

Q1. (2018)

|      |                                       |   |                |
|------|---------------------------------------|---|----------------|
| 01.2 | copper is less reactive than hydrogen | 1 | AO2<br>5.4.3.4 |
|------|---------------------------------------|---|----------------|

|               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                |                                              |                        |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|------------------------|
| 08.3          | <p>(Mg) <math>\frac{0.12}{24}</math> or 0.005 (moles)</p> <p>(Fe) <math>\frac{2}{3} \times 0.005 = 0.00333</math> (moles)</p> <p>(mass Fe) = <math>0.00333 \times 56</math></p> <p>= 0.1866 (g)</p> <p>= 187 (mg)</p> <p><b>OR</b></p> <p>(Mg) = <math>\frac{0.12}{(3 \times 24)} (1)</math></p> <p>= 0.00166 <b>or</b> <math>\frac{1}{600}</math> (moles) (1)</p> <p>(mass of Fe) = 0.00166</p> <p><b>or</b> <math>\frac{1}{600} \times 112 (2 \times 56) (1)</math></p> <p>= 0.1866 (g) (1)</p> <p>187 (mg) (1)</p> | <p>an answer of 185–190 (mg) scores <b>5</b> marks</p> <p>an answer of 0.185–0.19 scores <b>4</b> marks</p> <p>mark is for ÷ by 24</p> <p>mark is for <math>\times \frac{2}{3}</math></p> <p>mark is for <math>\times 56</math></p> <p>an answer of 280 (mg) scores <b>4</b> marks</p> <p>an answer of 0.280 scores <b>3</b> marks (no ratio from equation)</p> <p>184 scores <b>0</b> [= (3×24) + (2×56)]</p> | <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> | <p>AO2<br/>5.3.2.2</p> |
| 08.3<br>cont. | <p><b>OR</b></p> <p>72 g Mg → 112g Fe (1)</p> <p>1 g Mg → <math>\frac{112}{72}</math> <b>or</b> 1.56 g Fe (1)</p> <p>0.12 g Mg → <math>\frac{112}{72} \times 0.12</math> (1)</p> <p>= 0.1866 (g) (1)</p> <p>= 187 (mg) (1)</p>                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                |                                              |                        |

A)

|      |             |  |   |                |
|------|-------------|--|---|----------------|
| 01.1 | Ca Mg Zn Cu |  | 1 | AO3<br>5.4.1.2 |
|------|-------------|--|---|----------------|

B)

|      |                                                                                                                                                                                                                  |                                                                                                                     |   |                |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|---|----------------|
| 01.2 | any <b>two</b> from:                                                                                                                                                                                             |                                                                                                                     | 2 | AO3<br>5.4.1.2 |
|      | <ul style="list-style-type: none"> <li>mass (of metal / element)</li> <li>surface area (of metal / element)</li> <li>concentration (of acid)</li> <li>volume (of acid)</li> <li>temperature (of acid)</li> </ul> | allow weight<br><br>ignore size<br>ignore length<br><br>ignore pH<br>ignore strength<br><br>ignore room temperature |   |                |

C)

|      |                           |  |   |                |
|------|---------------------------|--|---|----------------|
| 01.3 | (type of) metal / element |  | 1 | AO2<br>5.4.1.2 |
|------|---------------------------|--|---|----------------|

Q4. (2022)

|    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |     |                 |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----------------|
| 03 | <b>Level 3:</b> The method would lead to the production of a valid outcome. All key steps are identified and logically sequenced.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 5–6 | AO3             |
|    | <b>Level 2:</b> The method would not necessarily lead to a valid outcome. Most steps are identified, but the method is not fully logically sequenced.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 3–4 | AO3             |
|    | <b>Level 1:</b> The method would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 1–2 | AO1             |
|    | No relevant content.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 0   |                 |
|    | <b>Indicative Content</b> <ul style="list-style-type: none"> <li>measure volume of (hydrochloric) acid</li> <li>into a suitable container eg polystyrene cup</li> <li>measure the initial temperature (of hydrochloric acid)</li> <li>with a thermometer</li> <li>add stated mass of one metal</li> <li>stir</li> <li>measure the highest temperature reached of the solution<br/><b>or</b><br/>measure temperature reached after a set time period</li> <li>determine the temperature difference</li> <li>repeat</li> <li>repeat for each metal</li> <li>with same mass</li> <li>in same physical state (powder, lump, etc)</li> <li>with the same volume and / or concentration of (hydrochloric) acid</li> <li>use results to arrange metals in order of reactivity</li> <li>most reactive metal has the largest temperature change</li> </ul> <p>to access level 3 there must be an indication of how the temperature change is determined with the same mass of the 3 different metals reacted with the same volume of (hydrochloric) acid</p> |     | 5.1.4.2<br>RPA2 |

## Q5. (2022)

|      |                                           |                         |   |                               |
|------|-------------------------------------------|-------------------------|---|-------------------------------|
| 07.1 | electrolysis                              |                         | 1 | AO3                           |
|      | of molten compound (of metal Y)           | allow liquid for molten | 1 | 5.4.1.3<br>5.4.3.2<br>5.4.3.3 |
|      | <b>OR</b>                                 |                         |   |                               |
|      | displacement (1)                          |                         |   |                               |
|      | by heating with a more reactive metal     |                         |   |                               |
|      | <b>or</b>                                 |                         |   |                               |
|      | by heating with potassium / magnesium (1) |                         |   |                               |

## Q6. (2024)

|      |      |                                                                           |   |                           |
|------|------|---------------------------------------------------------------------------|---|---------------------------|
| 06.1 | gold | allow Au<br>allow silver / Ag<br>allow platinum / Pt<br>allow copper / Cu | 1 | AO1<br>5.4.1.2<br>5.4.1.3 |
|------|------|---------------------------------------------------------------------------|---|---------------------------|