

Mark Scheme


1.

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|--------------|--|--------------|--|
| i | <p>Any two from: (Bioleaching is) cheaper or uses less energy (than traditional mining) ✓</p> <p>Idea that (bioleaching) allows copper to be extracted from low-grade ores ✓</p> <p>Bacteria used occur naturally / bacteria do not need any special treatment ✓</p> <p>(Bioleaching) does not release harmful sulfur dioxide (into the atmosphere) ✓</p> <p>Idea that (bioleaching) does not lead to destruction of the landscape like mining ✓</p> | 2 (AO1.1) | <p>IGNORE bioleaching is safer</p> <p>IGNORE less harmful to the environment, unless qualified</p> |
| ii | <p>(Sulfuric acid) may escape into water supplies /</p> <p>(Sulfuric acid) may escape into the soil ✓</p> | 1 (AO1.1) | <p>ALLOW an effect of acid escaping into soil eg changes pH of soil / makes soil acidic / stops plants growing / damage ecosystems</p> <p>ALLOW sulfuric acid can kill wildlife</p> <p>IGNORE references to acid rain</p> |
| Total | | 3 | |


2.

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| a | <p>Any two from: Fertilisers increase crop yields ✓ Idea that growing populations mean that farmers need to grow more crops ✓ Idea that fertilisers provide essential elements for crops ✓</p> | <p>2 (AO1.1)</p> | <p>IGNORE just references to good / increased / faster growth ALLOW specific examples of essential elements, ie nitrogen / potassium /</p> |
| | <p>Idea that the quality of crops will be reduced without fertilisers ✓ Idea that fertilisers allow farmers to use the same land over and over again ✓</p> | | <p>phosphorus IGNORE references to providing nutrients / minerals ALLOW specific example of reduced crop quality eg poor (root or fruit) growth / discoloured or yellow leaves etc IGNORE idea of controlling pests</p> |
| b | <p>Sulfur (for sulfur trioxide) ✓ Air (for nitrogen) ✓</p> | <p>2 (AO1.1)</p> | <p>IGNORE sulfur dioxide</p> |
| | <p>Total</p> | <p>4</p> | |

3.

| | | | | |
|--|---|--|-----------------------|--|
| | i | <p>Repeat the titration until concordant results are obtained ✓</p> <p>Repeat the experiment without the indicator ✓</p> | <p>2(AO 3.3b)</p> | <p>ALLOW note how much sulfuric acid is needed to neutralise the ammonia</p> <p>ALLOW idea of using (activated) charcoal to remove the indicator BUT IGNORE idea of just removing indicator before crystallising</p> <p>ALLOW idea of doing a rough titration and then repeating without indicator for 2 marks</p> <p><u>Examiner's Comments</u></p> <p>Good responses to this question described repeating the titration until concordant results are obtained and then repeating the experiment without the indicator. Lower ability candidates described using concentrated acid to give purer crystals, filtering the impure crystals or using distillation to remove the indicator.</p> <p> AfL</p> <p>The idea of repeating the experiment to obtain concordant titres was only seen from higher ability candidates.</p> |
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3.

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|--|----|---|--------------|--|
| | ii | Volumes of solution are too large for titration method / large volumes of liquid need to be heated and then allowed to crystallise ✓ | 1(AO 1.1) | ALLOW idea that industrial method is on a much larger scale / ORA ALLOW titration is a batch process / not a continuous process ALLOW idea that industry wants the |
| | | | | reaction to be continually occurring IGNORE idea that it takes too long to do on a large scale Examiner's Comments  Misconception A common misconception that the process would be too slow in a laboratory. |
| | | Total | 3 | |

4.

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|---|----|--|----------|---|
| a | | Aluminium is above carbon in the reactivity series so cannot be obtained by reaction of oxide with carbon (1) Copper is below carbon in the reactivity series (1) | 2 | |
| b | i | $Al^{3+} + 3e^{-} \rightarrow Al(l)$ | 1 | ALLOW any correct multiple ALLOW = instead of \rightarrow DO NOT ALLOW & or and instead of + |
| | ii | Ions cannot move (1) | 1 | IGNORE electrons cannot move |
| | | Total | 4 | |

5.

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|--------------|--|----------|---|
| a | <p>Leave for a longer period of time so that the results are more differentiated / keep at the same temperature because rate of reaction changes with temperature (1)</p> | 1 | <p>IGNORE references to same mass of metals</p> <p>ALLOW same surface area of metal strip because surface area affects rate of reaction</p> |
| b | <p>ANY THREE FROM</p> <p>Water is needed for corrosion (of most metals) since no corrosion in dry air but there is corrosion in moist air (1)</p> <p>Most metals corrode faster in moist alkaline air since more corrosion than in moist air (1)</p> <p>Most metals corrode faster in moist acidic air since more corrosion than in moist air (1)</p> <p>The rate of corrosion is not related to the reactivity series with reference to either copper or aluminium (1)</p> | 3 | |
| Total | | 4 | |