Surname		Other Names	
Centre Number			Candidate Number				
Candidate Signature									

General Certificate of Secondary Education
June 2004

SCIENCE: DOUBLE AWARD (MODULAR) 346006
CHEMISTRY (MODULAR)
Earth Materials (Module 06)

Tuesday 29 June 2004 Morning Session

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

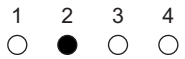
You may use a calculator.

Time allowed: 30 minutes

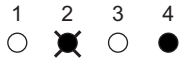
Instructions
- Fill in the boxes at the top of this page.
- Check that your name, candidate number and centre number are printed on the separate answer sheet.
- Check that the separate answer sheet has the title "Earth Materials" printed on it.
- Attempt **one Tier only**, **either** the Foundation Tier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

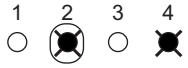
- Use a **black ball-point pen**.
- For each answer **completely fill in the circle** as shown:



- 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

nitrogen

sulphur dioxide

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

The diagram shows some of the layers in and around the Earth.

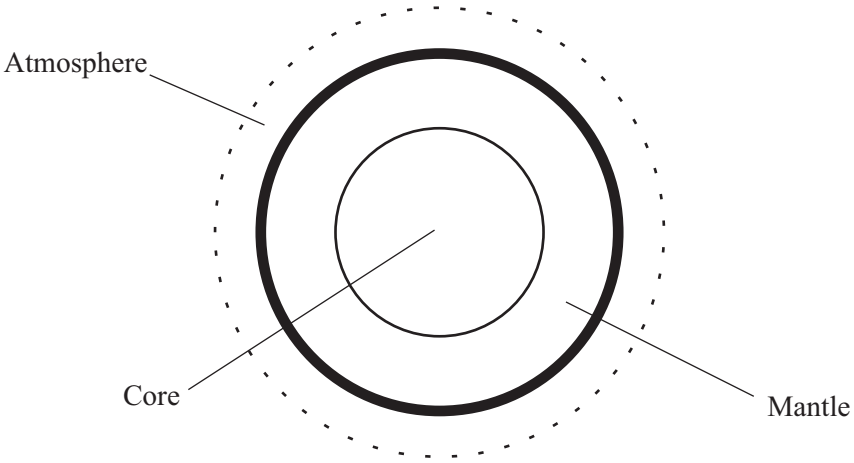
Match words from the list with the numbers **1–4** in the table.

atmosphere

core

lithosphere

mantle



Layer	What we can say about the layer
1	it has solid properties but can flow very slowly
2	it is cracked into a number of tectonic plates
3	it is made up mainly of iron and nickel
4	it is made up mainly of nitrogen and oxygen

TURN OVER FOR THE NEXT QUESTION

QUESTION THREE

This question is about common names for substances.

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

limestone

quicklime

slaked lime

soda

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 common name for sodium carbonate

QUESTION FOUR

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

QUESTION FIVE

The flow chart shows the stages in the thermal decomposition of hydrocarbons with large molecules.

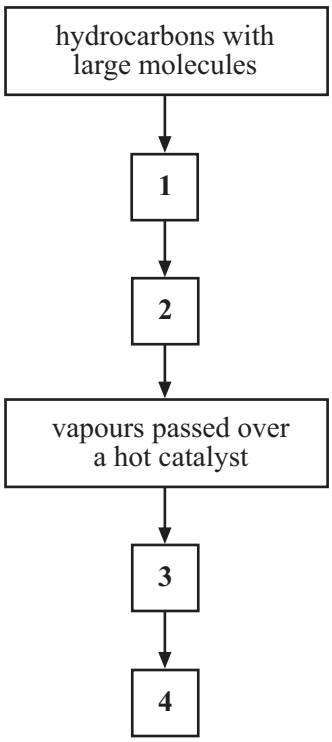
Match sentences **P**, **Q**, **R** or **S** from the list with the spaces **1–4** in the flow chart.

P **hydrocarbons with large molecules are cracked**

Q **hydrocarbons with large molecules are heated**

R **hydrocarbons with large molecules vaporise**

S **hydrocarbons with small molecules are produced**



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 tectonic plates.

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

convection currents in the Earth's interior are driven by heat from the Sun

South America and Africa have slowly moved apart

South America and Africa lie on the same tectonic plate

tectonic plates are moved by convection currents in the Earth's crust

tectonic plates move at relative speeds of a few centimetres a year

QUESTION SEVEN

This question is about rocks and structures in the Earth's crust.

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

folded and faulted rocks are evidence that the Earth's crust is unstable

metamorphic rocks provide evidence that the Earth's crust is cooling

metamorphic rocks usually lie on top of sedimentary rocks

new mountain ranges are produced by weathering and erosion

ripple marks in sedimentary rocks were formed by waves or currents

NO QUESTIONS APPEAR ON THIS PAGE

TURN OVER FOR THE NEXT QUESTION

SECTION C

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

Each of these questions has four parts.

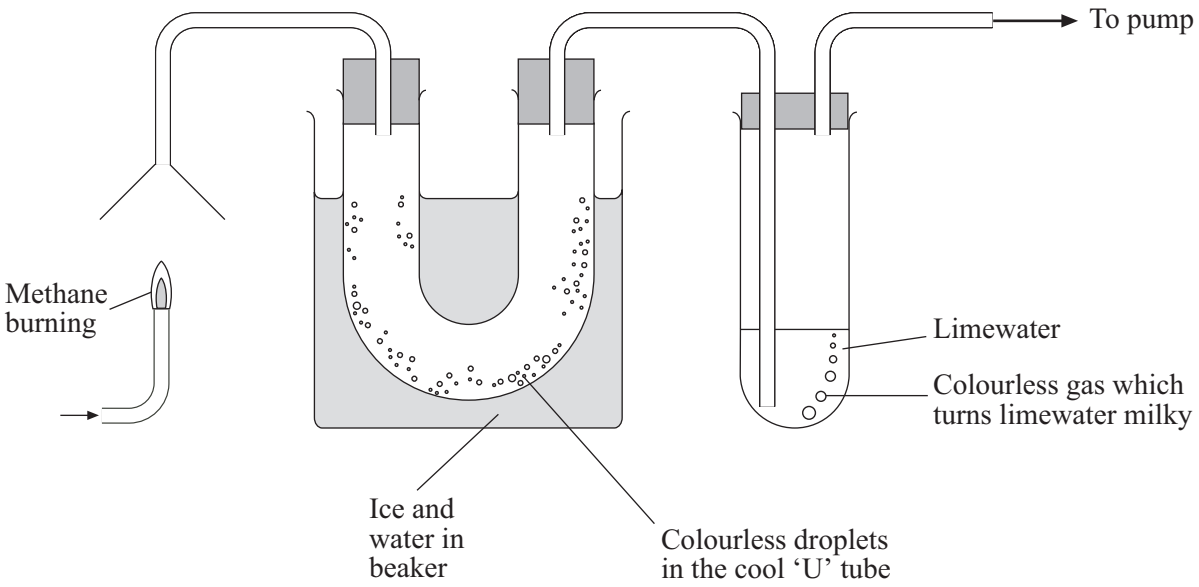
In each part choose only **one** answer.

Mark your choices on the answer sheet.

QUESTION EIGHT

Methane is a hydrocarbon.

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



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

A Ammonia

B Hydrogen

C Nitrogen

D Oxygen

8.2 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.

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

A ammonia.

B carbon dioxide.

C nitrogen.

D sulphur dioxide.

8.4 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 NINE

- Scientists used to believe that the Earth was cooling.
  The shrinking core was making the crust wrinkle.
- In 1915 Alfred Wegener suggested that all the continents had once been joined together.
  Later, they had split up and the separate pieces had moved apart.
- Few people believed Wegener's theory.
  Later, new evidence suggested that the crust was divided into plates which could move slowly.
  This gave support to Wegener's theory.

9.1 How did scientists, who supported the idea that the Earth was cooling, explain the formation of mountains?

A Mountains rose up from the sea bed

B Mountains were formed by volcanoes

C The high points of wrinkles formed the mountains

D The less dense rocks rose above those that were more dense

9.2 What name was given to Wegener's theory of crustal movement?

A Continental drift

B Continental shrinking

C Mountain building

D Subduction

9.3 Scientists now believe that mountain ranges are formed . . . . .

A by earthquakes.

B by large-scale movements of the Earth's crust.

C by magma rising from the sea floor.

D by material from the fluid mantle being forced above the crust.

9.4 New mountain ranges replace older mountain ranges which . . . . .

A are destroyed by earthquakes.

B are destroyed when tectonic plates come together.

C are worn down by weathering and erosion.

D sink back into the mantle.

THERE ARE NO QUESTIONS PRINTED ON THIS PAGE

TURN OVER FOR THE NEXT QUESTION

QUESTION TEN

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	$C_4 - C_{12}$
paraffin	$C_{11} - C_{15}$
diesel oil	$C_{14} - C_{19}$
bitumen	C_{50} and upwards

10.1 Crude oil can be separated into fractions by fractional distillation because . . . . .

A the fractions flow at different rates.

B the fractions have different boiling points.

C the fractions have different colours.

D the fractions have different densities.

10.2 Hydrocarbons with the smallest molecules will be found in . . . . .

A the bitumen fraction.

B the diesel fraction.

C the paraffin fraction.

D the petrol fraction.

10.3 Compared with petrol, diesel oil . . . . .

A has a higher boiling point.

B ignites more easily.

C is a thinner liquid.

D is more volatile.

10.4 Hydrocarbons with fewer than 4 carbon atoms in their molecules . . . . .

A will be difficult to ignite.

B will be more viscous than the hydrocarbons in the paraffin fraction.

C will be useful as fuels.

D will have higher boiling points than hydrocarbons in the bitumen fraction.

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

The flow chart shows the stages in the thermal decomposition of hydrocarbons with large molecules.

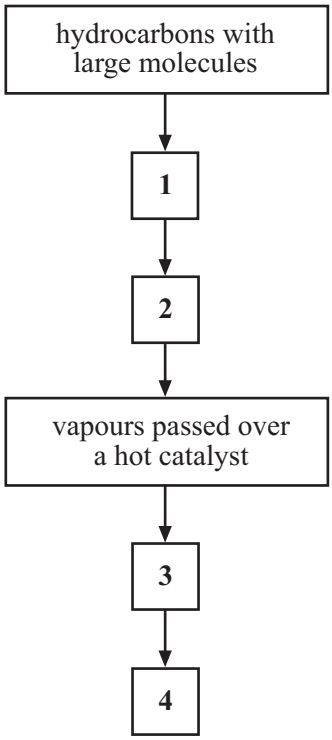
Match sentences, **P**, **Q**, **R** or **S**, from the list with the spaces **1–4** in the flow chart.

P **hydrocarbons with large molecules are cracked**

Q **hydrocarbons with large molecules are heated**

R **hydrocarbons with large molecules vaporise**

S **hydrocarbons with small molecules are produced**



QUESTION TWO

This question is about gases.

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

carbon dioxide (CO_2)

ethene (C_2H_4)

methane (CH_4)

ozone (O_3)

Gas	What we can say about the gas
1	a hydrocarbon present in small amounts in the Earth's early atmosphere
2	it absorbs some of the harmful ultraviolet radiation from the sun
3	it reacts with sea water to produce calcium hydrogencarbonate
4	it is the simplest alkene

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

This question is about rocks and structures in the Earth's crust.

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

folded and faulted rocks are evidence that the Earth's crust is unstable

metamorphic rocks provide evidence that the Earth's crust is cooling

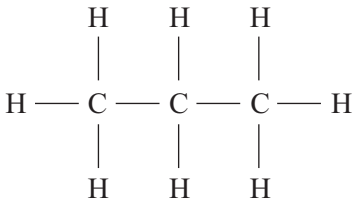
metamorphic rocks usually lie on top of sedimentary rocks

new mountain ranges are produced by weathering and erosion

ripple marks in sedimentary rocks were formed by waves or currents

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 is a polymer

it is a saturated compound

it is an alkene

it reacts with bromine water and turns it colourless

the carbon-carbon bonds are covalent bonds

THERE ARE NO QUESTIONS PRINTED ON THIS PAGE

TURN OVER FOR THE NEXT QUESTION

SECTION C

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

Each of these questions has four parts.

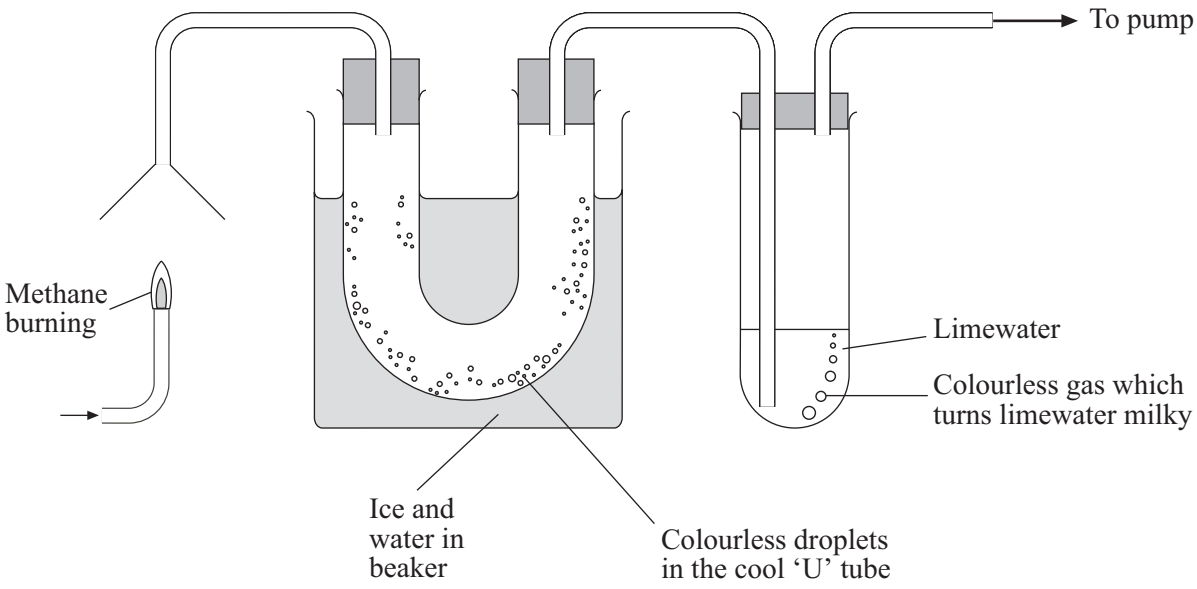
In each part choose only **one** answer.

Mark your choices on the answer sheet.

QUESTION FIVE

Methane is a hydrocarbon.

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



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

A Ammonia

B Hydrogen

C Nitrogen

D Oxygen

5.2 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.

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

A ammonia.

B carbon dioxide.

C nitrogen.

D sulphur dioxide.

5.4 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 SIX

- Scientists used to believe that the Earth was cooling.
  The shrinking core was making the crust wrinkle.
- In 1915 Alfred Wegener suggested that all the continents had once been joined together.
  Later, they had split up and the separate pieces had moved apart.
- Few people believed Wegener's theory.
  Later, new evidence suggested that the crust was divided into plates which could move slowly.
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6.1 How did scientists, who supported the idea that the Earth was cooling, explain the formation of mountains?

A Mountains rose up from the sea bed

B Mountains were formed by volcanoes

C The high points of wrinkles formed the mountains

D The less dense rocks rose above those that were more dense

6.2 What name was given to Wegener's theory of crustal movement?

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6.3 Scientists now believe that mountain ranges are formed . . . . .

A by earthquakes.

B by large-scale movements of the Earth's crust.

C by magma rising from the sea floor.

D by material from the fluid mantle being forced above the crust.

6.4 New mountain ranges replace older mountain ranges which . . . . .

A are destroyed by earthquakes.

B are destroyed when tectonic plates come together.

C are worn down by weathering and erosion.

D sink back into the mantle.

THERE ARE NO QUESTIONS PRINTED ON THIS PAGE

TURN OVER FOR THE NEXT QUESTION

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
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paraffin	$C_{11} - C_{15}$
diesel oil	$C_{14} - C_{19}$
bitumen	C_{50} and upwards

7.1 Crude oil can be separated into fractions by fractional distillation because . . . . .

A the fractions flow at different rates.

B the fractions have different boiling points.

C the fractions have different colours.

D the fractions have different densities.

7.2 Hydrocarbons with the smallest molecules will be found in . . . . .

A the bitumen fraction.

B the diesel fraction.

C the paraffin fraction.

D the petrol fraction.

7.3 Compared with petrol, diesel oil . . . . .

A has a higher boiling point.

B ignites more easily.

C is a thinner liquid.

D is more volatile.

7.4 Hydrocarbons with fewer than 4 carbon atoms in their molecules . . . . .

A will be difficult to ignite.

B will be more viscous than the hydrocarbons in the paraffin fraction.

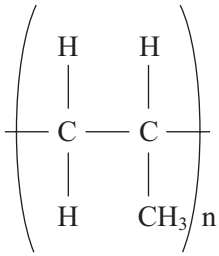
C will be useful as fuels.

D will have higher boiling points than hydrocarbons in the bitumen fraction.

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 saturated alkane.

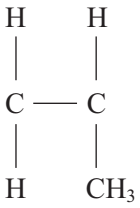
B a saturated alkene.

C an unsaturated alkane.

D an unsaturated alkene.

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

A



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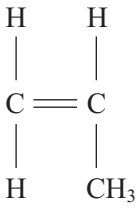
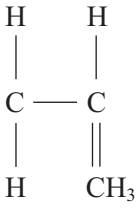
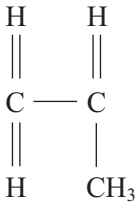


C



D



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.

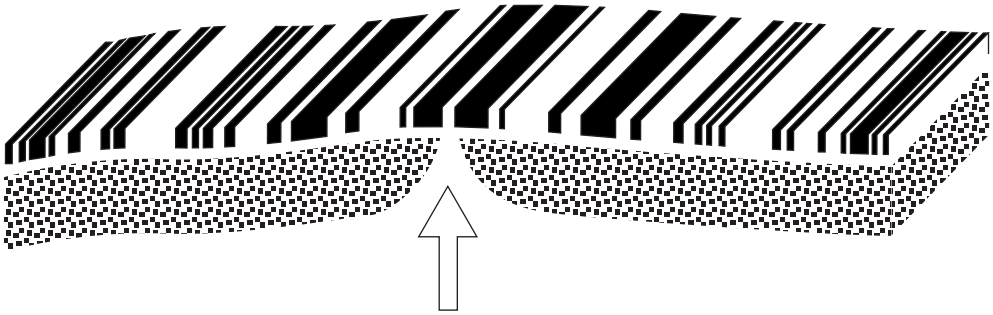
C poly(propene) and water.

D poly(propene) only.

TURN OVER FOR THE NEXT QUESTION

QUESTION NINE

The drawing shows the magnetic reversal patterns located in some areas in the oceanic crust.



9.1 These magnetic reversal patterns are found . . . . .

A around continents.

B parallel to faults in the Earth's crust.

C parallel to oceanic ridges.

D where a tectonic plate is subducted.

9.2 The magnetic reversal patterns are caused by . . . . .

A changes in the density of the rising magma.

B changes in the direction of the Earth's magnetic field.

C changes in the direction of the Earth's rotation.

D changes in the types of rising magma.

9.3 The direction of the Earth's magnetic field is recorded by . . . . . .

A alternating bands of igneous and metamorphic rocks.

B fossils in the sedimentary rocks.

C iron-rich minerals in the solidified magma.

D ripple marks in the sedimentary rocks.

9.4 The rising magma produces new . . . . .

A basaltic, continental crust.

B basaltic, oceanic crust.

C granitic, continental crust.

D granitic, oceanic crust.

TURN OVER FOR THE NEXT QUESTION

QUESTION TEN

There was little or no nitrogen in the Earth's atmosphere when it was first formed.

Gradually, the amount increased until it reached the present day level.

10.1 One cause of the increase in the amount of nitrogen in the Earth's atmosphere was . . . . .

A the activity of denitrifying bacteria.

B the decomposition of carbonate rocks.

C the development of the ozone layer.

D volcanic activity.

10.2 Which reaction in the atmosphere produced additional nitrogen?

A ammonia + carbon dioxide

B ammonia + oxygen

C methane + carbon dioxide

D methane + oxygen

10.3 About how much nitrogen does 1000 cm^3 of the Earth's present day atmosphere contain?

A 200 cm^3

B 400 cm^3

C 600 cm^3

D 800 cm^3

10.4 When the amount of nitrogen was increasing, the amount of carbon dioxide was decreasing.

One reason for this was . . . . .

A some carbon dioxide was reacting with methane.

B some carbon dioxide was reacting with sea water.

C the burning of fossil fuels.

D volcanic activity.

END OF TEST