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|---------------------|--|------------------|--|
| Surname | | Other Names | |
| Centre Number | | Candidate Number | |
| Candidate Signature | | | |

General Certificate of Secondary Education
March 2006



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

346015

Wednesday 8 March 2006 Morning Session

For this paper you must have:

- a black ball-point pen
- an objective test 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.
- Do all rough work in this book, **not** on your answer sheet.

Instructions for recording answers

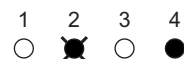
- Use a **black ball-point pen**.

- For each answer **completely fill in the circle** as shown:

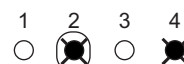


- Do **not** extend beyond the circles.

- 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 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 gases.

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

carbon dioxide (CO₂)

methane (CH₄)

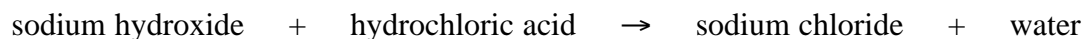
oxygen (O₂)

water vapour (H₂O)

| Gas | What we can say about the gas |
|------------|--|
| 1 | it combines with sulphur to form sulphur dioxide |
| 2 | it is a hydrocarbon gas |
| 3 | it is formed when carbon burns in air |
| 4 | it is formed when hydrogen burns in air |

QUESTION TWO

This question is about the reaction shown in the word equation.



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

an acid

an alkali

an indicator

a salt

In this reaction, the products are . . . **1** . . . and water.

Sodium hydroxide is . . . **2** . . . and is neutralised by . . . **3**

. . . **4** . . . can be used to show when the sodium hydroxide has been completely neutralised.

Turn over for the next question

Turn over ►

QUESTION THREE

This question is about crude oil.

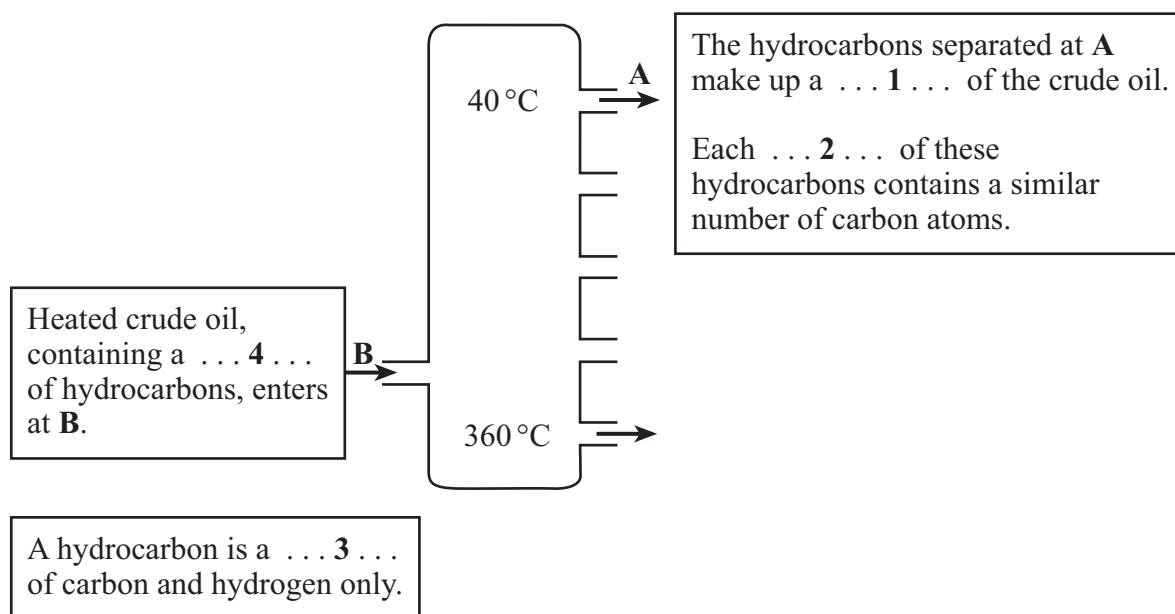
Match words from the list with the numbers 1–4 on the diagram.

compound

fraction

mixture

molecule



QUESTION FOUR

This question is about processes that change things.

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

biodegrade

combine

condense

neutralise

| Process | Example of the process |
|----------------|---|
| 1 | to break down cardboard by microorganisms |
| 2 | to change a hydrocarbon from vapour to liquid |
| 3 | to react together limestone and clay to make cement |
| 4 | to reduce the acidity of lake water by adding limestone |

Turn over for the next question

Turn over ►

QUESTION FIVE

This question is about the positions of four metals, **W**, **X**, **Y** and **Z**, in the reactivity series.

Metal **Y** can be extracted from its oxide by heating a mixture of the oxide and carbon.

Metal **Z** **cannot** be extracted from its oxide by heating a mixture of the oxide and carbon.

Hydrogen will displace metal **X** from its oxide but will **not** displace metal **Y** from its oxide.

Metal **W** will displace metal **X** from its compounds.

Metal **W** will **not** displace metal **Y** from its compounds.

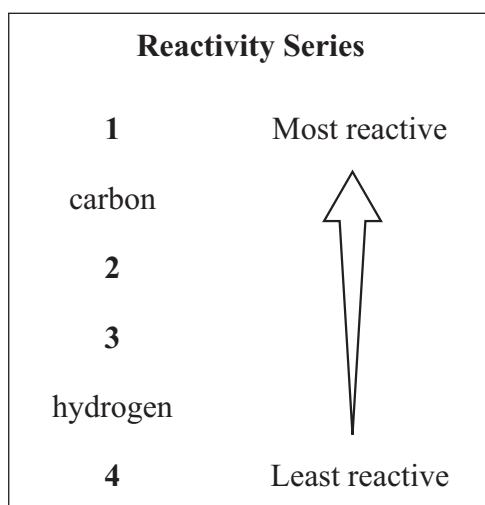
Match metals from the list with the numbers **1–4** in the reactivity series.

metal W

metal X

metal Y

metal Z



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 periodic table.

Which **two** statements are correct?**all the metals are in Group 1 and the central block****argon is in Group 0****metal alloys are in Group 3****more than $\frac{3}{4}$ of the elements are metals****the transition elements are in Group 1****QUESTION SEVEN**

This question is about elements, mixtures and compounds.

Which **two** statements are correct?**air is a compound****carbon dioxide is an element****concrete is a mixture****crude oil is a mixture of several elements****substances with different boiling points can be separated by distillation****Turn over ►**

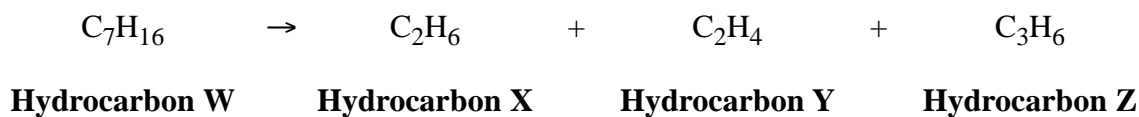
SECTION CQuestions **EIGHT** to **TEN**.

Each of these questions has four parts.

In each part choose only **one** answer.Mark your choices on the answer sheet.

QUESTION EIGHT

The equation shows a hydrocarbon with large molecules being broken down into hydrocarbons with smaller molecules.

**8.1** What is this process called?

- A Combination
- B Combustion
- C Condensation
- D Cracking

8.2 The breakdown of the hydrocarbon with large molecules is done by . . .

- A fractional distillation.
- B passing the hot vapour over a hot catalyst.
- C reaction with a strong acid.
- D reaction with a strong alkali.

8.3 Which of the hydrocarbons is most difficult to ignite?

- A Hydrocarbon **W**
- B Hydrocarbon **X**
- C Hydrocarbon **Y**
- D Hydrocarbon **Z**

8.4 Which of the hydrocarbons has the highest boiling point?

- A Hydrocarbon **W**
- B Hydrocarbon **X**
- C Hydrocarbon **Y**
- D Hydrocarbon **Z**

Turn over for the next question

Turn over ►

QUESTION NINE

This question is about limestone and some substances that can be made from it.

9.1 Quicklime is made . . .

- A by dissolving slaked lime in water.
- B by heating limestone strongly.
- C by the reaction of hydrochloric acid with limestone.
- D by the reaction of limestone with carbon dioxide.

9.2 Which word equation shows how slaked lime can be made?

- A calcium carbonate \rightarrow calcium hydroxide + water
- B calcium carbonate + water \rightarrow calcium hydroxide + carbon dioxide
- C calcium oxide \rightarrow calcium hydroxide + water
- D calcium oxide + water \rightarrow calcium hydroxide

9.3 Both limestone and slaked lime are used . . .

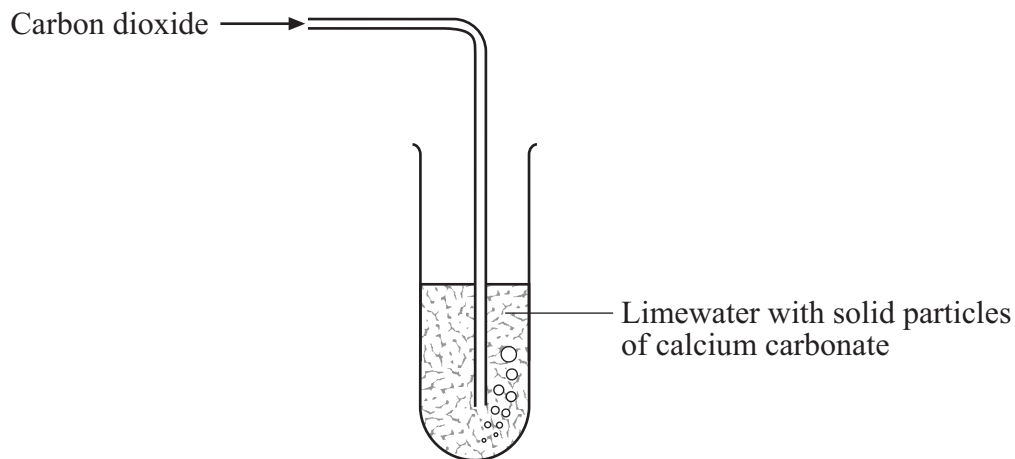
- A to make building blocks for houses.
- B to make cement.
- C to make iron.
- D to reduce the acidity of soils.

9.4 Slaked lime dissolves slightly in water.

The solution is called limewater.

If carbon dioxide gas is bubbled into limewater, solid particles of calcium carbonate are made.

The other product of the reaction is water.



Which of these is the word equation for this reaction?

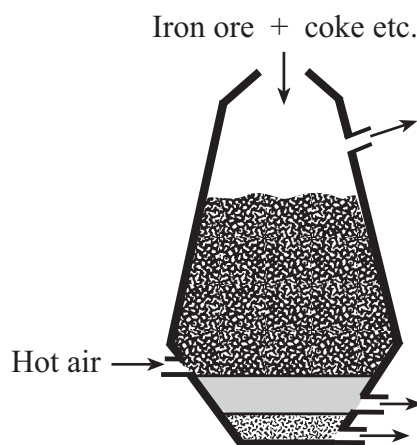
- A** calcium carbonate + carbon dioxide → calcium hydroxide + water
- B** calcium carbonate + water → calcium hydroxide + carbon dioxide
- C** calcium hydroxide + carbon dioxide → calcium carbonate + water
- D** calcium oxide + water → calcium carbonate + carbon dioxide

Turn over for the next question

Turn over ►

QUESTION TEN

Iron is extracted from iron oxide in a blast furnace.



10.1 Why is hot air blown into the furnace?

- A To cool down the contents
- B To melt the iron ore
- C To react with the coke and release energy
- D To react with the iron ore

10.2 Coke burns in the blast furnace to form . . .

- A calcium oxide.
- B carbon.
- C carbon dioxide.
- D slag.

10.3 The substance mainly responsible for taking the oxygen from the iron oxide is . . .

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

10.4 When oxygen is taken from iron oxide, we say that the iron oxide is . . .

- A distilled.
- B electrolysed.
- C oxidised.
- D reduced.

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 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.

Metal **Y** can be extracted from its oxide by heating a mixture of the oxide and carbon.

Metal **Z** **cannot** be extracted from its oxide by heating a mixture of the oxide and carbon.

Hydrogen will displace metal **X** from its oxide but will **not** displace metal **Y** from its oxide.

Metal **W** will displace metal **X** from its compounds.

Metal **W** will **not** displace metal **Y** from its compounds.

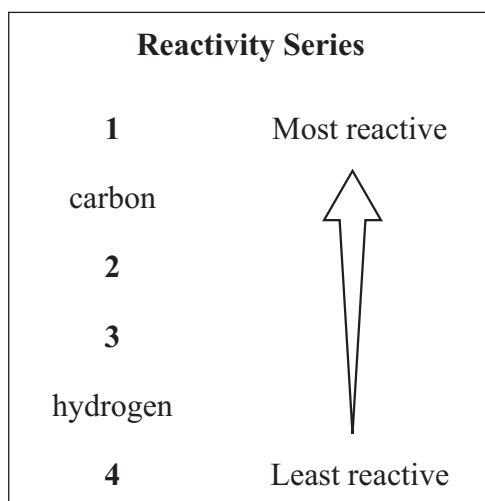
Match metals from the list with the numbers **1–4** in the reactivity series.

metal W

metal X

metal Y

metal Z



QUESTION TWO

Chemical reactions can be represented by word equations.

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

carbon dioxide

ethene

hydrogen

oxygen

sulphur + ... **1** ... → sulphur dioxide

magnesium carbonate → magnesium oxide + ... **2** ...

... **3** ... + oxygen → carbon dioxide + water

lead oxide + ... **4** ... → lead + water

Turn over for the next question

Turn over ►

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 elements, mixtures and compounds.

Which **two** statements are correct?**air is a compound****carbon dioxide is an element****concrete is a mixture****crude oil is a mixture of several elements****substances with different boiling points can be separated by distillation**

QUESTION FOUR

Use the information about **hydrocarbon E** and **hydrocarbon F** to answer the question which follows.

| | |
|---------------------------------------|---------------------------------------|
| Hydrocarbon E | Hydrocarbon F |
| Formula C ₂ H ₆ | Formula C ₂ H ₄ |

Which **two** rows of the table, **J, K, L, M** and **N**, about these two hydrocarbons are correct?

| | Hydrocarbon E | Hydrocarbon F |
|----------|--|--|
| J | carbon atoms joined by a single bond | carbon atoms joined by a double bond |
| K | an alkene | an alkene |
| L | carbon atoms have four bonds | carbon atoms have four bonds |
| M | unsaturated | saturated |
| N | structural formula $ \begin{array}{c} \text{H} \quad \text{H} \\ \quad \\ \text{H} - \text{C} - \text{C} - \text{H} \\ \quad \\ \text{H} \quad \text{H} \end{array} $ | structural formula $ \begin{array}{c} \text{H} \quad \text{H} \\ \quad \\ \text{C} - \text{C} \\ \quad \\ \text{H} \quad \text{H} \end{array} $ |

Turn over for the next question

Turn over ►

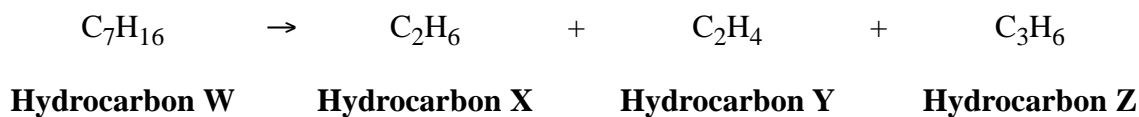
SECTION CQuestions **FIVE** to **TEN**.

Each of these questions has four parts.

In each part choose only **one** answer.Mark your choices on the answer sheet.

QUESTION FIVE

The equation shows a hydrocarbon with large molecules being broken down into hydrocarbons with smaller molecules.

**5.1** What is this process called?

- A Combination
- B Combustion
- C Condensation
- D Cracking

5.2 The breakdown of the hydrocarbon with large molecules is done by . . .

- A fractional distillation.
- B passing the hot vapour over a hot catalyst.
- C reaction with a strong acid.
- D reaction with a strong alkali.

5.3 Which of the hydrocarbons is most difficult to ignite?

- A Hydrocarbon **W**
- B Hydrocarbon **X**
- C Hydrocarbon **Y**
- D Hydrocarbon **Z**

5.4 Which of the hydrocarbons has the highest boiling point?

- A Hydrocarbon **W**
- B Hydrocarbon **X**
- C Hydrocarbon **Y**
- D Hydrocarbon **Z**

Turn over for the next question

Turn over ►

QUESTION SIX

This question is about limestone and some substances that can be made from it.

6.1 Quicklime is made . . .

- A by dissolving slaked lime in water.
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- A calcium carbonate \rightarrow calcium hydroxide + water
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6.3 Both limestone and slaked lime are used . . .

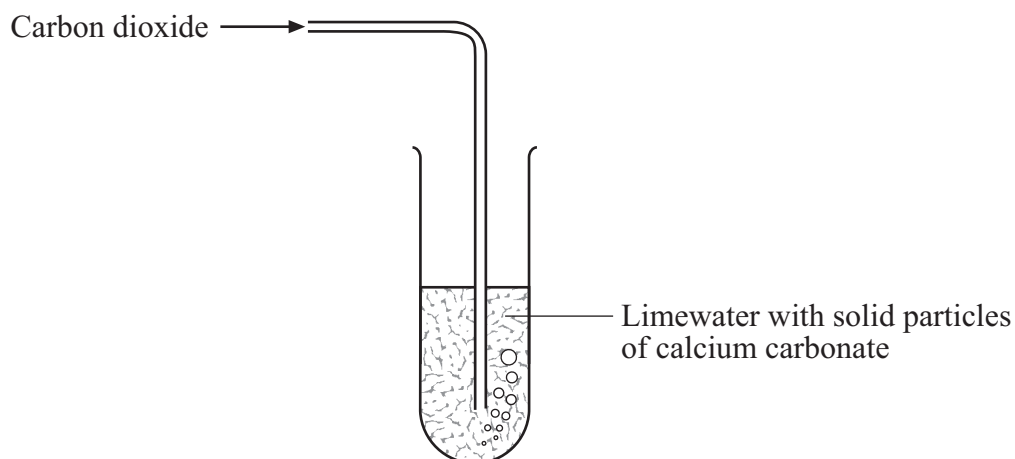
- A to make building blocks for houses.
- B to make cement.
- C to make iron.
- D to reduce the acidity of soils.

6.4 Slaked lime dissolves slightly in water.

The solution is called limewater.

If carbon dioxide gas is bubbled into limewater, solid particles of calcium carbonate are made.

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Which of these is the word equation for this reaction?

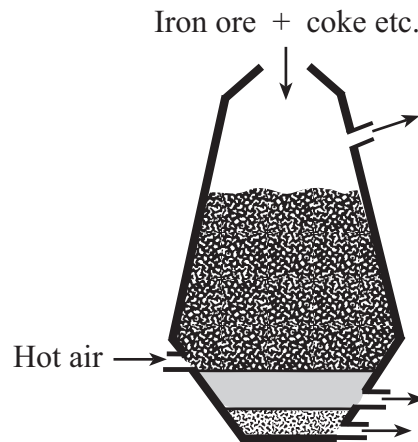
- A** calcium carbonate + carbon dioxide → calcium hydroxide + water
- B** calcium carbonate + water → calcium hydroxide + carbon dioxide
- C** calcium hydroxide + carbon dioxide → calcium carbonate + water
- D** calcium oxide + water → calcium carbonate + carbon dioxide

Turn over for the next question

Turn over ►

QUESTION SEVEN

Iron is extracted from iron oxide in a blast furnace.



7.1 Why is hot air blown into the furnace?

- A To cool down the contents
- B To melt the iron ore
- C To react with the coke and release energy
- D To react with the iron ore

7.2 Coke burns in the blast furnace to form . . .

- A calcium oxide.
- B carbon.
- C carbon dioxide.
- D slag.

7.3 The substance mainly responsible for taking the oxygen from the iron oxide is . . .

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

7.4 When oxygen is taken from iron oxide, we say that the iron oxide is . . .

- A distilled.
- B electrolysed.
- C oxidised.
- D reduced.

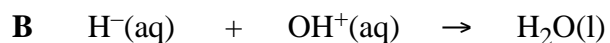
Turn over for the next question

Turn over ►

QUESTION EIGHT

An alkali will react with an acid to make a neutral salt.

8.1 The equation for this reaction can be written . . .



8.2 At the neutral point, the mixture contains water and . . .

A acid only.

B alkali only.

C salt and acid.

D salt only.

8.3 The salt, sodium nitrate, can be made using this method.

Which chemicals should be used?

A Sodium hydroxide and ammonia solution

B Sodium hydroxide and hydrochloric acid

C Sodium hydroxide and nitric acid

D Sodium oxide and nitric acid

8.4 An acid salt is one in which only part of the replaceable hydrogen of an acid has been replaced by a metal.

Which of these salts of sulphuric acid, H_2SO_4 , is an acid salt?

A Calcium sulphate, CaSO_4

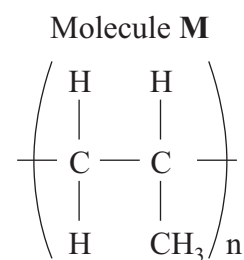
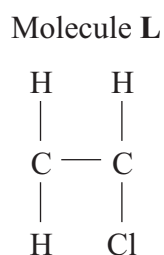
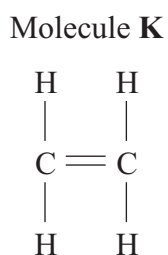
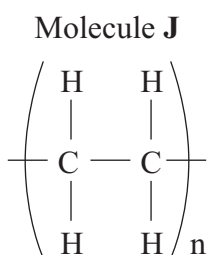
B Magnesium sulphate, MgSO_4

C Potassium sulphate, K_2SO_4

D Sodium hydrogen sulphate, NaHSO_4

QUESTION NINE

The diagrams show the structural formulae of the molecules of four compounds, **J**, **K**, **L** and **M**.



9.1 Which of these are polymer molecules?

- A Molecule **K** only
- B Molecules **J** and **K**
- C Molecules **J** and **M**
- D Molecules **K** and **M**

9.2 Polymers are formed from monomers which are . . .

- A alkanes.
- B saturated.
- C unreactive.
- D unsaturated.

9.3 Which of the molecules **J**, **K**, **L** or **M** is a monomer that could be polymerised?

- A Molecule **J**
- B Molecule **K**
- C Molecule **L**
- D Molecule **M**

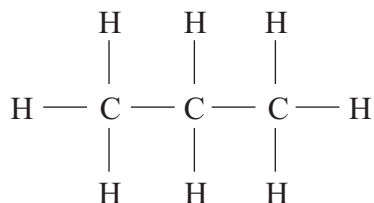
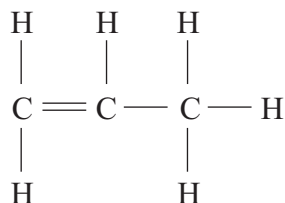
9.4 In addition polymerisation, the products are . . .

- A the polymer and carbon dioxide.
- B the polymer and hydrogen.
- C the polymer and water.
- D the polymer only.

Turn over ►

QUESTION TEN

The diagrams represent two different hydrocarbon molecules.

Molecule of hydrocarbon **X**Molecule of hydrocarbon **Y**

10.1 What types of hydrocarbon do these molecules represent?

| Hydrocarbon X | Hydrocarbon Y |
|----------------------|----------------------|
| A polymer | unsaturated |
| B saturated | polymer |
| C saturated | unsaturated |
| D unsaturated | polymer |

10.2 When hydrocarbon **X** burns in the air, it produces . . .

- A** carbon dioxide only.
- B** carbon dioxide and water.
- C** carbon dioxide, hydrogen and water.
- D** sulphur dioxide and water.

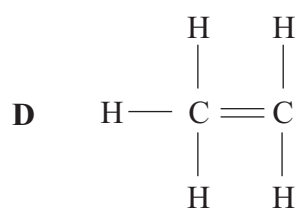
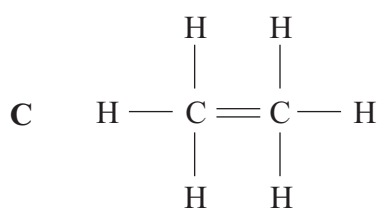
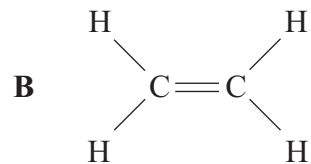
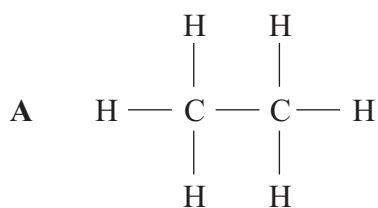
10.3 The chemical formula for a molecule of hydrocarbon **X** is C_3H_8

The chemical formula for a molecule of hydrocarbon **Y** is . . .

- A** C_2H_6
- B** C_2H_8
- C** C_3H_6
- D** C_4H_8

10.4 Ethane is a saturated hydrocarbon whose molecules contain two carbon atoms.

Which formula represents ethane?



END OF TEST

There are no questions printed on this page