Surname		Other Names	
Centre Number			Candidate Number				
Candidate Signature									

General Certificate of Secondary Education
June 2004

ASSESSMENT and QUALIFICATIONS ALLIANCE

SCIENCE: SINGLE AWARD (MODULAR) 346015
Materials and Reactions (Module 15)

Tuesday 29 June 2004 Morning Session

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

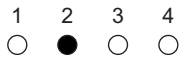
You may use a calculator.

Time allowed: 30 minutes

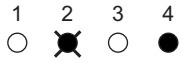
Instructions
- Fill in the boxes at the top of this page.
- Check that your name, candidate number and centre number are printed on the separate answer sheet.
- Check that the separate answer sheet has the title "Materials and Reactions" printed on it.
- Attempt **one Tier only**, **either** the Foundation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

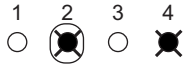
- Use a **black ball-point pen**.
- For each answer **completely fill in the circle** as shown:



- 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 chemical substances.

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

air

carbon

oxygen

poly(ethene)

Chemical substance	What we can say about the substance
1	it is a compound
2	it is a gaseous element
3	it is a mixture
4	it is a solid element

QUESTION TWO

This question is about common names for substances.

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

haematite

limestone

quicklime

slaked lime

Common name	Substance
1	it is a rock formed mainly of calcium carbonate
2	it is the common name for calcium hydroxide
3	it is the common name for calcium oxide
4	it is the ore from which iron is obtained

QUESTION THREE

This question is about processes that change things.

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

condensation

decomposition

evaporation

neutralisation

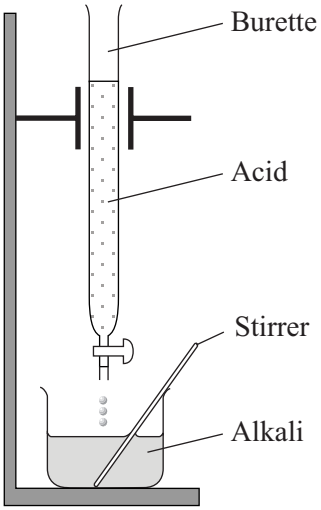
Process	Example of the process
1	addition of powdered limestone to reduce the acidity in lakes
2	breakdown of magnesium carbonate when it is heated
3	changing a gaseous hydrocarbon into liquid form
4	formation of water vapour from water

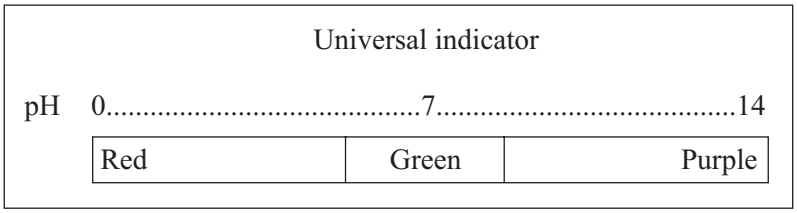
Turn over ▶

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.



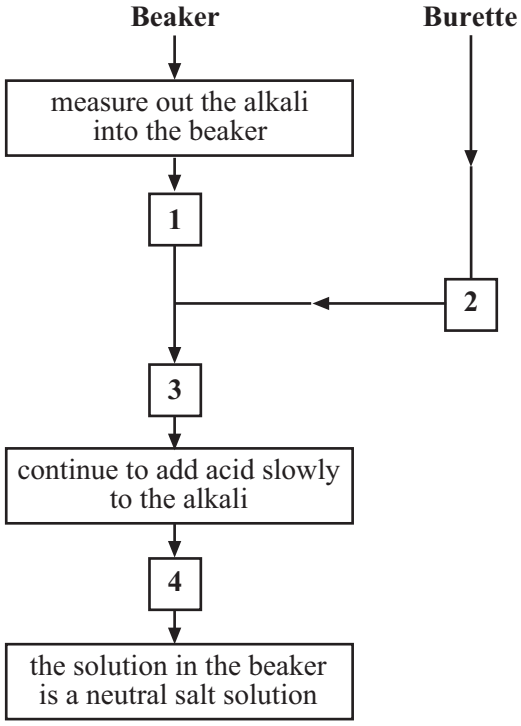


P **add a few drops of indicator which turns purple**

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**.

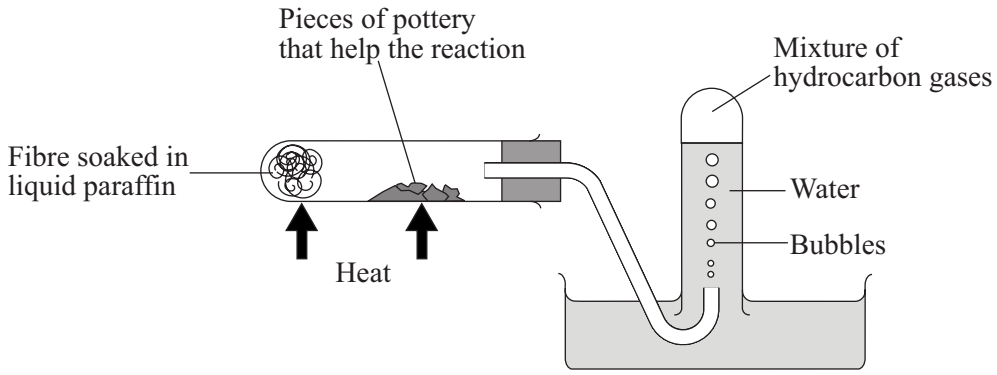
In these questions choose the best **two** answers.

Do **not** choose more than two.

Mark your choices on the answer sheet.

QUESTION SIX

This question is about cracking the hydrocarbons in liquid paraffin.
Liquid paraffin is thick (viscous).



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

cracking of the paraffin produces polymers

hydrocarbon gases ignite less easily than the liquid paraffin

the broken pieces of pottery act as a catalyst

the paraffin is vaporised before it is cracked

the paraffin molecules are smaller than hydrocarbon gas molecules

QUESTION SEVEN

Crude oil can be separated into fractions.

Each fraction contains several different hydrocarbons.

Fraction of crude oil	Number of carbon atoms in each hydrocarbon molecule
petrol	$C_4 - C_{12}$
diesel oil	$C_{14} - C_{19}$
lubricating oil	$C_{21} - C_{50}$
bitumen	C_{50} and upwards

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

diesel oil boils at a lower temperature than lubricating oil

diesel oil is a thinner liquid than petrol

crude oil is separated into fractions by thermal decomposition

hydrocarbons with fewer than 4 carbon atoms in their molecules are difficult to ignite

the hydrocarbons in each fraction have similar boiling points

TURN OVER FOR THE NEXT QUESTION

SECTION C

Questions **EIGHT** to **TEN**.

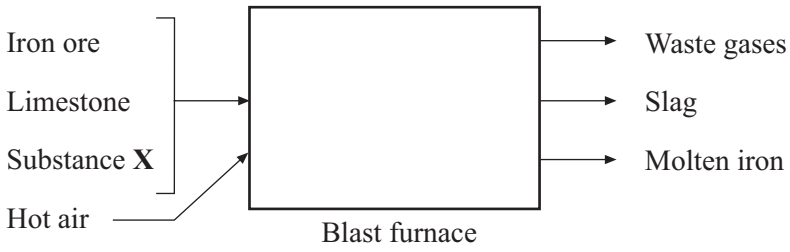
Each of these questions has four parts.

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

Mark your choices on the answer sheet.

QUESTION EIGHT

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



8.1 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

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

A Carbon dioxide

B Carbon monoxide

C Hot air

D Oxygen

8.3 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

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

A Carbon dioxide and nitrogen.

B Carbon dioxide and oxygen.

C Carbon monoxide and carbon dioxide.

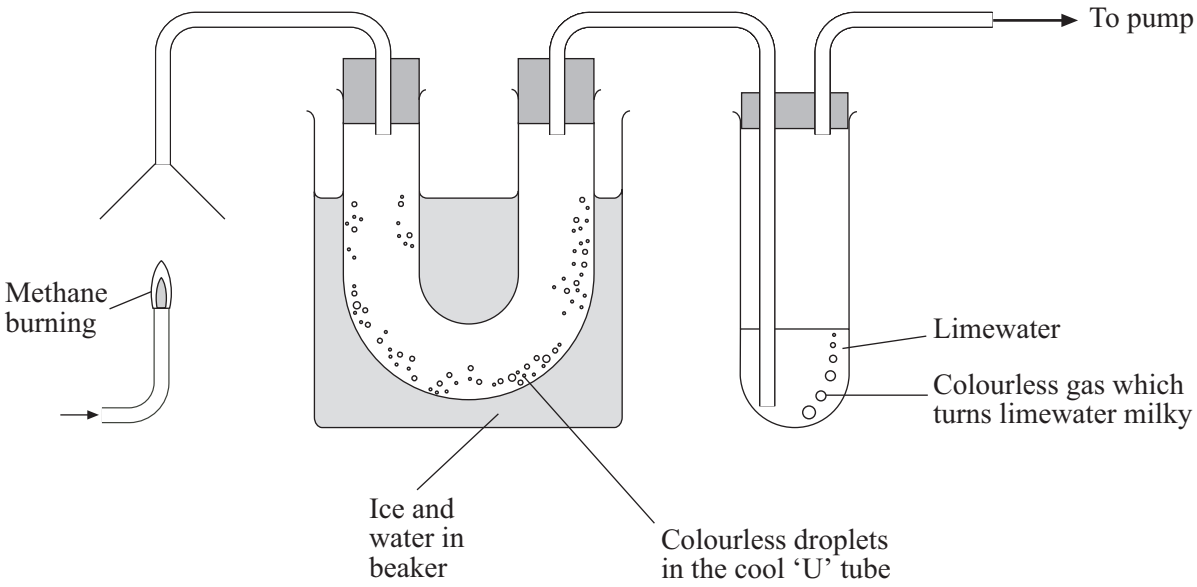
D Carbon monoxide and nitrogen.

TURN OVER FOR THE NEXT QUESTION

QUESTION NINE

Methane is a hydrocarbon.

The diagram shows apparatus used to investigate methane burning in air.



9.1 Which gas in the air reacts with methane in this experiment?

A Ammonia

B Hydrogen

C Nitrogen

D Oxygen

9.2 The compound that collects in the 'U' tube, as colourless droplets, is . . . . .

A a carbonate.

B an oxide of carbon.

C an oxide of hydrogen.

D an oxide of sulphur.

9.3 The colourless gas produced when the methane burns is . . . . .

A ammonia.

B carbon dioxide.

C nitrogen.

D sulphur dioxide.

9.4 Methane is a gas and it is easily ignited.

This suggests that it is a hydrocarbon . . . . .

A that will not burn easily.

B with a high boiling point.

C with a large number of carbon atoms in its molecule.

D with small molecules.

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

Crude oil can be separated into fractions.

Each fraction contains several different hydrocarbons.

Fraction of crude oil	Number of carbon atoms in each hydrocarbon molecule
petrol	$C_4 - C_{12}$
diesel oil	$C_{14} - C_{19}$
lubricating oil	$C_{21} - C_{50}$
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Choose the **two** statements that are correct.

diesel oil boils at a lower temperature than lubricating oil

diesel oil is a thinner liquid than petrol

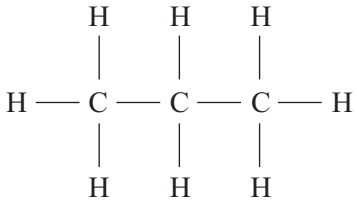
crude oil is separated into fractions by thermal decomposition

hydrocarbons with fewer than 4 carbon atoms in their molecules are difficult to ignite

the hydrocarbons in each fraction have similar boiling points

QUESTION FOUR

The diagram shows a molecule of a compound that can be obtained from crude oil.



Which **two** statements about this compound are correct?

it burns to produce carbon dioxide and water

it is a polymer

it is a saturated compound

it is produced by addition polymerisation

its molecules can join together to form poly(ethene)

TURN OVER FOR THE NEXT QUESTION

SECTION C

Questions **FIVE** to **TEN**.

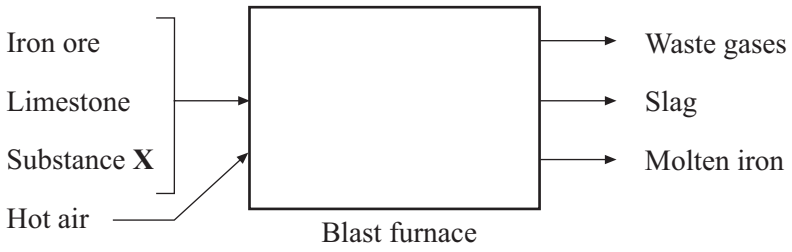
Each of these questions has four parts.

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

Mark your choices on the answer sheet.

QUESTION FIVE

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



5.1 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

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

A Carbon dioxide

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C Hot air

D Oxygen

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

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C Limestone and acidic impurities

D Limestone and iron

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

A Carbon dioxide and nitrogen.

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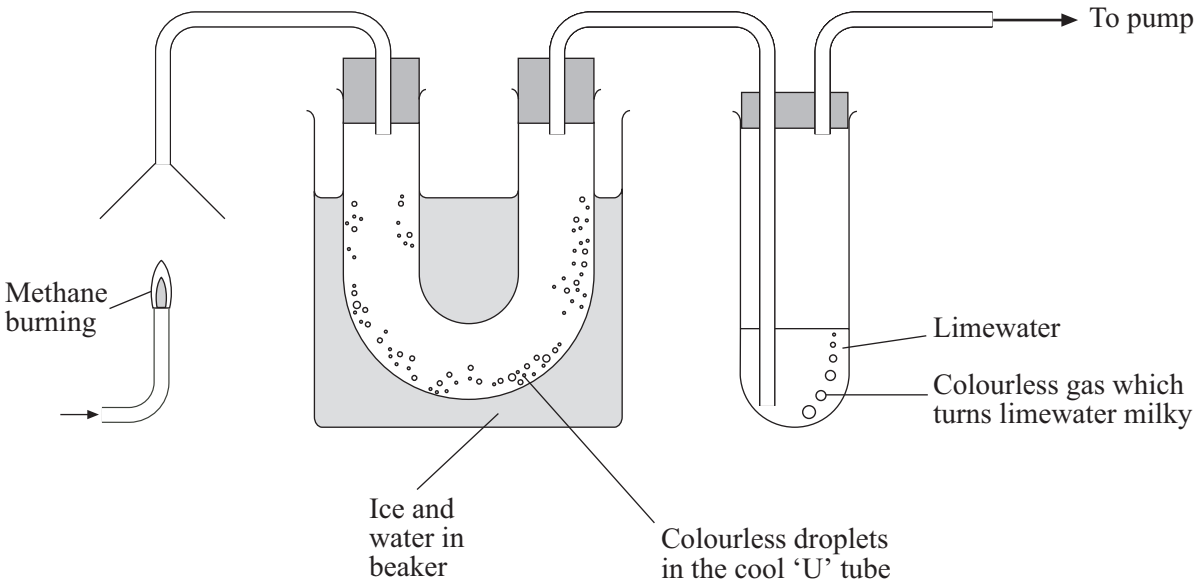
TURN OVER FOR THE NEXT QUESTION

QUESTION SIX

Methane is a hydrocarbon.

The diagram shows apparatus used to investigate methane burning in air.



6.1 Which gas in the air reacts with methane in this experiment?

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B Hydrogen

C Nitrogen

D Oxygen

6.2 The compound that collects in the 'U' tube, as colourless droplets, is . . . . .

A a carbonate.

B an oxide of carbon.

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6.3 The colourless gas produced when the methane burns is . . . . .

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C nitrogen.

D sulphur dioxide.

6.4 Methane is a gas and it is easily ignited.

This suggests that it is a hydrocarbon . . . . .

A that will not burn easily.

B with a high boiling point.

C with a large number of carbon atoms in its molecule.

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TURN OVER FOR THE NEXT QUESTION

QUESTION SEVEN

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

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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.

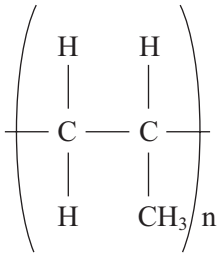
C it is only a recent discovery.

D its relative atomic mass is too great.

TURN OVER FOR THE NEXT QUESTION

QUESTION EIGHT

The diagram represents a long chain molecule of poly(propene).



8.1 The general name given to long chain molecules such as this is . . . . .

A ethenes.

B poly(ethenes).

C polymers.

D polythenes.

8.2 The monomer, propene, from which poly(propene) is made, is . . . . .

A a non-flammable hydrocarbon.

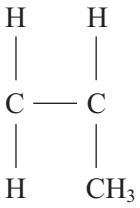
B a saturated hydrocarbon.

C an unreactive hydrocarbon.

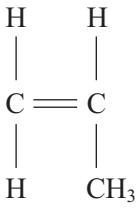
D an unsaturated hydrocarbon.

8.3 A molecule of propene can be represented by . . . . .

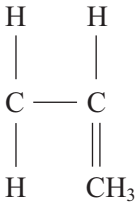
A



B



C



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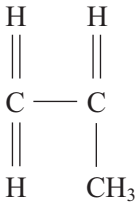


8.4 When molecules of propene react to produce poly(propene), the products of the reaction are . . . . .

A poly(propene) and carbon dioxide.

B poly(propene) and oxygen.

C poly(propene) and water.

D poly(propene) only.

TURN OVER FOR THE NEXT QUESTION

QUESTION NINE

Iron (steel) will corrode in moist air.

Stainless steel does not corrode.
Stainless steel is a mixture of iron and other metals.

9.1 Mixtures of metals are called . . . . .

A alloys.

B catalysts.

C compounds.

D ores.

9.2 One metal mixed with iron to make stainless steel is . . . . .

A aluminium.

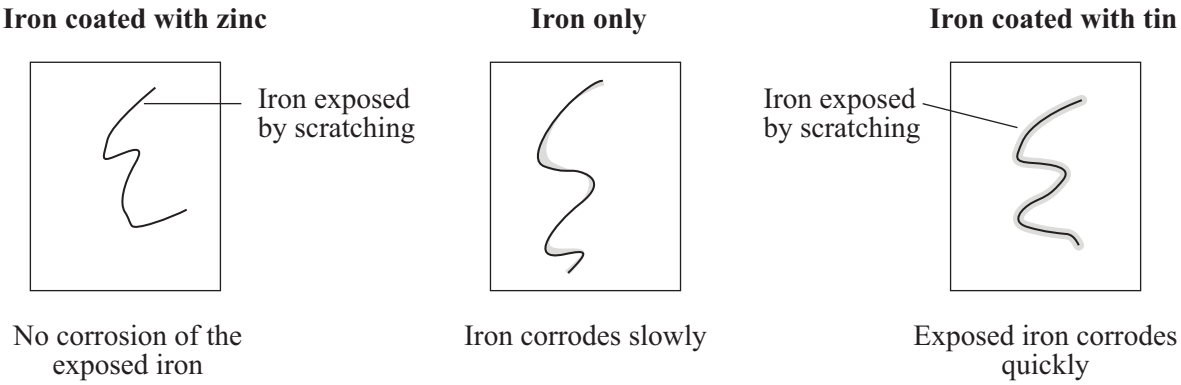
B calcium.

C chromium.

D potassium.

Iron corrodes when it reacts with moist air.

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



Magnesium	Most reactive
Zinc	
Iron	
Tin	
Lead	Least reactive

9.3 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.

9.4 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 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