

| Question Number | Answer  | Acceptable answers | Mark       |
|-----------------|---|--------------------|------------|
| <b>1(a)(i)</b>  | electrical (energy) / electricity / direct (electric) current |                    | <b>(1)</b> |

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|-----------------|--|---|------------|
| <b>1(a)(ii)</b> | A description including <ul style="list-style-type: none"> <li>• {light / ignite} gas / lighted splint (1)</li> <li>• gas burns / (squeaky) pop (if air is present) (1)</li> </ul> | reject glowing splint<br>second mark conditional on first | <b>(2)</b> |

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| <b>1(b)</b>     | sea water / salt / brine / sodium chloride (solution) |                    | <b>(1)</b> |

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| <b>1(c)(i)</b>  | <b>D</b> salt and water only |                    | <b>(1)</b> |

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| <b>1(c)(ii)</b> | A description to include two from <ul style="list-style-type: none"> <li>• (green) solid {disappears / dissolves} (1)</li> <li>• effervesces / bubbles (of colourless gas) given off (1)</li> <li>• blue (solution) forms (1)</li> </ul> | ignore references to names of products<br>fizz<br>goes blue<br>ignore incorrect colours of solution<br>ignore temperature rise | <b>(2)</b> |

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|-----------------|---|---------------------------|------------|
| <b>1(d)(i)</b>  | An explanation linking <ul style="list-style-type: none"> <li>• tablet C (1)</li> <li>• because it neutralises greatest volume of acid (1)</li> </ul> | ignore references to rate | <b>(2)</b> |

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| <b>1(d)(ii)</b> | <ul style="list-style-type: none"> <li>• {crushed tablets / chewed tablets} have a shorter reaction time (than whole tablets) (1)</li> </ul> | ignore crushed because times are quicker / larger surface area / do not need to break down | <b>(1)</b> |

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| <b>2(a)</b>     | magnesium nitrate<br>water<br>carbon dioxide<br><br>all three correct (2)<br>magnesium nitrate + one other correct (1) | allow correct formulae | <b>(2)</b> |

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| <b>2(b)(i)</b>  | C – neutralisation |                    | <b>(1)</b> |

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| <b>2(b)(ii)</b> | $\text{ZnO} + 2\text{HCl} \rightarrow \text{ZnCl}_2 + \text{H}_2\text{O}$ (3)<br><br>LHS (1)<br>RHS (1)<br>balancing of correct formula (1) | correct multiples<br>ignore state symbols | <b>(3)</b> |

| Question Number | Indicative Content   | Mark       |
|-----------------|--|------------|
| <b>QWC</b>      | <p><b>*2(c)</b></p> <p>A description including some of the following points</p> <p>experiment set up</p> <ul style="list-style-type: none"> <li>• hydrochloric acid in container</li> <li>• carbon rods in acid</li> <li>• attach rods to electrical supply</li> <li>• d.c. supply(or reference to positive and negative)</li> <li>• test tubes to collect gases</li> </ul> <p>test hydrogen</p> <ul style="list-style-type: none"> <li>• lighted splint</li> <li>• squeaky pop (with air)/burns</li> </ul> <p>test chlorine</p> <ul style="list-style-type: none"> <li>• (damp blue) litmus paper</li> <li>• (turns red then) bleaches/white</li> </ul> | <b>(6)</b> |
| <b>Level</b>    | No rewardable content  |            |
| <b>1</b>        | <p><b>1 – 2</b></p> <ul style="list-style-type: none"> <li>• a limited description e.g. simple description/diagram of electrolysis set up OR description of test for one of the gases.</li> <li>• the answer communicates ideas using simple language and uses limited scientific terminology</li> <li>• spelling, punctuation and grammar are used with limited accuracy</li> </ul>   |            |
| <b>2</b>        | <p><b>3 – 4</b></p> <ul style="list-style-type: none"> <li>• a simple description e.g. a full description of electrolysis OR test for both gases OR simple description of electrolysis and the test for one of the gases.</li> <li>• the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately</li> <li>• spelling, punctuation and grammar are used with some accuracy</li> </ul>   |            |
| <b>3</b>        | <p><b>5 – 6</b></p> <ul style="list-style-type: none"> <li>• a detailed description e.g. description of electrolysis and test for both gases OR a full description of electrolysis and of one gas test.</li> <li>• The answer communicates ideas clearly and coherently uses a range of scientific terminology accurately</li> <li>• spelling, punctuation and grammar are used with few errors</li> </ul>   |            |

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|-----------------|--------------------------------------|--------------------|------------|
| <b>3 (a)</b>    | A aluminium nitrate and lead sulfate |                    | <b>(1)</b> |

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|-----------------|---|--|------------|
| <b>3 (b)</b>    | <p>An explanation linking two of the following</p> <p>strong (forces of / electrostatic) attraction (1)</p> <p>(between) oppositely charged <u>ions</u> (1)</p> <p>requires lot of heat/energy {to separate ions/overcome forces/break bonds} (1)</p> | <p>Any reference to molecules/molecular/intermolecular/covalent scores 0 marks overall</p> <p>strong bonds<br/>ignore "between atoms" for this mark<br/>ignore strong lattice / giant structure</p> <p>positive and negative <u>ions</u><br/>reject between bonds<br/>reject charged atoms for this mark</p> <p>{high / more} {heat / energy}</p> <p>ignore hard to melt/high temperature needed</p> | <b>(2)</b> |

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|-----------------|-----------------------------------|---------------------|------------|
| <b>3 (c)(i)</b> | <b>white</b> {precipitate /solid} | <b>white</b> powder | <b>(1)</b> |

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| <b>3(c)(ii)</b> | <p>BaSO<sub>4</sub> + 2KCl (2)</p> <p>OR</p> <p>BaSO<sub>4</sub> + KCl (1)</p> | <p>SO<sub>4</sub>Ba / ClK</p> <p>Ignore incorrect use of case, or use of superscript or large number 4</p> | <b>(2)</b> |

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| <b>3(d)(i)</b>  | C K <sup>+</sup> |                    | <b>(1)</b> |

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| <b>3 (d)(ii)</b> | <p>A description linking three of the following</p> <p>(sequence has to be correct for full marks)</p> <p>M1 add/mix/react only sodium carbonate (solution) and lead nitrate (solution) (1)</p> <p>M2 filter (off precipitate) (1)</p> <p><b>M3 dep on M2</b></p> <p>M3 wash/rinse (solid/residue with distilled water)</p> <p>OR</p> <p>dry using {filter paper/paper towel/in a (warm/drying) oven} (1)</p> | <p>add/mix/react the (two) solutions/them</p> <p>for M1 ignore warm/heat mixture</p> <p>if any indication of heating to evaporate anywhere only M1 can be scored</p> <p>if any other reagent added eg acid can score max 2 for question</p> <p>decant (off the solution)</p> <p>reject if wash with acid or other reagent</p> <p>leave to dry / in the sun / on a radiator / near a window</p> <p>reject heat/hot oven</p> | <b>(3)</b> |

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| <b>4(a)</b>     | D aq l |                    | <b>(1)</b> |

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|-----------------|---------------------------------------|---|------------|
| <b>4(b)</b>     | $H^+ + OH^- (1) \rightarrow H_2O (1)$ | LHS (1) RHS (1)<br>ignore state symbols, even if incorrect.<br>allow inclusion of spectator ions, $Na^+$ and $Cl^-$ , if shown on both sides for one mark max | <b>(2)</b> |

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| <b>4(c)(i)</b>  | suitable acid-base indicator<br>eg methyl orange,<br>phenolphthalein | litmus<br>reject universal indicator<br>allow recognisable phonetic spelling | <b>(1)</b> |

| Question Number | Answer  | Acceptable answers                                  | Mark       |
|-----------------|---|---|------------|
| <b>4(c)(ii)</b> | correct colour change for suitable indicator in 4(c)(i):<br><br>methyl orange :<br>yellow $\rightarrow$ orange/pink/red<br><br>phenolphthalein :<br>magenta/pink $\rightarrow$ colourless | litmus : blue $\rightarrow$ red<br><br>ignore clear | <b>(1)</b> |

Link 4ci and 4cii together on e-Pen

| Question Number | Answer  | Acceptable answers  | Mark       |
|-----------------|---|---|------------|
| <b>4(d)</b>     | rel mass NaOH = 23.0 + 16.0 + 1.00 (1)<br><br>concentration = $\frac{20.0}{\text{formula mass}} \times 1$ (1) | (= 40.0) (1)<br><br>0.5 (mol dm <sup>-3</sup> ) without working (2) | <b>(2)</b> |

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| 4(e)            | moles of NaOH = $\frac{25.0 \times 1.50}{1000}$ (1)<br>(= 0.0375 moles)<br>ratio 1 : 1 /<br>moles NaOH = moles HCl (1)<br><br>conc of HCl = $\frac{0.0375 \times 1000}{30.0}$ (1)<br>(= 1.25 (mol dm <sup>-3</sup> ))<br>OR<br>25.0 x 1.50 = 30.0 x conc acid (2)<br><br>conc of HCl = $\frac{25.0 \times 1.50}{30.0}$ (1)<br>(=1.25 (mol dm <sup>-3</sup> )) | 0.0375 (1) – without working shown<br><br>conc of HCl = 1.25 (mol dm <sup>-3</sup> )(3)<br>without any working shown<br>allow ecf<br><br>conc = $\frac{30.0 \times 1.50}{25.0} = 1.80$ (2)<br>(mol dm <sup>-3</sup> )<br><br>allow 0.00125 / 0.125 / 12.5 max<br>2 | (3)  |