Surname		Other Names	
Centre Number			Candidate Number				
Candidate Signature							

General Certificate of Secondary Education
Spring 2004

AQA
ASSESSMENT and QUALIFICATIONS ALLIANCE

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

Wednesday 3 March 2004 Morning Session

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

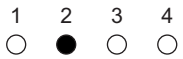
You may use a calculator.

Time allowed: 30 minutes

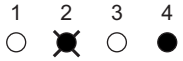
Instructions
- Fill in the boxes at the top of this page.
- Check that your name, candidate number and centre number are printed on the separate answer sheet.
- Check that the separate answer sheet has the title "Metals" printed on it.
- Attempt **one Tier only**, **either** the Foundation Tier **or**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

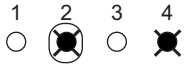
- Use a **black ball-point pen**.
- For each answer **completely fill in the circle** as shown:



- 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 four chemical substances.

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

bauxite

cryolite

haematite

limestone

Substance	What we can say about the substance
1	it is an aluminium compound with a lower melting point than aluminium oxide
2	it is an iron ore
3	it is the main aluminium ore
4	it is used in the blast furnace to remove acidic impurities

QUESTION TWO

This question is about the properties of four elements.

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

carbon

hydrogen

mercury

zinc

State at 20 °C	Metal	Non-metal
solid	**1**	**2**
liquid	**3**	
gas		**4**

QUESTION THREE

This question is about gases.

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

ammonia

argon

hydrogen

oxygen

Gas	What we can say about the gas
1	it dissolves in water to make an alkaline solution
2	it is in Group 0 of the periodic table
3	it is produced at the positive electrode during electrolysis of metal oxides
4	it is produced when potassium reacts with water

QUESTION FOUR

The flow chart shows stages in the manufacture of iron in a blast furnace.

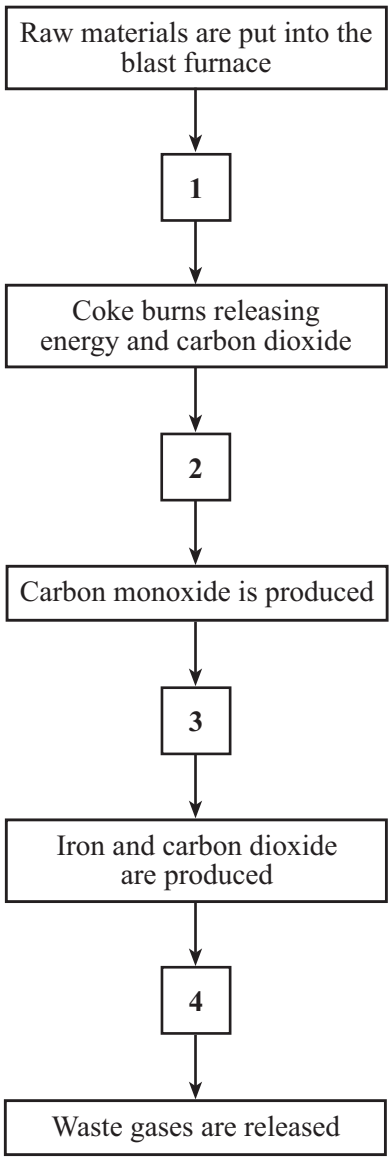
Match sentences **J**, **K**, **L** or **M** from the list with the numbers **1–4**, to explain what happens in this process.

J **carbon dioxide reacts with coke**

K **carbon monoxide reacts with iron oxide**

L **hot air is blown into the furnace**

M **molten iron flows to the bottom of the furnace**



QUESTION FIVE

The table shows the results of heating four metals, **W**, **X**, **Y** and **Z**, with an oxide of a different metal.

Yes means that a reaction between the metal and the metal oxide took place.

No means that there was no reaction.

Metal / Metal oxide	**Metal W**	**Metal X**	**Metal Y**	**Metal Z**
Copper oxide	Yes	Yes	Yes	No
Iron oxide	Yes	No	No	No
Lead oxide	Yes	Yes	No	No
Zinc oxide	No	No	No	No

Match metals **W**, **X**, **Y** and **Z** from the table with the numbers **1 – 4** in the reactivity series.

1 Most reactive metal

2

3

4 Least reactive metal

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

This question is about the elements in the periodic table.

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

all Group 2 elements have similar properties

all the elements in the central block are gases

metals are found only in the central block and in Group 2

the elements are arranged in order of their reactivity

vertical columns of elements are called Groups

QUESTION SEVEN

This question is about the alkali metals.

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

their compounds are blue or green

they are placed in Group 1 because they all have a low density

they conduct heat and electricity

they react only slowly with oxygen and water

they react with chlorine (a non-metal), to form ionic compounds

NO QUESTIONS APPEAR ON THIS PAGE

TURN OVER FOR THE NEXT QUESTION

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 three metals.

They are all in the central block in the periodic table.

copper **iron** **platinum**

8.1 To which group of metals do copper, iron and platinum belong?

A Alkali metals

B Alkaline earth metals

C Noble metals

D Transition metals

8.2 Another element that belongs to this group of metals is . . . . .

A argon.

B mercury.

C potassium.

D sodium.

8.3 Iron and platinum . . . . .

A are poor conductors of electricity.

B are used as catalysts.

C do not react with water.

D have low melting points.

8.4 Compounds of this group of metals are useful in pottery glazes because . . . . .

A they are coloured.

B they are good conductors of heat.

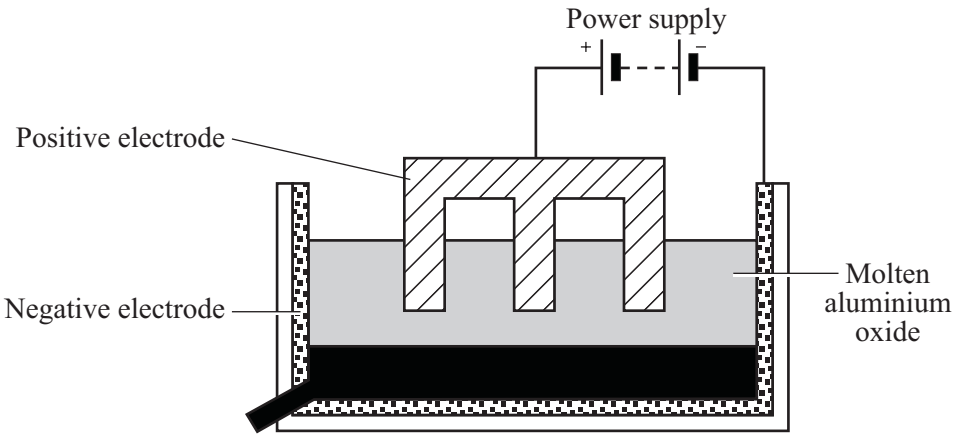
C they have high melting points.

D they react only slowly with air.

TURN OVER FOR THE NEXT QUESTION

QUESTION NINE

The diagram shows how aluminium can be extracted from aluminium oxide.



9.1 The electrodes are made from . . . . .

A carbon.

B chromium.

C copper.

D cryolite.

9.2 The aluminium oxide must be molten so that . . . . .

A the aluminium and oxide ions can react together.

B the aluminium formed does not oxidise.

C the ions are free to move about.

D the molecules of aluminium oxide do not decompose.

9.3 Which substance forms at the negative electrode and why?

	Substance	**Reason**
A	aluminium	it has negative ions
B	aluminium	it has positive ions
C	oxygen	it has negative ions
D	oxygen	it has positive ions

9.4 The positive electrode burns away quickly.

The gas produced as it burns is . . . . .

A carbon dioxide.

B hydrogen.

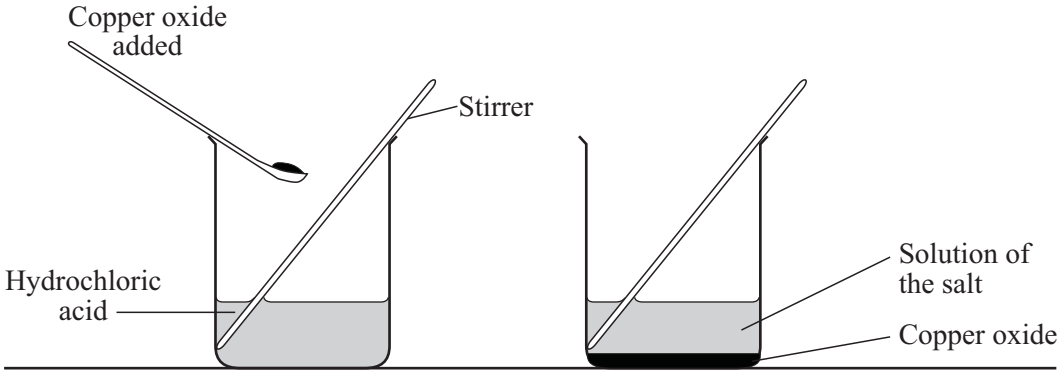
C nitrogen.

D sulphur dioxide.

TURN OVER FOR THE NEXT QUESTION

QUESTION TEN

The diagram shows how a student makes a solution of a salt.



10.1 The student knows when all the acid is used up because . . . . .

A no more bubbles of carbon dioxide will be produced.

B no more bubbles of hydrogen will be produced.

C no more copper oxide will react.

D the solution will begin to turn blue.

10.2 Any solid copper oxide can be removed from the solution of the salt by . . . . .

A crystallisation.

B distillation.

C evaporation.

D filtration.

10.3 The products of the reaction between copper oxide and hydrochloric acid are . . . . .

A copper chloride and carbon dioxide.

B copper chloride and hydrogen.

C copper chloride and water.

D copper chloride only.

10.4 Copper oxide is a base that will not dissolve in water.

What name do we give to a soluble base?

A A hydroxide

B A nitrate

C An acid

D An alkali

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

The table shows the results of heating four metals, **W**, **X**, **Y** and **Z**, with an oxide of a different metal.

Yes means that a reaction between the metal and the metal oxide took place.

No means that there was no reaction.

Metal / Metal oxide	**Metal W**	**Metal X**	**Metal Y**	**Metal Z**
Copper oxide	Yes	Yes	Yes	No
Iron oxide	Yes	No	No	No
Lead oxide	Yes	Yes	No	No
Zinc oxide	No	No	No	No

Match metals **W**, **X**, **Y** and **Z** from the table with the numbers **1 – 4** in the reactivity series.

1 Most reactive metal

2

3

4 Least reactive metal

QUESTION TWO

This question is about four of the substances involved in these two chemical reactions.

ammonia + sulphuric acid → ammonium sulphate + water

copper oxide + hydrogen → copper + water

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

ammonia

ammonium sulphate

copper oxide

hydrogen

Substance	What we can say about the substance in these reactions
1	it is neutralised
2	it is oxidised
3	it is reduced
4	it is a salt

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 alkali metals.

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

their compounds are blue or green

they are placed in Group 1 because they all have a low density

they conduct heat and electricity

they react only slowly with oxygen and water

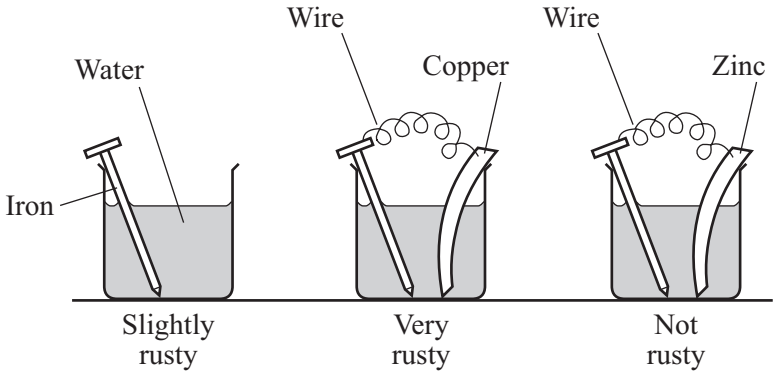
they react with chlorine (a non-metal) to form ionic compounds

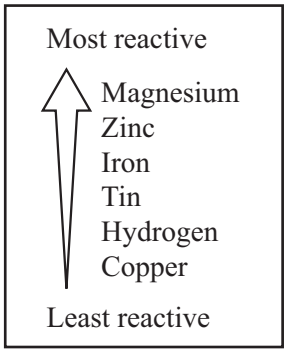
QUESTION FOUR

Iron will react with oxygen, when water is present, to form rust.

If the iron is connected to another metal, this can affect the rate of rusting.

The diagrams show the results of an experiment with three iron nails, which were left as shown for a few days.





Which **two** statements are supported by the results of this experiment?

iron rusts less quickly when attached to a more reactive metal

iron rusts more quickly when attached to a more reactive metal

iron rusts more quickly when attached to copper

iron would not rust if connected to copper

tin and magnesium do not react with oxygen

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 three metals.

They are all in the central block in the periodic table.

copper **iron** **platinum**

5.1 To which group of metals do copper, iron and platinum belong?

A Alkali metals

B Alkaline earth metals

C Noble metals

D Transition metals

5.2 Another element that belongs to this group of metals is . . . . .

A argon.

B mercury.

C potassium.

D sodium.

5.3 Iron and platinum . . . . .

A are poor conductors of electricity.

B are used as catalysts.

C do not react with water.

D have low melting points.

5.4 Compounds of this group of metals are useful in pottery glazes because . . . . .

A they are coloured.

B they are good conductors of heat.

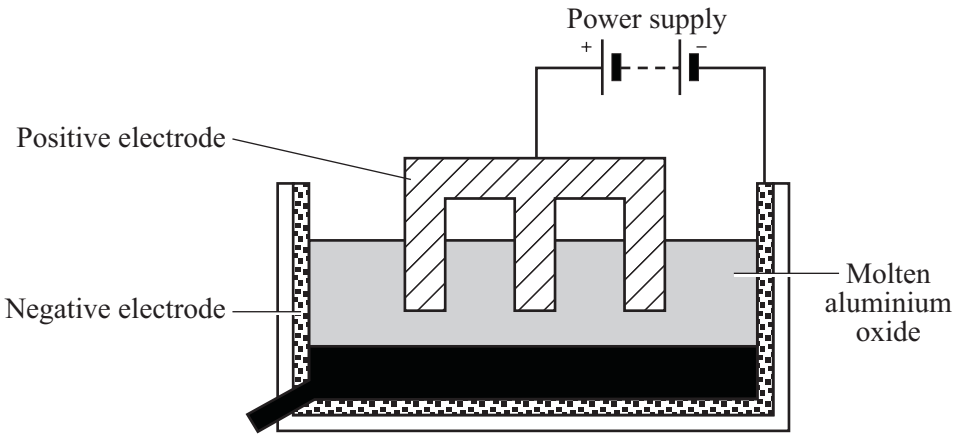
C they have high melting points.

D they react only slowly with air.

TURN OVER FOR THE NEXT QUESTION

QUESTION SIX

The diagram shows how aluminium can be extracted from aluminium oxide.



6.1 The electrodes are made from . . . . .

A carbon.

B chromium.

C copper.

D cryolite.

6.2 The aluminium oxide must be molten so that . . . . .

A the aluminium and oxide ions can react together.

B the aluminium formed does not oxidise.

C the ions are free to move about.

D the molecules of aluminium oxide do not decompose.

6.3 Which substance forms at the negative electrode and why?

	Substance	**Reason**
A	aluminium	it has negative ions
B	aluminium	it has positive ions
C	oxygen	it has negative ions
D	oxygen	it has positive ions

6.4 The positive electrode burns away quickly.

The gas produced as it burns is . . . . .

A carbon dioxide.

B hydrogen.

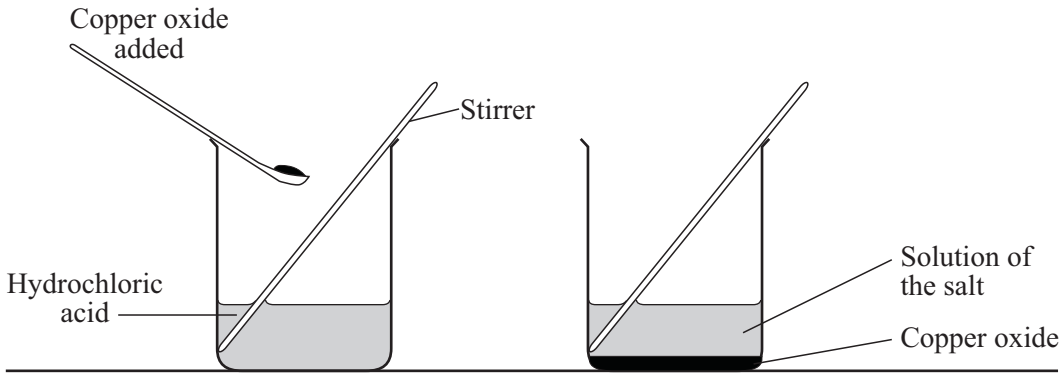
C nitrogen.

D sulphur dioxide.

TURN OVER FOR THE NEXT QUESTION

QUESTION SEVEN

The diagram shows how a student makes a solution of a salt.



7.1 The student knows when all the acid is used up because . . . . .

A no more bubbles of carbon dioxide will be produced.

B no more bubbles of hydrogen will be produced.

C no more copper oxide will react.

D the solution will begin to turn blue.

7.2 Any solid copper oxide can be removed from the solution of the salt by . . . . .

A crystallisation.

B distillation.

C evaporation.

D filtration.

7.3 The products of the reaction between copper oxide and hydrochloric acid are . . . . .

A copper chloride and carbon dioxide.

B copper chloride and hydrogen.

C copper chloride and water.

D copper chloride only.

7.4 Copper oxide is a base that will not dissolve in water.

What name do we give to a soluble base?

A A hydroxide

B A nitrate

C An acid

D An alkali

TURN OVER FOR THE NEXT QUESTION

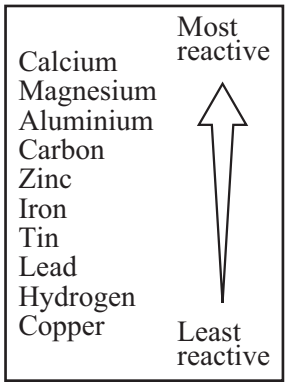
QUESTION EIGHT

Iron is obtained from iron oxide in a blast furnace.

The word equations show two of the reactions which take place in the furnace.

carbon + oxygen → carbon dioxide

carbon dioxide + carbon → carbon monoxide



8.1 The substance oxidised in **both** these reactions is . . . . .

A carbon.

B carbon dioxide.

C carbon monoxide.

D oxygen.

8.2 How is the iron obtained from the iron oxide?

A The iron ore is decomposed by the heat energy produced

B The iron ore reacts with limestone

C The iron oxide is reduced by carbon dioxide

D The iron oxide is reduced by carbon monoxide

8.3 Another way in which iron can be displaced from iron oxide is by reaction with . . . . .

A aluminium.

B hydrogen.

C lead.

D tin.

8.4 How could calcium be extracted from calcium chloride?

A By displacement reaction with magnesium

B By melting it and then passing an electric current through the molten calcium chloride

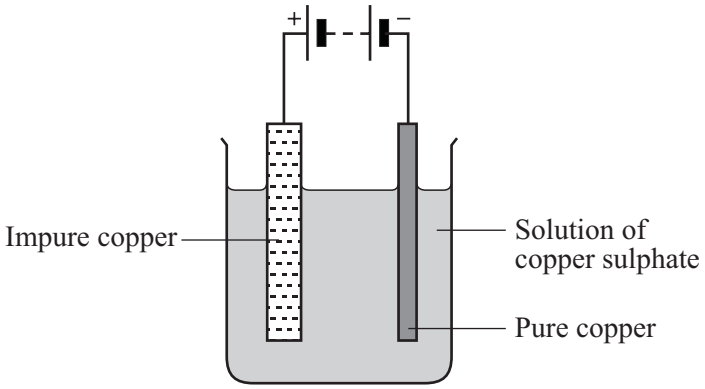
C By passing an electric current through solid calcium chloride

D By strongly heating the calcium chloride with carbon

TURN OVER FOR THE NEXT QUESTION

QUESTION NINE

The diagram shows how pure copper can be obtained from impure copper.



9.1 At the positive 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.

9.2 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.

9.3 The reaction at the negative electrode is . . . . .

A oxidation.

B redox.

C reduction.

D transition.

9.4 A very thin layer of copper can be put onto an iron object to make it look more attractive. This is done in a very similar process to that used for purifying copper.

Which arrangement would be used?

	Positive electrode	Negative electrode	Solution
A	iron object	pure copper	copper sulphate
B	iron object	pure copper	iron sulphate
C	pure copper	iron object	copper sulphate
D	pure copper	iron object	iron sulphate

TURN OVER FOR THE NEXT QUESTION

QUESTION TEN

This question is about making salts.

10.1 When a solution of an acid is completely neutralised by a solution of an alkali and the products are left in solution, the reaction can be represented by . . . . .

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

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

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

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

10.2 Which of the following salts **cannot** be produced by the type of reaction described in **10.1**?

A Ammonium nitrate

B Potassium sulphate

C Sodium chloride

D Zinc chloride

10.3 Sodium sulphate is a soluble salt that can be made by the reaction between a solution of an acid and a solution of an alkali.

Which of the following could be used to prepare the alkaline solution?

A A soluble metal hydroxide

B A soluble non-metal hydroxide

C An insoluble metal oxide

D An insoluble non-metal oxide

10.4 Which of the following could you use to produce the salt, sodium sulphate?

A sodium hydroxide + hydrochloric acid

B sodium hydroxide + sodium chloride

C sodium hydroxide + sulphur

D sodium hydroxide + sulphuric acid

END OF TEST