Surname		Other Names	
Centre Number			Candidate Number				
Candidate Signature									

General Certificate of Secondary Education
June 2004

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

Tuesday 29 June 2004 Morning Session

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

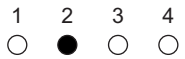
You may use a calculator.

Time allowed: 30 minutes

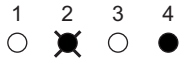
Instructions
- Fill in the boxes at the top of this page.
- Check that your name, candidate number and centre number are printed on the separate answer sheet.
- Check that the separate answer sheet has the title "Metals" printed on it.
- Attempt **one Tier only**, **either** the Foundation Tier **or**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

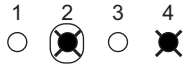
- Use a **black ball-point pen**.
- For each answer **completely fill in the circle** as shown:



- 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 14 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

This question is about metals.

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

aluminium

copper

gold

iron

Metal	What we can say about the metal
1	it is a transition metal that weathers to a green compound
2	it is extracted from the ore bauxite
3	it is extracted from the ore haematite
4	it is unreactive and found in the Earth as the metal itself

QUESTION TWO

This question is about substances **A** and **B** reacting together to make salts.

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

copper oxide

nitric acid

potassium chloride

zinc hydroxide

Substance A	Substance B	Salt produced
potassium hydroxide	hydrochloric acid	**1**
sodium hydroxide	**2**	sodium nitrate
3	sulphuric acid	copper sulphate
4	hydrochloric acid	zinc chloride

QUESTION THREE

This question is about types of reactions.

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

corrosion

electrolysis

neutralisation

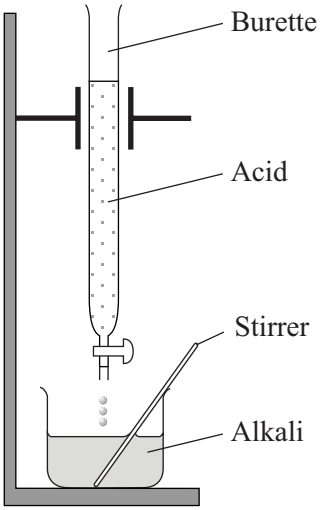
reduction

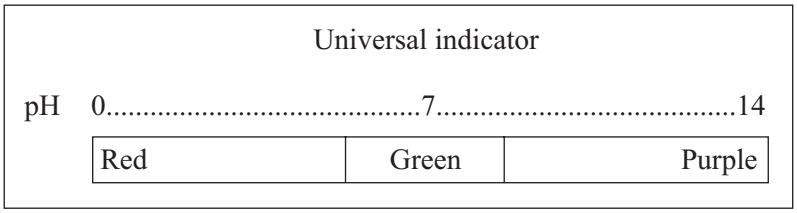
Type of reaction	Example of the type of reaction
1	ammonium hydroxide reacts with sulphuric acid to produce ammonium sulphate and water
2	a thin layer of aluminium oxide forms on the surface of the metal
3	molten sodium chloride is decomposed into sodium and chlorine when an electric current is passed through it
4	zinc is obtained from zinc oxide by removal of the oxygen

QUESTION FOUR

The flow chart shows the stages in making a salt.

Match the sentences **P**, **Q**, **R** or **S** from the list with the spaces **1–4** to explain how to make the salt.



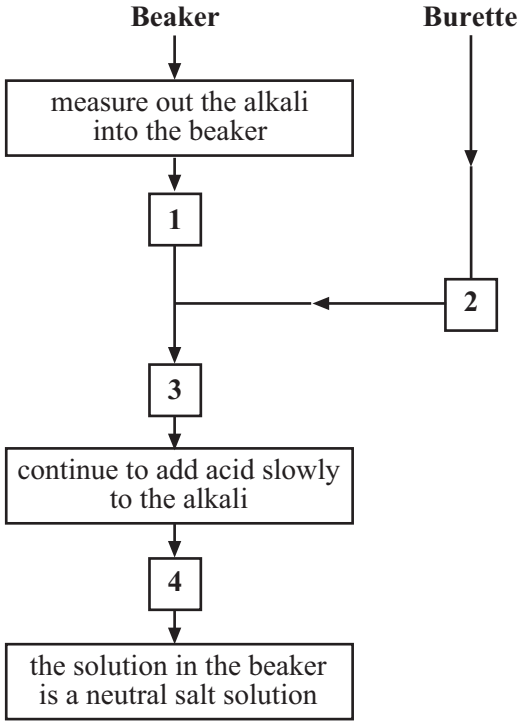


P **add a few drops of indicator which turns purple**

Q **fill the burette with the acid**

R **slowly add the acid to the alkali while stirring**

S **stop adding acid when the indicator turns green**



QUESTION FIVE

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

You can reduce the oxides of metals **W** and **X** by heating with carbon.
You can reduce the oxide of metal **W** but not the oxide of metal **X** by heating with hydrogen.

You cannot reduce the oxides of metals **Y** or **Z** by heating with carbon.
You can reduce the oxide of metal **Y** by heating with metal **Z**.

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

metal W	**1**	Most reactive
metal X	**2**	
metal Y	**carbon**	
metal Z	**3**	
	hydrogen	
	4	Least reactive

TURN OVER FOR THE NEXT QUESTION

SECTION B

Questions **SIX** and **SEVEN**.

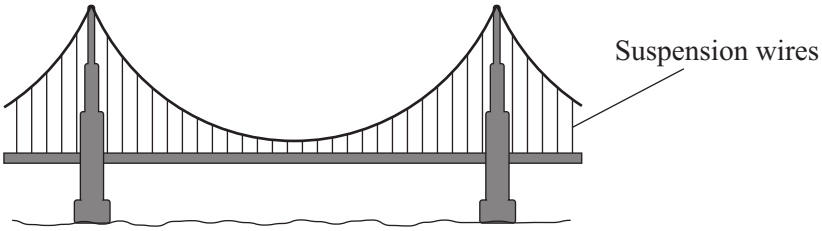
In these questions choose the best **two** answers.

Do **not** choose more than two.

Mark your choices on the answer sheet.

QUESTION SIX

The diagram shows a suspension bridge with iron (steel) suspension wires.



Which **two** of the following are properties of iron (steel), that make it suitable for building bridges?

it can be bent and shaped

it does not corrode

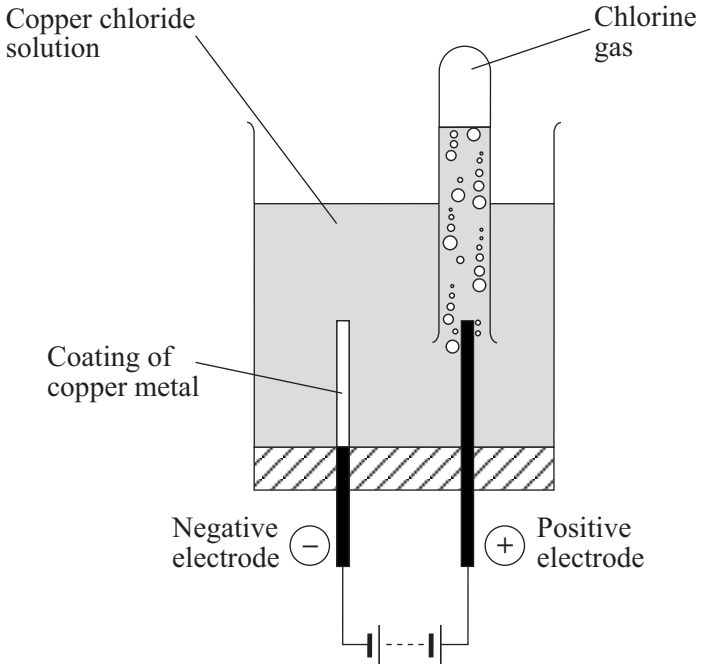
it has a low melting point

it is a good conductor of heat

it is a strong metal

QUESTION SEVEN

Copper chloride is an ionic compound.
Copper is a metal element and chlorine is a non-metal element.
The diagram shows what happens when an electric current is passed through a solution of copper chloride.



Which **two** statements are correct?

a coating of copper will form on the positive electrode

chloride ions are positive

copper chloride is decomposed into its elements

copper ions move to the negative electrode

solid copper chloride will conduct an electric current

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 the metals in Group 1 of the periodic table.

8.1 Which of these metals is a Group 1 metal?

A Aluminium

B Copper

C Iron

D Potassium

8.2 The first three metals in Group 1 . . . . .

A are electrical insulators.

B float on water.

C form coloured compounds.

D have a high density.

8.3 Group 1 metals react with water.

Group 1 metal + water → Group 1 metal hydroxide + substance **Y**

What is substance **Y**?

A Carbon dioxide

B Hydrogen

C Nitrogen

D Oxygen

8.4 Group 1 metals react with the non-metal chlorine, making metal chlorides.

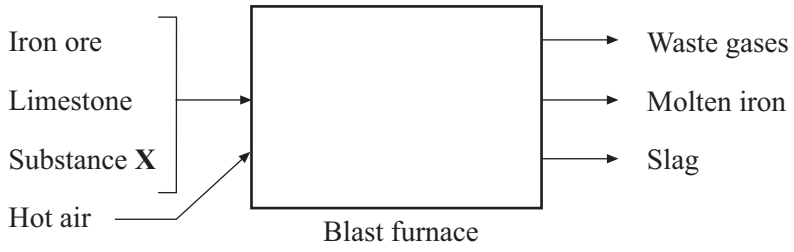
Which line shows the correct properties of Group 1 metal chlorides when they are dissolved in water?

	Appearance	**Conductivity**
A	coloured	conduct an electric current
B	coloured	do not conduct an electric current
C	colourless	conduct an electric current
D	colourless	do not conduct an electric current

TURN OVER FOR THE NEXT QUESTION

QUESTION NINE

The diagram shows most of the substances used in a blast furnace to produce iron.



9.1 The mixture of iron ore and limestone put into a blast furnace also contains substance **X**.

What is substance **X**?

A Chromium

B Coke

C Limestone

D Sulphur

9.2 Which substance reacts with the iron oxide in the furnace to produce iron?

A Carbon dioxide

B Carbon monoxide

C Hot air

D Oxygen

9.3 Which two substances react together in the furnace to produce slag?

A Coke and limestone

B Hot air and limestone

C Limestone and acidic impurities

D Limestone and iron

9.4 The waste gases leaving the furnace are mainly . . . . .

A carbon dioxide and nitrogen.

B carbon dioxide and oxygen.

C carbon monoxide and carbon dioxide.

D carbon monoxide and nitrogen.

TURN OVER FOR THE NEXT QUESTION

QUESTION TEN

In the periodic table, the elements are arranged in vertical columns called Groups.

In Group 2, these are the first three metals.

Beryllium
Magnesium
Calcium

10.1 These three metals are put into the same Group because they have . . . . .

A similar atomic masses.

B similar boiling points.

C similar chemical properties.

D similar densities.

10.2 There are about 100 elements in the periodic table.

Of these, approximately how many are metals?

A 33

B 50

C 67

D 78

10.3 In the periodic table, the transition elements are found . . . . .

A in Group 0.

B in Groups 1 and 2.

C in the central block.

D on the right-hand side.

10.4 *Magnalium* is a metal alloy made by mixing the metals aluminium and magnesium.

Magnalium is not in the periodic table because . . . . .

A it has properties different from the metals in any other Group.

B it is not an element.

C it is only a recent discovery.

D its relative atomic mass is too great.

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

You can reduce the oxides of metals **W** and **X** by heating with carbon.
You can reduce the oxide of metal **W** but not the oxide of metal **X** by heating with hydrogen.

You cannot reduce the oxides of metals **Y** or **Z** by heating with carbon.
You can reduce the oxide of metal **Y** by heating with metal **Z**.

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

metal W	**1**	Most reactive
metal X	**2**	
metal Y	**carbon**	
metal Z	**3**	
	hydrogen	
	4	Least reactive

QUESTION TWO

Chemical reactions can be represented by word equations.

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

carbon monoxide

copper

copper oxide

oxygen

copper chloride + zinc → . . . . . **1** . . . . . + zinc chloride

. . . . . **2** . . . . . + hydrogen → copper + water

iron + ... **3** . . . . . → iron oxide

lead oxide + ... **4** . . . . . → lead + carbon dioxide

TURN OVER FOR THE NEXT QUESTION

SECTION B

Questions **THREE** and **FOUR**.

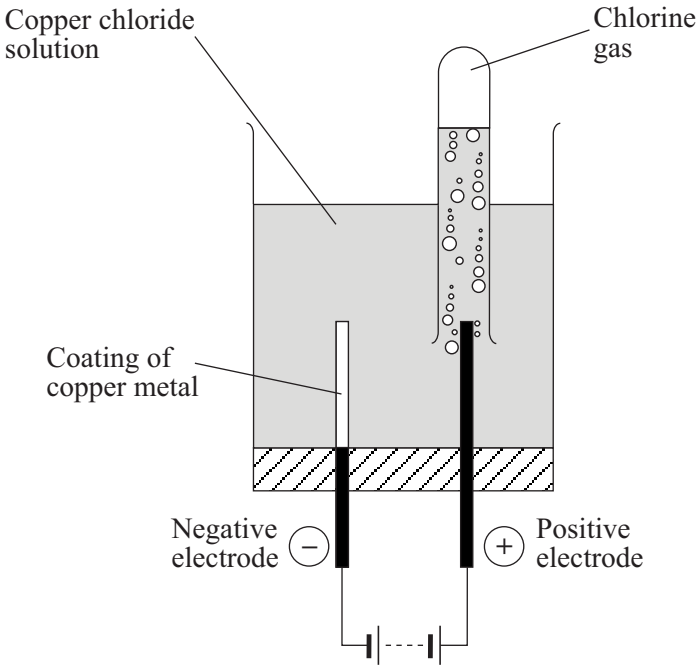
In these questions choose the best **two** answers.

Do **not** choose more than two.

Mark your choices on the answer sheet.

QUESTION THREE

Copper chloride is an ionic compound.
Copper is a metal element and chlorine is a non-metal element.
The diagram shows what happens when an electric current is passed through a solution of copper chloride.



Which **two** statements are correct?

a coating of copper will form on the positive electrode

chloride ions are positive

copper chloride is decomposed into its elements

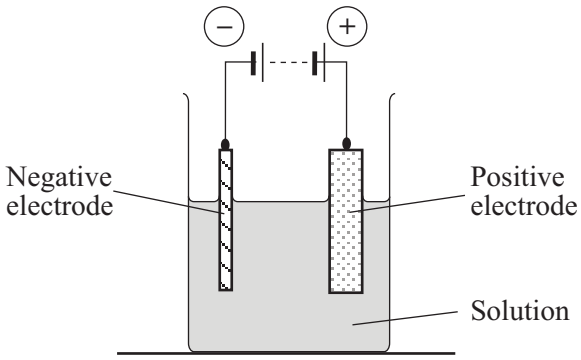
copper ions move to the negative electrode

solid copper chloride will conduct an electric current

QUESTION FOUR

Impure copper is purified by electrolysis.

The diagram shows how this can be done.



Choose the **two** statements that are correct.

at the end of the electrolysis the negative electrode will be larger

copper atoms from the impure electrode lose electrons to form copper ions

the impure copper is the negative electrode

the solution contains negative copper ions

the solution could be zinc sulphate

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 the metals in Group 1 of the periodic table.

5.1 Which of these metals is a Group 1 metal?

A Aluminium

B Copper

C Iron

D Potassium

5.2 The first three metals in Group 1 . . . . .

A are electrical insulators.

B float on water.

C form coloured compounds.

D have a high density.

5.3 Group 1 metals react with water.

Group 1 metal + water → Group 1 metal hydroxide + substance **Y**

What is substance **Y**?

A Carbon dioxide

B Hydrogen

C Nitrogen

D Oxygen

5.4 Group 1 metals react with the non-metal chlorine, making metal chlorides.

Which line shows the correct properties of Group 1 metal chlorides when they are dissolved in water?

	Appearance	**Conductivity**
A	coloured	conduct an electric current
B	coloured	do not conduct an electric current
C	colourless	conduct an electric current
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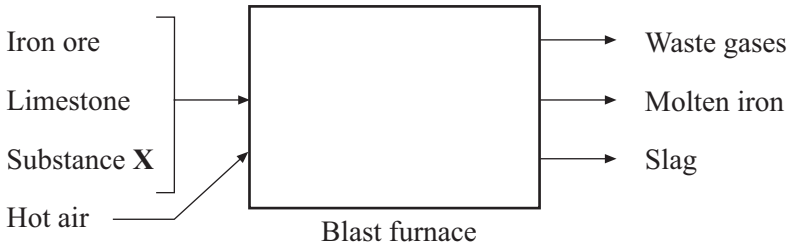
TURN OVER FOR THE NEXT QUESTION

QUESTION SIX

The diagram shows most of the substances used in a blast furnace to produce iron.



6.1 The mixture of iron ore and limestone put into a blast furnace also contains substance **X**.

What is substance **X**?

A Chromium

B Coke

C Limestone

D Sulphur

6.2 Which substance reacts with the iron oxide in the furnace to produce iron?

A Carbon dioxide

B Carbon monoxide

C Hot air

D Oxygen

6.3 Which two substances react together in the furnace to produce slag?

A Coke and limestone

B Hot air and limestone

C Limestone and acidic impurities

D Limestone and iron

6.4 The waste gases leaving the furnace are mainly . . . . .

A carbon dioxide and nitrogen.

B carbon dioxide and oxygen.

C carbon monoxide and carbon dioxide.

D carbon monoxide and nitrogen.

TURN OVER FOR THE NEXT QUESTION

QUESTION SEVEN

In the periodic table, the elements are arranged in vertical columns called Groups.

In Group 2, these are the first three metals.

Beryllium
Magnesium
Calcium

7.1 These three metals are put into the same Group because they have . . . . .

A similar atomic masses.

B similar boiling points.

C similar chemical properties.

D similar densities.

7.2 There are about 100 elements in the periodic table.

Of these, approximately how many are metals?

A 33

B 50

C 67

D 78

7.3 In the periodic table, the transition elements are found . . . . .

A in Group 0.

B in Groups 1 and 2.

C in the central block.

D on the right-hand side.

7.4 *Magnalium* is a metal alloy made by mixing the metals aluminium and magnesium.

Magnalium is not in the periodic table because . . . . .

A it has properties different from the metals in any other Group.

B it is not an element.

C it is only a recent discovery.

D its relative atomic mass is too great.

TURN OVER FOR THE NEXT QUESTION

QUESTION EIGHT

Electrolysis can be used to coat iron with a thin layer of zinc.

The process is similar to the process used to get pure copper from impure copper.

8.1 What happens at the negative electrode?

A Iron atoms gain electrons to form iron ions

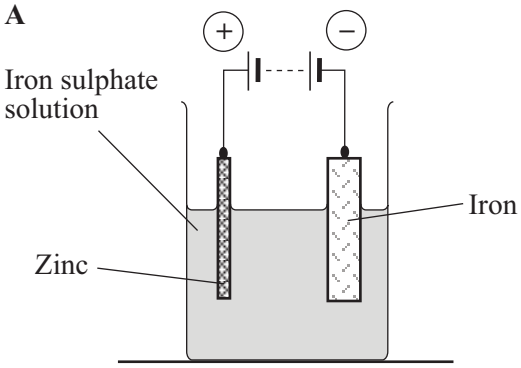
B Iron ions gain electrons to form iron atoms

C Zinc ions gain electrons to form zinc atoms

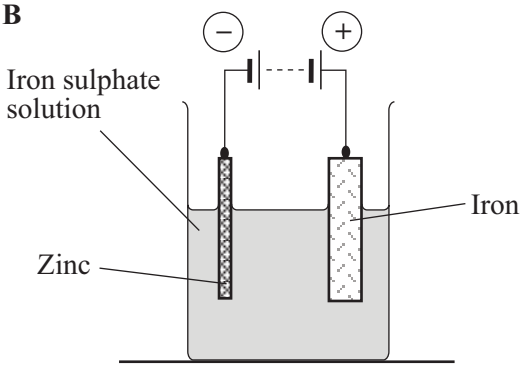
D Zinc ions lose electrons to form zinc atoms

8.2 Which diagram shows the correct set-up to coat the iron plate with zinc?

A



B



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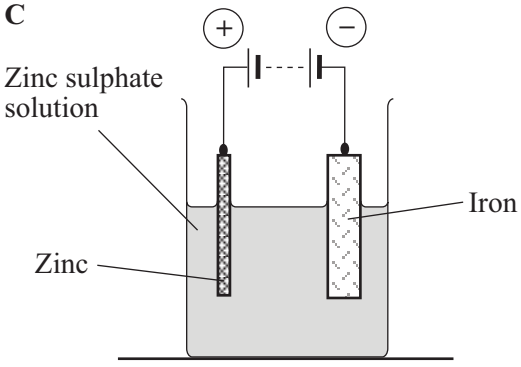

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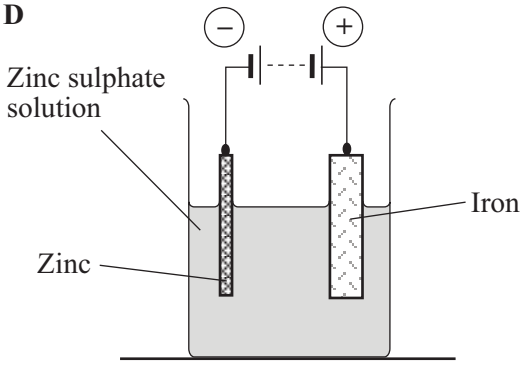
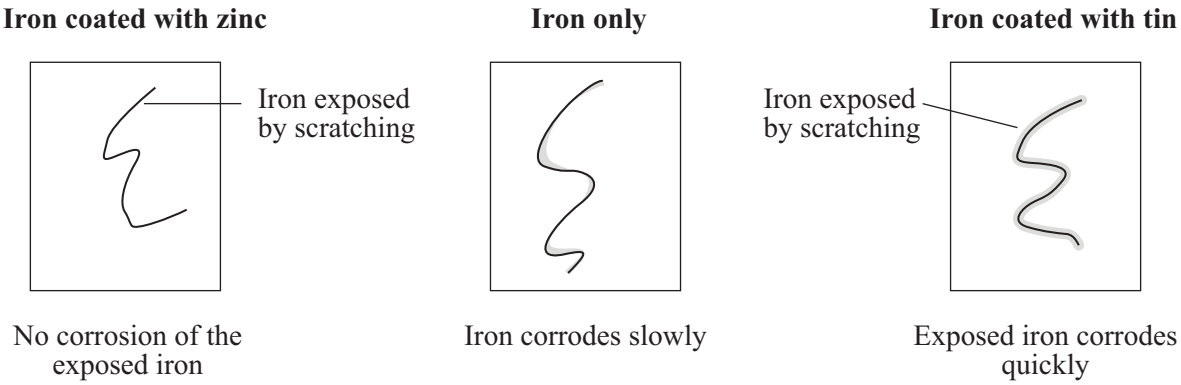
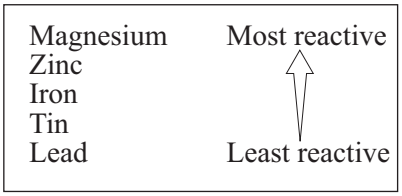


Iron corrodes when it reacts with moist air.

The diagrams show how the rate of corrosion is affected when iron is coated with another metal and then the surface is scratched to expose the iron.





8.3 These results show that . . . . .

A exposed iron corrodes less quickly when connected to tin.

B exposed iron corrodes less quickly when connected to tin or zinc.

C exposed iron corrodes less quickly when connected to zinc.

D exposed iron corrodes more quickly when connected to tin or zinc.

8.4 These results suggest that . . . . .

A iron corrodes less quickly when connected to a less reactive metal.

B iron corrodes less quickly when connected to a more reactive metal.

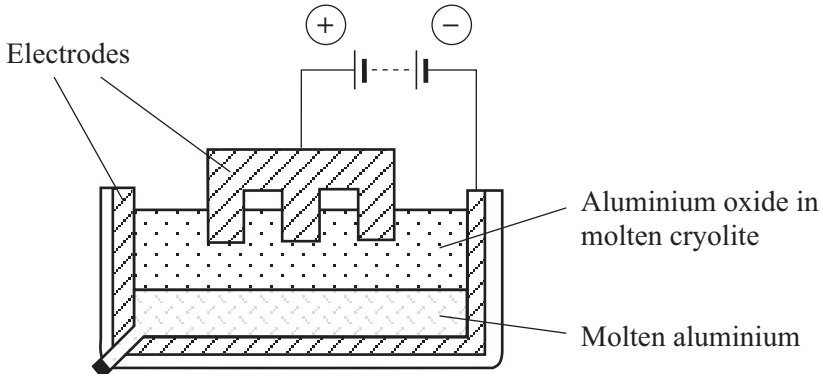
C iron corrodes more quickly when connected to a more reactive metal.

D iron corrodes more quickly when connected to any other metal.

QUESTION NINE

The diagram shows an electrolytic cell.

It is used to obtain aluminium metal from aluminium oxide.



9.1 From which element are the electrodes made?

A Carbon

B Iron

C Sulphur

D Zinc

9.2 The positive electrodes are replaced frequently because . . . . .

A they react with aluminium.

B they react with aluminium oxide.

C they react with cryolite.

D they react with oxygen.

9.3 Aluminium forms at the negative electrode.

What change and what type of reaction takes place at the negative electrode?

	Change	Type of reaction
A	positive ions gain electrons	oxidation
B	positive ions gain electrons	reduction
C	positive ions lose electrons	oxidation
D	positive ions lose electrons	reduction

9.4 Aluminium does not corrode easily even though it is a reactive metal because . . . . .

A it has a high melting point.

B it is protected by a layer of aluminium oxide.

C it is a transition metal.

D it is hard, tough and strong.

TURN OVER FOR THE NEXT QUESTION

QUESTION TEN

We can make a solution of an alkali metal salt by using a neutralisation reaction.

This is a general word equation for this type of reaction.

acid + alkaline hydroxide solution → neutral salt solution + water

10.1 This type of reaction can also be represented by . . . . .

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

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

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

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

10.2 Which of these salts can be made by this type of reaction?

A Copper sulphate

B Iron sulphate

C Potassium chloride

D Zinc chloride

10.3 A solution of sodium chloride will be acidic if it also contains an excess of . . . . .

A chloride ions.

B hydrogen ions.

C hydroxide ions.

D sodium ions.

10.4 Which of these gases dissolves in water to produce an alkaline solution?

A Ammonia

B Carbon dioxide

C Hydrogen

D Oxygen

END OF TEST