**CAMBRIDGE INTERNATIONAL EXAMINATIONS**

**GCE Advanced Subsidiary Level and GCE Advanced Level**

# MARK SCHEME for the May/June 2013 series

## 9701 CHEMISTRY

**9701/32** Paper 32 (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 2013 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.

CAMBRIDGE
International Examinations

| Question | Sections | Indicative material | Mark |
|---|---|---|---|
| **1 (a)** | MMO Collection | **I** All thermometer readings **and** two weighings + correct mass of **FB 1** recorded**.** | 1 |
| | PDO Recording | **II** Correct headings and units in table (lines not needed). Weighings and mass to same no. dp. *Must use solidus, brackets or describe unit fully in words. If units not included in column headings, every entry must have the correct unit shown.* | 1 |
| | | **III** Temperature recorded to 0.5 °C *(must have at least one ending in .5 °C and one ending in .0 °C).* | 1 |
| | MMO Quality | Award **IV** and **V** if $\delta \leq 0.30\,^{\circ}\text{C g}^{-1}$ | 1 |
| | | Award **IV** if $0.30 < \delta \leq 0.60\,^{\circ}\text{C g}^{-1}$ | 1 [5] |
| **1 (b)** | PDO Layout | **I** Uniform scales chosen to use more than half of each axis. At least 5 large squares on *y*-axis. Axes labelled, units not needed. Scale extends at least 1 °C below lowest recorded point. | 1 |
| | | **II** All points correctly plotted to within ½ small square and in correct small square. | 1 |
| | | **III** Appropriate lines of best fit drawn. | 1 |
| | ACE Interpretation | **IV** Lines extrapolated and correct value (within 0.5 °C) of $\Delta T$ from graph (ignore sf and sign). | 1 [4] |
| **1 (c)** | PDO Recording | **I** Table drawn to include weighings, correct mass of **FB 2**, initial and final thermometer readings (ignore units), headings must be unambiguous. | 1 |
| | MMO Quality | Award **II** and **III** if $\delta \leq 0.30\,^{\circ}\text{C g}^{-1}$ | 1 |
| | | Award **II** if $0.30 < \delta \leq 0.60\,^{\circ}\text{C g}^{-1}$ | 1 [3] |

| | | | | |
|---|---|---|---|---|
| **(d) (i) (iii) (ii)** | PDO Display | **I** Shows **25** x 4.3 × $\Delta T$ for step 1 **and** for step 2 (no need to check calculation).<br>**II** Should be $\frac{answer\ to\ (i)\ x\ 84.0}{mass\ \boldsymbol{FB\ 1}\ x\ 1000}$ | 1 | |
| **(iv)** | | **III** Calculates $\frac{answer\ to\ (iii)\ x\ 106.0}{mass\ \boldsymbol{FB\ 2}\ x\ 1000}$ | 1 | |
| | | | 1 | |
| **(v)** | ACE Conclusions | Award **IV** and **V** if correctly calculates $\Delta H$ from answers to **(ii)** and **(iv)** with correct sign<br>(answer to **(iv)** – 2 × answer to **(ii)** scores 2<br>**(iv)** – **(ii)** scores 1<br>**2(ii)** – **(iv)** scores 1) | 1 | |
| | PDO Display | **VI** Signs in **(ii)** (+ve) and **(iv)** (–ve). | 1 | |
| | | **VII** All final answers given to 2 or 4 sf (minimum of 3 answers attempted). | 1 | [7] |
| **(e) (i)** | ACE Interpretation | Single balance reading ± 0.005 or 0.01 g for 2dp balance.<br>$\Delta m$ ± 0.01 or 0.02 g for 2 dp balance.<br>*0.05 or 0.1 g for 1 dp balance / 0.0005 or 0.001 for 3 dp.* | 1 | |
| **(ii)** | | *Number of dps must correspond to candidate's own readings.*<br>Calculates max $\Delta m$ error / mass **FB 2** in Step 2 to 2 or more sf (2 minimum for 1 dp balance and up to 4 for 3 dp balance).<br>*Allow ecf.* | 1 | [2] |
| **(f) (i)** | ACE Improvements | Student incorrect as acid already in excess/ greater volume gives smaller $\Delta T$/greater volume needs more heat energy and/or greater % error. | 1 | [1] |
| **(ii)** | MMO Interpretation | **Attempts** to calculate $\Delta T$ / $m$ or $m$ / $\Delta T$ for **each** result or ratios of $m_1/m_2$ and $T_1$ / $T_2$ or similar (not averages of two). | 1 | |
| | MMO Decisions | Correct calculation (1.35 / 1.37 or 0.74 / 0.73).<br>Conclusion – yes, values concordant / consistent or no, values differ. | 1 | [2] |
| | | | | **[Total: 24]** |

| | | | | |
|---|---|---|---|---|
| | **FB 4** $MnCl_2$ | | **FB 5** $Fe(NO_3)_3$ **+** $HNO_3$ | **FB 6** $ZnSO_4$ **+** $H_2SO_4$ |
| **2** | **(a)** | MMO *Decisions* | **I** Selects any 2 from barium chloride or nitrate, silver nitrate or lead nitrate. | 1 |
| | | | **II** NaOH (allow OH if ion formulae already penalised) + $Al$ and warm for $NO_3^-$. | 1 |
| | | | For **III** and **IV** any two from | |
| | | MMO *Collection* | • only **FB 4** gives white ppt with $Ag^+$ | 1 |
| | | | • only **FB 6** gives white ppt with $Ba^{2+}$ | 1 |
| | | | • **FB 4** and **FB 6** give a white ppt with $Pb^{2+}$ (allow relevant dash as alternative to ppt) | 1 [5] |
| | | | (ppt in any other test with $Ag^+$, $Pb^{2+}$ or $Ba^{2+}$ is a CON) | |
| | | | **V FB 5** only forms gas/ $NH_3$ turns litmus paper blue | |
| **2** | **(b)** | MMO Collection | **FB 4** gives off-white / buff / light brown ppt insoluble in both **and** darkening of the ppt in either. | 1 |
| | | | **FB 5** gives red-brown/brown/rust/orange-brown (not red, not orange) ppt insoluble in excess of both. | 1 |
| | | | **FB 6** gives white ppt soluble in excess of both<br>or<br>Award 1 mark if all NaOH or $NH_3$ observations, including in excess, are correct except 'darkening of ppt in **(i)**. | 1 [3] |
| **2** | **(c)** | ACE Conclusions | **FB 4** contains $Mn^{2+}$ and $Cl^-$. | 1 |
| | | | **FB 5** contains $Fe^{3+}$ and $NO_3^-$. | 1 |
| | | | **FB 6** contains $Zn^{2+}$ and $SO_4^{2-}$. | 1[3] |
| **2** | **(d)** | MMO Decisions | **I** Selects suitable tests: two of Mg / Zn / Fe / $Na_2CO_3$, litmus paper/U.I. paper, chromate. (specific names of reagents not needed) (expected results not needed) | 1 |
| | | PDO Layout | **II** Single table (no repeat headings)(must be the 2 reagents stated above). | 1 |
| | | MMO Collection | **III** Correct observations for **FB 4** and either **FB 5** or **FB 6**. For **FB 4** correct observation is allowed if no +ve test for gas. | 1 |
| | | | **IV** Correct observations for other from **FB 5** and **FB 6.** | 1 |
| | | ACE Conclusions | **V** **FB 5** and **FB 6** contain $H^+$. | 1 [5] |
| | | | | **[Total: 16]** |