

Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

General Certificate of Secondary Education
Spring 2004



**SCIENCE: SINGLE AWARD (MODULAR)
Materials and Reactions (Module 15)**

346015

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 “Materials and Reactions” 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 fuels.

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

carbon

oxygen

sulphur

water (vapour)

Hydrocarbons are compounds of the elements hydrogen and **1**

When hydrocarbons burn in air, hydrogen and **2** combine to form **3**

Some fuels also contain the element **4**

QUESTION TWO

This question is about four elements.

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

carbon

hydrogen

iron (a transition element)

potassium

State at 20 °C	Metal in Group 1 of the periodic table	Metal in central block of the periodic table	Non-metal
solid	1	2	3
gas			4

QUESTION THREE

This question is about chemical compounds.

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

atoms

compounds

elements

molecules

Quicklime and slaked lime are **1**

Quicklime is made up of the **2** calcium and oxygen.

The greater the number of carbon **3** in hydrocarbons, the larger the **4**

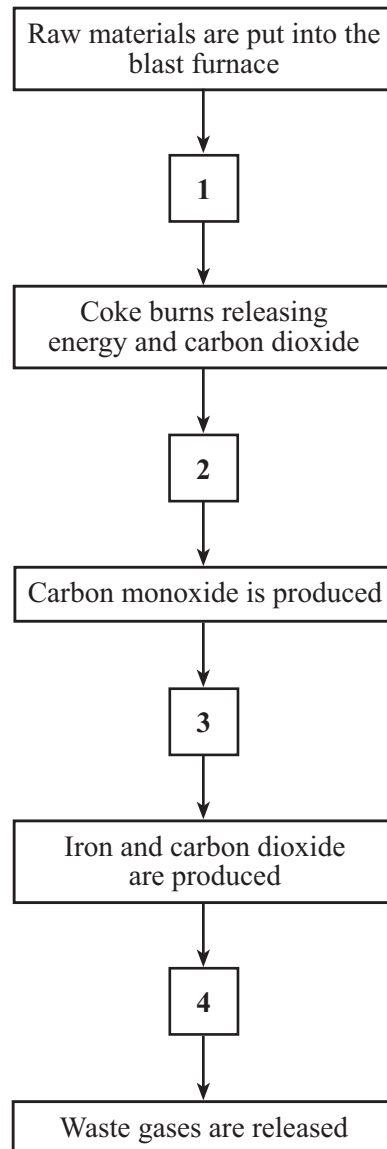
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QUESTION FOUR

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

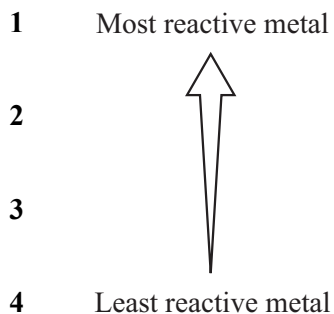
The table shows the results of heating four metals, **W**, **X**, **Y** and **Z**, with an oxide of a different metal.

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

No means that there was no reaction.

Metal	Metal W	Metal X	Metal Y	Metal Z
Metal oxide				
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.



TURN OVER FOR THE NEXT QUESTION

Turn over ►

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 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 properties of four hydrocarbons that are found in crude oil.

Name of the hydrocarbon	Boiling point
ethane	- 89 °C
butane	0 °C
pentane	+ 36 °C
decane	+ 175 °C

Choose from the list the **two** statements that are correct.**decane has the largest molecules****decane will be most volatile****ethane and butane are gases at 20 °C****ethane has the highest boiling point****pentane ignites most easily**

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

This question is about the uses of limestone and some of the substances made from limestone.

8.1 Which of these substances is used as a stone for building?

- A Coke
- B Limestone
- C Quicklime
- D Slaked lime

8.2 We add slaked lime to the soil to

- A improve the drainage.
- B increase the humus content.
- C reduce the acidity.
- D reduce the alkalinity.

8.3 Concrete is made by mixing water with

- A cement and limestone.
- B cement, clay and quicklime.
- C cement, sand and crushed rock.
- D crushed rock and sand.

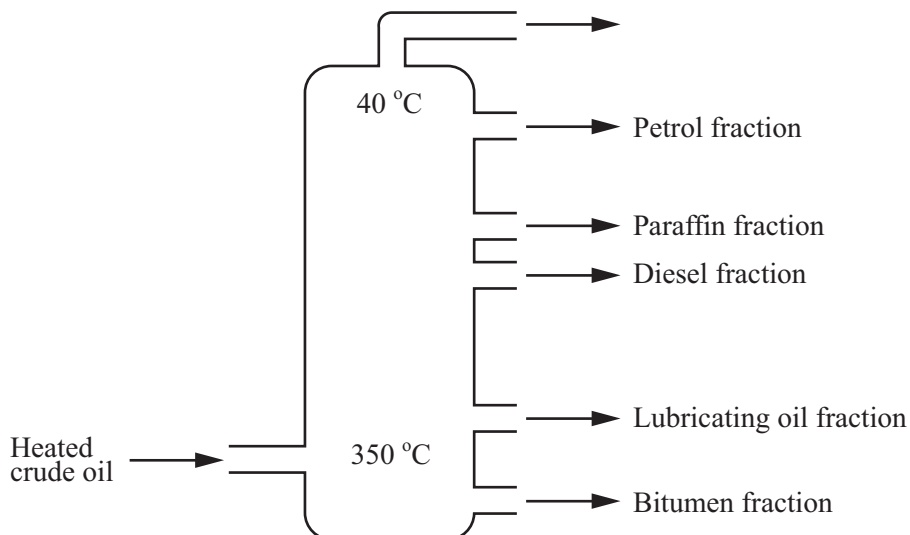
8.4 In the blast furnace, slag is produced from the reaction of

- A limestone and acidic impurities.
- B limestone and alkaline impurities.
- C limestone and coke.
- D limestone and iron.

Turn over ►

QUESTION NINE

The diagram shows how a fractionating column can be used to separate the substances in crude oil into a number of fractions.



9.1 Crude oil can be separated into fractions in this way because it is

- A a compound.
- B a hydrocarbon.
- C a mixture of compounds.
- D a mixture of elements.

9.2 The crude oil is heated to about 350 °C before it enters the fractionating column.

This is so that it will

- A condense.
- B decompose.
- C react.
- D vaporise.

9.3 In the fractionating column, the crude oil separates into fractions when it

- A** condenses at different temperatures.
- B** condenses at 40 °C.
- C** condenses at 350 °C.
- D** cracks into smaller molecules.

9.4 The fractions which are collected from the top of the fractionating column

- A** are polymers.
- B** are solids at room temperature.
- C** are useful as fuels.
- D** have high boiling points.

TURN OVER FOR THE NEXT QUESTION

Turn over ►

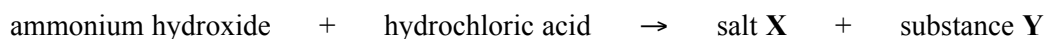
QUESTION TEN

This question is about salts.

10.1 Which group of elements forms soluble hydroxides?

- A Alkali metals
- B Group 0 elements
- C Non-metal elements
- D Transition metals

This is the equation for the reaction between ammonium hydroxide and hydrochloric acid.



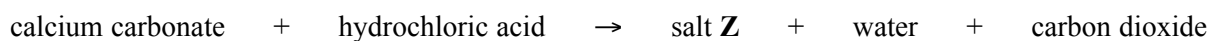
10.2 What is the name of the salt **X**?

- A Ammonium chloride
- B Ammonium hydroxide
- C Ammonium nitrate
- D Ammonium sulphate

10.3 What is the name of substance **Y**?

- A Carbon dioxide
- B Hydrogen
- C Oxygen
- D Water

10.4 Calcium carbonate will also react with hydrochloric acid.



What is the name of the salt **Z**?

- A Ammonium chloride
- B Calcium chloride
- C Carbon chloride
- D Carbonate chloride

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 ONE

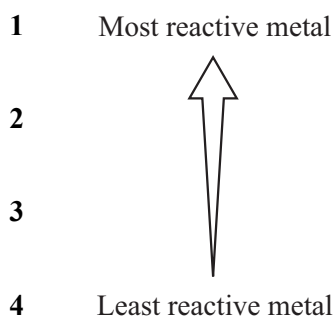
The table shows the results of heating four metals, **W**, **X**, **Y** and **Z**, with an oxide of a different metal.

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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

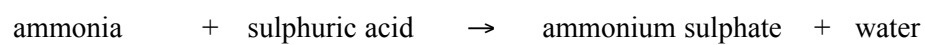
Match metals **W**, **X**, **Y** and **Z** from the table with the numbers **1–4** in the reactivity series.



Turn over ►

QUESTION TWO

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



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

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 properties of four hydrocarbons that are found in crude oil.

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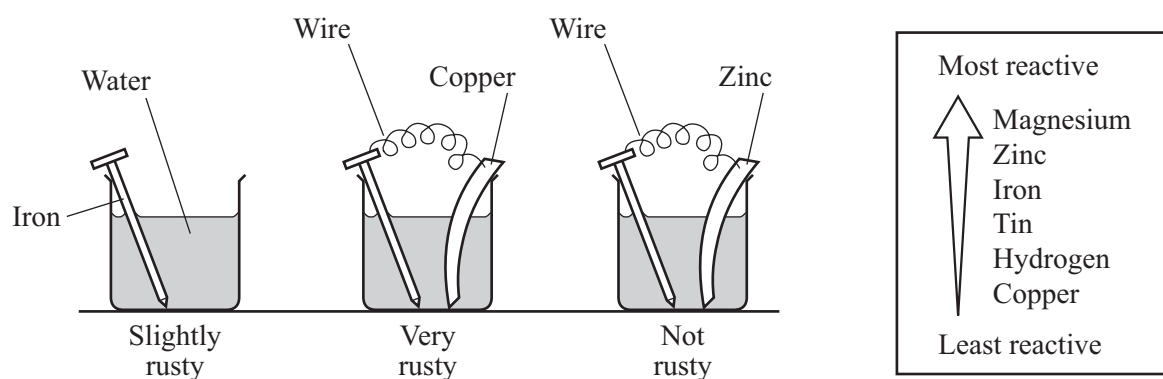
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QUESTION FOUR

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

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

This question is about the uses of limestone and some of the substances made from limestone.

5.1 Which of these substances is used as a stone for building?

- A Coke
- B Limestone
- C Quicklime
- D Slaked lime

5.2 We add slaked lime to the soil to

- A improve the drainage.
- B increase the humus content.
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5.3 Concrete is made by mixing water with

- A cement and limestone.
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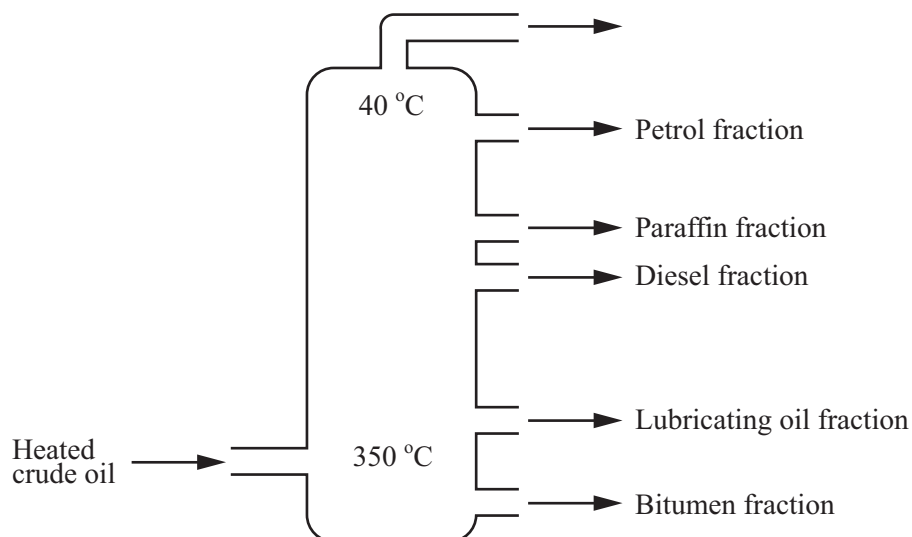
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TURN OVER FOR THE NEXT QUESTION

Turn over ►

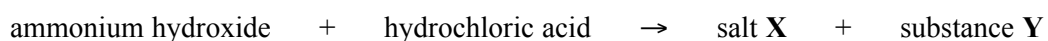
QUESTION SEVEN

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7.1 Which group of elements forms soluble hydroxides?

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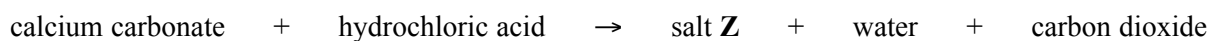
7.2 What is the name of the salt **X**?

- A** Ammonium chloride
- B** Ammonium hydroxide
- C** Ammonium nitrate
- D** Ammonium sulphate

7.3 What is the name of substance **Y**?

- A** Carbon dioxide
- B** Hydrogen
- C** Oxygen
- D** Water

7.4 Calcium carbonate will also react with hydrochloric acid.



What is the name of the salt **Z**?

- A** Ammonium chloride
- B** Calcium chloride
- C** Carbon chloride
- D** Carbonate chloride

QUESTION EIGHT

This question is about making salts.

8.1 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



8.2 Which of these substances can be produced by the type of reaction described in **8.1**?

A Ammonium nitrate

B Copper sulphate

C Lead sulphate

D Zinc chloride

8.3 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

8.4 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

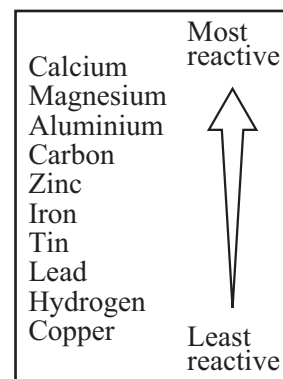
D sodium hydroxide + sulphuric acid

Turn over ►

QUESTION NINE

Iron is obtained from iron oxide in the blast furnace.

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



9.1 The substance oxidised in **both** these reactions is

- A carbon.
- B carbon dioxide.
- C carbon monoxide.
- D oxygen.

9.2 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

9.3 The waste gases leaving the furnace are mainly a mixture of

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

9.4 How could calcium be extracted from calcium chloride?

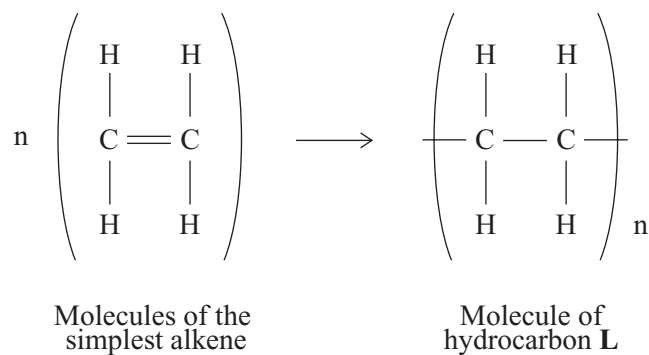
- A** By displacement reaction with magnesium
- B** By melting it and then passing an electric current through the molten calcium chloride
- C** By passing an electric current through solid calcium chloride
- D** By strongly heating the calcium chloride with carbon

TURN OVER FOR THE NEXT QUESTION

Turn over ►

QUESTION TEN

The diagram represents a chemical reaction.



10.1 What is the name of the simplest alkene?

- A Butene
- B Ethane
- C Ethene
- D Methane

10.2 What type of substance is hydrocarbon L?

- A A monomer
- B A polymer
- C An alkene
- D An unsaturated hydrocarbon

10.3 The letter 'n' before the molecule of the simplest alkene means

- A a large number.
- B a small number.
- C neutral.
- D nine.

10.4 The simplest alkene can take part in a reaction of this type because

- A it can be cracked.
- B it has C — H bonds.
- C it is saturated.
- D it is unsaturated.

END OF TEST

THERE ARE NO QUESTIONS PRINTED ON THIS PAGE