Cambridge International AS & A Level

Cambridge International Examinations
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.

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 October/November 2016 series for most Cambridge IGCSE®, Cambridge International A and AS Level components and some Cambridge O Level components.

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

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**

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. *(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).* **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 $\Delta H = \dfrac{\textbf{(c)(i)} \times 65.4}{\text{correct mass from } \textbf{(a)} \times 1000}$ Negative sign and both answers recorded to 2–4 sf	1 1 **3**
1(d)	Correctly uses = $\dfrac{\textbf{(c)(ii)} \times 100}{217}$	1 **1**

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 (*reason must follow effect)*	1 1 **2**
	Total	**14**

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**

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

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td colspan="3">FB 4 is HCOOH(aq); FB 5 is HCl(aq); FB 6 is NH_4Cl and $ZnSO_4$(s)</td></tr>
<tr><td>3(a)(i)</td><td>
<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 / black ppt / mirror AND</td><td>No reaction / white ppt</td></tr>
</table>
</td><td>1
1
1
1</td></tr>
<tr><td>3(a)(ii)</td><td>hydrogen (ion) / H^+</td><td>1</td></tr>
<tr><td>3(a)(iii)</td><td>it can be oxidised / contains – CHO group / methanoate ion / $HCOO^-$ / is a reducing agent</td><td>1</td></tr>
<tr><td>3(a)(iv) and 3(a)(v)</td><td>FB 4 is a weaker acid than FB 5 / FB 4 is less dissociated than FB 5
(ecf on reverse ΔTs)

Energy is needed to break (O to H) bond so less is released</td><td>1

1
8</td></tr>
</table>

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**