

Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

General Certificate of Secondary Education
June 2005



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

Tuesday 28 June 2005 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:

1	2	3	4
<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>

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

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

1	2	3	4
<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>

- 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:

1	2	3	4
<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>

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

The chemical elements are arranged in the periodic table according to their properties.

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

Group 0

Group 1

Group 2

the central block

The alkali metals, such as potassium, are in **1**

The transition metals are in **2**

Some other metals are in **3**

The noble gases such as argon are in **4**

QUESTION TWO

This question is about metals.

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

aluminium

gold

iron

mercury

Metal	What we can say about the metal
1	it is a liquid at room temperature
2	it is extracted from the ore bauxite
3	it is extracted from the ore haematite
4	it is found uncombined in the Earth's crust

QUESTION THREE

Some reactions which produce salts are shown in the table below.

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

copper sulphate

hydrochloric acid

sulphuric acid

zinc hydroxide

Acid		Alkali or base		Salt
1	reacts with	sodium hydroxide	to produce	sodium chloride
sulphuric acid	reacts with	copper oxide	to produce	2
nitric acid	reacts with	3	to produce	zinc nitrate
4	reacts with	ammonia solution	to produce	ammonium sulphate

Turn over ►

QUESTION FOUR

This question is about the uses of some substances.

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

carbon

copper chloride

limestone

platinum

Substance	How it is used
1	as a catalyst in chemical reactions
2	in pottery glazes
3	to make electrodes for the production of aluminium
4	to remove acid impurities in the blast furnace

QUESTION FIVE

Metal **W** displaces metal **X** from its oxide when heated.

Metal **W** does **not** react when heated with the oxide of metal **Z**.

Metal **Y** reacts faster with water than metal **Z** reacts with water.

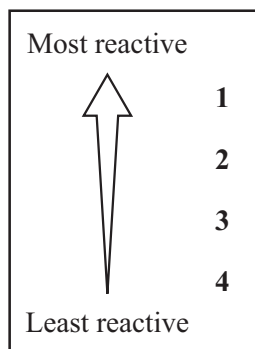
Match the metals from the list with the numbers 1–4 in the reactivity series.

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 SIXWhich **two** of the following elements are non-metals?**argon****carbon****copper****magnesium****potassium****QUESTION SEVEN**Which **two** of the following are properties of the alkali metals?**they form coloured compounds****they form hydroxides that are insoluble in water****they have lower melting points than most transition metals****they react with non-metals to form ionic compounds****they react with water, releasing oxygen****Turn over ►**

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

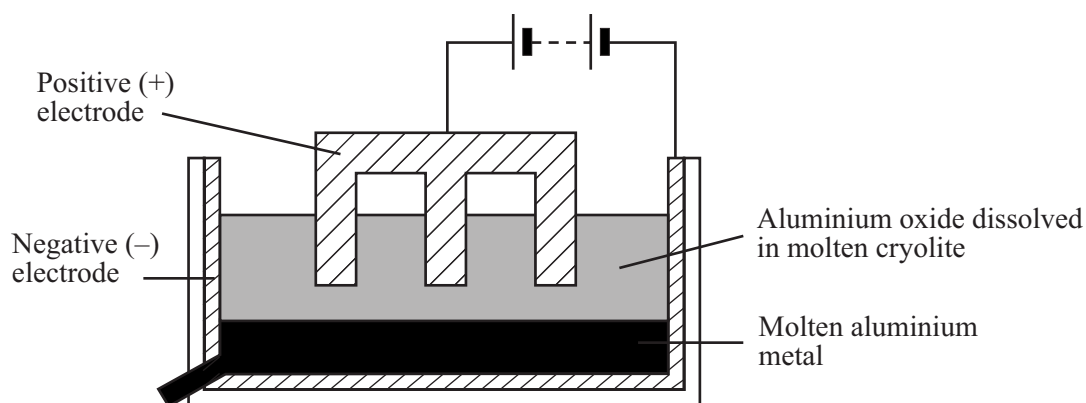
Each of these questions has four parts.

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

Mark your choices on the answer sheet.

QUESTION EIGHT

The diagram shows the process used to extract aluminium metal from aluminium oxide.



8.1 The aluminium oxide is not melted. Instead, it is dissolved in molten cryolite.

This is because

- A** aluminium oxide has a very high melting point.
- B** cryolite acts as a catalyst.
- C** cryolite removes impurities in the process.
- D** molten aluminium oxide does not conduct electricity.

8.2 The aluminium oxide has to be in a liquid state so that

- A** the atoms can move to the electrodes.
- B** the electrodes last longer.
- C** the ions can move to the electrodes.
- D** the process occurs at a higher temperature.

8.3 In this process, where is the aluminium metal produced?

Why is it produced here?

	Where the aluminium is produced	Reason it is produced here
A	negative electrode	aluminium atoms are positive
B	negative electrode	aluminium ions are positive
C	positive electrode	aluminium atoms are negative
D	positive electrode	aluminium ions are negative

8.4 Which gas is formed during electrolysis of aluminium oxide?

- A** Argon
- B** Hydrogen
- C** Nitrogen
- D** Oxygen

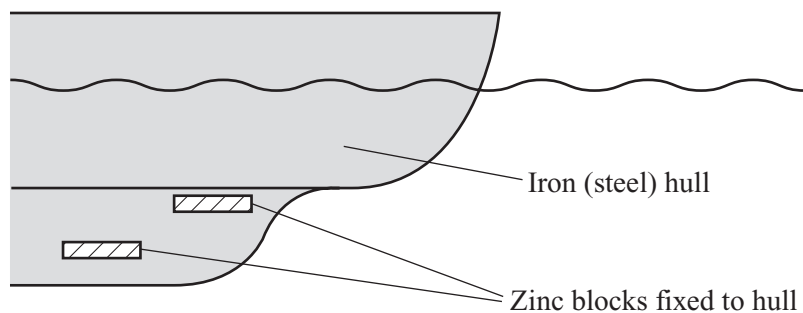
TURN OVER FOR THE NEXT QUESTION

Turn over ►

QUESTION NINE

Unprotected metals may corrode if in contact with oxygen and water.

The iron (steel) hull of a ship corrodes (rusts) quickly if not protected.



9.1 The zinc corrodes instead of the iron (steel).

What name is given to this type of protection?

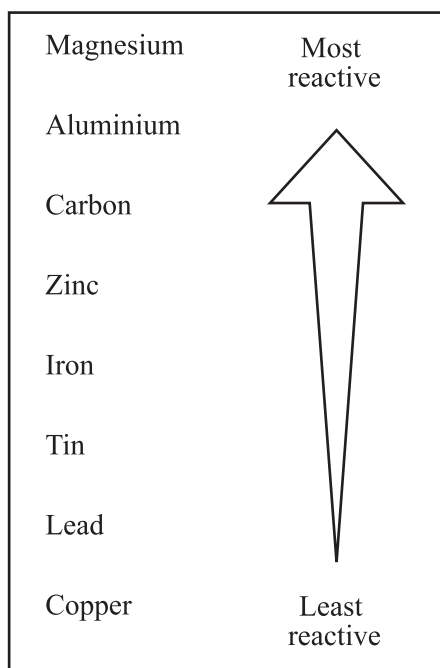
- A Electrolytic protection
- B Parasitic protection
- C Sacrificial protection
- D Transitional protection

9.2 Why does the zinc corrode instead of the iron (steel)?

- A Iron does not react with salt water
- B Zinc is a less reactive metal
- C Zinc is a more reactive metal
- D Zinc is a softer metal

9.3 Which other metal could be used to protect the hull of a ship in a similar way?

- A Copper
- B Lead
- C Magnesium
- D Tin



9.4 Corrosion of aluminium is slower than expected because

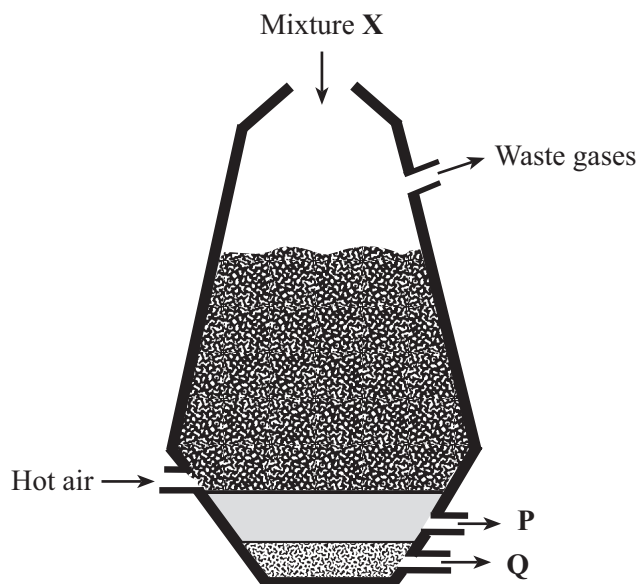
- A it has a shiny surface.
- B it is a hard metal.
- C it is a low density metal.
- D it is protected by a thin oxide layer.

TURN OVER FOR THE NEXT QUESTION

Turn over ►

QUESTION TEN

The diagram shows a blast furnace which is used to obtain iron.



10.1 Which line best describes mixture X?

- A Coke and iron ore
- B Coke and limestone
- C Coke, bauxite and limestone
- D Coke, iron ore and limestone

10.2 Why is hot air pumped into the blast furnace?

- A To provide the carbon dioxide required for reactions in the furnace
- B To release energy from the fuel in the furnace
- C To sweep waste gases from the furnace
- D To thoroughly mix the contents

10.3 Which line gives the best description of substances **P** and **Q**?

	Substance P	Substance Q
A	molten iron	molten slag
B	molten iron	solid slag
C	molten slag	molten iron
D	solid iron	molten slag

10.4 The hot air, which enters the blast furnace, consists mainly of nitrogen and oxygen gases.

The waste gases, which leave, consist mainly of

- A** carbon dioxide.
- B** carbon monoxide.
- C** nitrogen and carbon dioxide.
- D** nitrogen and oxygen.

END OF TEST

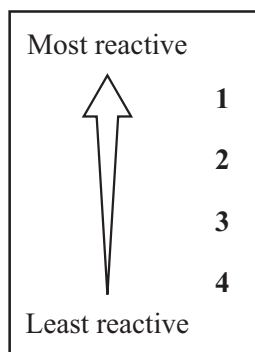
You must do **one Tier** only, **either** the Foundation Tier **or** the Higher Tier.
The Foundation Tier is earlier in this booklet.

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**.

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QUESTION ONEMetal **W** displaces metal **X** from its oxide when heated.Metal **W** does **not** react when heated with the oxide of metal **Z**.Metal **Y** reacts faster with water than metal **Z** reacts with water.Match the metals from the list with the numbers **1–4** in the reactivity series.**Metal W****Metal X****Metal Y****Metal Z**

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 oxide

iron sulphate

lead oxide

copper sulphate + iron →**1**..... + copper

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

.....**3**..... + hydrogen → copper + water

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

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 THREEWhich **two** of the following are properties of the alkali metals?**they form coloured compounds****they form hydroxides that are insoluble in water****they have lower melting points than most transition metals****they react with non-metals to form ionic compounds****they react with water, releasing oxygen****QUESTION FOUR**Which **two** of these solutions are used as a source of OH^- (aq) ions?**ammonia solution****copper sulphate solution****hydrochloric acid****sodium hydroxide solution****sulphuric acid**

NO QUESTIONS APPEAR ON THIS PAGE

TURN OVER FOR THE NEXT QUESTION

Turn over ►

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

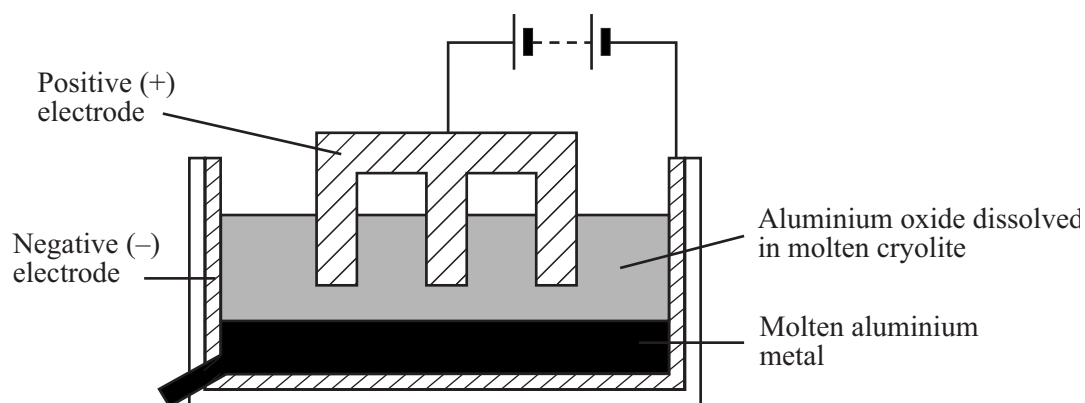
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QUESTION FIVE

The diagram shows the process used to extract aluminium metal from aluminium oxide.



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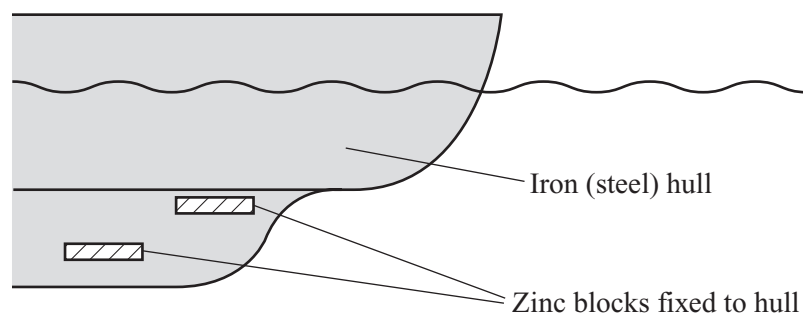
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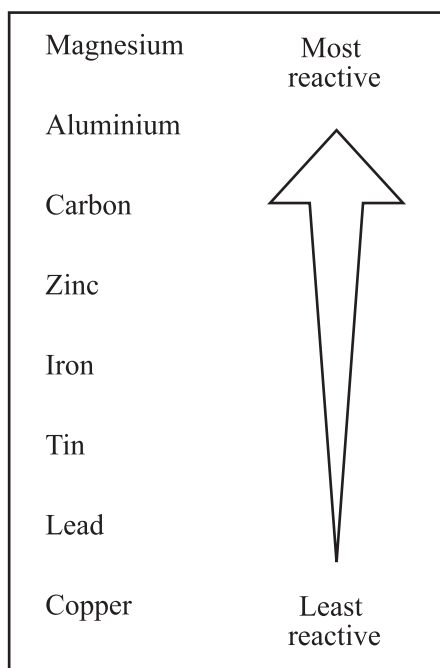
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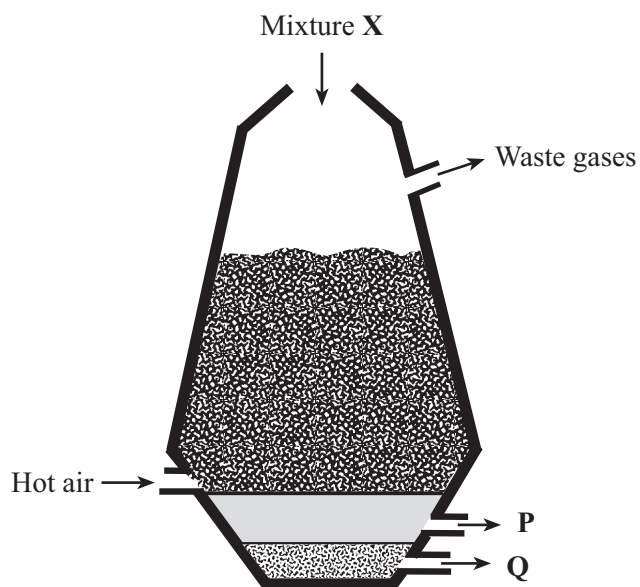
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TURN OVER FOR THE NEXT QUESTION

Turn over ►

QUESTION SEVEN

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TURN OVER FOR THE NEXT QUESTION

Turn over ►

QUESTION EIGHT

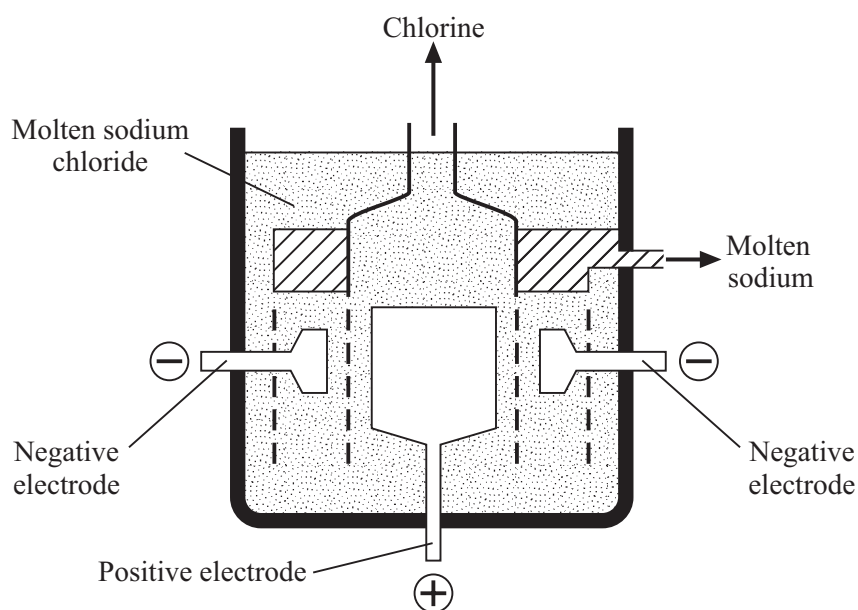
This question is about sodium metal and its compounds.

8.1 Sodium reacts with chlorine (a non-metal) to produce sodium chloride.

Which line best describes the compound sodium chloride?

- A** Coloured and insoluble in water
- B** Coloured and soluble in water
- C** White and insoluble in water
- D** White and soluble in water

The diagram shows how sodium is extracted from molten sodium chloride.



8.2 What happens at the negative electrode?

- A** Chlorine atoms gain electrons and become chloride ions
- B** Chloride ions lose electrons and become chlorine atoms
- C** Sodium atoms lose electrons and become sodium ions
- D** Sodium ions gain electrons and become sodium atoms

8.3 The reaction at the negative electrode is called

- A decomposition.
- B electrolysis.
- C oxidation.
- D reduction.

8.4 The word equations show two reactions involving a gas **F**.

sodium + water → sodium hydroxide + gas **F**

gas **F** + copper oxide → solid **G** + water

What are gas **F** and solid **G**?

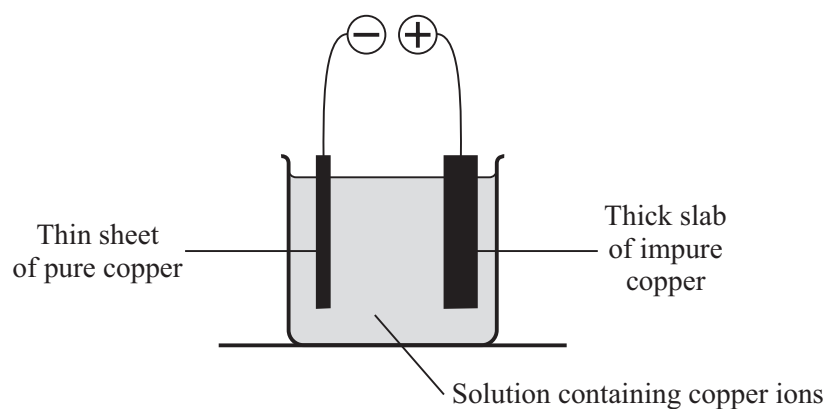
- | | Gas F | Solid G |
|---|----------------|------------------|
| A | carbon dioxide | copper |
| B | chlorine | copper hydroxide |
| C | hydrogen | copper |
| D | oxygen | copper hydroxide |

TURN OVER FOR THE NEXT QUESTION

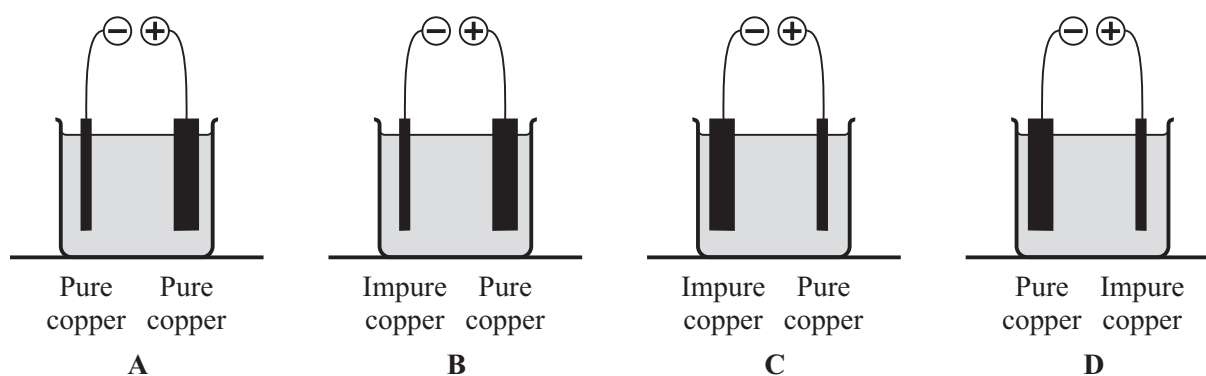
Turn over ►

QUESTION NINE

The diagram shows how impure copper from a furnace can be made into much purer copper.



9.1 Which diagram shows the end result of this process?



9.2 What is this process for purifying copper called?

- A Decomposition
- B Electrolysis
- C Neutralisation
- D Reduction

- 9.3** A very similar process can be used to put a thin layer of chromium on to a steel car bumper. (Steel is mainly iron.)

Which row of the table gives the correct set-up for doing this?

	Positive electrode	Negative electrode	Ion in solution
A	chromium bar	steel bumper	iron
B	chromium bar	steel bumper	chromium
C	steel bumper	chromium bar	iron
D	steel bumper	chromium bar	chromium

- 9.4** What happens to chromium atoms during this process?

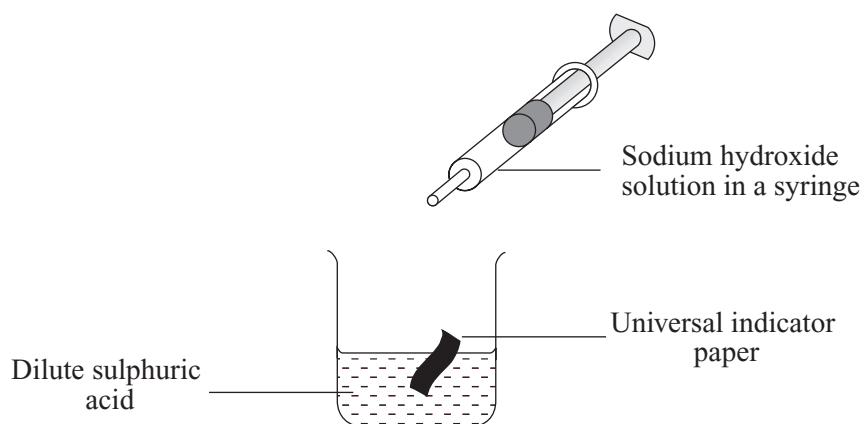
- A** They are oxidised and then reduced
- B** They are reduced and then oxidised
- C** They are oxidised only
- D** They are reduced only

TURN OVER FOR THE NEXT QUESTION

Turn over ►

QUESTION TEN

Salts can be made by neutralising an acid with an alkali.



10.1 Sodium hydroxide solution is added to just neutralise the sulphuric acid.

Which salt will be made?

- A Copper sulphate
- B Sodium chloride
- C Sodium nitrate
- D Sodium sulphate

10.2 Universal indicator paper changes colour to show the pH value of a solution.

What is the pH of the sodium hydroxide solution in the syringe?

What is the pH of the solution in the beaker, when the sulphuric acid is just neutralised?

	pH of sodium hydroxide solution in the syringe	pH of the solution in the beaker when the sulphuric acid is just neutralised
A	3	7
B	6	8
C	13	7
D	13	9

10.3 Which equation shows the reaction that takes place when dilute acid neutralises an alkaline solution?



10.4 Which chemicals should be used to make the salt, potassium nitrate?

A Potassium hydroxide and hydrochloric acid

B Potassium hydroxide and nitric acid

C Potassium metal and hydrochloric acid

D Potassium metal and nitric acid

END OF TEST

THERE ARE NO QUESTIONS PRINTED ON THIS PAGE