0 1 . 1 Metals are extracted from their ores. Many copper ores contain only 2% of copper compounds.

Copper is now extracted from ores containing a low percentage of copper compounds.

Suggest two reasons why. **[2 marks]**

any two from:
- **copper / ores are running out / harder to find**
- **there are no / very small amounts of high-grade copper ores left**
- **copper metal is in demand**
- **copper is expensive**
- **now economical to extract copper from low-grade ores**

allow new methods of extraction e.g. bioleaching and phytomining
allow high-grade ores are running out

.....

0 1 . 2 The extraction of pure copper is expensive.
Give one reason why. **[1 mark]**

any one from:
- large amounts of fuels / energy used (for the furnace and electrolysis) **[1]**

allow large amounts of electricity needed
ignore high temperature / electrolysis unqualified
- (the extraction has) many steps / stages / processes **[1]**

allow (extraction) is a long process / takes a lot of time
- large amounts of ore / material have to be mined **[1]**

allow ores contain a low percentage of copper

.....

0 1 . 3 Large areas of land are contaminated with copper compounds.

Phytomining can be used to remove these copper compounds from the land.

What is used in phytomining to remove copper compounds from the land?
[1 mark]

(growing) plants **[1]**

.....

0 2 . 1 Copper is produced from copper sulfate solution by displacement using scrap iron or by electrolysis.

During the electrolytes of copper sulfate solution, which electrode do the copper ions move towards?

Give a reason for your answer. **[2 marks]**

(copper ions move towards) the negative electrode / cathode **[1]**
because copper ions / Cu^{2+} are positively charged or are oppositely charged or copper ions need to gain electrons **[1]**
allow because metal ions are positive or opposites attract **[1]**

0 2 . 2 Give two reasons why scrap iron is used to displace copper. **[2 marks]**
Use the Chemistry Data Sheet to help you to answer this question.

iron is more reactive (than copper) **[1]**
iron is cheap(er than copper) **[1]**
allow cheaper or uses less energy than electrolysis **[1]**

.....

0 2 . 3 Complete the word equation. **[2 marks]**

copper (II) sulfate + iron ⟶ **iron (II) sulfate [1] + copper [1]**

0 2 . 4 Write the balanced symbol equation. **[2 marks]**

$CuSO_4 + Fe \longrightarrow FeSO_4 + Cu$
LHS [1] RHS [1]

.....

(Total 12 marks)

End