

Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

General Certificate of Secondary Education
Spring 2003



SCIENCE: DOUBLE AWARD (MODULAR)
SCIENCE: CHEMISTRY (MODULAR)
Earth Materials (Module 06)

346006

Wednesday 5 March 2003 Morning Session

In addition to this paper you will require:

- an HB pencil and a rubber;
- an answer sheet.

Time allowed: 30 minutes

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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 “Earth Materials” printed on it.
- Attempt **one Tier only**, either the Foundation Tier **or** the Higher Tier.
- Answer **all** the questions for the Tier you are attempting.
- 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.
- Mark your responses on the separate answer sheet only. Rough work may be done on the question paper.
- Mark the best responses by using a thick pencil stroke to fill in the box. Use an HB pencil. Make sure the pencil stroke does **not** extend beyond the box. Do **not** use ink or ball-point pen. If you wish to change your answer, rub out your first answer completely. See below.

Examples:

	1	2	3	4
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QUESTION XXX				
xxx.1	<input type="checkbox"/> A	<input checked="" type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
xxx.2	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input checked="" type="checkbox"/> D
xxx.3	<input type="checkbox"/> A	<input checked="" type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
xxx.4	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D

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 rub 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 gases.

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

carbon dioxide

oxygen

sulphur dioxide

water vapour

Gas	What we can say about the gas
1	it is an oxide of hydrogen
2	it is formed when sulphur burns in air
3	it reacts with carbon to form carbon dioxide
4	it is produced in the thermal decomposition of copper carbonate

QUESTION TWO

This passage is about the positions of the land masses of South America and Africa.

Match words from the list with each of the spaces **1–4** in the passage.

fossils

plates

rocks

shapes

Some sedimentary deposits on the east coast of South America and the west coast of Africa contain similar animal remains that we call **1**

On these coasts there are also similar patterns of sedimentary **2**

The two land masses have **3** which fit quite closely.

These pieces of evidence suggest that the tectonic **4** on which these land masses lie have moved apart.

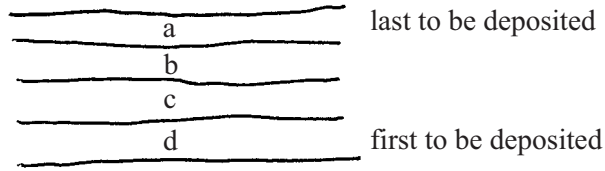
TURN OVER FOR THE NEXT QUESTION

Turn over ►

QUESTION THREE

This passage is about rocks near the Earth's surface that have been affected by large forces.

They were deposited in this order.



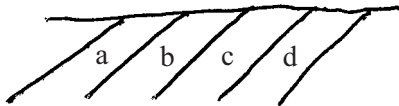
Choose words from the list for each of the spaces 1–4 in the sentences.

faulted

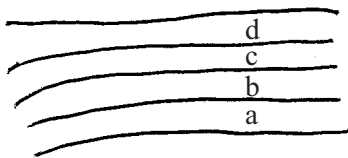
folded

tilted

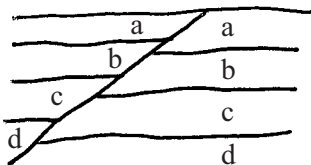
turned upside down



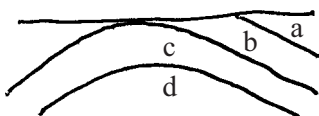
These rocks have been **1**



These rocks have been **2**



These rocks have been **3**



These rocks have been **4**

QUESTION FOUR

The diagram shows stages in the cracking of hydrocarbons.

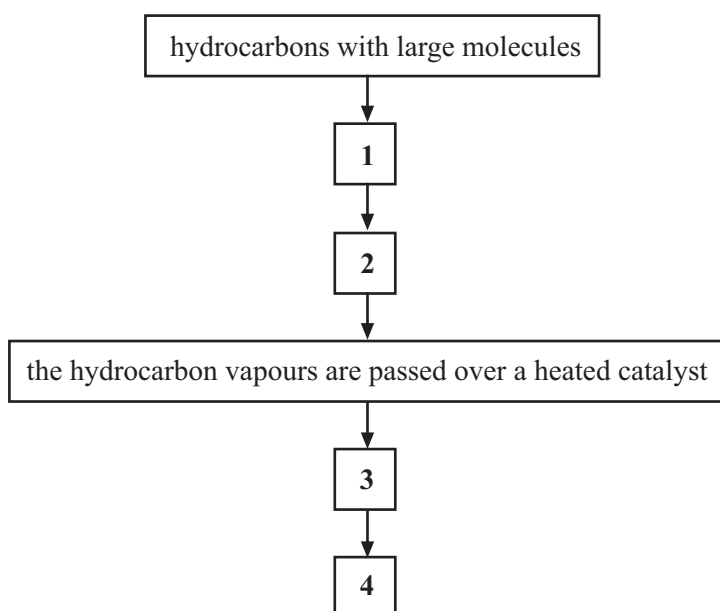
Match words from the list with each of the spaces 1–4, to describe what happens in this process.

hydrocarbons with small molecules

the hydrocarbons are heated

the hydrocarbons are in a vapour state

thermal decomposition of hydrocarbons



TURN OVER FOR THE NEXT QUESTION

Turn over ►

QUESTION FIVE

This question is about chemical and physical changes.

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

condensation

decomposition

evaporation

neutralisation

Process	Example of the process
1	addition of limestone to lakes to reduce acidity
2	the breakdown of zinc carbonate to zinc oxide and carbon dioxide
3	the change from water to water vapour
4	the change from water vapour to water

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 plastics (polymers).

Choose from the list the **two** statements that are correct.**all hydrocarbons with large molecules are polymers****microorganisms break down waste polythene****most plastics (polymers) are biodegradable****poly(propene) is a plastic used for making crates and ropes****some small hydrocarbon molecules can be used to make plastics (polymers)****QUESTION SEVEN**

This question is about the Earth's crust.

Choose from the list the **two** statements that are correct.**metamorphic rocks are found in ancient mountain ranges****old mountain ranges are worn down by weathering and erosion****the crust reaches almost halfway to the Earth's centre****the Earth's crust is made mainly of iron and nickel****the mountain ranges were formed because of the shrinking crust****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**8.1** The word equation shows the breakdown of limestone when it is heated in a lime kiln.

Which substance completes the word equation?

- A Calcium chloride
 - B Calcium hydrogencarbonate
 - C Calcium hydroxide
 - D Calcium oxide
- 8.2** Powdered limestone can be mixed with powdered clay and heated in a rotary kiln.
- The main useful product is
- A cement.
 - B concrete.
 - C glass.
 - D quicklime.
- 8.3** The chemical name for slaked lime is
- A calcium chloride.
 - B calcium hydroxide.
 - C calcium oxide.
 - D calcium sulphate.

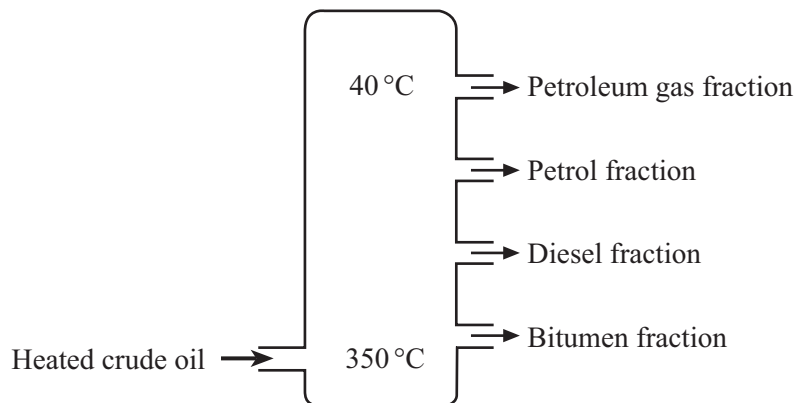
8.4 One use of slaked lime is to

- A** make concrete.
- B** make quicklime.
- C** make soil less acid.
- D** neutralise alkaline lake water.

TURN OVER FOR THE NEXT QUESTION

QUESTION NINE

In a fractionating column, crude oil is separated into a number of fractions, some of which are shown in the diagram.



9.1 Crude oil is

- A** a compound of carbon and hydrogen only.
- B** a mixture of elements.
- C** a mixture of hydrocarbons.
- D** an element.

9.2 The hydrocarbon molecules in each fraction contain

- A** a similar number of carbon atoms.
- B** a similar number of oxygen atoms.
- C** carbon, hydrogen and oxygen atoms.
- D** exactly the same number of carbon atoms.

9.3 Hydrocarbon molecules vary in size.

The fraction containing hydrocarbons with the smallest molecules is

- A** the bitumen fraction.
- B** the diesel fraction.
- C** the petrol fraction.
- D** the petroleum gas fraction.

9.4 When compared with other hydrocarbons, those with the smallest molecules

- A** will be easier to ignite.
- B** will be less volatile.
- C** will be more viscous.
- D** will have higher boiling points.

TURN OVER FOR THE NEXT QUESTION

Turn over ►

QUESTION TEN

The composition of the Earth's atmosphere has changed since it was first formed.

Earth's early atmosphere	Earth's present-day atmosphere
mainly carbon dioxide	mainly nitrogen and oxygen
water vapour	water vapour
little or no oxygen	little carbon dioxide
small amounts of other gases	small amounts of other gases

10.1 Most of the carbon dioxide which formed the early atmosphere was from

- A** the burning of fossil fuels.
- B** the decomposition of carbonate rocks.
- C** the eruption of volcanoes.
- D** the respiration of animals.

10.2 The amount of oxygen in the atmosphere increased because of

- A** the activity of plants.
- B** the condensation of water vapour.
- C** the decomposition of carbon dioxide.
- D** the formation of fossil fuels.

10.3 The amount of carbon dioxide was gradually reduced because of

- A** the evolution of animals.
- B** the formation of carbonate rocks.
- C** the reaction with ammonia.
- D** the reaction with oxygen.

10.4 In the present-day atmosphere, the proportions of oxygen and nitrogen are

	Oxygen (%)	Nitrogen (%)
A	0.03	20
B	20	0.03
C	20	80
D	80	20

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 chemical and physical changes.

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

condensation

decomposition

evaporation

neutralisation

Process	Example of the process
1	addition of limestone to lakes to reduce acidity
2	the breakdown of zinc carbonate to zinc oxide and carbon dioxide
3	the change from water to water vapour
4	the change from water vapour to water

QUESTION TWO

This question is about gases that have been part of the Earth's atmosphere at some point since it was first formed.

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

ammonia

methane

nitrogen

ozone

Gas	What we can say about the gas
1	it filters out ultraviolet radiation from the Sun
2	it is a hydrocarbon and was present in small amounts in the early atmosphere
3	it reacts with oxygen to form nitrogen gas
4	it was released into the early atmosphere by the activity of denitrifying bacteria

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 the Earth's crust.

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

- metamorphic rocks are found in ancient mountain ranges**
- old mountain ranges are worn down by weathering and erosion**
- the crust reaches almost halfway to the Earth's centre**
- the Earth's crust is made mainly of iron and nickel**
- the mountain ranges were formed because of the shrinking crust**

QUESTION FOUR

This question is about carbon dioxide gas.

Which **two** statements about the gas are correct?

- it is produced during the cracking of large hydrocarbon molecules**
- it is produced when quicklime reacts with water**
- it is released during thermal decomposition of carbonate rocks**
- it is released in the polymerisation of alkenes**
- it reacts with sea water to form calcium carbonate**

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**5.1** The word equation shows the breakdown of limestone when it is heated in a lime kiln.

Which substance completes the word equation?

- A Calcium chloride
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 - C Calcium hydroxide
 - D Calcium oxide
- 5.2** Powdered limestone can be mixed with powdered clay and heated in a rotary kiln.

The main useful product is

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 - C glass.
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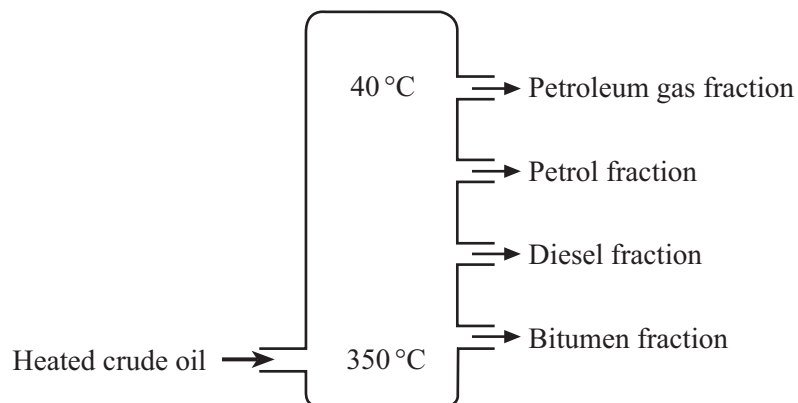
5.4 One use of slaked lime is to

- A** make concrete.
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- C** make soil less acid.
- D** neutralise alkaline lake water.

TURN OVER FOR THE NEXT QUESTION

QUESTION SIX

In a fractionating column, crude oil is separated into a number of fractions, some of which are shown in the diagram.



6.1 Crude oil is

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- C** a mixture of hydrocarbons.
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- B** a similar number of oxygen atoms.
- C** carbon, hydrogen and oxygen atoms.
- D** exactly the same number of carbon atoms.

6.3 Hydrocarbon molecules vary in size.

The fraction containing hydrocarbons with the smallest molecules is

- A** the bitumen fraction.
- B** the diesel fraction.
- C** the petrol fraction.
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6.4 When compared with other hydrocarbons, those with the smallest molecules

- A** will be easier to ignite.
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TURN OVER FOR THE NEXT QUESTION

Turn over ►

QUESTION SEVEN

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- C** the eruption of volcanoes.
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7.2 The amount of oxygen in the atmosphere increased because of

- A** the activity of plants.
- B** the condensation of water vapour.
- C** the decomposition of carbon dioxide.
- D** the formation of fossil fuels.

7.3 The amount of carbon dioxide was gradually reduced because of

- A the evolution of animals.
- B the formation of carbonate rocks.
- C the reaction with ammonia.
- D the reaction with oxygen.

7.4 In the present-day atmosphere, the proportions of oxygen and nitrogen are

	Oxygen (%)	Nitrogen (%)
A	0.03	20
B	20	0.03
C	20	80
D	80	20

TURN OVER FOR THE NEXT QUESTION

Turn over ►

QUESTION EIGHT

Hydrocarbons are compounds of carbon and hydrogen.

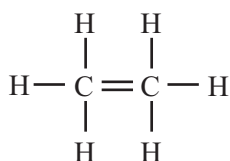
The formulas for two hydrocarbons, **X** and **Y**, are shown below.

Hydrocarbon X	Formula C₂H₆
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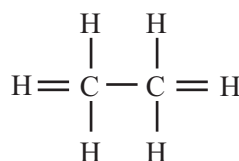
Hydrocarbon Y	Formula C₃H₆
----------------------	---

8.1 The structural formula for hydrocarbon **X** is

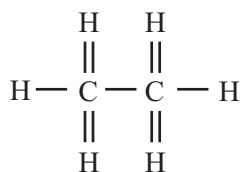
A



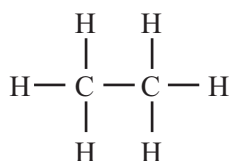
B



C



D



8.2 In both compounds, carbon atoms form the spine of the molecule.

How are the carbon atoms joined?

Hydrocarbon X

Hydrocarbon Y

A by a single bond

by single bonds

B by a double bond

by single bonds

C by a single bond

by single or double bonds

D by a single or double bond

by double bonds

8.3 To which group of hydrocarbons do these compounds belong?

	Hydrocarbon X	Hydrocarbon Y
A	saturated	saturated
B	saturated	unsaturated
C	unsaturated	saturated
D	unsaturated	unsaturated

8.4 Which of these hydrocarbons belongs to the same group as hydrocarbon X?

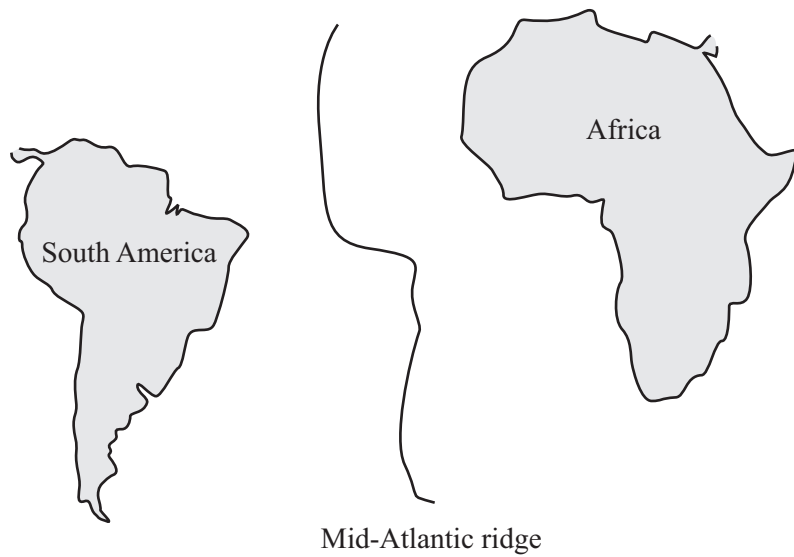
- A** C_3H_8
- B** C_4H_8
- C** C_5H_{10}
- D** C_6H_{12}

TURN OVER FOR THE NEXT QUESTION

Turn over ►

QUESTION NINE

An oceanic ridge runs through the Atlantic Ocean.



- 9.1** What is happening to the tectonic plates along this ridge?
- A** One is sliding beneath the other
 - B** They are moving apart
 - C** They are moving towards each other
 - D** They are sliding past each other
- 9.2** Magma extruded from fractures close to the ridge solidifies to form
- A** new, basaltic, continental crust.
 - B** new, basaltic, oceanic crust.
 - C** new, granitic, continental crust.
 - D** new, granitic, oceanic crust.

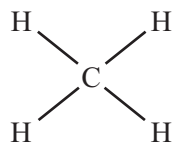
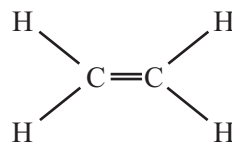
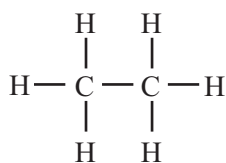
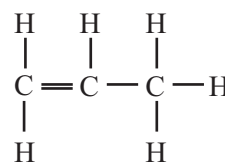
- 9.3** As a result of the formation of new crust
- A** earthquakes frequently occur.
 - B** fold mountains are formed.
 - C** sea floor spreading is taking place.
 - D** the Earth's magnetic field is reversed.
- 9.4** As new rocks form alongside the ridge, the direction of the Earth's magnetic field is recorded by
- A** basaltic and granitic bands of rocks.
 - B** dark and light bands in the rocks.
 - C** iron rich minerals in the rocks.
 - D** radioactive minerals in the rocks.

TURN OVER FOR THE NEXT QUESTION

Turn over ►

QUESTION TEN

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

**Hydrocarbon J****Hydrocarbon K****Hydrocarbon L****Hydrocarbon M**

10.1 Which of these compounds can undergo polymerisation?

- A** Hydrocarbons **J** and **K**
- B** Hydrocarbons **K** and **M**
- C** Hydrocarbons **L** and **M**
- D** Hydrocarbon **K** only

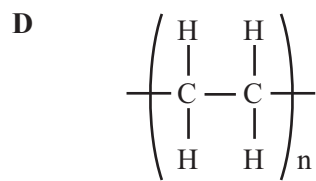
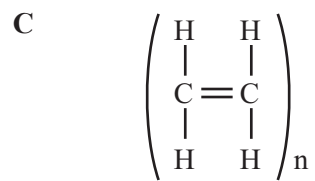
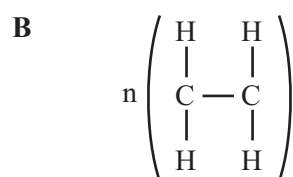
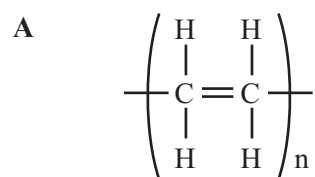
10.2 Each small hydrocarbon molecule from which a polymer is produced is called

- A** a monomer.
- B** an alkane.
- C** an ester.
- D** an oxide.

10.3 From which of the four hydrocarbons can poly(ethene) be made?

- A Hydrocarbon J
- B Hydrocarbon K
- C Hydrocarbon L
- D Hydrocarbon M

10.4 Poly(ethene) can be represented by the formula



END OF TEST