OXFORD

INTERNATIONAL AQA EXAMINATIONS

Topic Test: OxfordAQA International GCSE Chemistry 9202

Chemical changes

Name: _____

Class: _____

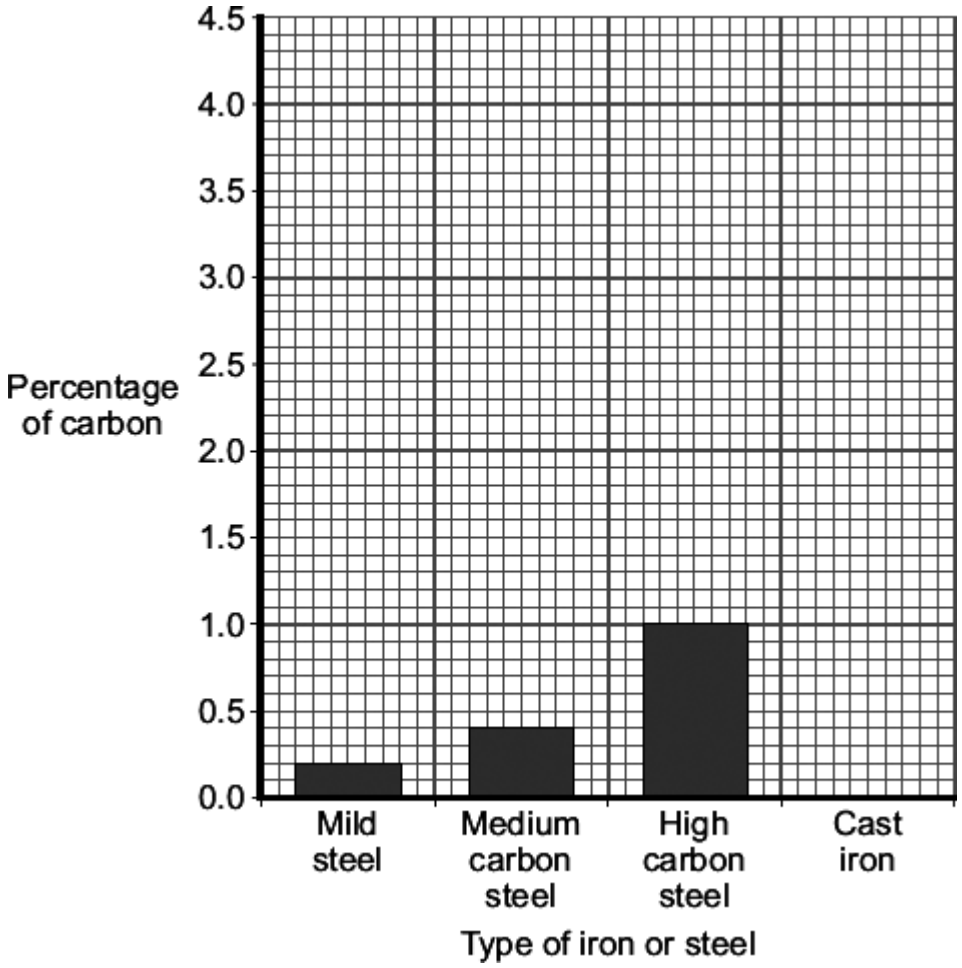
Date: _____

Time: **47 minutes**

Marks: **47 marks**

Comments:

1 The bar chart shows the percentage of carbon in three types of steel.



(a) Draw a ring around the correct word in the box to complete the sentence.

Steel is the name used for

alloys
atoms
ores

of iron.

(1)

(b) Cast iron contains 4% carbon.

Draw the bar for cast iron on the chart.

(1)

(c) Cast iron is more brittle than these three types of steel.

Use the bar chart to suggest why.

_____

_____

(1)

(d) One type of stainless steel contains iron with 0.2% carbon to which 8% nickel and 18% chromium were added.

(i) Tick (✓) the percentage of iron in this type of stainless steel.

Percentage (%) of iron	Tick (✓)
92.4	
88.6	
73.8	

(1)

(ii) Use the bar chart to name the type of steel that contains only 0.2% carbon.

_____

(1)

(iii) Draw a ring around the correct word in the box to complete the sentence.

Stainless steel is used for knives and forks because it is resistant to

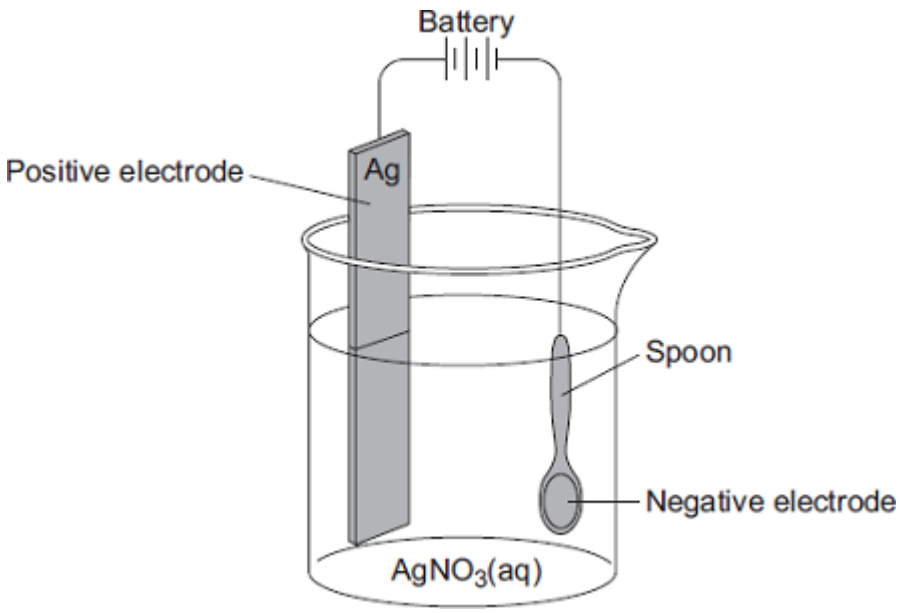
corrosion.
decomposition.
distillation.

(1)

(Total 6 marks)

2 Electroplating is used to coat a cheap metal with a thin layer of an expensive metal.

In the diagram a teaspoon made of nickel is being coated with silver.



Silver nitrate ($AgNO_3$) contains silver ions (Ag^+) and nitrate ions (NO_3^-).

(a) Solid silver nitrate, $AgNO_3(s)$, does **not** conduct electricity.

Choose the correct answer in the box to complete the sentence.

are too big	**cannot move**	**are too small**

Solid silver nitrate does **not** conduct electricity because the ions _____

_____

(1)

(b) Draw a ring around the correct answer to complete each sentence.

(i) Silver ions move to the negative electrode because

they have

- no charge.
- a negative charge.
- a positive charge.

(1)

(ii) When silver ions reach the negative electrode they turn into silver

- atoms.
- compounds.
- molecules.

(1)

(Total 3 marks)

3 Carbon dioxide is produced when metal carbonates are heated.

(a) (i) Draw a ring around the correct answer to complete the word equation.

magnesium carbonate →

- magnesium
- magnesium hydroxide
- magnesium oxide

+ carbon dioxide

(1)

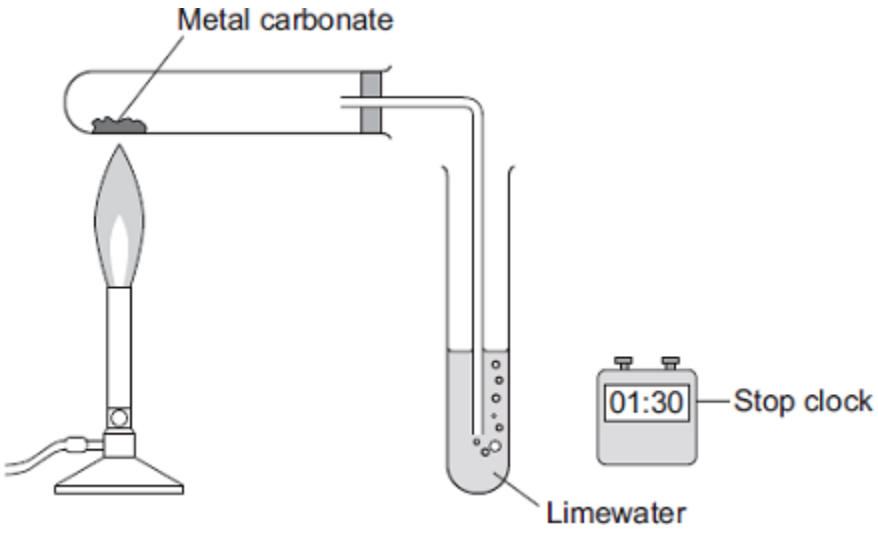
(ii) Draw a ring around the correct answer to complete the sentence.

The reaction to produce carbon dioxide from magnesium carbonate is

combustion.
decomposition.
fermentation.

(1)

(b) A student investigated what happens when metal carbonates are heated.



The student:

- used the apparatus to investigate heating four metal carbonates
- started the stop clock at the same time as he began to heat the metal carbonate
- stopped the stop clock when carbon dioxide was produced.

The student's results are shown in the table.

Metal carbonate	Time taken for the production of carbon dioxide to start in seconds
Calcium carbonate	163
Copper carbonate	24
Magnesium carbonate	92
Zinc carbonate	67

(i) Tick (✓) the type of graph the student should draw from these results.

Type of graph	Tick (✓)
Bar chart	
Line graph	
Scatter graph	

(1)

(ii) Use the Chemistry Data Sheet to help you to answer this question.

Draw a ring around the correct answer to complete the sentence.

The more reactive the metal in the carbonate the | less / more / same | time is

taken for the production of carbon dioxide to start.

(1)

(iii) How did the student know that carbon dioxide was produced?

Use the diagram of the apparatus to help you to answer this question.

_____

_____

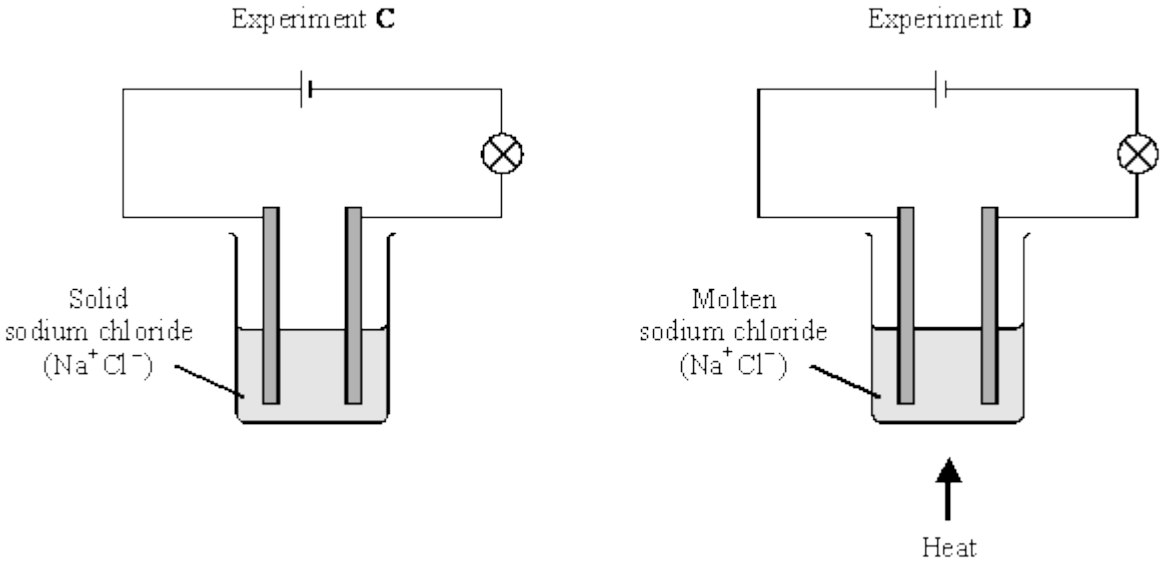
_____

_____

(2)

(Total 6 marks)

4 (a) Two experiments were set up as shown.



(i) Give **two** observations which would be seen only in Experiment **D**.

1. _____

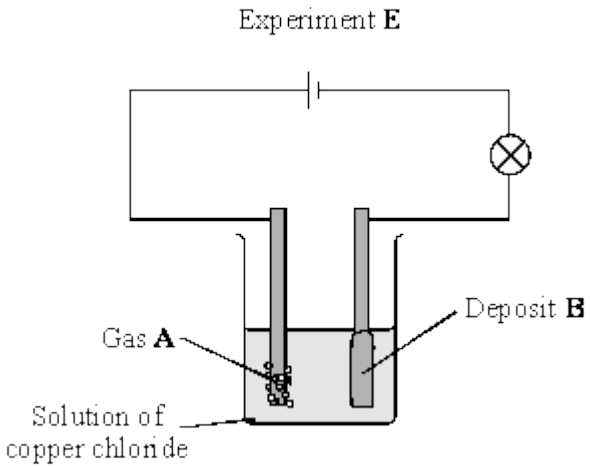
2. _____

(2)

(ii) Explain why in Experiment **C** no changes would be seen.

(2)

(b) Another *electrolysis* experiment used an aqueous solution of copper chloride.



(i) What does *electrolysis* mean?

(2)

(ii) Name the gas **A** and the deposit **B**.

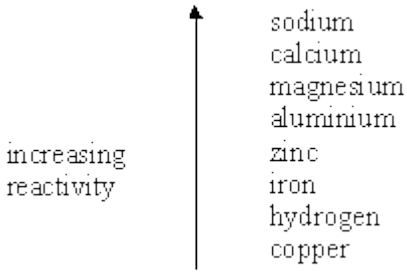
(2)

(c) Give **one** industrial use of electrolysis.

(1)

(Total 9 marks)

5 Part of a reactivity series is:



(a) Carbon is used in blast furnaces to obtain iron and zinc from their oxides, but electrolysis has to be used to obtain aluminium from its oxide.

Draw an arrow on the reactivity series above to show where carbon fits into the series.

(1)

(b) Predict the method of extraction used to obtain calcium from its ore and explain your answer.

_____

_____

_____

(2)

(c) The formula for zinc oxide is ZnO. Write a balanced equation for the extraction of zinc in the blast furnace.

_____

(2)

(Total 5 marks)

6 The flow diagram shows the main stages used to extract a metal from its ore.

mining the ore → purifying the ore → extracting the metal

The table shows some information about three metals.

Metal	Metal ore	Purified ore	% of metal in the ore	% of metal in the Earth's crust
aluminium	bauxite	aluminium oxide, Al_2O_3	28.0	8.0
copper	chalcocite	copper sulfide, Cu_2S	0.5	0.001
iron	haematite	iron oxide, Fe_2O_3	29.0	5.0

(a) Use the information in the table and your knowledge and understanding to help you to answer the questions.

(i) Suggest why purifying the copper ore produces large quantities of waste.

_____

_____

_____

(1)

(ii) Suggest why the annual world production of iron is forty times greater than that of aluminium.

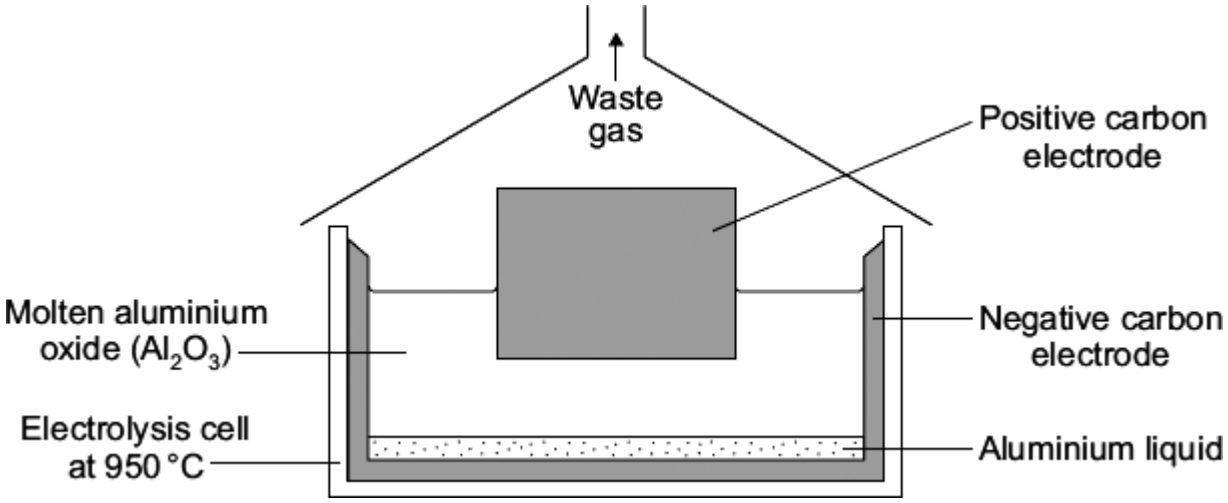
_____

_____

_____

(1)

(b) Aluminium is used for drinks cans.
Aluminium is extracted from its purified ore by electrolysis.



(i) Suggest why the aluminium produced in the electrolysis cell is a liquid.

_____

_____

(1)

(ii) In this electrolysis, aluminium and oxygen gas are produced from the aluminium oxide.

Use the information in the diagram to suggest why most of the waste gas is carbon dioxide and not oxygen.

_____

_____

_____

_____

(2)

(iii) Aluminium is the most abundant metal in the Earth's crust.

Suggest **two** reasons why we should recycle aluminium drinks cans.

1. _____

_____

2. _____

_____

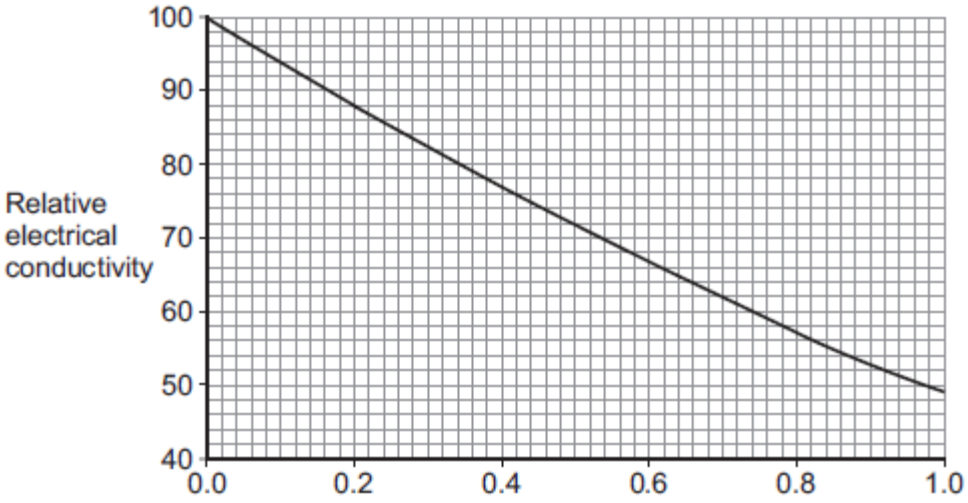
(2)

(Total 7 marks)

7 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.

$$CuS + O_2 \rightarrow Cu + SO_2$$

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)

1 (a) alloys

1

(b) bar drawn correctly up to 4%

ignore width of bar

1

(c) (contains) more carbon

ignore contains 4% carbon

accept higher level responses related to structure / arrangement of atoms

1

(d) (i) 73.8

1

(ii) mild (steel)

1

(iii) corrosion

1

[6]

2 (a) cannot move

1

(b) (i) a positive charge

1

(ii) atoms

1

[3]

3 (a) (i) magnesium oxide

1

(ii) decomposition

1

(b) (i) bar chart

1

(ii) more

1

(iii) limewater

1

turns cloudy / milky

accept forms a white precipitate

1

[6]

4 (a) (i) bulb lights up

1

bubbles / fizz / gas or chlorine given off

1

(ii) in solid, ions

1

are not free to move / (charged) particles cannot move or converse

atoms / electrons cannot move worth 0 marks

1

(b) (i) breakdown / decomposition / splitting up

***not** separation*

1

by using electricity

1

(ii) gas **A** = chlorine / oxygen

1

deposit **B** = copper

1

(c) any one from:

- manufacturer of chlorine / sodium hydroxide / hydrogen / sodium
- electroplating of steel / reference to plating

  ***not** galvanising*
- extraction of aluminium / metal reactivity series specified
- purification of copper

  ***not** making copper*

1

[9]

5 (a) An arrow indicating a position between aluminium and zinc.

1

(b) electrolysis

1

because calcium is more reactive (than aluminium **or** carbon)

accept it is more reactive
or *very reactive*

1

OR

in a blast furnace

1

because calcium is less reactive (than carbon **or** lower)

1

(c) any equation from

1 mark for correct formulae

1 mark for balancing

$2ZnO + C \rightarrow 2Zn + CO_2$

$ZnO + CO \rightarrow Zn + CO_2$

$ZnO + C \rightarrow Zn + CO$

1

[5]

6 (a) (i) low percentage / very little of metal (in the ore)

accept <u>only</u> 0.5% metal in the ore ***or*** *over 99% waste in the ore* ***or*** *nearly 100% waste in the ore*

ignore reference to percentage of metal in the Earth's crust ***or*** *energy used or pollution*

1

(ii) any **one** from

(it = iron)

- iron uses less energy / fuel for extraction
  ignore electrolysis / uses electricity / reactivity
- iron has more uses
- more demand for iron
  ignore high abundance in the Earth's crust / high percentage of metal in ore
- iron is stronger
  ignore harder
- cheaper / costs less
- easier to extract

1

(b) (i) has melting point lower than 950°C

(it = aluminium)

allow has a low melting point

ignore boiling point

1

(ii) electrode(s) made of carbon

1

oxygen reacts with electrode(s) / carbon

accept $C + O_2 (\rightarrow CO_2)$

NB oxygen reacts with the carbon electrode(s) = ***2*** *marks*

1

(iii) any **two** from:

- saves resources / non-renewable
  accept aluminium / ore will run out ***or*** *conserves aluminium*
- landfill problem
  accept aluminium does not corrode
- saves energy / fuel / electricity
  ignore global warming
- less carbon dioxide / carbon emissions **or** reduces carbon footprint
  ignore consequences of quarrying / mining
- less quarrying / mining
  ignore pollution / harms environment / costs / easy to recycle

2

[7]

7 (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]