisor value of $\Delta T/m$ to 1 dp and records it at the top of the accuracy grid. ($\Delta T = T_{\text{max}} - T$ at 2 minutes) Examiner calculates candidate value of $\Delta T/m$ to 1 dp and difference from Supervisor.	

Supervisor ratio	<10	10–20	20>
Award III if difference is	±2.0	±3.0	±4.0
Award IV if difference is	±1.0	±2.0	±3.0

	Award III and IV according to above table	1 1 4
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Question	Answer	Marks
1(b)	I Axes clearly labelled (headings or units) and T on y-axis. Uniform scale to use more than half of each axis including 3°C above the highest recorded temperature. II All points plotted to within half a small square and within the correct small square. <i>(Any point that is supposed to be on a line must be on the line and any point that is supposed to be within a small square must not be on a boundary line. Do not allow large dots unless the centre of the dot is correctly positioned).</i> III Appropriate lines of best fit drawn. AND either a straight line / smooth curve after the max T OR a smooth curve from 3 minutes. IV Lines extrapolated and correct value (within 0.2°C) of ΔT from graph	1 1 1 1 4
1(c)(i)	Correctly calculates energy change = $25 \times 4.2 \times \Delta T$ from (b) or correctly calculated ΔT from table	1
1(c)(ii)	Correctly uses value of energy change $\Delta H = \frac{(\text{c})(i) \times 65.4}{\text{correct mass from (a)} \times 1000}$ Negative sign and both answers recorded to 2–4 sf	1 1 3
1(d)	Correctly uses = $\frac{(\text{c})(ii) \times 100}{217}$	1 1

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1(e) effect	1(e) reason
maximum T would be to RHS/ gradient (to max T) less steep/longer time to the maximum T	surface area less (so reaction slower)
max T remains same	as number of amount/ moles (of zinc) is the same
max T is smaller as reaction takes longer/is slower/surface area is less	greater heat loss

Question	Answer	Marks
1(e)	stated effect reason (<i>reason must follow effect</i>)	1 1 2
	Total	14

Page 5	Mark Scheme	Syllabus	Paper
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Question	Answer	Marks
2(a)	Mass of solid used between 2.20 and 2.40 g Table with correct headings / units • mass of crucible • mass of crucible + FB 3 • mass of crucible + residue / FB 3 after heating Units: /g, (g), in g, in gram(me)s Award III if % mass loss is ≥ 30 but ≤ 42 Award III and IV if % mass loss is ≥ 33 but ≤ 39	1 1 1 1 4
2(b)(i) and (ii)	Correctly calculates mass of anhydrous salt AND mass of water lost.	1
2(b)(iii)	Shows expression: $\frac{\text{mass water}}{18} \div \frac{\text{mass anhydrous}}{159.6}$ Correctly calculates, including showing working, value of x from (iii) and gives as integer	1 1
2(b)(iv)	Equation completed with x from (iii) and state symbols	1 4
2(c)(i)	(Solid) turns blue and steam / water vapour given off / temperature rises / heat released / hissing / sizzling (owtte)	1
2(c)(ii)	Anhydrous salt returns to hydrated or original formula quoted Reaction is exothermic	1 1 3

Page 6	Mark Scheme	Syllabus	Paper
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Question	Answer	Marks
2(d)	Value less than accepted value: not all water removed and heat to constant mass	1
	Value more than accepted value: (anhydrous) salt decomposes and practical method of limiting temperature / heat very gently / thermostatically controlled oven	1
		2
	Total:	13

Page 7	Mark Scheme	Syllabus	Paper
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Question	Answer	Marks										
FB 4 is HCOOH(aq); FB 5 is HCl(aq); FB 6 is NH ₄ Cl and ZnSO ₄ (s)												
3(a)(i)	<table><tr><th>FB 4</th><th>FB 5</th></tr><tr><td>Fizz</td><td>Fizz</td></tr><tr><td>Gas turns limewater cloudy white / milky / chalky / white ppt. OR</td><td>Gas turns limewater cloudy white / milky / chalky / white ppt.</td></tr><tr><td>(Purple) to / goes colourless / paler</td><td>No reaction / stays / turns purple</td></tr><tr><td>Silver / grey / AND black ppt / mirror</td><td>No reaction / white ppt</td></tr></table>	FB 4	FB 5	Fizz	Fizz	Gas turns limewater cloudy white / milky / chalky / white ppt. OR	Gas turns limewater cloudy white / milky / chalky / white ppt.	(Purple) to / goes colourless / paler	No reaction / stays / turns purple	Silver / grey / AND black ppt / mirror	No reaction / white ppt	1
	FB 4	FB 5										
	Fizz	Fizz										
	Gas turns limewater cloudy white / milky / chalky / white ppt. OR	Gas turns limewater cloudy white / milky / chalky / white ppt.										
	(Purple) to / goes colourless / paler	No reaction / stays / turns purple										
Silver / grey / AND black ppt / mirror	No reaction / white ppt											
		1										
		1										
		1										
3(a)(ii)	hydrogen (ion) / H ⁺	1										
3(a)(iii)	it can be oxidised / contains –CHO group / methanoate ion / HCOO [–] / is a reducing agent	1										
3(a)(iv) and 3(a)(v)	FB 4 is a weaker acid than FB 5 / FB 4 is less dissociated than FB 5 (ecf on reverse ΔTs)	1										
	Energy is needed to break (O to H) bond so less is released	1										
		8										

Page 8	Mark Scheme	Syllabus	Paper
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Question	Answer	Marks
3(b)	Use of NaOH(aq) AND NH ₃ (aq) (as test for metal ions) AND using solution of FB 6 / using FB 6 (aq)	1
	Use of NaOH(aq) and with excess and result: white ppt soluble in excess	1
	Use of NH ₃ (aq) and with excess and result: white ppt soluble in excess	1
	With NaOH(aq) and heat and gas / NH ₃ that turns litmus blue	1
	Cations are zinc / Zn ²⁺ and ammonium / NH ₄ ⁺	1
		5
	Total:	13