Surname		Other Names	
Centre Number			Candidate Number				
Candidate Signature									

General Certificate of Secondary Education
June 2005

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

ASSESSMENT and QUALIFICATIONS ALLIANCE

Tuesday 28 June 2005 Morning Session

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

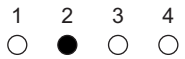
You may use a calculator.

Time allowed: 30 minutes

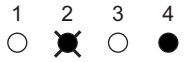
Instructions
- Fill in the boxes at the top of this page.
- Check that your name, candidate number and centre number are printed on the separate answer sheet.
- Check that the separate answer sheet has the title "Materials and Reactions" printed on it.
- Attempt **one Tier only**, **either** the Foundation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

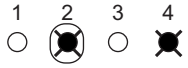
- Use a **black ball-point pen**.
- For each answer **completely fill in the circle** as shown:



- 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 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

The table is about raw materials and substances made from them.

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

calcium oxide

concrete

limestone

slaked lime

Substance	What we can say about the substance
1	it is a quarried rock used as a building material
2	it is made by heating calcium carbonate
3	it is made from cement and used as a building material
4	it is made from quicklime and used to reduce the acidity of soils

QUESTION THREE

This question is about chemical substances.

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

atoms

compounds

elements

molecules

Carbon dioxide and water are both . . . . . **1** . . . . . .

Carbon dioxide is made up of the non-metal . . . . . **2** . . . . . carbon and oxygen.

In . . . . . **3** . . . . . of water (H_2O), hydrogen and oxygen . . . . . **4** . . . . . combine in the ratio 2:1.

QUESTION FOUR

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.

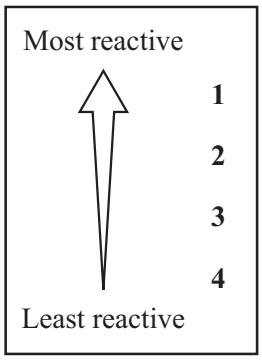
Match the metals from the list with the numbers **1–4** in the reactivity series.

Metal W

Metal X

Metal Y

Metal Z



QUESTION FIVE

This question is about processes that change things.

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

cracking

evaporation

neutralisation

oxidation

Process	Example of the process
1	a large hydrocarbon molecule is broken down into smaller molecules
2	hydrogen burns in air to produce water (vapour)
3	liquid water changes to form water vapour
4	powdered limestone is added to a lake to reduce the acidity

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

Which **two** of the following elements are non-metals?

argon

carbon

copper

magnesium

potassium

QUESTION SEVEN

Substances **X** and **Y** are hydrocarbons.

These are the formulae:

C_2H_6	$C_{10}H_{22}$
Substance **X**	Substance **Y**

Which **two** of the following statements are correct?

substance Y has a higher boiling point than substance X

substance Y has smaller molecules than substance X

substance Y is more viscous than substance X

substance Y is more volatile than substance X

substance Y will ignite more easily than substance X

SECTION C

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

Each of these questions has four parts.

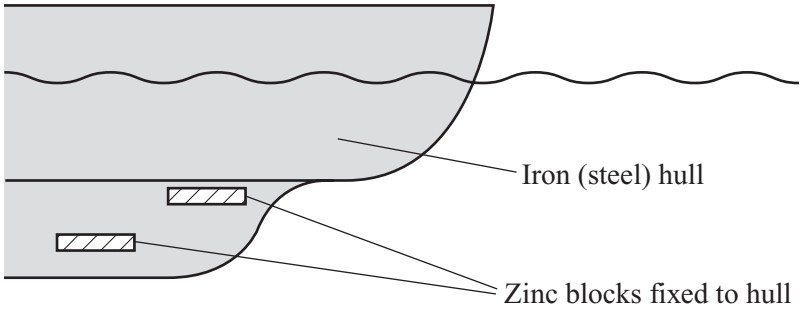
In each part choose only **one** answer.

Mark your choices on the answer sheet.

QUESTION EIGHT

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

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



8.1 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

8.2 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

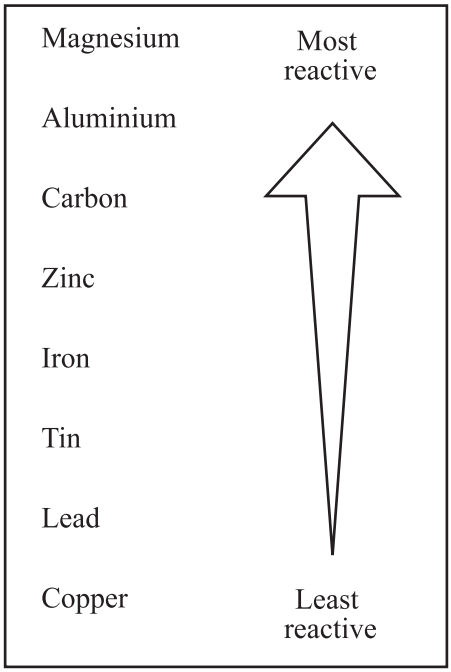
8.3 Which other metal could be used to protect the hull of a ship in a similar way?

A Copper

B Lead

C Magnesium

D Tin



8.4 Stainless steel is made by mixing iron with . . . . .

A chromium.

B copper.

C magnesium.

D zinc.

TURN OVER FOR THE NEXT QUESTION

QUESTION NINE

Crude oil is obtained from the Earth's crust.

Crude oil is mainly a mixture of hydrocarbons.

9.1 Which line correctly describes a hydrocarbon?

	Type of substance	Composition
A	compound	carbon and hydrogen only
B	compound	carbon, hydrogen and oxygen
C	mixture	carbon and hydrogen only
D	mixture	carbon, hydrogen and oxygen

9.2 Crude oil is separated into fractions by fractional distillation.

In the fractionating column, the oil separates into fractions when . . . . .

A it evaporates.

B the vapour condenses at 100 °C.

C the vapour condenses at different temperatures.

D thermal decomposition occurs.

9.3 Fractional distillation works because the hydrocarbons in crude oil have . . . . .

A different boiling points.

B different chemical properties.

C exactly the same boiling point.

D the same ignition temperature.

9.4 All the hydrocarbon molecules in each fraction have . . . . .

A a similar number of carbon atoms.

B a similar number of oxygen atoms.

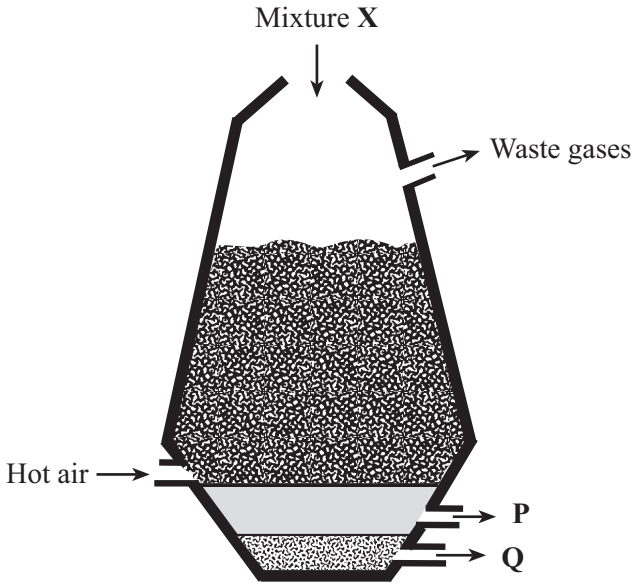
C exactly the same number of carbon atoms.

D exactly the same number of hydrogen atoms.

TURN OVER FOR THE NEXT QUESTION

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 ONE

This question is about processes that change things.

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

cracking

evaporation

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oxidation

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1	a large hydrocarbon molecule is broken down into smaller molecules
2	hydrogen burns in air to produce water (vapour)
3	liquid water changes to form water vapour
4	powdered limestone is added to a lake to reduce the acidity

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

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

Substances **X** and **Y** are hydrocarbons.

These are the formulae:

C_2H_6	$C_{10}H_{22}$
Substance **X**	Substance **Y**

Which **two** of the following statements are correct?

substance Y has a higher boiling point than substance X

substance Y has smaller molecules than substance X

substance Y is more viscous than substance X

substance Y is more volatile than substance X

substance Y will ignite more easily than substance X

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

SECTION C

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

Each of these questions has four parts.

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QUESTION FIVE

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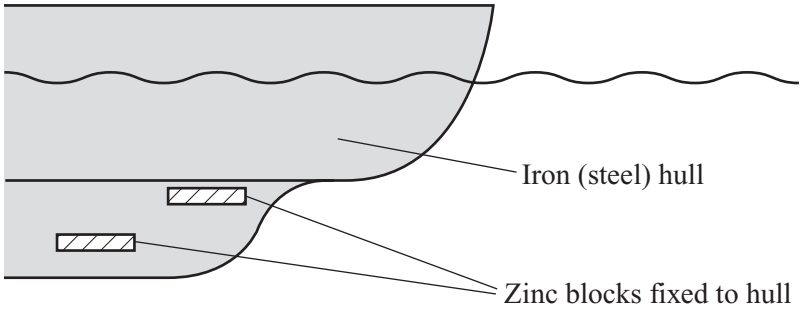

5.1 The zinc corrodes instead of the iron (steel).

What name is given to this type of protection?

A Electrolytic protection

B Parasitic protection

C Sacrificial protection

D Transitional protection

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

A Iron does not react with salt water

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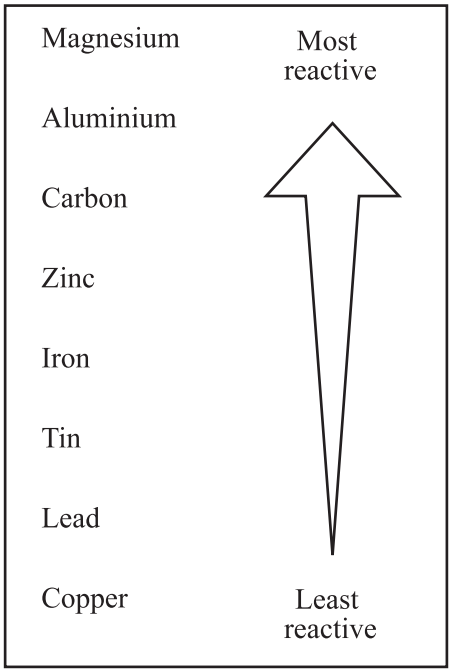
B Lead

C Magnesium

D Tin



5.4 Stainless steel is made by mixing iron with . . . . .

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B copper.

C magnesium.

D zinc.

TURN OVER FOR THE NEXT QUESTION

QUESTION SIX

Crude oil is obtained from the Earth's crust.

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In the fractionating column, the oil separates into fractions when . . . . .

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C exactly the same boiling point.

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A a similar number of carbon atoms.

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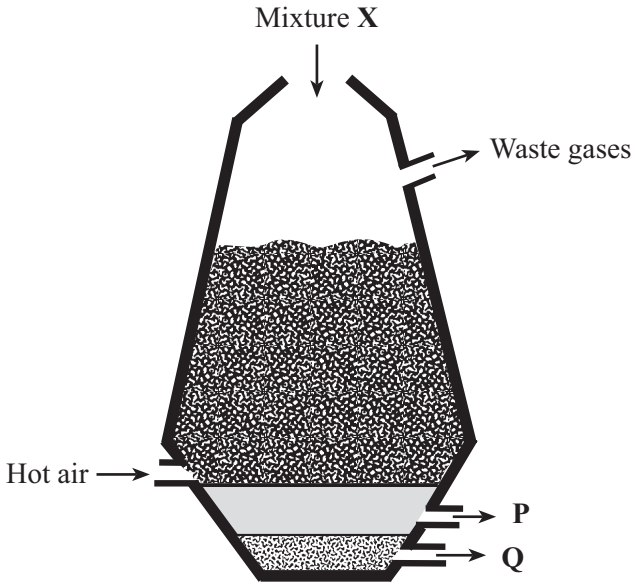
C exactly the same number of carbon atoms.

D exactly the same number of hydrogen atoms.

TURN OVER FOR THE NEXT QUESTION

QUESTION SEVEN

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



7.1 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

7.2 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

7.3 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

7.4 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.

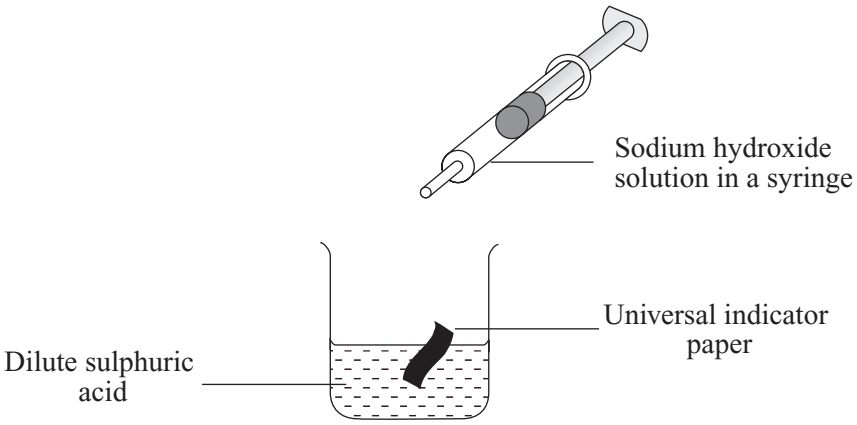
C nitrogen and carbon dioxide.

D nitrogen and oxygen.

TURN OVER FOR THE NEXT QUESTION

QUESTION EIGHT

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



8.1 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

8.2 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

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

A $H^{+}(aq) + OH^{+}(aq) \rightarrow H_2O(l)$

B $H^{+}(aq) + OH^{-}(aq) \rightarrow H_2O(l)$

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

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

8.4 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

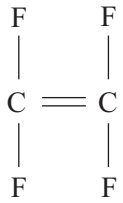
D Potassium metal and nitric acid

TURN OVER FOR THE NEXT QUESTION

QUESTION NINE

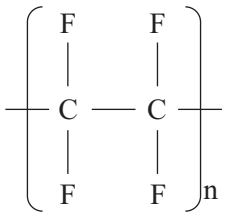
The elements carbon and fluorine form a compound called tetrafluoroethene.

The formula is

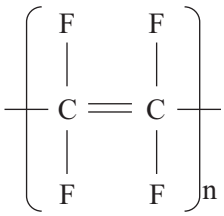


9.1 In a similar way to ethene, molecules of tetrafluoroethene can be joined to make long chains.

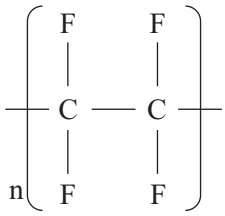
How are these chains represented?



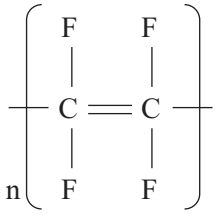
A



B



C



D

9.2 Each molecule of tetrafluoroethene from which the long chain is made is called . . . . .

A a fraction.

B a hydrocarbon.

C a monomer.

D a polymer.

9.3 The reaction to form a long chain molecule from smaller molecules is called . . . . .

A cracking.

B fractionating.

C polymerisation.

D saturation.

9.4 In the reaction to join small molecules of tetrafluoroethene together, the products are . . . . .

A poly(tetrafluoroethene) and carbon dioxide.

B poly(tetrafluoroethene) and oxygen.

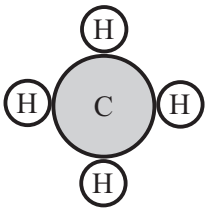
C poly(tetrafluoroethene) and water.

D poly(tetrafluoroethene) only.

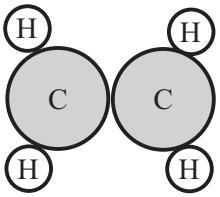
TURN OVER FOR THE NEXT QUESTION

QUESTION TEN

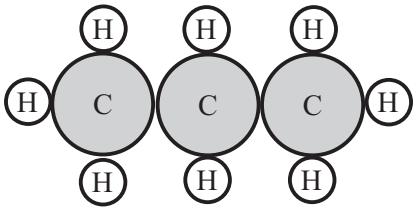
The diagrams represent four hydrocarbon molecules.



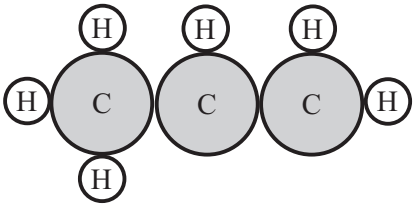
Molecule **R**



Molecule **S**



Molecule **T**



Molecule **U**

10.1 Which of the molecules are saturated hydrocarbons?

A **R** and **S**

B **R** and **T**

C **S** and **U**

D **T** and **U**

10.2 The chemical formula for molecule **R** is CH_4

Which of the following is the chemical formula for molecule **U**?

A C_3H_6

B C_3H_7

C C_3H_8

D C_8H_3

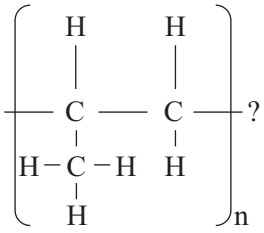
10.3 Which of the molecules have a double carbon carbon bond?

A **R** and **S**

B **R** and **T**

C **S** and **U**

D **T** and **U**

10.4 Which of the molecules will form the polymer 

A **R**

B **S**

C **T**

D **U**

END OF TEST

THERE ARE NO QUESTIONS PRINTED ON THIS PAGE