

Using Earth's res, Potable Water

Question Paper

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	Question Paper

Time Allowed: 44 minutes

Score: /43

Percentage: /100

Grade Boundaries:

Q1. Copper can be produced from copper(II) sulfate solution by two different methods.

Method 1 – Electrolysis

- (a) To produce copper by electrolysis a student has inert electrodes, a d.c. power supply, a switch and electrical wires for the external circuit.

Draw and label the apparatus set up to produce copper from copper(II) sulfate solution by electrolysis.

(2)

- (b) Suggest why the colour of the copper(II) sulfate solution fades during the electrolysis.

.....

.....

.....

.....

(3)

- (c) Explain how copper is produced from copper(II) sulfate solution by electrolysis.

.....

.....

.....

.....

.....

.....

.....

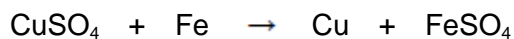
.....

.....

(4)

Method 2 – Displacement

- (d) The chemical equation for the displacement of copper using iron is:



Calculate the minimum mass of iron needed to displace all of the copper from 50 cm³ of copper(II) sulfate solution.

The concentration of the copper(II) sulfate solution is 80 g CuSO₄ per dm³.

Relative atomic masses (*A_r*): O = 16; S = 32; Fe = 56; Cu = 63.5

Give your answer to 2 significant figures.

.....

.....

.....

.....

.....

Mass of iron = g

(4)
(Total 13 marks)

Q2. This question is about copper.

- (a) Copper can be extracted by smelting copper-rich ores in a furnace.

The equation for one of the reactions in the smelting process is:



Explain why there would be an environmental problem if sulfur dioxide gas escaped into the atmosphere.

.....

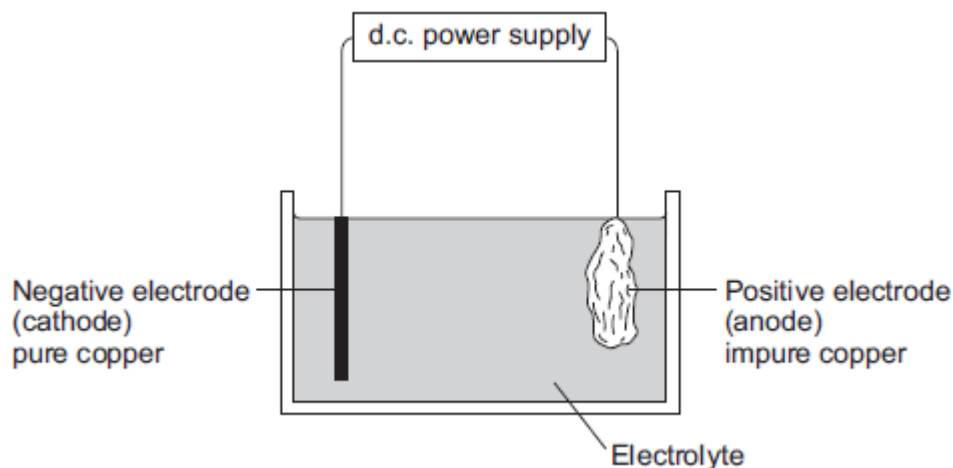
.....

.....

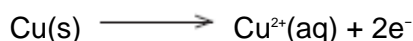
.....

(2)

- (b) The impure copper produced by smelting is purified by electrolysis, as shown below.



Copper atoms are oxidised at the positive electrode to Cu^{2+} ions, as shown in the half equation.



- (i) How does the half equation show that copper atoms are oxidised?

.....

(1)

- (ii) The Cu^{2+} ions are attracted to the negative electrode, where they are reduced to produce copper atoms.

Write a balanced half equation for the reaction at the negative electrode.

.....

(1)

- (iii) Suggest a suitable electrolyte for the electrolysis.

.....

(1)

- (c) Copper metal is used in electrical appliances.

Describe the bonding in a metal, and explain why metals conduct electricity.

.....

.....

.....

.....

.....

.....

.....

.....

(4)

- (d) Soil near copper mines is often contaminated with low percentages of copper compounds.

Phytomining is a new way to extract copper compounds from soil.

Describe how copper compounds are extracted by phytomining.

.....

.....

.....

.....

.....

.....

(3)

- (e) A compound in a copper ore has the following percentage composition by mass:

55.6% copper, 16.4% iron, 28.0% sulfur.

Calculate the empirical formula of the compound.

Relative atomic masses (A_r): S = 32; Fe = 56; Cu = 63.5

You must show all of your working.

.....

.....

.....

.....

.....

.....

.....

.....

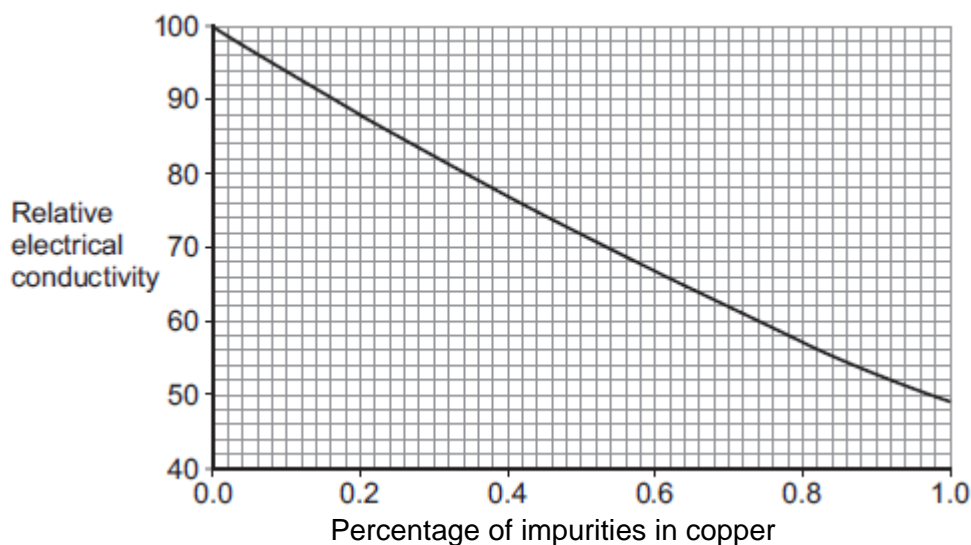
Empirical formula =

(4)
(Total 16 marks)

Q3. This question is about copper.

- (a) Most of the copper extracted is used in electric circuits.

The figure below shows how impurities change the electrical conductivity of copper.



Copper extracted by smelting is about 99% pure.

The 99% pure copper produced by smelting is purified to 99.9999% pure copper by electrolysis.

Use values from the graph to explain why copper is purified to 99.9999%.

.....

.....

.....

.....

(2)

- (b) In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.

Read the information in the box.

Copper extraction

World demand for copper for the year 2011 was about 20 million tonnes.

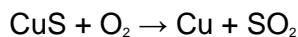
World reserves of copper are estimated to be 700 million tonnes.

Most of the copper used is obtained from copper ores, which are mined.

The copper ore chalcopyrite is heated in a furnace to produce copper sulfide, CuS

The furnace is heated by burning fossil fuels.

Air is then blown through the hot copper sulfide, to produce copper and sulfur dioxide.



A scientist made the statement: 'Copper should be recycled'.

Use the information in the box and your own knowledge and understanding to justify the scientist's statement.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Extra space

.....

.....

.....

.....

.....

.....

.....

.....

(6)

- (c) Phytomining is used to obtain copper from land that contains very low percentages of copper compounds.

Describe how copper compounds are obtained by phytomining.

.....

.....

.....

.....

.....

.....

.....

.....

(3)

(Total 11 marks)

Q4. Good quality water is needed for a healthy life.

In the United Kingdom, obtaining safe water for drinking is as simple as turning on a tap. The water is made safe to drink by water companies.

However, in many parts of Africa and Asia, water used for drinking is contaminated and untreated. It is estimated that 2.2 million people die each year as a result of drinking contaminated water.



DADA DANESHANANDA, Man with filtered water from the Mafi-Zongo water project. www.amurt.net/africa/ghana/2005

Efforts are being made to solve this problem and more water is being treated.

Describe how water in the United Kingdom is treated.

Explain how this makes it safe to drink.

.....

.....

.....

.....

.....

.....

.....

(Total 3 marks)

