Surname		Other Names	
Centre Number			Candidate Number				
Candidate Signature									

General Certificate of Secondary Education
Spring 2005

AQA
ASSESSMENT and QUALIFICATIONS ALLIANCE

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

Wednesday 2 March 2005 Morning Session

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

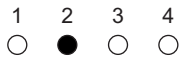
You may use a calculator.

Time allowed: 30 minutes

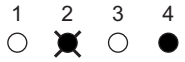
Instructions
- Fill in the boxes at the top of this page.
- Check that your name, candidate number and centre number are printed on the separate answer sheet.
- Check that the separate answer sheet has the title "Materials & Reactions" printed on it.
- Attempt **one Tier only**, **either** the Foundation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

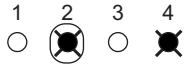
- Use a **black ball-point pen**.
- For each answer **completely fill in the circle** as shown:



- 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 13 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 limestone.

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

calcium carbonate

calcium hydroxide

calcium oxide

carbon dioxide

Limestone is a rock containing mainly . . . . . **1** . . . . . .

Limestone can be heated in a kiln to make quicklime, which is also called . . . . . **2** . . . . . .

In this process . . . . . **3** . . . . . is also produced.

Quicklime reacts with water to produce . . . . . **4** . . . . . .

QUESTION TWO

This question is about metal and non-metal elements.

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

carbon

chromium

iron

sulphur

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

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

A non-metal element that will displace less reactive metals from their oxides is . . . . . **3** . . . . . .

Most fuels contain carbon and hydrogen and may also contain . . . . . **4** . . . . . .

TURN OVER FOR THE NEXT QUESTION

QUESTION THREE

This question is about how we use some substances.

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

clay

haematite

poly(ethene)

poly(propene)

Substance	What we use it for
1	to make cement
2	to make iron
3	to make plastic bags and plastic bottles
4	to make ropes and crates

QUESTION FOUR

This question is about processes that change things.

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

combining

condensing

cracking

neutralising

Process	Example of the process
1	breaking down the alkane, decane ($C_{10}H_{22}$), to form octane (C_8H_{18}) and ethene (C_2H_4)
2	forming the oceans on Earth from water (vapour) in the atmosphere
3	reacting together hydrogen and oxygen to form water (vapour)
4	using slaked lime to reduce acidity in soils

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.

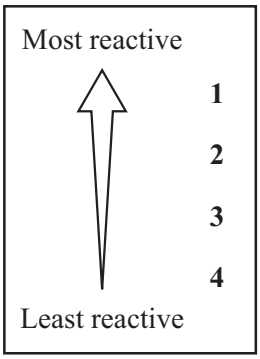
Match the metals from the list with the numbers **1–4** in the reactivity series.

metal A

metal B

metal C

metal D



TURN OVER FOR THE NEXT QUESTION

SECTION B

Questions **SIX** and **SEVEN**.

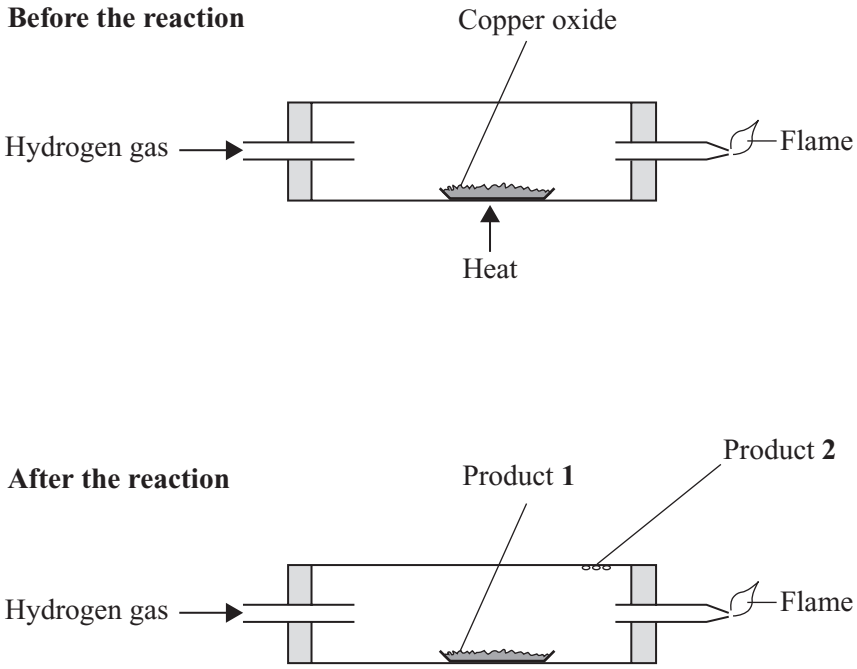
In these questions choose the best **two** answers.

Do **not** choose more than two.

Mark your choices on the answer sheet.

QUESTION SIX

The diagram shows an experiment where hydrogen gas reacts with copper oxide.



Which are the **two** products of this reaction?

copper

copper hydroxide

copper sulphate

oxygen

water

QUESTION SEVEN

This question is about plastics.

Which **two** of these statements are true?

most plastics are biodegradable

most plastics resist breakdown by microorganisms

plastics are made when large molecules are broken down

plastics are produced by fractional distillation of crude oil

poly(ethene) is a plastic

TURN OVER FOR THE NEXT QUESTION

SECTION C

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

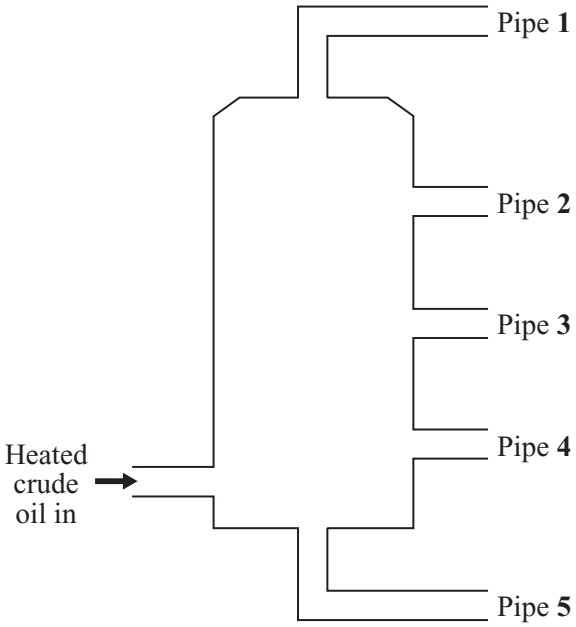
Each of these questions has four parts.

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

Mark your choices on the answer sheet.

QUESTION EIGHT

Fractional distillation is used to separate crude oil into fractions.



8.1 Crude oil is . . . . .

A a compound of hydrocarbon atoms.

B a compound of hydrocarbon molecules.

C a mixture of hydrocarbon atoms.

D a mixture of hydrocarbon molecules.

8.2 Which physical change occurs to crude oil vapour during this fractional distillation?

A Condensation

B Evaporation

C Freezing

D Melting

8.3 From which pipe would you obtain the most volatile fraction?
From which pipe would you obtain the most viscous fraction?

	Most volatile	Most viscous
A	Pipe **1**	Pipe **1**
B	Pipe **1**	Pipe **5**
C	Pipe **5**	Pipe **1**
D	Pipe **5**	Pipe **5**

8.4 From which pipe would you obtain the fraction with the highest boiling point?
From which pipe would you obtain the fraction which could be most easily ignited?

	Highest boiling point	Most easily ignited
A	Pipe **1**	Pipe **1**
B	Pipe **1**	Pipe **5**
C	Pipe **5**	Pipe **1**
D	Pipe **5**	Pipe **5**

TURN OVER FOR THE NEXT QUESTION

QUESTION NINE

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															
Na	Mg	**Central block**									Al					Ar
	Ca				Cr		Fe			Cu	Zn					

9.1 The metals in the **central block** are called the . . . . .

A alkali metals.

B alkaline earth metals.

C noble gases.

D transition elements.

9.2 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).

9.3 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**.

9.4 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

QUESTION TEN

This question is about burning fuels.

10.1 Many fuels contain hydrocarbons.

Hydrocarbons are . . . . .

A compounds.

B elements.

C mixtures.

D oxides.

10.2 Which word equation shows what happens when a pure hydrocarbon burns?

A hydrocarbon + carbon dioxide → oxygen + water

B hydrocarbon + oxygen → carbon dioxide + water

C hydrocarbon + oxygen → hydrogen + carbon dioxide

D hydrocarbon + oxygen → sulphur dioxide + water

10.3 When crude oil burns, the three main products are carbon dioxide, water and sulphur dioxide.

These three substances are all . . . . .

A carbonates.

B hydroxides.

C oxides.

D sulphates.

10.4 Coke is used as a fuel in the blast furnace.

When the coke burns in the hot air blown into the furnace, the main product is . . . . .

A carbon.

B carbon dioxide.

C sulphur dioxide.

D water.

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.

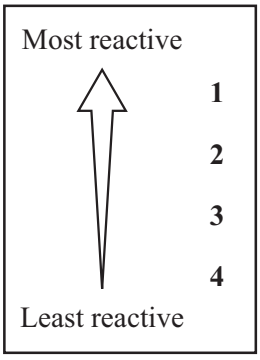
Match the metals from the list with the numbers **1–4** in the reactivity series.

metal A

metal B

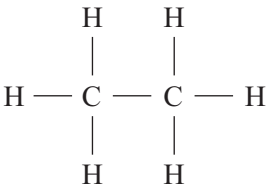
metal C

metal D



QUESTION TWO

The diagrams below show the structural formulae of four organic compounds.



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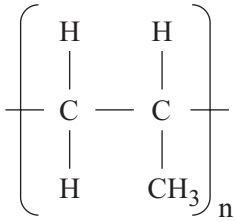

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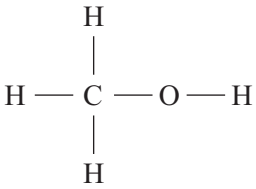

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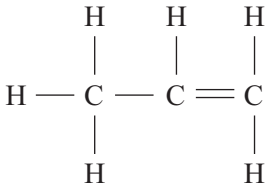


M

Match each compound with the descriptions **1–4** in the table.

Organic compound	Description
1	it is a polymer
2	it is a saturated hydrocarbon with a low melting point
3	it is an unsaturated hydrocarbon
4	it is **not** a hydrocarbon

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 plastics.

Which **two** of these statements are true?

most plastics are biodegradable

most plastics resist breakdown by microorganisms

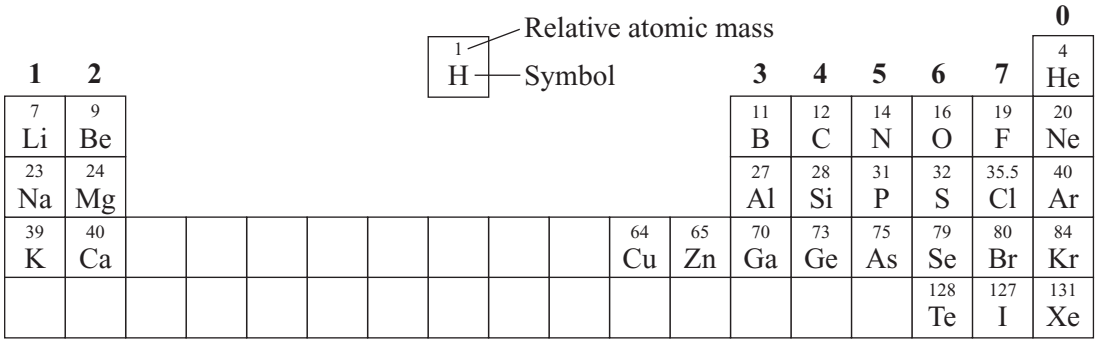
plastics are made when large molecules are broken down

plastics are produced by fractional distillation of crude oil

poly(ethene) is a plastic

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 position in the table.



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 C

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

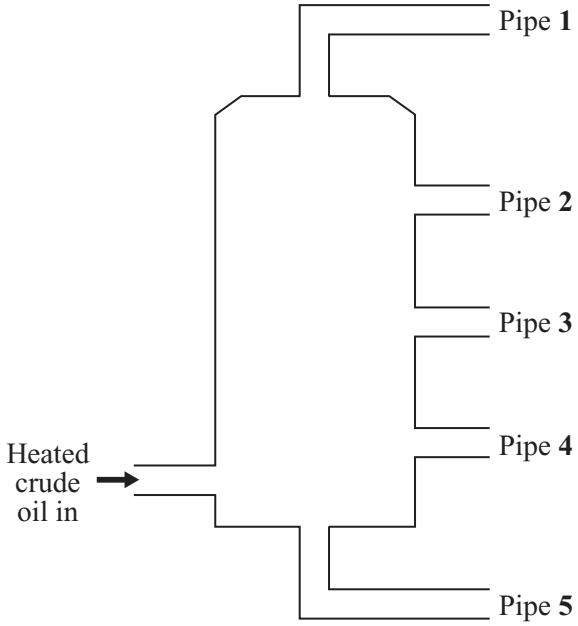
Each of these questions has four parts.

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

Mark your choices on the answer sheet.

QUESTION FIVE

Fractional distillation is used to separate crude oil into fractions.



5.1 Crude oil is . . . . .

A a compound of hydrocarbon atoms.

B a compound of hydrocarbon molecules.

C a mixture of hydrocarbon atoms.

D a mixture of hydrocarbon molecules.

5.2 Which physical change occurs to crude oil vapour during this fractional distillation?

A Condensation

B Evaporation

C Freezing

D Melting

5.3 From which pipe would you obtain the most volatile fraction?
From which pipe would you obtain the most viscous fraction?

	Most volatile	**Most viscous**
A	Pipe **1**	Pipe **1**
B	Pipe **1**	Pipe **5**
C	Pipe **5**	Pipe **1**
D	Pipe **5**	Pipe **5**

5.4 From which pipe would you obtain the fraction with the highest boiling point?
From which pipe would you obtain the fraction which could be most easily ignited?

	Highest boiling point	**Most easily ignited**
A	Pipe **1**	Pipe **1**
B	Pipe **1**	Pipe **5**
C	Pipe **5**	Pipe **1**
D	Pipe **5**	Pipe **5**

TURN OVER FOR THE NEXT QUESTION

QUESTION SIX

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																
Na	Mg	**Central block**										Al					Ar
	Ca				Cr		Fe			Cu	Zn						

6.1 The metals in the **central block** are called the . . . . .

A alkali metals.

B alkaline earth metals.

C noble gases.

D transition elements.

6.2 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).

6.3 Metals are found in Groups **1** and **2** and in . . . . . .

A the **central block**.

B Group **0** and the **central bloc**k.

C Groups **0** and **7**.

D Groups **4** and **7**.

6.4 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

QUESTION SEVEN

This question is about burning fuels.

7.1 Many fuels contain hydrocarbons.

Hydrocarbons are . . . . .

A compounds.

B elements.

C mixtures.

D oxides.

7.2 Which word equation shows what happens when a pure hydrocarbon burns?

A hydrocarbon + carbon dioxide → oxygen + water

B hydrocarbon + oxygen → carbon dioxide + water

C hydrocarbon + oxygen → hydrogen + carbon dioxide

D hydrocarbon + oxygen → sulphur dioxide + water

7.3 When crude oil burns, the three main products are carbon dioxide, water and sulphur dioxide.

These three substances are all . . . . .

A carbonates.

B hydroxides.

C oxides.

D sulphates.

7.4 Coke is used as a fuel in the blast furnace.

When the coke burns in the hot air blown into the furnace, the main product is . . . . .

A carbon.

B carbon dioxide.

C sulphur dioxide.

D water.

NO QUESTIONS APPEAR ON THIS PAGE

TURN OVER FOR THE NEXT QUESTION

QUESTION EIGHT

This question is about substances called saturated hydrocarbons.

8.1 The saturated hydrocarbons most useful as fuels have . . . . .

A large molecules.

B large numbers of carbon atoms in a molecule.

C large numbers of hydrogen atoms in a molecule.

D small molecules.

8.2 Which types of bonds are usually found in saturated hydrocarbons?

	Carbon carbon bonds	**Carbon hydrogen bonds**
A	double	double
B	double	single
C	single	double
D	single	single

8.3 Which of the following could be a saturated hydrocarbon?

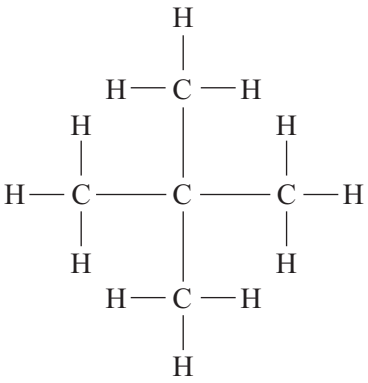
A A substance that burns to form sulphur dioxide

B A substance that can form addition polymers

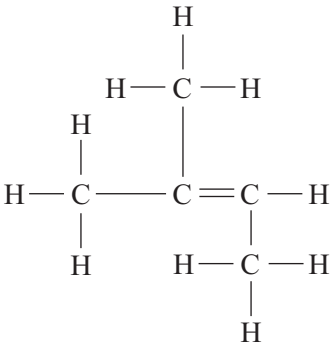
C A substance with the formula C_4H_8

D An unreactive hydrocarbon

8.4 Which of the following structural formulae represents a saturated hydrocarbon?



A



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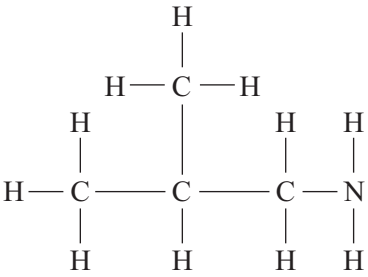

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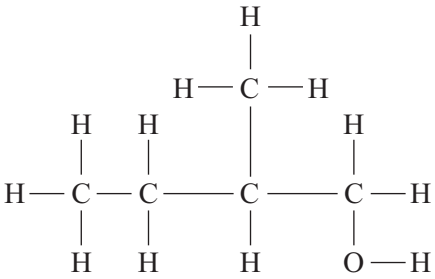


D

TURN OVER FOR THE NEXT QUESTION

QUESTION NINE

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.

9.1 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

9.2 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.

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

A $H^+(aq) + OH^-(aq) \rightarrow 2HO(l)$

B $H^+(aq) + OH^-(aq) \rightarrow H^{2+}O^-(l)$

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

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

9.4 The reaction between hydrochloric acid and ammonia solution can be written . . . . .

A ammonia solution + hydrochloric acid → ammonia chloride + hydrogen.

B ammonia solution + hydrochloric acid → ammonia chloride + water.

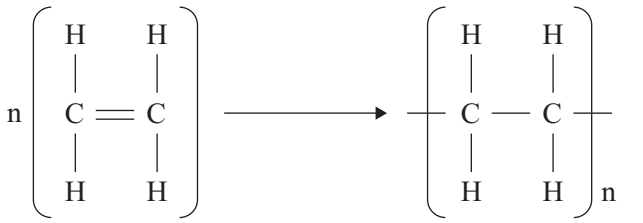
C ammonia solution + hydrochloric acid → ammonium chloride + hydrogen.

D ammonia solution + hydrochloric acid → ammonium chloride + water.

TURN OVER FOR THE NEXT QUESTION

QUESTION TEN

This equation represents a reaction to produce a polymer.



Molecules of monomer Molecule of polymer

10.1 The letter 'n' before the formula for the monomer, stands for . . . . .

A a large number.

B a small number.

C nine.

D normal.

10.2 The monomer is reactive because it is . . . . .

A a carbohydrate.

B a hydrogencarbonate.

C a saturated hydrocarbon.

D an unsaturated hydrocarbon.

10.3 The monomer and polymer in this reaction are . . . . .

	Monomer	**Polymer**
A	ethane	poly(ethane)
B	ethane	poly(ethene)
C	ethene	poly(ethene)
D	styrene	poly(styrene)

10.4 The monomer belongs to a series of hydrocarbons called alkenes and can be represented by the chemical formula C_2H_4.

The formula for the alkene with 3 carbon atoms will be . . . . .

A C_3H_4

B C_3H_6

C C_3H_8

D C_3H_{10}

END OF TEST

THERE ARE NO QUESTIONS PRINTED ON THIS PAGE