

Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

General Certificate of Secondary Education
Spring 2005



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

Wednesday 2 March 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 11 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 the properties of some metals.

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

bent

conduct

cut

melt

All metals **1** heat.

Metals can also be easily **2** or hammered into shape.

Alkali metals are softer than transition metals so they can be **3** more easily.

Alkali metals **4** at a lower temperature than transition metals (except for mercury).

QUESTION TWO

The diagram shows how aluminium is extracted.

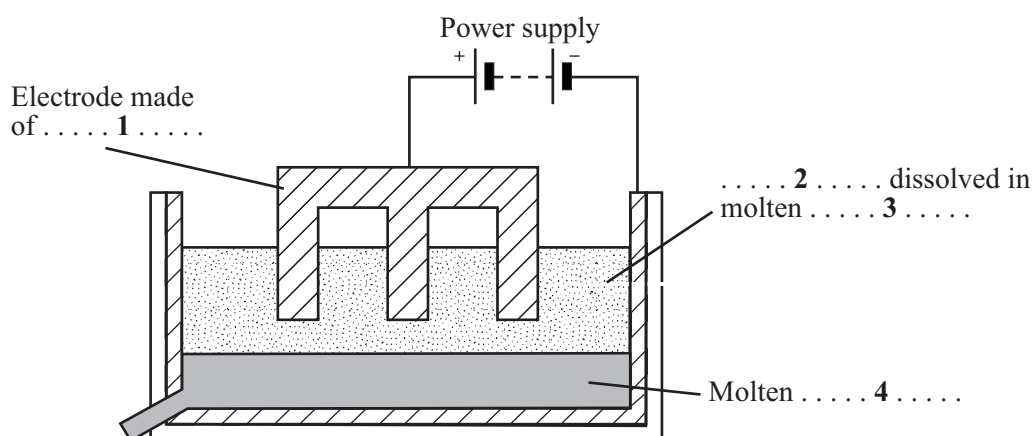
Match words from the list with the labels 1–4 on the diagram.

aluminium

aluminium oxide

carbon

cryolite

**QUESTION THREE**

This question is about metals and metal alloys.

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

aluminium

chromium

iron

magnesium

Zinc is a more reactive metal and so will protect 1 from corrosion.

Stainless steel is a non-rusting alloy of iron and 2

An oxide layer quickly develops to protect 3 from corrosion.

Aluminium can be made stronger by mixing it with 4

Turn over ►

QUESTION FOUR

The diagram shows a blast furnace.

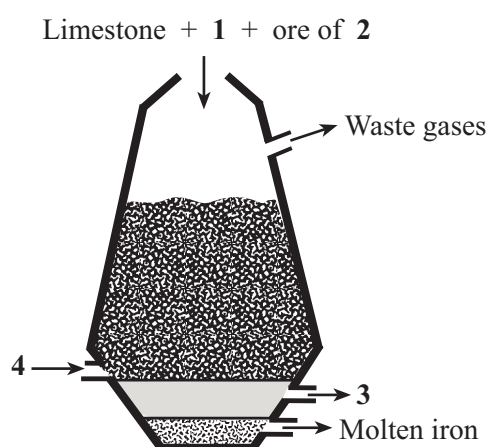
Match words from the list with the numbers 1–4 on the diagram.

coke (carbon)

hot air

iron

molten slag

**QUESTION FIVE**

This question is about four metals **A**, **B**, **C** and **D**.

- Metal **A** is the only one of these metals that reacts with cold water.
- Metal **C** reacts more vigorously than metal **B** with dilute acid.
- Metal **D** will displace metal **C** from its oxide.

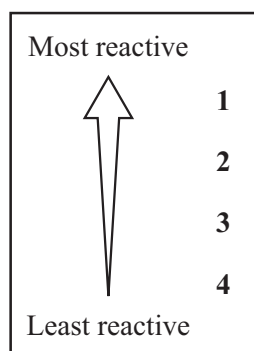
Match the metals from the list with the numbers 1–4 in the reactivity series.

metal A

metal B

metal C

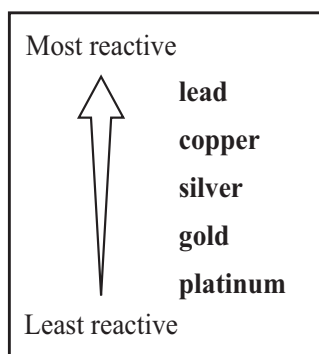
metal D



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 these metals are most likely to form coloured compounds?**copper****iron****magnesium****potassium****sodium****QUESTION SEVEN**

This question is about the five metals listed in the reactivity series below.

Which **two** of these metals are most likely to be found in the Earth's crust as the metals themselves rather than as metal compounds?**TURN OVER FOR THE NEXT QUESTION**

Turn over ►

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

The diagram shows the symbols for some elements in a section of the periodic table. The Group number is shown at the top of each column.

1		2												3	4	5	6	7	0
Li	Be																	He	
Na	Mg	Central block										Al					Ar		
	Ca				Cr		Fe			Cu	Zn								

- 8.1 Which metal in the table is most often used for electrical cables?
- A Ca (calcium)
- B Cu (copper)
- C Fe (iron)
- D Zn (zinc)
- 8.2 Two elements shown in the table that have similar chemical properties are
- A Li (lithium) and Al (aluminium).
- B Li (lithium) and Be (beryllium).
- C Mg (magnesium) and Ca (calcium).
- D Na (sodium) and Mg (magnesium).

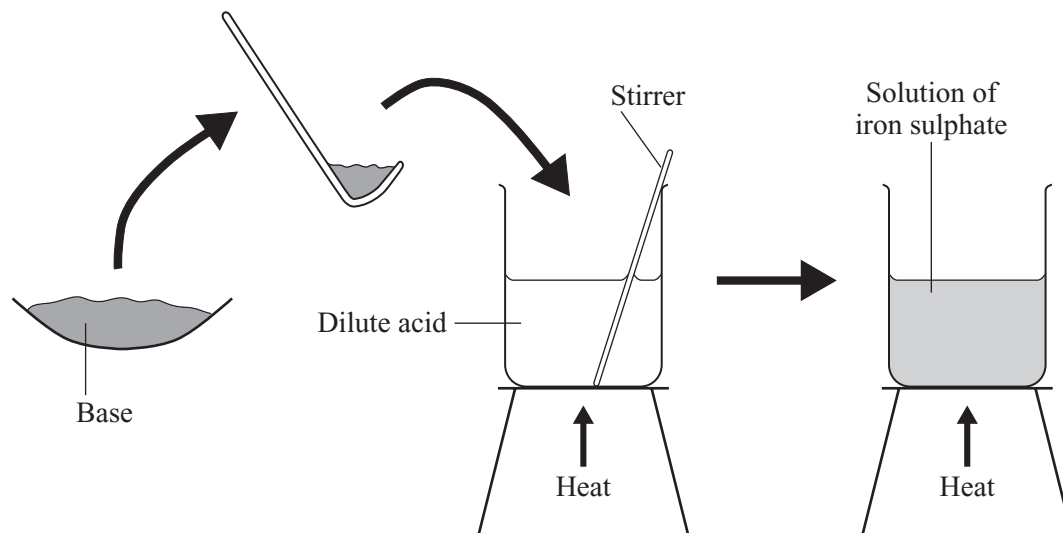
- 8.3** Metals are found in Groups **1** and **2** and in
- A** the **central block**.
 - B** Group **0** and the **central block**.
 - C** Groups **0** and **7**.
 - D** Groups **4** and **7**.
- 8.4** Be (beryllium) follows Li (lithium) in the table, so Be (beryllium) probably has
- A** a greater relative atomic mass.
 - B** a lower density.
 - C** a lower melting point.
 - D** a lower relative atomic mass.

TURN OVER FOR THE NEXT QUESTION

Turn over ►

QUESTION NINE

Iron sulphate is a green crystalline salt.
It is made by the reaction of a base with an acid.



9.1 Which base and which acid are used in this reaction to produce iron sulphate?

	Base	Acid
A	iron chloride	sulphuric acid
B	iron oxide	hydrochloric acid
C	iron chloride	nitric acid
D	iron oxide	sulphuric acid

9.2 When the reaction is complete, the unreacted base can be removed by

- A** condensation.
- B** distillation.
- C** evaporation.
- D** filtration.

9.3 Which word equation shows a similar reaction to produce copper sulphate?

- A copper chloride + nitric acid → copper sulphate + water
- B copper oxide + hydrochloric acid → copper sulphate + water
- C copper oxide + sulphuric acid → copper sulphate + water
- D copper sulphide + sulphuric acid → copper sulphate + water

9.4 Which substances react together to produce the salt ammonium sulphate?

- A ammonia solution + citric acid
- B ammonia solution + hydrochloric acid
- C ammonia solution + nitric acid
- D ammonia solution + sulphuric acid

TURN OVER FOR THE NEXT QUESTION

Turn over ►

QUESTION TEN

This question is about the Group 1 metals.

10.1 The metals in this Group are also called the

- A alkali metals.
- B base metals.
- C halogen metals.
- D transition metals.

10.2 Group 1 metals react with non-metal elements.

Which line correctly describes the compounds produced?

- A Coloured, insoluble in water
- B Coloured, soluble in water
- C White, insoluble in water
- D White, soluble in water

10.3 Potassium hydroxide dissolves in water to form

- A a neutral solution.
- B a yellow solution.
- C an acidic solution.
- D an alkaline solution.

10.4 When compared with transition metals, Group 1 metals

- A are harder.
- B are less reactive.
- C are stronger.
- D have a lower density.

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 four metals **A**, **B**, **C** and **D**.

- Metal **A** is the only one of these metals that reacts with cold water.
- Metal **C** reacts more vigorously than metal **B** with dilute acid.
- Metal **D** will displace metal **C** from its oxide.

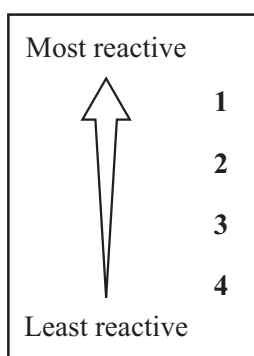
Match the metals from the list with the numbers **1–4** in the reactivity series.

metal **A**

metal **B**

metal **C**

metal **D**



Turn over ►

QUESTION TWO

The diagrams show how a gas can be used to displace a metal from one of its compounds.

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

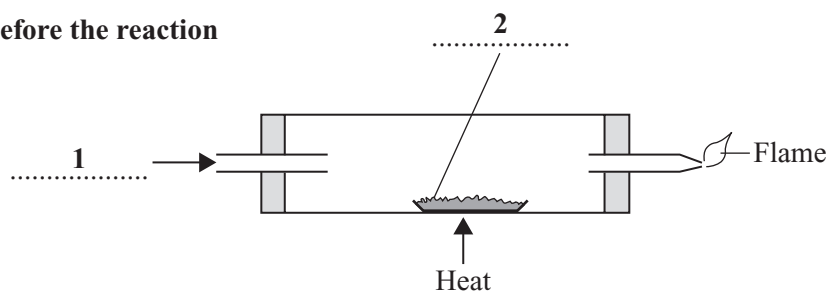
copper

copper oxide

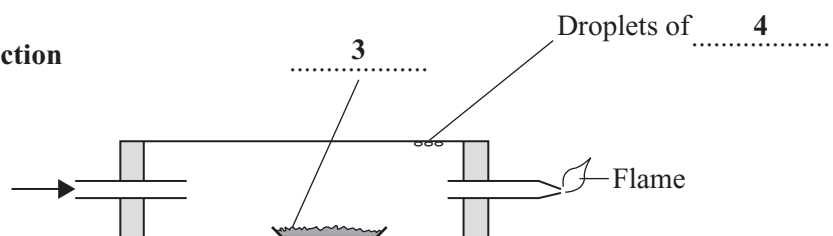
hydrogen

water

Before the reaction



After the reaction

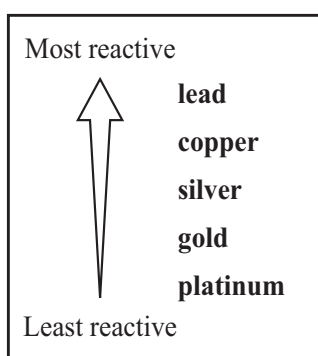


SECTION BQuestions **THREE** and **FOUR**.In these questions choose the best **two** answers.Do **not** choose more than two.

Mark your choices on the answer sheet.

QUESTION THREE

This question is about the five metals listed in the reactivity series below.

Which **two** of these metals are most likely to be found in the Earth's crust as the metals themselves rather than as metal compounds?**QUESTION FOUR**

The diagram shows part of the periodic table of elements. The symbols and relative atomic masses for some of the elements are given, in their correct positions, in the table.

		Relative atomic mass										0						
		Symbol										4						
1	2											3	4	5	6	7	0	
7	9											11	12	14	16	19	20	
Li	Be											B	C	N	O	F	Ne	
23	24											27	28	31	32	35.5	40	
Na	Mg											Al	Si	P	S	Cl	Ar	
39	40										64	65	70	73	75	79	80	84
K	Ca										Cu	Zn	Ga	Ge	As	Se	Br	Kr
																128	127	131
																Te	I	Xe

Which **two** pairs of elements are not in the order of their relative atomic masses?**argon (Ar) and potassium (K)****chlorine (Cl) and argon (Ar)****magnesium (Mg) and aluminium (Al)****neon (Ne) and sodium (Na)****tellurium (Te) and iodine (I)****Turn over ►**

SECTION CQuestions **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

The diagram shows the symbols for some elements in a section of the periodic table. The Group number is shown at the top of each column.

1		2												3	4	5	6	7	0
Li	Be	Central block																He	
Na	Mg											Al					Ar		
	Ca				Cr		Fe			Cu	Zn								

- 5.1** Which metal in the table is most often used for electrical cables?
- A Ca (calcium)
- B Cu (copper)
- C Fe (iron)
- D Zn (zinc)
- 5.2** Two elements shown in the table that have similar chemical properties are
- A Li (lithium) and Al (aluminium).
- B Li (lithium) and Be (beryllium).
- C Mg (magnesium) and Ca (calcium).
- D Na (sodium) and Mg (magnesium).

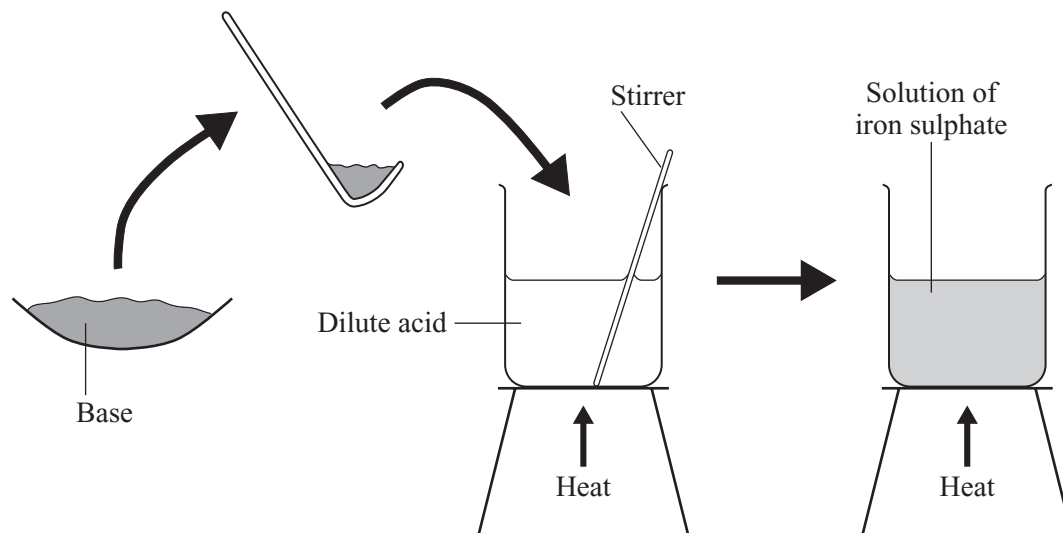
- 5.3** Metals are found in Groups **1** and **2** and in
- A** the **central block**.
 - B** Group **0** and the **central block**.
 - C** Groups **0** and **7**.
 - D** Groups **4** and **7**.
- 5.4** Be (beryllium) follows Li (lithium) in the table, so Be (beryllium) probably has
- A** a greater relative atomic mass.
 - B** a lower density.
 - C** a lower melting point.
 - D** a lower relative atomic mass.

TURN OVER FOR THE NEXT QUESTION

Turn over ►

QUESTION SIX

Iron sulphate is a green crystalline salt.
It is made by the reaction of a base with an acid.



6.1 Which base and which acid are used in this reaction to produce iron sulphate?

	Base	Acid
A	iron chloride	sulphuric acid
B	iron oxide	hydrochloric acid
C	iron chloride	nitric acid
D	iron oxide	sulphuric acid

6.2 When the reaction is complete, the unreacted base can be removed by

- A** condensation.
- B** distillation.
- C** evaporation.
- D** filtration.

6.3 Which word equation shows a similar reaction to produce copper sulphate?

- A copper chloride + nitric acid → copper sulphate + water
- B copper oxide + hydrochloric acid → copper sulphate + water
- C copper oxide + sulphuric acid → copper sulphate + water
- D copper sulphide + sulphuric acid → copper sulphate + water

6.4 Which substances react together to produce the salt ammonium sulphate?

- A ammonia solution + citric acid
- B ammonia solution + hydrochloric acid
- C ammonia solution + nitric acid
- D ammonia solution + sulphuric acid

TURN OVER FOR THE NEXT QUESTION

Turn over ►

QUESTION SEVEN

This question is about the Group 1 metals.

7.1 The metals in this Group are also called the

- A** alkali metals.
- B** base metals.
- C** halogen metals.
- D** transition metals.

7.2 Group 1 metals react with non-metal elements.

Which line correctly describes the compounds produced?

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

7.3 Potassium hydroxide dissolves in water to form

- A** a neutral solution.
- B** a yellow solution.
- C** an acidic solution.
- D** an alkaline solution.

7.4 When compared with transition metals, Group 1 metals

- A** are harder.
- B** are less reactive.
- C** are stronger.
- D** have a lower density.

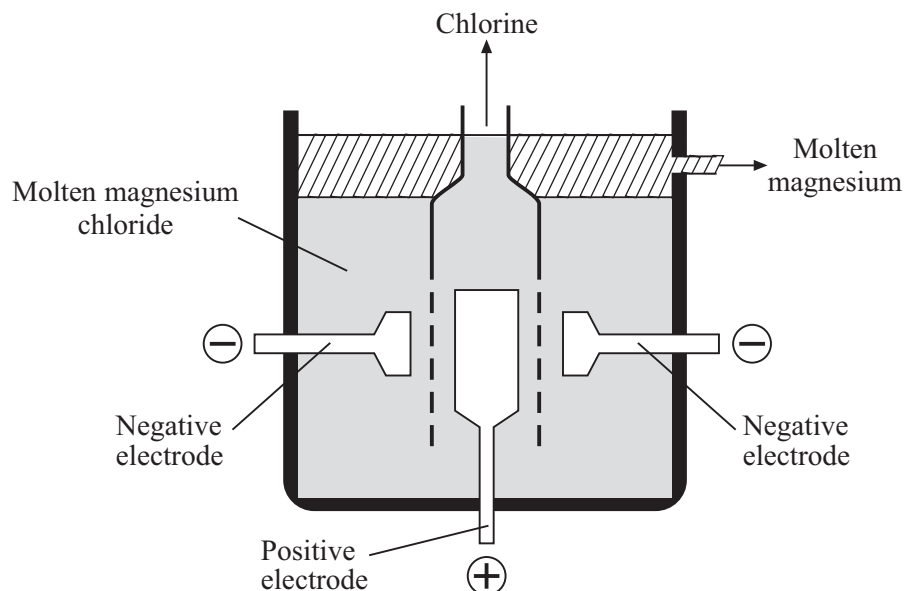
NO QUESTIONS APPEAR ON THIS PAGE

TURN OVER FOR THE NEXT QUESTION

Turn over ►

QUESTION EIGHT

Magnesium metal is produced by passing an electric current through molten magnesium chloride.



8.1 To produce the magnesium chloride, magnesium hydroxide is reacted with hydrochloric acid.



This is an example of

- A a decomposition reaction.
 - B a displacement reaction.
 - C a neutralisation reaction.
 - D a reduction reaction.
- 8.2 What happens at the negative electrode?
- A Chloride ions lose electrons and become neutral chlorine atoms
 - B Neutral chlorine atoms gain electrons and become chloride ions
 - C Magnesium ions gain electrons and become neutral magnesium atoms
 - D Neutral magnesium atoms lose electrons and become magnesium ions

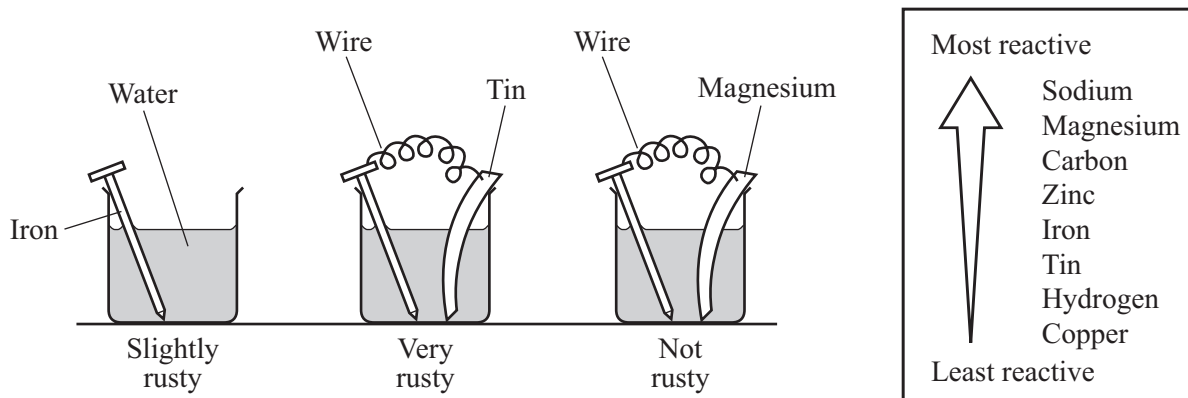
- 8.3** The reaction at the negative electrode is called
- A** decomposition.
 - B** electrolysis.
 - C** oxidation.
 - D** reduction.
- 8.4** Which of the following happens to the chloride ions in the magnesium chloride?
- A** They are decomposed
 - B** They are displaced
 - C** They are oxidised
 - D** They are reduced

TURN OVER FOR THE NEXT QUESTION

Turn over ►

QUESTION NINE

Iron reacts with oxygen from the air to form rust. This reaction only happens if water is also present. The diagrams show the amount of rusting after 24 hours if the iron is connected to other metals.



9.1 The results show that

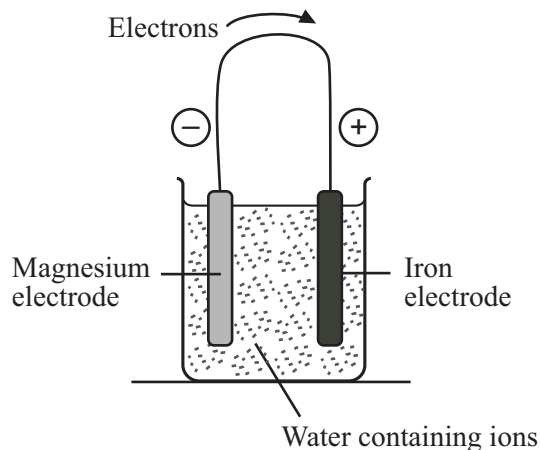
- A iron rusts less quickly when connected to either tin or magnesium.
- B iron rusts less quickly when connected to magnesium but more quickly when connected to tin.
- C iron rusts less quickly when connected to tin but more quickly when connected to magnesium.
- D iron rusts more quickly when connected to either tin or magnesium.

9.2 The results suggest that

- A iron rusts less quickly when connected to a less reactive metal.
- B iron rusts less quickly when connected to a more reactive metal.
- C iron rusts more quickly when connected to a more reactive metal.
- D the reactivity of the metal to which iron is connected makes no difference to how quickly the iron rusts.

When you put two different metals into water containing ions, you get an electrical cell. This can make a current flow through a wire joining the two metals.

Electrons leave the more reactive metal of the two and travel through the wire to the other metal.



9.3 Which row of the table correctly describes the effect on the metals as the current flows through the wire?

	Magnesium	Iron
A	gains electrons	gains electrons
B	loses electrons	gains electrons
C	gains electrons	loses electrons
D	loses electrons	loses electrons

9.4 Because of the transfer of electrons through the wire

- A** iron atoms become iron ions, so the iron corrodes.
- B** iron ions become iron atoms, so the iron corrodes.
- C** magnesium atoms become magnesium ions, so the magnesium corrodes.
- D** magnesium ions become magnesium atoms, so the magnesium corrodes.

Turn over ►

QUESTION TEN

The formula for sulphuric acid is H_2SO_4 .

The formula for hydrochloric acid is HCl .

When sulphuric acid reacts with sodium hydroxide solution, a neutral salt, sodium sulphate (Na_2SO_4), and an acid salt, sodium hydrogen sulphate (NaHSO_4), can be formed.

When hydrochloric acid reacts with sodium hydroxide solution, it forms only a neutral salt.

10.1 Which one of these forms both acid and neutral salts?

- A Carbonic acid, H_2CO_3
- B Hydriodic acid, HI
- C Hydrobromic acid, HBr
- D Nitric acid, HNO_3

10.2 When sulphuric acid reacts with potassium hydroxide solution, the neutral salt formed is

- A potassium chloride.
- B potassium hydrogen sulphate.
- C potassium nitrate.
- D potassium sulphate.

10.3 When sulphuric acid is completely neutralised by sodium hydroxide solution, the reaction can be written

- A $\text{H}^+(\text{aq}) + \text{OH}^-(\text{aq}) \rightarrow 2\text{HO}(\text{l})$
- B $\text{H}^+(\text{aq}) + \text{OH}^-(\text{aq}) \rightarrow \text{H}^{2+}\text{O}^-(\text{l})$
- C $\text{H}^+(\text{aq}) + \text{OH}^-(\text{aq}) \rightarrow \text{H}_2\text{O}(\text{l})$
- D $\text{H}^-(\text{aq}) + \text{OH}^+(\text{aq}) \rightarrow \text{H}_2\text{O}(\text{l})$

10.4 The reaction between hydrochloric acid and ammonia solution can be written

- A ammonia solution + hydrochloric acid \rightarrow ammonia chloride + hydrogen.
- B ammonia solution + hydrochloric acid \rightarrow ammonia chloride + water.
- C ammonia solution + hydrochloric acid \rightarrow ammonium chloride + hydrogen.
- D ammonia solution + hydrochloric acid \rightarrow ammonium chloride + water.

END OF TEST