

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.

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| 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. <i>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.</i> | 1 |
| | | III Temperature recorded to 0.5°C (<i>must have at least one ending in .5 °C and one ending in .0 °C</i>). | 1 |
| | MMO Quality | Award IV and V if $\delta \leq 0.30 \text{ °C g}^{-1}$ Award IV if $0.30 < \delta \leq 0.60 \text{ °C g}^{-1}$ | 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 ΔT 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 $\delta \leq 0.30 \text{ °C g}^{-1}$ Award II if $0.30 < \delta \leq 0.60 \text{ °C g}^{-1}$ | 1 1 [3] |

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|-----|-------|--------------------|---|--------------------|-----|
| (d) | (i) | PDO Display | I Shows $25 \times 4.3 \times \Delta T$ for step 1 and for step 2 (no need to check calculation). | 1 | |
| | (ii) | | II Should be $\frac{\text{answer to (i)} \times 84.0}{\text{mass FB 1} \times 1000}$ | | |
| | (iii) | | | | |
| | (iv) | | III Calculates $\frac{\text{answer to (iii)} \times 106.0}{\text{mass FB 2} \times 1000}$ | 1 | |
| | (v) | ACE Conclusions | Award IV and V if correctly calculates ΔH from answers to (ii) and (iv) with correct sign (answer to (iv) – 2 × answer to (ii) scores 2 (iv) – (ii) scores 1 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. $\Delta m \pm 0.01$ or 0.02 g for 2 dp balance. 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. Calculates max Δm 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). Allow ecf. | 1 | [2] |
| (f) | (i) | ACE Improvements | Student incorrect as acid already in excess/ greater volume gives smaller ΔT /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 $0.74 / 0.73$). Conclusion – yes, values concordant / consistent or no, values differ. | 1 | [2] |
| | | | | [Total: 24] | |

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| Page 4 | Mark Scheme | Syllabus | Paper |
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| FB 4 MnCl ₂ | | FB 5 Fe(NO ₃) ₃ + HNO ₃ | FB 6 ZnSO ₄ + H ₂ SO ₄ |
|------------------------|--|---|---|
| 2 (a) | MMO <i>Decisions</i> MMO <i>Collection</i> | <p>I Selects any 2 from barium chloride or nitrate, silver nitrate or lead nitrate.</p> <p>II NaOH (allow OH if ion formulae already penalised) + <i>Al</i> and warm for NO₃⁻.</p> <p>For III and IV any two from</p> <ul style="list-style-type: none"> only FB 4 gives white ppt with Ag⁺ only FB 6 gives white ppt with Ba²⁺ FB 4 and FB 6 give a white ppt with Pb²⁺ (allow relevant dash as alternative to ppt) <p>(ppt in any other test with Ag⁺, Pb²⁺ or Ba²⁺ is a CON)</p> <p>V FB 5 only forms gas/ NH₃ turns litmus paper blue</p> | <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>[5]</p> |
| 2 (b) | MMO <i>Collection</i> | <p>FB 4 gives off-white / buff / light brown ppt insoluble in both and darkening of the ppt in either.</p> <p>FB 5 gives red-brown/brown/rust/orange-brown (not red, not orange) ppt insoluble in excess of both.</p> <p>FB 6 gives white ppt soluble in excess of both or</p> <p>Award 1 mark if all NaOH or NH₃ observations, including in excess, are correct except 'darkening of ppt in (i).</p> | <p>1</p> <p>1</p> <p>1</p> <p>[3]</p> |
| 2 (c) | ACE <i>Conclusions</i> | <p>FB 4 contains Mn²⁺ and Cl⁻.</p> <p>FB 5 contains Fe³⁺ and NO₃⁻.</p> <p>FB 6 contains Zn²⁺ and SO₄²⁻.</p> | <p>1</p> <p>1</p> <p>1[3]</p> |
| 2 (d) | MMO <i>Decisions</i> PDO <i>Layout</i> MMO <i>Collection</i> ACE <i>Conclusions</i> | <p>I Selects suitable tests: two of Mg / Zn / Fe / Na₂CO₃, litmus paper/U.I. paper, chromate. (specific names of reagents not needed) (expected results not needed)</p> <p>II Single table (no repeat headings)(must be the 2 reagents stated above).</p> <p>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.</p> <p>IV Correct observations for other from FB 5 and FB 6.</p> <p>V FB 5 and FB 6 contain H⁺.</p> | <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>[5]</p> |
| | | | [Total: 16] |