Surname		Other Names	
Centre Number			Candidate Number				
Candidate Signature									

General Certificate of Secondary Education
Winter 2004

SCIENCE: DOUBLE AWARD (MODULAR) 346005
CHEMISTRY (MODULAR)
Metals (Module 05)

Thursday 18 November 2004 Morning Session

In addition to this paper you will require:
- a black ball-point pen;
- an answer sheet.

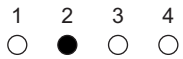
You may use a calculator.

Time allowed: 30 minutes

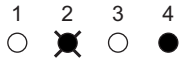
Instructions
- Fill in the boxes at the top of this page.
- Check that your name, candidate number and centre number are printed on the separate answer sheet.
- Check that the separate answer sheet has the title "Metals" printed on it.
- Attempt **one Tier only**, **either** the Foundation Tier **or** 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. Rough work may be done on the question paper.

Instructions for recording answers

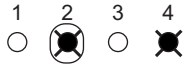
- Use a **black ball-point pen**.
- For each answer **completely fill in the circle** as shown:



- 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 12 of this booklet.

FOUNDATION TIER

SECTION A

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

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

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

Mark your choices on the answer sheet.

QUESTION ONE

Chemical elements with similar properties are in the same Group of the periodic table.

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

argon

copper

potassium

transition metals

Alkali metals	**1**	**Group 0 Elements**
lithium	iron	helium
sodium	**2**	neon
3	platinum	**4**

QUESTION TWO

The diagram shows a blast furnace.

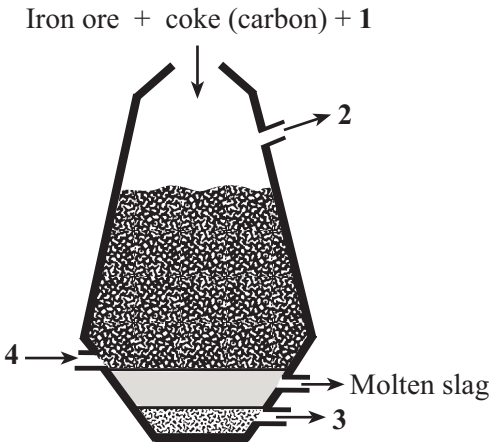
Match words from the list with the numbers **1–4** in the diagram.

hot air

limestone

molten iron

waste gases



QUESTION THREE

When acids react with alkalis, salts are formed.

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

hydrochloric acid

potassium hydroxide

sodium chloride

sulphuric acid

Acid	+	Alkali	Salt formed
hydrochloric acid	+	sodium hydroxide	**1**
2	+	potassium hydroxide	potassium chloride
3	+	sodium hydroxide	sodium sulphate
nitric acid	+	**4**	potassium nitrate

Turn over ▶

QUESTION FOUR

This question is about the properties and uses of some elements.

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

carbon

copper

magnesium

sodium

Element	What we can say about the element
1	it floats on water
2	it is a non-metal that conducts electricity
3	it is mixed with aluminium to make a stronger alloy
4	it is used to make electrical cables

QUESTION FIVE

This question is about the sources and uses of metals.

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

aluminium

copper

iron

potassium

Metal	What we can say about the metal
1	it is obtained mainly from the ore bauxite
2	it is obtained mainly from the ore haematite
3	it reacts with water, releasing hydrogen
4	when used for roofing, it can weather to a green colour

SECTION B

Questions **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 potassium and its compounds.

Which **two** of the following statements are correct?

potassium chloride dissolves in water to produce an acid solution

potassium chloride, in aqueous solution, will conduct electricity

potassium chloride is a coloured compound

potassium chloride is insoluble in water

potassium reacts with the non-metal element chlorine to form potassium chloride

QUESTION SEVEN

This question is about the periodic table.

Which **two** of the following statements are correct?

about half the elements are metals

columns of elements with similar properties are called Groups

most of the elements are arranged in order of their relative atomic masses

the metals are in Groups 4 and 7

the transition elements are in Group 0

SECTION C

Questions **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

This question is about obtaining metals.

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

A alloys.

B fossil fuels.

C ores.

D sedimentary rocks.

8.2 Gold is found in rocks as the metal itself.

This is because gold . . . . .

A is a reactive metal.

B is a soft metal.

C is an unreactive metal.

D reacts with water but not with oxygen.

8.3 The method used to extract a metal from its compounds depends on . . . . . .

A the colour of the metal.

B the density of the metal.

C the hardness of the metal.

D the reactivity of the metal.

8.4 Impure copper metal can be purified by . . . . .

A combustion.

B electrolysis.

C oxidation.

D reduction.

TURN OVER FOR THE NEXT QUESTION

QUESTION NINE

This question is about some reactions of iron and aluminium.

9.1 Some metals react slowly with gases in the atmosphere.

This process is called . . . . .

A alloying.

B catalysis.

C corrosion.

D reduction.

9.2 Iron reacts more slowly with oxygen and water from the air if it is attached to a piece of zinc.

This is called . . . . .

A alloying.

B decomposition.

C sacrificial protection.

D transition.

9.3 Zinc can be attached to iron to prevent rusting because zinc is . . . . .

A a harder metal.

B a transition metal.

C more reactive.

D more shiny.

9.4 A thin surface layer prevents further reaction of aluminium with the substances in the atmosphere.

This protective layer is . . . . .

A a coating of grease.

B a film of water.

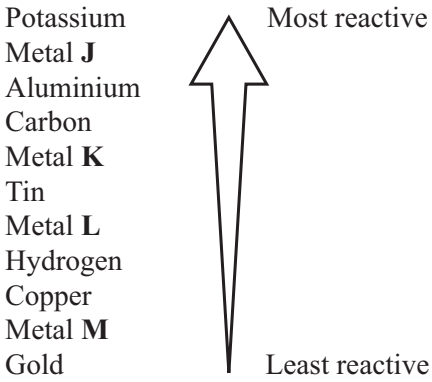
C an alloy.

D made of aluminium oxide.

TURN OVER FOR THE NEXT QUESTION

QUESTION TEN

This question is about some of the metals in the reactivity series.
Four of the metals are represented by the letters **J**, **K**, **L** and **M**.
The non-metals carbon and hydrogen are also shown.



10.1 Which metal is most likely to be extracted from its ore by electrolysis?

A Metal **J**

B Metal **K**

C Metal **L**

D Metal **M**

10.2 Which metals are most likely to be extracted from their ores by heating with carbon?

A Metals **J**, **K** and **L**

B Metals **J**, **K** and **M**

C Metals **J**, **L** and **M**

D Metals **K**, **L** and **M**

10.3 Which metal could be extracted from its ore by heating with hydrogen?

A Metal **J**

B Metal **K**

C Metal **L**

D Metal **M**

10.4 Which metals could displace tin from tin oxide?

A Metals **J** and **K**

B Metals **J** and **L**

C Metals **K** and **L**

D Metals **L** and **M**

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 the 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 sources and uses of metals.

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

aluminium

copper

iron

potassium

Metal	What we can say about the metal
1	it is obtained mainly from the ore bauxite
2	it is obtained mainly from the ore haematite
3	it reacts with water, releasing hydrogen
4	when used for roofing, it can weather to a green colour

QUESTION TWO

Chemical reactions can be represented by word equations.

Match words from the list with the spaces **1–4** in the equations.

carbon dioxide

copper chloride

iron

water

copper oxide + hydrochloric acid → . . . . . **1** . . . . . + water

iron oxide + carbon monoxide → iron + ... **2** . . . . .

copper oxide + hydrogen → copper + ... **3** . . . . .

iron oxide + aluminium → . . . . . **4** . . . . . + aluminium oxide

TURN OVER FOR THE NEXT QUESTION

SECTION B

Questions **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

This question is about the periodic table.

Which **two** of the following statements are correct?

about half the elements are metals

columns of elements with similar properties are called Groups

most of the elements are arranged in order of their relative atomic masses

the metals are in Groups 4 and 7

the transition elements are in Group 0

QUESTION FOUR

This question is about the metal copper and its compounds.

Which **two** of the following statements are correct?

copper belongs to Group 1 in the periodic table

copper oxide is a base

copper oxide is soluble in water

copper oxide reacts with sulphuric acid to produce copper chloride

many copper salts are coloured

NO QUESTIONS APPEAR ON THIS PAGE

TURN OVER FOR THE NEXT QUESTION

SECTION C

Questions **FIVE** to **TEN**.

Each of these questions has four parts.

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

Mark your choices on the answer sheet.

QUESTION FIVE

This question is about obtaining metals.

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

A alloys.

B fossil fuels.

C ores.

D sedimentary rocks.

5.2 Gold is found in rocks as the metal itself.

This is because gold . . . . .

A is a reactive metal.

B is a soft metal.

C is an unreactive metal.

D reacts with water but not with oxygen.

5.3 The method used to extract a metal from its compounds depends on . . . . . .

A the colour of the metal.

B the density of the metal.

C the hardness of the metal.

D the reactivity of the metal.

5.4 Impure copper metal can be purified by . . . . .

A combustion.

B electrolysis.

C oxidation.

D reduction.

TURN OVER FOR THE NEXT QUESTION

QUESTION SIX

This question is about some reactions of iron and aluminium.

6.1 Some metals react slowly with gases in the atmosphere.

This process is called . . . . .

A alloying.

B catalysis.

C corrosion.

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6.2 Iron reacts more slowly with oxygen and water from the air if it is attached to a piece of zinc.

This is called . . . . .

A alloying.

B decomposition.

C sacrificial protection.

D transition.

6.3 Zinc can be attached to iron to prevent rusting because zinc is . . . . .

A a harder metal.

B a transition metal.

C more reactive.

D more shiny.

6.4 A thin surface layer prevents further reaction of aluminium with the substances in the atmosphere.

This protective layer is . . . . .

A a coating of grease.

B a film of water.

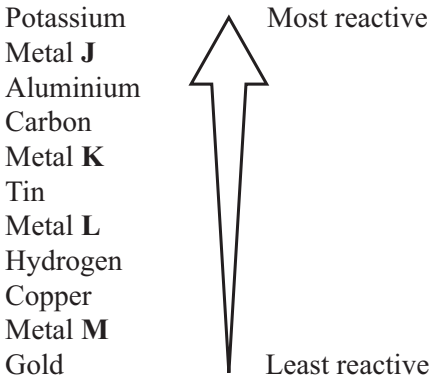
C an alloy.

D made of aluminium oxide.

TURN OVER FOR THE NEXT QUESTION

QUESTION SEVEN

This question is about some of the metals in the reactivity series.
Four of the metals are represented by the letters **J**, **K**, **L** and **M**.
The non-metals carbon and hydrogen are also shown.



7.1 Which metal is most likely to be extracted from its ore by electrolysis?

A Metal **J**

B Metal **K**

C Metal **L**

D Metal **M**

7.2 Which metals are most likely to be extracted from their ores by heating with carbon?

A Metals **J**, **K** and **L**

B Metals **J**, **K** and **M**

C Metals **J**, **L** and **M**

D Metals **K**, **L** and **M**

7.3 Which metal could be extracted from its ore by heating with hydrogen?

A Metal **J**

B Metal **K**

C Metal **L**

D Metal **M**

7.4 Which metals could displace tin from tin oxide?

A Metals **J** and **K**

B Metals **J** and **L**

C Metals **K** and **L**

D Metals **L** and **M**

TURN OVER FOR THE NEXT QUESTION

QUESTION EIGHT

Aluminium oxide is electrolysed to produce aluminium metal.

8.1 Aluminium oxide has a very high melting point. To lower the temperature of the electrolyte, the aluminium oxide is dissolved in molten . . . . .

A aluminium sulphate.

B bauxite.

C cryolite.

D haematite.

8.2 This reaction takes place during the manufacture of aluminium.

carbon + oxygen → carbon dioxide

Where does this reaction take place?

A At the carbon cell lining that acts as the negative electrode

B At the carbon rods that act as positive electrodes

C In the molten electrolyte far from either negative or positive electrodes

D Where the molten aluminium leaves the electrolytic cell

8.3 During the manufacture of aluminium metal, aluminium ions gain electrons and become atoms of aluminium.

Where does this reaction take place? What type of chemical reaction is it?

	Where the reaction takes place	**Type of reaction**
A	negative electrode	oxidation
B	negative electrode	reduction
C	positive electrode	oxidation
D	positive electrode	reduction

8.4 During the manufacture of aluminium metal, oxide ions release electrons and form molecules of oxygen gas.

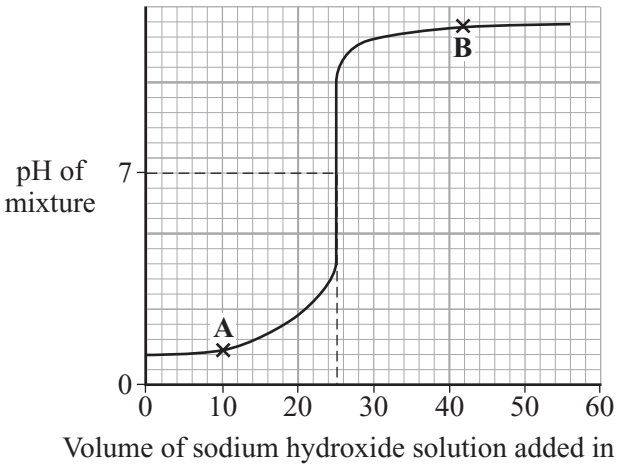
Where does this reaction take place? What type of chemical reaction is it?

	Where the reaction takes place	Type of reaction
A	negative electrode	oxidation
B	negative electrode	reduction
C	positive electrode	oxidation
D	positive electrode	reduction

TURN OVER FOR THE NEXT QUESTION

QUESTION NINE

Sodium hydroxide solution was carefully added to 25 cm^3 dilute hydrochloric acid.
After each addition the mixture was stirred and its pH taken using an accurate instrument.
The graph shows how the pH changed as the alkali was added.



9.1 The reaction between the sodium hydroxide solution and the hydrochloric acid solution can be represented by . . . . .

A $2H^+(aq) + OH^-(aq) \rightarrow H_2O(l)$

B $2H^+(aq) + O^{2-}(aq) \rightarrow H_2O(l)$

C $H^+(aq) + OH^-(aq) \rightarrow H_2O(l)$

D $H^+(aq) + OH^+(aq) \rightarrow H_2O(l)$

9.2 What volume of sodium hydroxide solution exactly neutralised the sample of hydrochloric acid?

A 7 cm^3

B 10 cm^3

C 25 cm^3

D 40 cm^3

9.3 At the neutral point, the mixture would contain water and . . . . .

A hydrochloric acid only.

B sodium chloride and hydrochloric acid.

C sodium chloride only.

D sodium hydroxide only.

9.4 Which of the following correctly describes the ion concentrations at points **A** and **B**?

A The concentration of H^+ ions is equal at **A** and **B**

B The concentration of H^+ ions is greater at **A** than at **B**

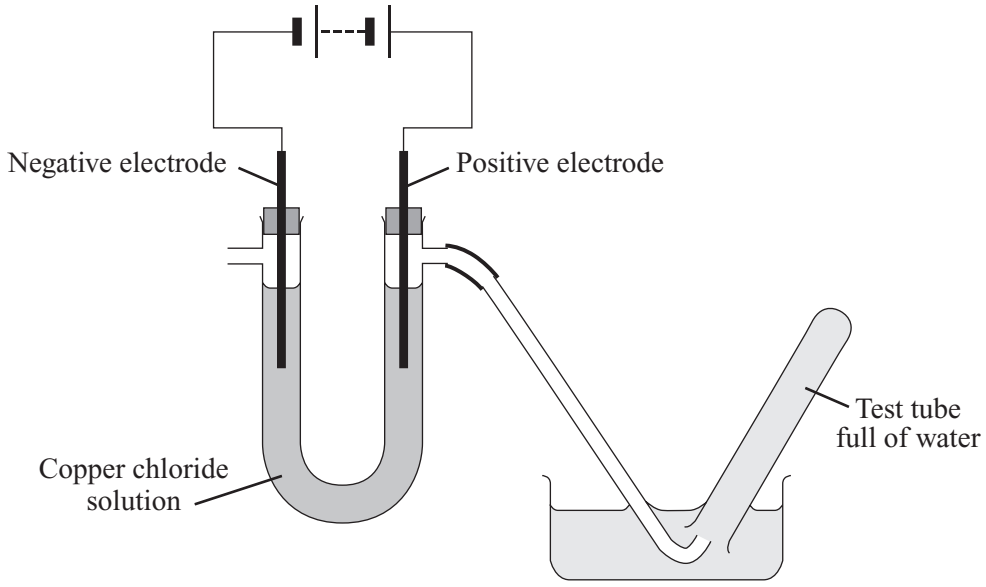
C The concentration of H^+ ions is greater at **B** than at **A**

D The concentration of OH^- ions is greater at **A** than at **B**

TURN OVER FOR THE NEXT QUESTION

QUESTION TEN

The diagram shows an experiment using a solution of copper chloride.



As the electric current flows through the solution, the copper chloride is broken down into simpler substances.

10.1 What is the name given to this process?

A Corrosion

B Deposition

C Electrolysis

D Electroplating

10.2 What would you expect to see happening at the positive electrode and in the test tube?

	At the positive electrode	**In the test tube**
A	bubbles of gas	chlorine gas collecting
B	bubbles of gas	hydrogen gas collecting
C	copper deposited	chlorine gas collecting
D	copper deposited	hydrogen gas collecting

10.3 At the positive electrode, negatively charged ions lose electrons.

This reaction is described as . . . . .

A decomposition.

B oxidation.

C redox.

D reduction.

10.4 What happens at the negative electrode?

A Copper atoms gain electrons to form copper ions

B Copper atoms lose electrons to form copper ions

C Copper ions gain electrons to form copper atoms

D Copper ions lose electrons to form copper atoms

END OF TEST