



## New Document 1

Name: \_\_\_\_\_

Class: \_\_\_\_\_

Date: \_\_\_\_\_

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Time: **38 minutes**

Marks: **37 marks**

Comments:

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**Q1.**

This question is about the reactions of acids.

- (a) When dilute hydrochloric acid is reacted with sodium hydroxide solution there is a temperature change.

Explain how the temperature changes.

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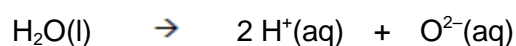
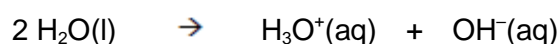
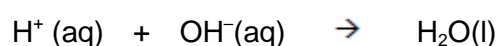
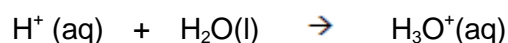
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(2)

- (b) Acids produce hydrogen ions in aqueous solutions.

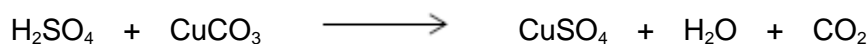
What is the ionic equation for neutralisation reactions?

Tick **one** box.



(1)

- (c) Sulfuric acid reacts with copper carbonate to produce a salt, water and carbon dioxide.



What is the name of the salt produced?

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(1)

- (d) A student reacted four metals with water and with a dilute acid to work out the order of reactivity of the metals.

The table below shows some of the observations.

Metal	Reaction with water	Reaction with dilute acid
Calcium	Bubbles of gas	X

Copper	Y	No bubbles of gas
Magnesium	Few bubbles of gas	Bubbles of gas
Zinc	No bubbles of gas	Bubbles of gas

Write the observations for X and Y.

Observation at X \_\_\_\_\_

Observation at Y \_\_\_\_\_

(2)

- (e) Write the four metals, calcium, copper, magnesium and zinc, in order of reactivity.

Start with the **most** reactive metal.

\_\_\_\_\_

(2)

- (f) Some gases given off in reactions can be identified by chemical tests.

Draw **one** line from each chemical test to the name of the gas.

Chemical test	Gas
Put in a lighted splint. The gas burns with a pop sound.	Carbon dioxide
Put in a glowing splint. The gas relights the splint.	Chlorine
Put into limewater. The gas turns limewater cloudy.	Hydrogen
	Nitrogen
	Oxygen

(3)

- (g) Acids react with bases to produce salts and water (H<sub>2</sub>O).

The electronic structure of a hydrogen atom is 2,1

The electronic structure of an oxygen atom is 2,6

Draw a diagram to show the arrangement of the outer shell electrons in a molecule of water.

(2)

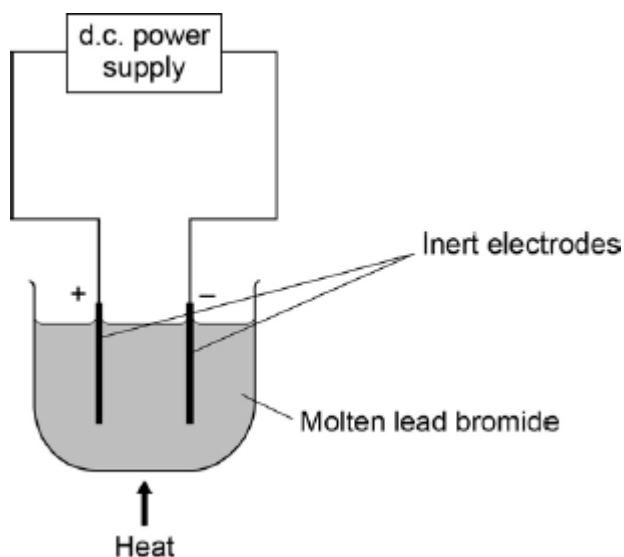
(Total 13 marks)

**Q2.**

This question is about the electrolysis of two compounds.

**Figure 1** shows the electrolysis of molten lead bromide.

**Figure 1**



- (a) The electrolyte contains lead ions ( $\text{Pb}^{2+}$ ) and bromide ions ( $\text{Br}^-$ ).

Complete the sentences.

Use words from the box.

<b>atoms</b>	<b>bromide</b>	<b>bromine</b>	<b>ions</b>
<b>lead</b>	<b>molecules</b>	<b>oxygen</b>	

At the positive electrode the gas produced is \_\_\_\_\_

At the negative electrode lead \_\_\_\_\_

gain electrons and \_\_\_\_\_ .

**(3)**

- (b) A student measured the volumes of each gas produced during the electrolysis of water.

The table below shows the student's results.

Time in minutes	Volume of gas produced in $\text{cm}^3$	
	Hydrogen	Oxygen
0	0	0
2	11.2	5.4
4	20.1	11.4
6	32.5	17.6
8	40.0	23.7

10	60.9	30.0
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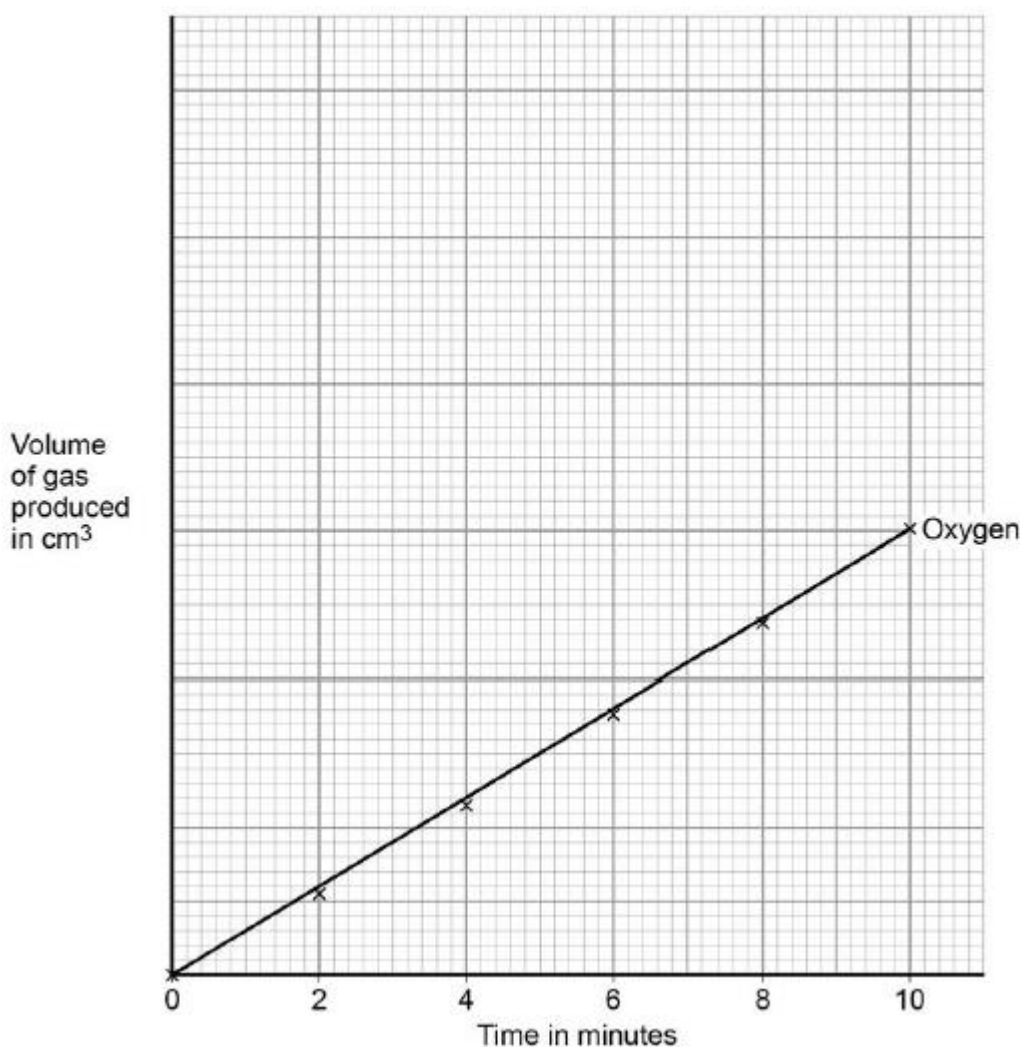
The student plotted a graph of the results for oxygen. **Figure 2** shows the graph.

The student did not put a scale on the y axis.

On the graph in **Figure 2**:

- complete the scale for the y axis
- plot the results for hydrogen
- include a line of best fit.

**Figure 2**



(3)

(c) Use the graph to calculate the mean volume of oxygen produced per second.

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Mean volume of oxygen produced = \_\_\_\_\_ cm<sup>3</sup> / s

(3)

(Total 9 marks)

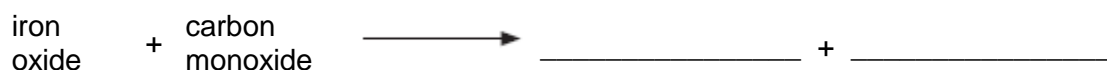
**Q3.**

Iron is extracted from iron oxide in the blast furnace.

(a) The equation for one of the reactions in the blast furnace is:



(i) Complete the word equation for this reaction.



(2)

(ii) Oxygen is removed from iron oxide in the blast furnace.

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

The iron oxide is

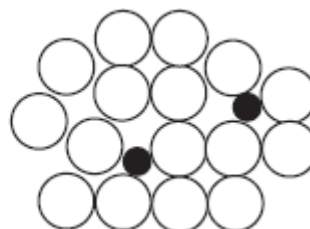
neutralised.
oxidised.
reduced.

(1)

(b) The diagrams represent pure iron and iron from the blast furnace.



Pure iron



Iron from the blast furnace

(i) Draw **one** line from each statement to the correct explanation.

Statement	Explanation
Pure iron is an element because .....	it is made of one sort of atom only.
Iron from the blast furnace is a mixture because .....	it contains two elements not chemically combined.
	every atom has the same number of neutrons.
	it contains two elements chemically combined.

(2)

- (ii) Explain why iron from the blast furnace is harder than pure iron.

Use the diagrams on page 4 to help you.

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(2)

(Total 7 marks)

**Q4.**

Where copper ore has been mined there are areas of land that contain very low percentages of copper compounds.

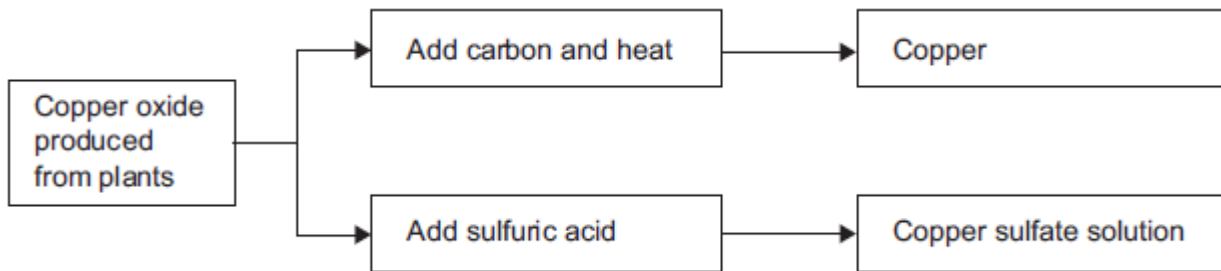
One way to extract the copper is to grow plants on the land.

The plants absorb copper compounds through their roots.

The plants are burned to produce copper oxide.

The copper oxide produced from plants can be reacted to produce copper or copper sulfate solution, as shown in **Figure 1**.

**Figure 1**



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

(i) Copper ores contain enough copper to make extraction of the metal

- carbon neutral.
- economical.
- reversible.

(1)

(ii) Using plants to extract metals is called

- photosynthesis.
- phytomining.
- polymerisation.

(1)

(iii) Copper oxide reacts with carbon to produce copper and

- carbon dioxide.
- oxygen.
- sulfur dioxide.

(1)

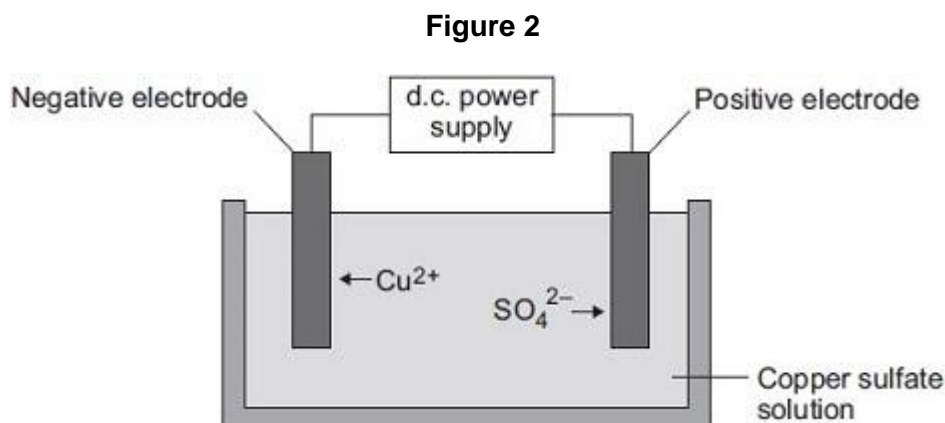
(b) Copper is produced from copper sulfate solution by displacement using iron or by electrolysis.

(i) Complete the word equation.



(2)

(ii) **Figure 2** shows the electrolysis of copper sulfate solution.





Why do copper ions go to the negative electrode?

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(1)

(c) Suggest **two** reasons why copper should **not** be disposed of in landfill sites.

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(2)

(Total 8 marks)

## Mark schemes

### Q1.

- (a) it goes up / increases

1

because the reaction is exothermic **or** transfers energy to the surroundings  
*allow gives out thermal / heat energy*

1

- (b)  $\text{H}^+(\text{aq}) + \text{OH}^-(\text{aq}) \rightarrow \text{H}_2\text{O}(\text{l})$

1

- (c) copper sulfate

1

- (d) **X** bubbles of gas

1

**Y** no bubbles of gas

1

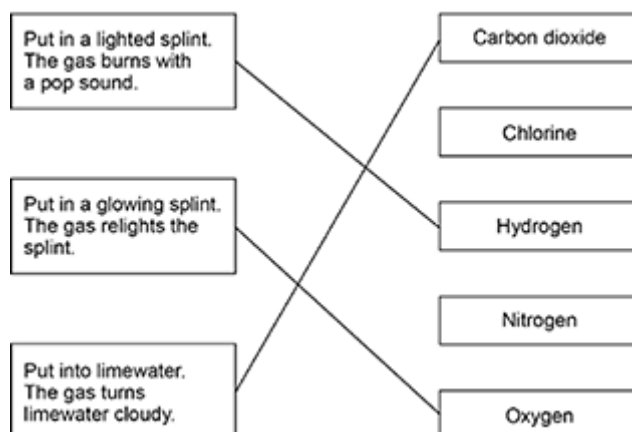
- (e) calcium > magnesium > zinc > copper

*if not all correct allow 1 mark for at least two metals in the correct position*

2

- (f) **Chemical test**

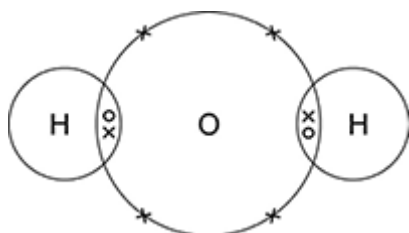
**Gas**



*extra lines from a test negate the mark*

3

- (g)



*two pairs of shared electrons*

1

*oxygen has four other electrons not bonded*

1

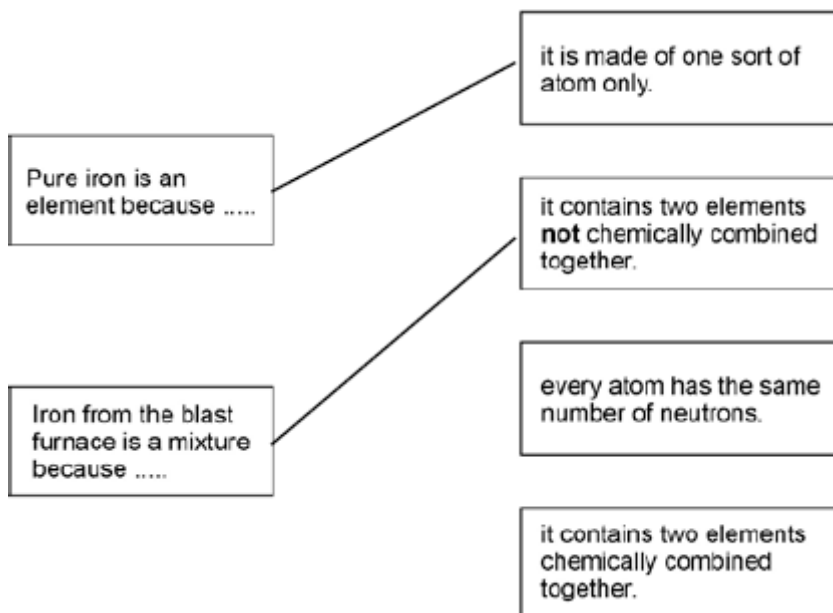
**Q2.**

- (a) bromine 1
- ions 1
- atoms 1
- (b) correct scale on y axis 1
- points correctly plotted using the scale  
*± ½ small square* 1
- best-fit line drawn 1
- (c) value for oxygen divided by corresponding time 1
- × 60 1
- = 0.05 (cm<sup>3</sup> / s)  
*allow 0.05 with no working shown for 3 marks* 1

[9]

**Q3.**

- (a) (i) iron 1  
*either order*
- carbon dioxide 1
- (ii) reduced 1
- (b) (i) **Statement** 1
- Explanation**



each correct line gains 1 mark  
 extra lines from statement negate the mark

max. 2

- (ii) the layers / rows are distorted / disrupted **or** it doesn't occur in layers **or** the atoms are different

1

so cannot **slide** over one another **or slide** less easily

1

[7]

**Q4.**

- (a) (i) economical

1

- (ii) phytomining

1

- (iii) carbon dioxide

1

- (b) (i) copper / Cu

1

iron sulfate / FeSO<sub>4</sub>

1

- (ii) copper / ions have a positive charge

*it = copper ions*

*allow copper ions have a different charge*

*accept copper / ions are free to move*

*accept to gain electrons*

*accept copper / ions are attracted to the negative electrode*

*or opposite charges attract*

1

- (c) any **two** from:

*ignore not biodegradable or does not decay*

- copper ores are limited / running out  
*allow copper is running out*
- copper can be recycled
- copper can be reused
- copper is expensive
- landfill sites are filling up
- copper compounds are toxic  
*allow copper is toxic*