

Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

General Certificate of Secondary Education
March 2006

SCIENCE: DOUBLE AWARD A (MODULAR)
CHEMISTRY A (MODULAR)
Metals (Module 05)

346005



Wednesday 8 March 2006 Morning Session

For this paper you must have:

- a black ball-point pen
- an objective test answer sheet

You may use a calculator.

Time allowed: 30 minutes

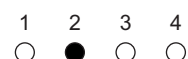
Instructions

- Fill in the boxes at the top of this page.
- Check that your name, candidate number and centre number are printed on the separate answer sheet.
- Check that the separate answer sheet has the title 'Metals' printed on it.
- Attempt **one Tier only**, either the Foundation Tier **or** the Higher Tier.
- Make sure that you use the correct side of the separate answer sheet; the Foundation Tier is printed on one side and the Higher Tier on the other.
- Answer **all** the questions for the Tier you are attempting.
- Record your answers on the separate answer sheet only.
- Do all rough work in this book, **not** on your answer sheet.

Instructions for recording answers

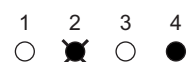
- Use a **black ball-point pen**.

- For each answer **completely fill in the circle** as shown:

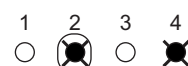


- Do **not** extend beyond the circles.

- If you want to change your answer, **you must** cross out your original answer, as shown:



- If you change your mind about an answer you have crossed out and now want to choose it, draw a ring around the cross as shown:



Information

- The maximum mark for this paper is 36.

Advice

- Do **not** choose more responses than you are asked to. You will lose marks if you do.
- Make sure that you hand in both your answer sheet and this question paper at the end of the test.
- If you start to answer on the wrong side of the answer sheet by mistake, make sure that you cross out **completely** the work that is not to be marked.

You must do **one Tier** only, **either** the Foundation Tier **or** the Higher Tier.
The Higher Tier starts on page 14 of this booklet.

FOUNDATION TIER

SECTION A

Questions **ONE** to **FIVE**.

In these questions match words in the list with the numbers.

Use **each** answer only **once**.

Mark your choices on the answer sheet.

QUESTION ONE

This question is about metals

Match words from the list with the numbers **1–4** in the table.

aluminium

copper

iron

mercury

Metal	What we can say about the metal
1	it changes to green when it weathers
2	it is extracted from the ore bauxite
3	it is extracted from the ore haematite
4	it is the transition metal with the lowest melting point

QUESTION TWO

This question is about some of the substances in Reactions **A** and **B**.

Reaction A sodium hydroxide + hydrochloric acid → sodium chloride + water

Reaction B copper oxide + sulphuric acid → copper sulphate + water

Match words from the list with the numbers **1–4** in the sentences.

a base

a salt

an acid

an alkali

In **Reaction A**, sodium hydroxide is . . . **1** . . . and is neutralised by . . . **2**

In **Reaction B**, copper oxide is . . . **3** . . . and copper sulphate is . . . **4**

Turn over for the next question

Turn over ►

QUESTION THREE

This question is about metals.

Match words from the list with the numbers **1–4** in the sentences.

chromium

copper

gold

magnesium

Aluminium can be made stronger by mixing it with . . . **1**

Stainless steel is a mixture of iron and . . . **2**

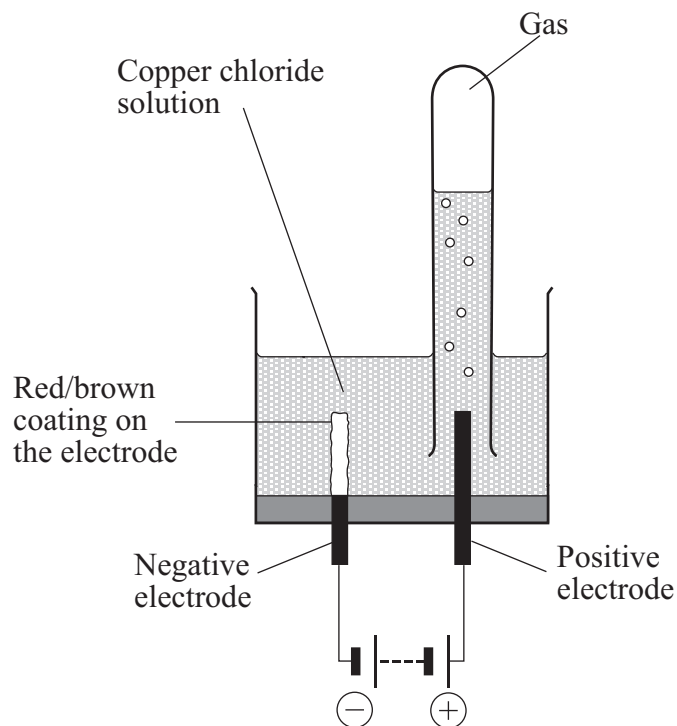
The electrical wiring in a house is usually made from . . . **3**

Transition metals are usually found in the Earth's crust as compounds, but . . . **4** . . . is found as the metal itself.

QUESTION FOUR

This question is about electrolysis of solutions of copper compounds.

Copper chloride is an ionic compound made up of copper and the non-metal element, chlorine.



Match words from the list with the numbers **1–4** in the sentences.

bromine

carbon

chlorine

copper

The gas that collects above the positive electrode is ... **1**

The element that collects at the negative electrode is ... **2**

The electrodes are made from the non-metal ... **3**

The copper chloride solution is replaced by a solution of copper bromide. The element now given off at the positive electrode is ... **4**

Turn over ►

QUESTION FIVE

This question is about the positions of four metals, **W**, **X**, **Y** and **Z**, in the reactivity series.

Metal **Y** can be extracted from its oxide by heating a mixture of the oxide and carbon.

Metal **Z** **cannot** be extracted from its oxide by heating a mixture of the oxide and carbon.

Hydrogen will displace metal **X** from its oxide but will **not** displace metal **Y** from its oxide.

Metal **W** will displace metal **X** from its compounds.

Metal **W** will **not** displace metal **Y** from its compounds.

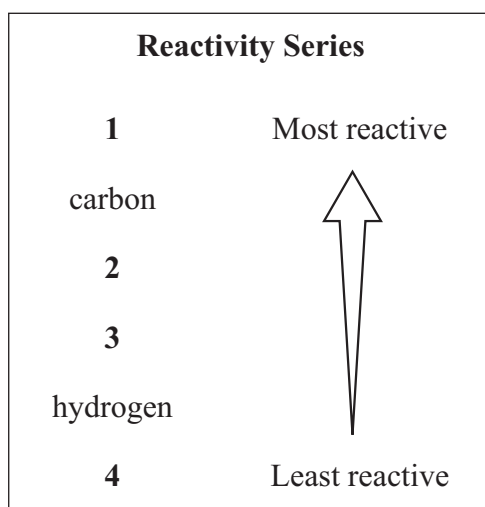
Match metals from the list with the numbers **1–4** in the reactivity series.

metal W

metal X

metal Y

metal Z



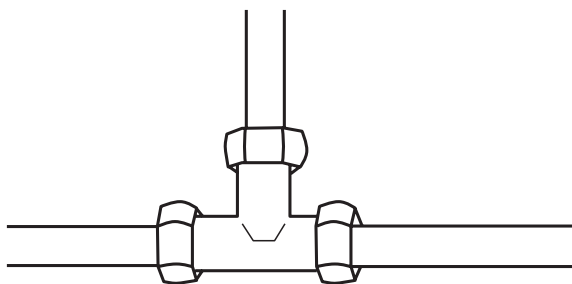
SECTION BQuestions **SIX** and **SEVEN**.In these questions choose the best **two** answers.Do **not** choose more than two.Mark your choices on the answer sheet.

QUESTION SIX

This question is about the periodic table.

Which **two** statements are correct?**all the metals are in Group 1 and the central block****argon is in Group 5****iron and platinum are transition metals****metal alloys are in Group 3****more than $\frac{3}{4}$ of the elements are metals****QUESTION SEVEN**

The water pipes in a house are usually made from copper.

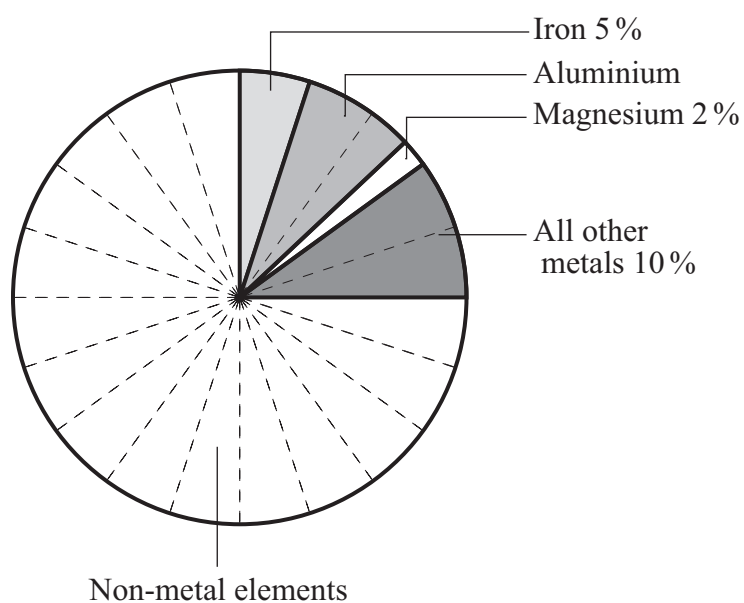
Which **two** properties of copper make it a good metal to use for making water pipes?**it does not go rusty****it has a shiny surface****it is a fairly expensive metal****it is a good conductor of electricity****it is easy to bend and shape****Turn over ►**

SECTION CQuestions **EIGHT** to **TEN**.

Each of these questions has four parts.

In each part choose only **one** answer.

Mark your choices on the answer sheet.

QUESTION EIGHT**8.1** The pie chart shows the percentages of the elements in the Earth's crust.

Reactivity Series	
Magnesium	Most reactive
Aluminium	↑
Carbon	
Iron	
Tin	
Hydrogen	

What is the percentage of aluminium in the Earth's crust?

- A** 2 %
- B** 5 %
- C** 8 %
- D** 12 %

8.2 Most metals occur in rocks combined with other elements.

Rocks from which a metal can be extracted economically are called . . .

- A alloys.
- B compounds.
- C mixtures.
- D ores.

8.3 Tin is extracted from tin oxide by heating a mixture of the oxide and carbon.

Which word equation shows this reaction?

- A tin + carbon dioxide → tin oxide + carbon
- B tin oxide + carbon → tin + carbon dioxide
- C tin oxide + carbon → tin + oxygen
- D tin oxide + carbon → tin + water

8.4 Magnesium is extracted from magnesium chloride . . .

- A by heating a mixture of carbon and magnesium chloride.
- B by heating the magnesium chloride in a stream of hydrogen.
- C by reaction with acid.
- D by using electricity.

Turn over for the next question

Turn over ►

QUESTION NINE

The table shows the densities of the first five metals in Group 1 of the periodic table.

Metal	Density in grams per cm³
Lithium	0.53
Sodium	0.97
Potassium	0.86
Rubidium	1.52
Caesium	1.87

9.1 The density of water is 1.00 gram per cm³.

Which of these metals will float on water?

- A** Caesium only
- B** Caesium and rubidium
- C** Lithium only
- D** Lithium, sodium and potassium

9.2 In this Group, the relative atomic mass . . .

- A** decreases from lithium to caesium.
- B** increases from lithium to caesium.
- C** is the same for all the metals.
- D** shows no particular trend.

9.3 In this Group, the metals . . .

- A** form coloured compounds.
- B** form insoluble hydroxides.
- C** react in a similar way with the non-metal element, chlorine.
- D** react in different ways with oxygen.

9.4 Compared to the transition metals, the Group 1 metals . . .

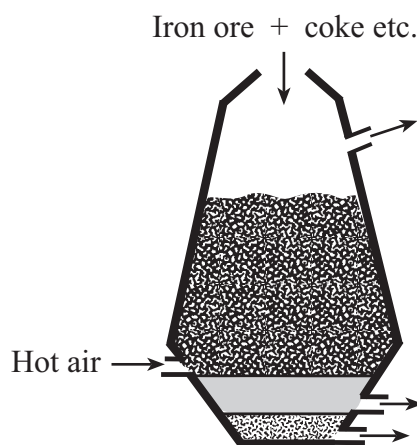
- A** are less reactive.
- B** are softer and less strong.
- C** have higher densities.
- D** have higher melting points.

Turn over for the next question

Turn over ►

QUESTION TEN

Iron is extracted from iron oxide in a blast furnace.



10.1 Why is hot air blown into the furnace?

- A To cool down the contents
- B To melt the iron ore
- C To react with the coke and release energy
- D To react with the iron ore

10.2 Coke burns in the blast furnace to form . . .

- A calcium oxide.
- B carbon.
- C carbon dioxide.
- D slag.

10.3 The substance mainly responsible for taking the oxygen from the iron oxide is . . .

- A carbon.
- B carbon dioxide.
- C carbon monoxide.
- D limestone.

10.4 When oxygen is taken from iron oxide, we say that the iron oxide is . . .

- A distilled.
- B electrolysed.
- C oxidised.
- D reduced.

END OF TEST

You must do **one Tier** only, **either** the Foundation Tier **or** the Higher Tier.
The Foundation Tier is earlier in this booklet.

HIGHER TIER

SECTION A

Questions **ONE** and **TWO**.

In these questions match words in the list with the numbers.

Use **each** answer only **once**.

Mark your choices on the answer sheet.

QUESTION ONE

This question is about the positions of four metals, **W**, **X**, **Y** and **Z**, in the reactivity series.

Metal **Y** can be extracted from its oxide by heating a mixture of the oxide and carbon.

Metal **Z** **cannot** be extracted from its oxide by heating a mixture of the oxide and carbon.

Hydrogen will displace metal **X** from its oxide but will **not** displace metal **Y** from its oxide.

Metal **W** will displace metal **X** from its compounds.

Metal **W** will **not** displace metal **Y** from its compounds.

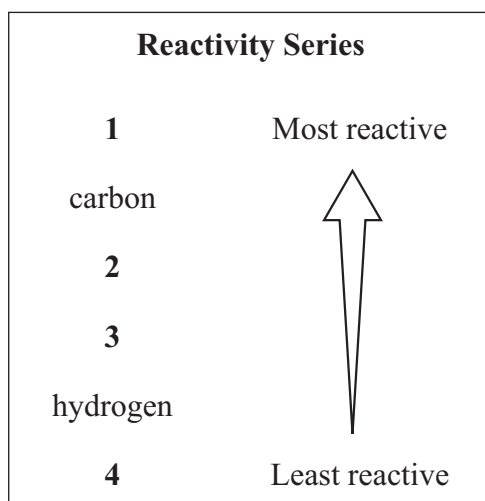
Match metals from the list with the numbers **1–4** in the reactivity series.

metal W

metal X

metal Y

metal Z



QUESTION TWO

This question is about chemical reactions.

Match reactions, **J**, **K**, **L** and **M**, with the numbers **1–4** in the table.

J ammonia reacts with hydrochloric acid to produce ammonium chloride and water

K copper oxide reacts with hydrogen to form copper and water

L oxygen ions lose electrons to form oxygen molecules

M zinc ions gain electrons to form zinc atoms

Chemical reaction	Type of reaction
1	neutralisation
2	oxidation
3	redox
4	reduction

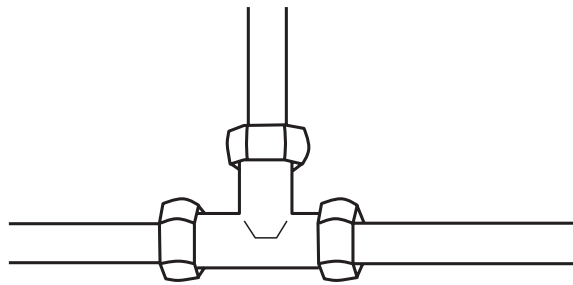
Turn over for the next question

Turn over ►

SECTION BQuestions **THREE** and **FOUR**.In these questions choose the best **two** answers.Do **not** choose more than two.Mark your choices on the answer sheet.

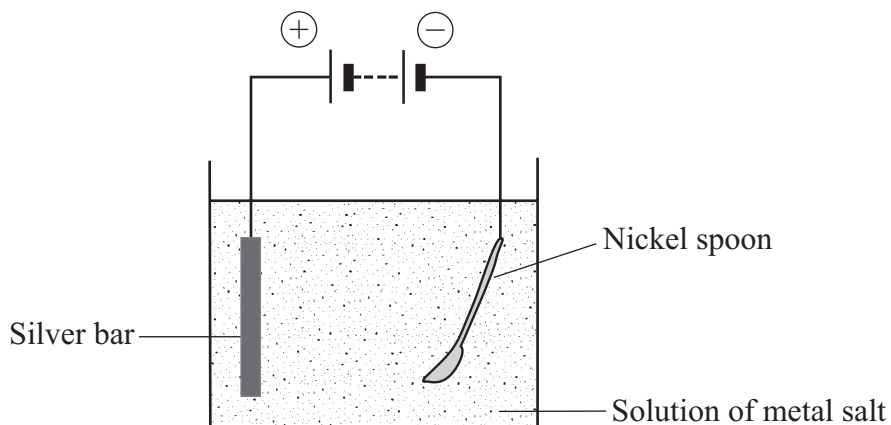
QUESTION THREE

The water pipes in a house are usually made from copper.

Which **two** properties of copper make it a good metal to use for making water pipes?**it does not go rusty****it has a shiny surface****it is a fairly expensive metal****it is a good conductor of electricity****it is easy to bend and shape**

QUESTION FOUR

We can put a thin coating of silver onto a nickel spoon to make it look more attractive. The silver is applied by electrolysis.



Which **two** statements about this silver plating are correct?

at the negative electrode, nickel ions gain electrons

at the positive electrode, the silver atoms lose electrons

the silver bar is set up as the negative electrode

the solution contains nickel ions

the solution contains silver ions

Turn over for the next question

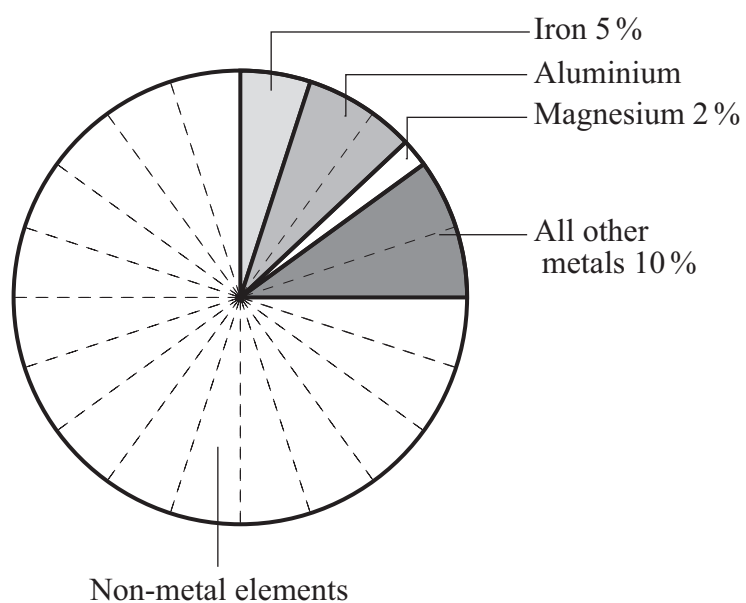
Turn over ►

SECTION CQuestions **FIVE** to **TEN**.

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QUESTION FIVE**5.1** The pie chart shows the percentages of the elements in the Earth's crust.

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5.2 Most metals occur in rocks combined with other elements.

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- A alloys.
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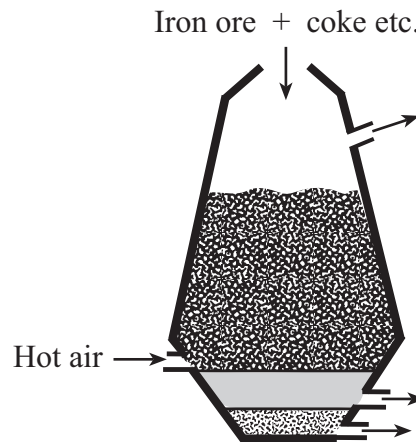
- A are less reactive.
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Turn over ►

QUESTION SEVEN

Iron is extracted from iron oxide in a blast furnace.



7.1 Why is hot air blown into the furnace?

- A To cool down the contents
- B To melt the iron ore
- C To react with the coke and release energy
- D To react with the iron ore

7.2 Coke burns in the blast furnace to form . . .

- A calcium oxide.
- B carbon.
- C carbon dioxide.
- D slag.

7.3 The substance mainly responsible for taking the oxygen from the iron oxide is . . .

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- C carbon monoxide.
- D limestone.

7.4 When oxygen is taken from iron oxide, we say that the iron oxide is . . .

- A distilled.
- B electrolysed.
- C oxidised.
- D reduced.

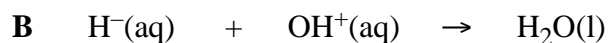
Turn over for the next question

Turn over ►

QUESTION EIGHT

An alkali will react with an acid to make a neutral salt.

8.1 The equation for this reaction can be written . . .



8.2 The salt, sodium nitrate, can be made using this method.

Which chemicals should be used?

A Sodium hydroxide and ammonia solution

B Sodium hydroxide and hydrochloric acid

C Sodium hydroxide and nitric acid

D Sodium oxide and nitric acid

8.3 Why can this method **not** be used to make copper nitrate?

A Acids do not react with copper hydroxide.

B Copper hydroxide is a base.

C Copper hydroxide is a green compound.

D Copper hydroxide is insoluble in water.

8.4 An acid salt is one in which only part of the replaceable hydrogen of an acid has been replaced by a metal.

Which of these salts of sulphuric acid, H_2SO_4 , is an acid salt?

A Calcium sulphate, CaSO_4

B Magnesium sulphate, MgSO_4

C Potassium sulphate, K_2SO_4

D Sodium hydrogen sulphate, NaHSO_4

Turn over for the next question

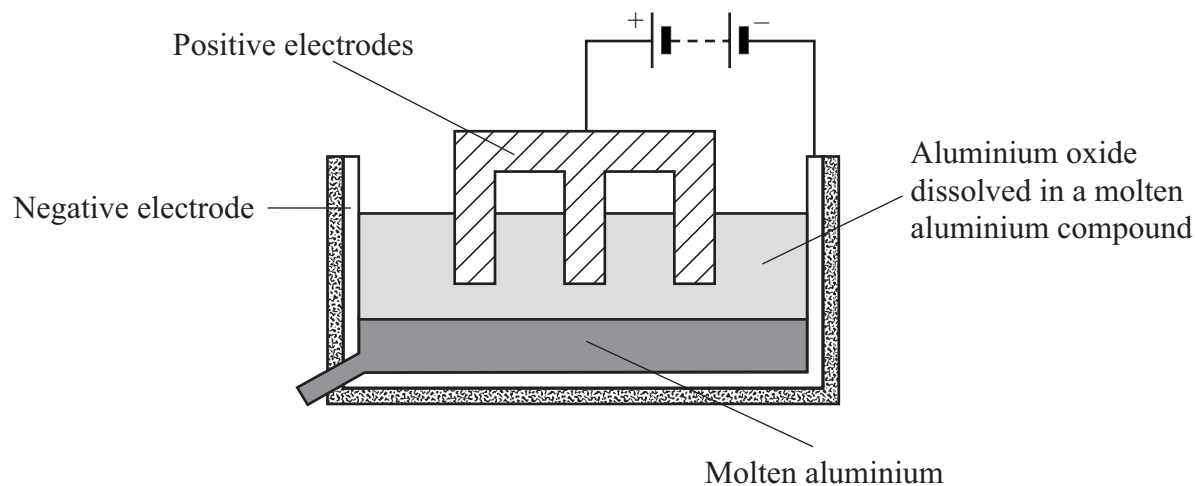
Turn over ►

QUESTION NINE

We can use electrolysis to extract aluminium from its purified ore.

An electric current is passed through molten aluminium oxide in an electrolytic cell.

The diagram shows the electrolytic cell.



9.1 In the cell, the aluminium oxide is dissolved in a molten aluminium compound called . . .

- A bauxite.
- B chromite.
- C cryolite.
- D haematite.

9.2 It is necessary to dissolve the aluminium oxide in this way because it . . .

- A has a high boiling point.
- B has a high density.
- C has a high melting point.
- D is insoluble in water.

9.3 Which gases are given off at the positive electrodes?

- A Oxygen and carbon dioxide
- B Oxygen and nitrogen
- C Oxygen and sulphur dioxide
- D Oxygen only

9.4 As a result of the reactions taking place, the positive electrodes . . .

- A are purified.
- B become coated in aluminium.
- C become coated in cryolite.
- D have to be replaced frequently.

Turn over for the next question

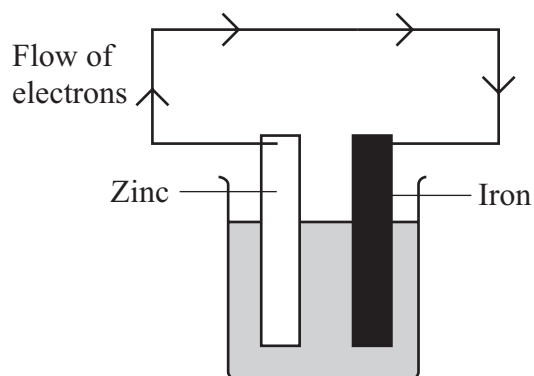
Turn over ►

QUESTION TEN

Two different metals are put into a solution containing ions.

Electrons flow through a wire connecting the metals.

Electrons flow from the more reactive to the less reactive metal.



10.1 The flow of electrons makes it difficult for the iron to lose electrons and form ions.

This means that the iron is not easily . . .

- A displaced.
- B electrolysed.
- C oxidised
- D reduced.

10.2 As the reaction proceeds, the zinc plate . . .

- A will be coated with iron.
- B will get gradually thinner.
- C will melt.
- D will release bubbles of carbon dioxide.

- 10.3** The electrode potential of a metal is a measure of how easily it loses electrons. The more negative the electrode potential is, the more easily the metal loses electrons.

These are the electrode potentials for some metals:

Silver	+ 0.8 volts
Copper	+ 0.3 volts
Iron	- 0.4 volts
Zinc	- 0.8 volts
Magnesium	- 2.4 volts

Which of these metals, if attached to iron, would most successfully prevent the iron from corroding?

- A Copper
 - B Magnesium
 - C Silver
 - D Zinc
- 10.4** Zinc and copper are placed in a solution containing ions, and are connected by a wire.

What happens to the two metals?

	Zinc	Copper
A	gains electrons	gains electrons
B	gains electrons	loses electrons
C	loses electrons	gains electrons
D	loses electrons	loses electrons

END OF TEST

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