

# Using Earth's res, Potable Water

## Mark Scheme

Level	GCSE (9-1)
Subject	Combined Science: Trilogy - Chemistry
Exam Board	AQA
Topic	5.10 Using Resources
Sub-Topic	Using Earth's res, Potable Water
Difficulty Level	Gold Level
Booklet	Mark Scheme

Time Allowed: 44 minutes

Score: /43

Percentage: /100

Grade Boundaries:

**M1.(a)** electrodes connected to d.c. power supply by wires

*for this diagram ignore the material used for the electrodes  
as long as they are made from carbon or metals that are  
inert*

1

electrodes labelled anode (+) and cathode (–)

1

(b) copper ions cause the blue colour

*answer must be in terms on copper ions*

1

copper ions are reduced / converted to copper ions

1

so the concentration of copper ions decreased

1

*if no other mark awarded allow 1 mark for copper ions are  
used up during electrolysis*

(c) copper ions are positive

1

so are attracted to the inert cathode **or** inert negative electrode

1

copper ions gain electrons at the inert cathode **or** inert negative electrode

1

so they are reduced to form copper atoms

1

(d) 50 cm<sup>3</sup> contains 4 g CuSO<sub>4</sub>

1

$$M_r \text{ CuSO}_4 = 159.5$$

1

$$4 \text{ g CuSO}_4 \text{ reacts with } \frac{4}{159.5} \times 56 \text{ g Fe}$$

$$= 1.40(43877)$$

1

$$= 1.4 \text{ (g)}$$

1

*accept 1.4(g) with no working shown for 4 marks*

*allow 1.40(43887) without working shown for 3 marks*

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**M2.(a)** because sulfur dioxide causes acid rain

1

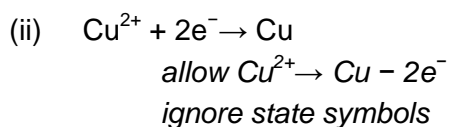
which kills fish / aquatic life **or** dissolves / damages statues / stonework **or** kills / stunts growth of trees

*if no other mark awarded then award 1 mark for sulfur dioxide is toxic or causes breathing difficulties.*

1

(b) (i) electrons are lost

1



1

(iii) copper sulfate

*allow any ionic copper compound*

1

(c) (lattice of) positive ions 1

delocalised electrons

*accept sea of electrons*

1

(electrostatic) attraction between the positive ions and the electrons

1

electrons can move through the metal / structure **or** can flow

*allow electrons can carry charge through the metal / structure*

*if wrong bonding named or described or attraction between oppositely charged ions then do not award M1 or M3 – MAX 2*

1

(d) (copper compounds are absorbed / taken up by) plants

*allow crops*

1

which are burned

1

the ash contains the copper compounds

*do not award M3 if the ash contains copper (metal)*

1

(e)

/ A <sub>r</sub>	55.6 / 63.5	16.4 / 56	28.0 / 32
moles	0.876	0.293	0.875
ratio	3	1	3
formula	Cu <sub>3</sub> FeS <sub>3</sub>		

*award 4 marks for Cu<sub>3</sub>FeS<sub>3</sub> with some correct working*

*award 3 marks for Cu<sub>3</sub>FeS<sub>3</sub> with **no** working*

*if the answer is not Cu<sub>3</sub>FeS<sub>3</sub> award up to 3 marks for correct steps from the table apply ecf*

*if the student has inverted the fractions award 3 marks for an answer of CuFe<sub>3</sub>S*

4

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**M3.(a)** pure copper is twice as good a conductor as 99% pure copper

*accept reverse argument*

*accept answers quoting 2 correct values from the graph  
scores 2*

*qualitative answer (e.g. pure copper is a better conductor  
than impure copper) scores 1*

**or**

*answers quoting a conductivity value from the graph scores  
1*

2

- (b) Marks awarded for this answer will be determined by the Quality of Communication (QC) as well as the standard of the scientific response.

### **0 marks**

No relevant content

### **Level 1 (1–2 marks)**

Simple list of a limited number of points given, with no linking between ideas

### **Level 2 (3–4 marks)**

A broader set of points made. There will probably not be links between ideas

### **Level 3 (5–6 marks)**

Answer includes linking between ideas, showing the consequence of either not recycling or the advantage of recycling. Answers such as less fossil fuel needed so less carbon dioxide produced **or** less carbon dioxide produced so less global warming

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

#### **resources**

**(recycling)** conserves supplies of ores

copper available for longer

as (at present rate of use) copper ores will run out in about 35 years

**(recycling)** conserves supplies of fossil fuels **or** energy

less fuel used at a lower cost

#### **land pollution**

mining scars landscape **or** produces noise pollution

mining destroys wildlife habitats

**(recycling)** less need to mine ores / fossil fuels

*so less habitat destroyed or less scarring of landscape*

**(recycling)** less need to use landfill for waste

#### **atmospheric pollution**

burning fossil fuels produces carbon dioxide / greenhouse gas

which (may) cause global warming **or** climate change  
extraction produces sulfur dioxide  
which causes acid rain  
which can kill trees / fish

6

(c) grow plants

*accept plants absorb copper (through roots)*

1

then plants are burned

1

ash (from burning) contains copper compounds

1

[11]

**M4.** **two** methods and **1 linked** explanation **or** **1** method and **two** explanations, **1** linked = **3** marks

no linking of method and explanation then max **2** marks

*ignore references to removal of hardness*

**method 1:**

filter

*ignore screening / sedimentation*

**explanation 1:**

remove insoluble substances / remove solids / small bits / dirt / mud/ soil / sand / silt

**method 2:**

precipitate / flocculate / add eg. alum

*allow other named substances*

**explanation 2:**

removes (some) soluble material as solids / removes (some) metal ions

**method 3:**

add chlorine / chlorine dioxide / ozone

**explanation 3:**

sterilise / kill bacteria / microorganisms / microbes

*ignore 'remove bacteria'*

*ignore disinfect*

**[3]**