

# MARK SCHEME

# GCSE

## CHEMISTRY

## AQA - COMBINED SCIENCE

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C10 - TEST 5  
USING RESOURCES  
Advanced

## Mark schemes

1.

(a) bioleaching

1

bacteria

*dependent on bioleaching being given*

1

phytomining

1

plants

*dependent on phytomining being given*

1

(b) any **three** from:

- copper ores are becoming scarce
- can extract from low grade ores  
*allow extraction of copper from contaminated land*
- mining not required  
*allow consequences of less mining*
- moving / disposing of large amounts of rock not required  
*allow less energy required*  
*allow fewer emissions of greenhouse gases **or** less carbon dioxide released*  
*allow reduces global warming*  
*ignore references to cost*

3

(c) iron is more reactive than copper

1

(so) iron displaces copper (from copper sulfate)

*allow (so) iron reduces copper ions*

1

(d) correct formulae and symbols

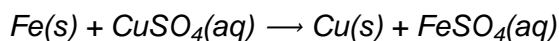
*equation must be correctly balanced*

1

correct state symbols

1

*allow for 2 marks*



$$(e) \quad (\text{moles copper ions}) = \frac{3.175}{63.5}$$

1

$$= 0.05 \text{ (moles)}$$

1

(number of copper ions =  
moles  $\times$  Avogadro constant)

$$= 0.05 \times 6.02 \times 10^{23}$$

*allow incorrectly calculated value for number of moles  
from step 2*

1

$$= 3.01 \times 10^{22} \text{ (ions)}$$

1

*an answer of  $3.01 \times 10^{22}$  (ions) scores 4 marks  
answer not given in standard form **max 3 marks***

[15]

2.

**Level 3 (5–6 marks):**

A detailed, coherent and logical justification of the scientist's statement, with relevant links made between statements in the question, phytomining and the effects of other methods of metal production on the environment.

**Level 2 (3–4 marks):**

An attempt to justify the scientist's statement is made, with some attempt at linking statements. The logic may be inconsistent at times but builds towards a coherent argument.

**Level 1 (1–2 marks):**

Discrete relevant points made. The logic may be unclear and may not be consistent with the reasoning. Links are not made.

**0 marks:**

No relevant content

**Indicative content**

- phytomining conserves supplies of ores
- copper will be available for longer as at present rate of use copper ores will run out in about 35 years
- phytomining conserves supplies of fossil fuels or energy
- less fuel used at a lower cost
- mining scars landscape or produces noise pollution
- mining destroys wildlife habitats
- with more phytomining less need to mine ores
- with phytomining less habitat destroyed or less scarring of landscape
- with phytomining less need to use landfill for waste
- burning fossil fuels produces carbon dioxide / greenhouse gas
- burning fossil fuels causes global warming or climate change
- extraction from ores produces sulfur dioxide which causes acid rain

[6]

3.

(a) transition (elements / metals)  
*accept d block (elements / metals)*

1

(b) any **three** from:  
*ignore references to cost*

- (good) conductor (of heat)  
*ignore references to electricity*
- can be bent / shaped  
*accept malleable*  
*ignore moulded*
- does not react with water  
*allow does not rust*  
*allow not very reactive*
- strong  
*allow durable*  
*ignore tough*
- hard enough to make pipes or tanks
- high melting point  
*allow ductile*

3

(c) Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should apply a 'best fit' approach to the marking.

**0 marks**

No relevant information

**(1 – 2 marks)**

At least one advantage **or** disadvantage of **either** method is given.

**(3 – 4 marks)**

At least one advantage **and** one disadvantage is given.

**or**

At least one advantage of **both** methods is given

**or**

At least one disadvantage of **both** methods is given.

**(5 – 6 marks)**

Advantages and disadvantages of **both** methods are given.

For 6 marks a reasonable attempt at a conclusion is made.

**examples of the points made in the response**

*ignore references to cost unless qualified.*

*ignore jobs / transport*

### **Advantages of smelting:**

- quicker
- extracts more copper
- more economically viable  
*allow involves fewer stages*

### **Disadvantages of smelting:**

- supply of copper rich ores is limited
- (mining causes) dust / noise pollution  
*ignore pollution unqualified*
- destruction of landscape or visual pollution
- destruction of habitats
- smelting uses non-renewable fuel
- smelting uses more energy / electricity
- large amounts of waste rock
- (mining / smelting) releases (more) carbon dioxide / causes global warming  
*allow (more) greenhouse gases*
- (smelting) releases sulfur dioxide / causes acid rain

### **Advantages of phytomining:**

- extracts copper from low grade ores
- conserves copper rich ores
- does not destroy landscape or less visual pollution  
*allow does not destroy habitats*  
*allow carbon neutral*

**Disadvantages of phytomining:**

- produces smaller amount of copper (per unit mass)
- takes up a lot of space
- takes a long time (to grow plants)
- produces carbon dioxide when plants burnt
- land cannot be used to grow food crops

**Electrolysis**

- Used in both methods (so neither an advantage or disadvantage)

**Conclusion supported by comparisons made**

6

**[10]**