

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

General Certificate of Secondary Education  
Spring 2004



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

**346006**

Wednesday 3 March 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:
 

|                       |                                  |                       |                       |
|-----------------------|----------------------------------|-----------------------|-----------------------|
| 1                     | 2                                | 3                     | 4                     |
| <input type="radio"/> | <input checked="" type="radio"/> | <input type="radio"/> | <input type="radio"/> |

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

- If you want to change your answer, **you must** cross out your original answer, as shown:
 

|                       |                                  |                       |                                  |
|-----------------------|----------------------------------|-----------------------|----------------------------------|
| 1                     | 2                                | 3                     | 4                                |
| <input type="radio"/> | <input checked="" type="radio"/> | <input type="radio"/> | <input checked="" type="radio"/> |

- 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:
 

|                       |                                  |                       |                                  |
|-----------------------|----------------------------------|-----------------------|----------------------------------|
| 1                     | 2                                | 3                     | 4                                |
| <input type="radio"/> | <input checked="" type="radio"/> | <input type="radio"/> | <input checked="" type="radio"/> |

**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.

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You must do **one Tier** only, **either** the Foundation Tier **or** the Higher Tier.  
The Higher Tier starts on page 12 of this booklet.

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**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.

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**QUESTION ONE**

This question is about fuels.

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

**carbon**

**oxygen**

**sulphur**

**water (vapour)**

Hydrocarbons are compounds of the elements hydrogen and . . . . . **1** . . . . .

When hydrocarbons burn in air, hydrogen and . . . . . **2** . . . . . combine to form . . . . . **3** . . . . .

Some fuels also contain the element . . . . . **4** . . . . .

**QUESTION TWO**

The pie charts show the gases in the Earth's early atmosphere and the Earth's present-day atmosphere.

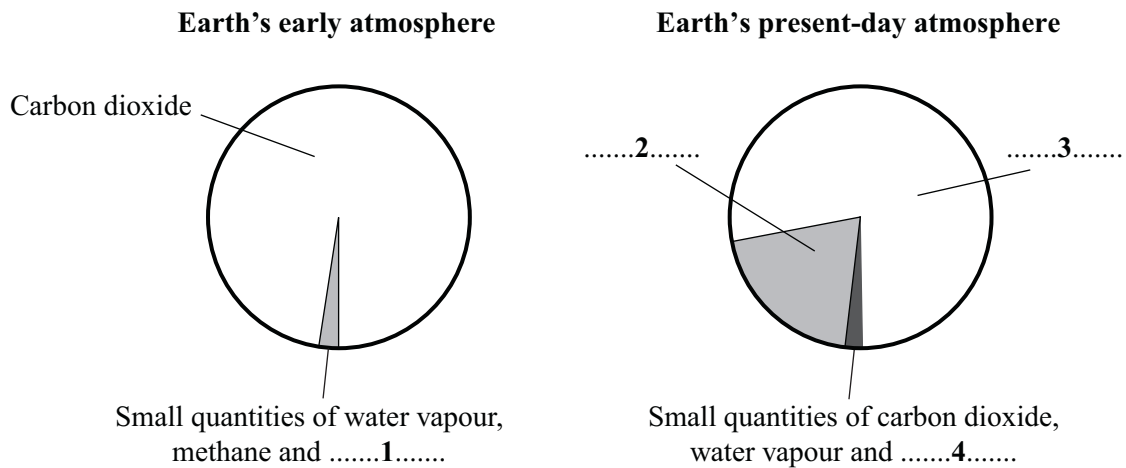
Match words from the list with the labels 1–4 on the pie charts.

**ammonia**

**nitrogen**

**noble gases**

**oxygen**

**QUESTION THREE**

This question is about chemical compounds.

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

**atoms**

**compounds**

**elements**

**molecules**

Quicklime and slaked lime are ..... 1 .....

Quicklime is made up of the ..... 2 ..... calcium and oxygen.

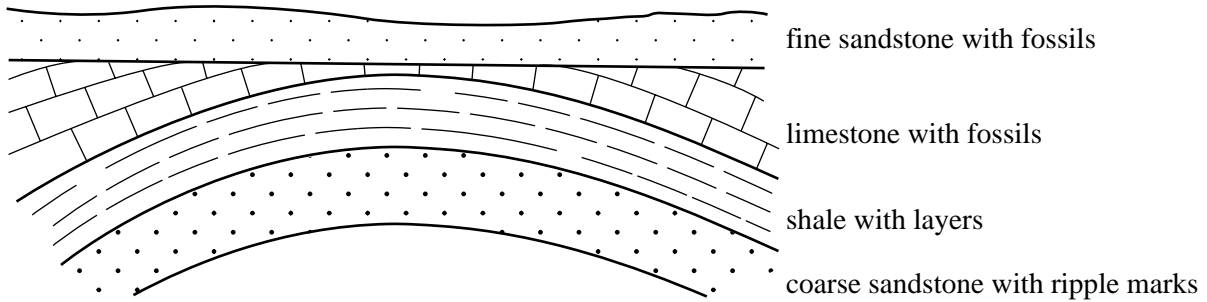
The greater the number of carbon ..... 3 ..... in hydrocarbons, the larger the ..... 4 .....

**Turn over ►**

### QUESTION FOUR

The diagram shows the rocks in a section of the Earth's crust.

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



| Rock type | What we can say about the rock type                           |
|-----------|---|
| 1         | it has not been affected by large forces in the Earth's crust |
| 2         | it is the youngest folded rock                                |
| 3         | it shows evidence of breaks in deposition                     |
| 4         | it shows evidence of waves or currents when it was deposited  |

### QUESTION FIVE

The flow chart shows some of the substances that can be made from limestone.

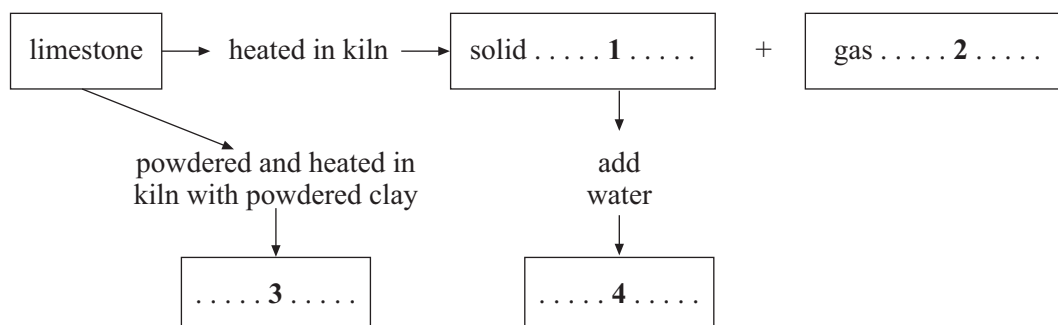
Match words from the list with the spaces 1–4 in the flow chart.

**calcium hydroxide**

**calcium oxide**

**carbon dioxide**

**cement**



**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 plastics (polymers).

Choose from the list the **two** statements that are correct.**most plastics are not broken down by microorganisms****plastic containers accumulate on waste tips because they are biodegradable****poly(ethene) is used to make cooking pans****poly(propene) is a polymer****some polymers can be made by cracking****QUESTION SEVEN**

This question is about the properties of four hydrocarbons that are found in crude oil.

| <b>Name of the hydrocarbon</b> | <b>Boiling point</b> |
|--------------------------------|----------------------|
| ethane                         | - 89 °C              |
| butane                         | 0 °C                 |
| pentane                        | + 36 °C              |
| decane                         | + 175 °C             |

Choose from the list the **two** statements that are correct.**decane has the largest molecules****decane will be most volatile****ethane and butane are gases at 20 °C****ethane has the highest boiling point****pentane ignites most easily**

Turn over ►

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**SECTION C**Questions **EIGHT** to **TEN**.

Each of these questions has four parts.

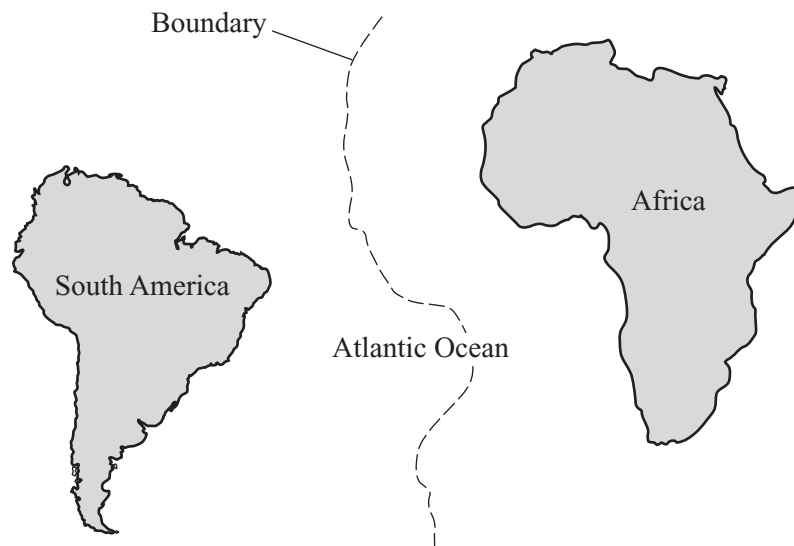
In each part choose only **one** answer.Mark your choices on the answer sheet.

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**QUESTION EIGHT**

The diagram shows the present positions of South America and Africa.

The position of the boundary between the tectonic plates on which they lie is also drawn.



**8.1** The patterns of rocks on the east coast of South America and the west coast of Africa are very similar.

This suggests that . . . . .

- A** Africa and South America have been moving slowly towards each other.
- B** Africa and South America were once together and have been moving slowly away from each other.
- C** Africa has been slowly sliding beneath South America.
- D** South America has been slowly sliding beneath Africa.

**8.2** Tectonic plates are constantly moving.

This movement is caused by . . . . .

- A convection currents.
- B the Earth's crust shrinking.
- C the gravitational attraction of the Sun.
- D the rotation of the Earth.

**8.3** The interior of the Earth remains hot because of . . . . .

- A earthquakes.
- B friction between the core and the mantle.
- C friction between the moving plates.
- D natural radioactive processes.

**8.4** The plates move with relative speeds of . . . . .

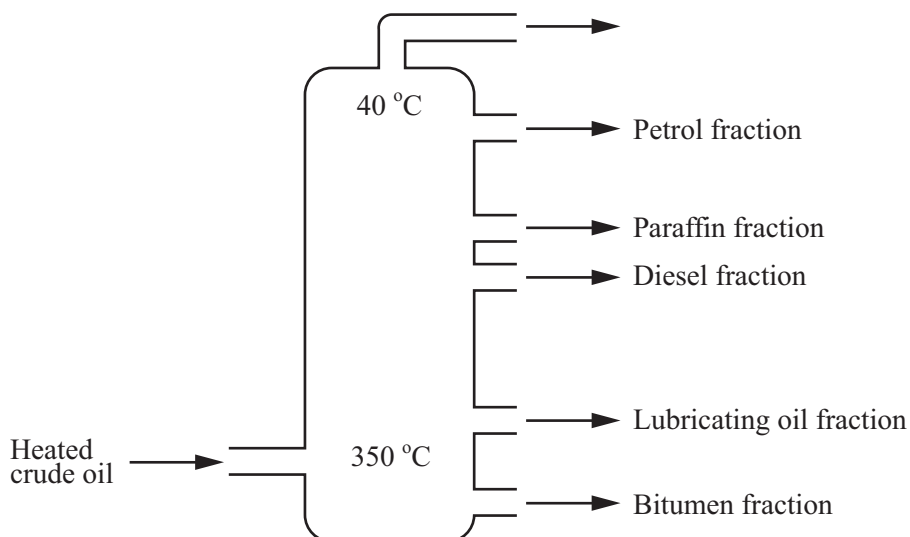
- A a few centimetres a day.
- B a few centimetres a week.
- C a few centimetres a month.
- D a few centimetres a year.

**TURN OVER FOR THE NEXT QUESTION**

**Turn over ►**

**QUESTION NINE**

The diagram shows how a fractionating column can be used to separate the substances in crude oil into a number of fractions.



**9.1** Crude oil can be separated into fractions in this way because it is . . . . .

- A a compound.
- B a hydrocarbon.
- C a mixture of compounds.
- D a mixture of elements.

**9.2** The crude oil is heated to about  $350\text{ }^{\circ}\text{C}$  before it enters the fractionating column.

This is so that it will . . . . .

- A condense.
- B decompose.
- C react.
- D vaporise.



**9.3** In the fractionating column, the crude oil separates into fractions when it . . . . .

- A condenses at different temperatures.
- B condenses at 40 °C.
- C condenses at 350 °C.
- D cracks into smaller molecules.

**9.4** The fractions which are collected from the top of the fractionating column . . . . .

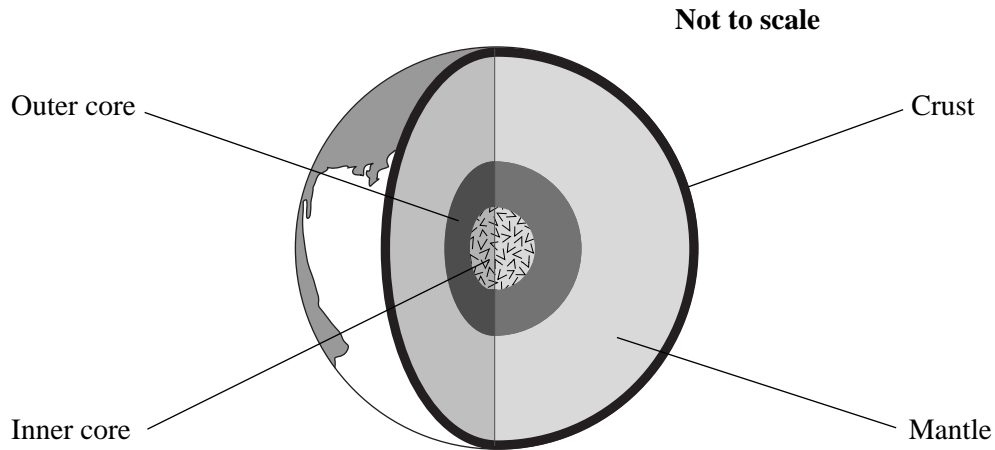
- A are polymers.
- B are solids at room temperature.
- C are useful as fuels.
- D have high boiling points.

**TURN OVER FOR THE NEXT QUESTION**

**Turn over ►**

**QUESTION TEN**

The diagram shows the layered structure of the Earth.



**10.1** The material of the crust . . . . .

- A is less dense than the material in the interior.
- B is made up mainly of basaltic rocks.
- C is made up mainly of granitic rocks.
- D is more dense than the material in the interior.

**10.2** The lithosphere . . . . .

- A is a lower layer in the atmosphere.
- B is a thin layer between the core and the mantle.
- C is made up of the crust and the upper part of the mantle.
- D is made up of the mantle and the outer core.

**10.3** The mantle . . . . .

- A extends more than halfway to the centre of the Earth.
- B has all the properties of a solid except that it can flow very slowly.
- C is a runny liquid.
- D is composed of molten magma.

**10.4** The inner core . . . . .

- A** is liquid and composed of iron and nickel.
- B** is liquid and composed of metamorphic rocks.
- C** is solid and composed of iron and nickel.
- D** is solid and composed of sedimentary rocks.

**END OF TEST**

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You must do **one Tier** only, **either** the Foundation Tier **or** the Higher Tier.  
The Foundation Tier is earlier in this booklet.

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**HIGHER TIER****SECTION A**Questions **ONE** and **TWO**.

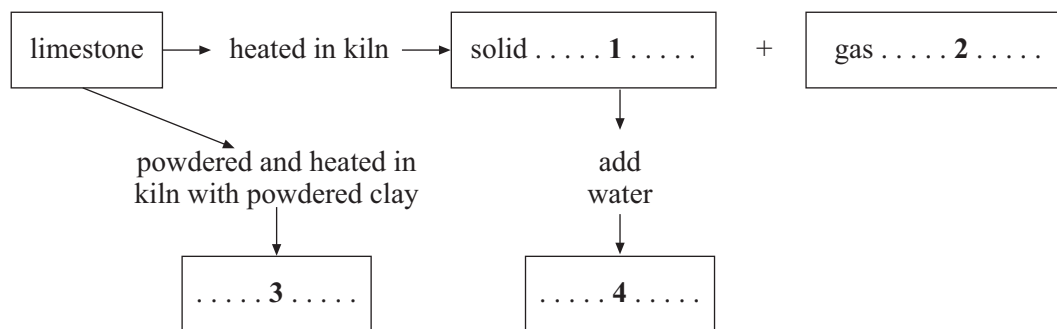
In these questions match the words in the list with the numbers.

Use **each** answer only **once**.

Mark your choices on the answer sheet.

**QUESTION ONE**

The flow chart shows some of the substances that can be made from limestone.

Match words from the list with the spaces **1–4** in the flow chart.**calcium hydroxide****calcium oxide****carbon dioxide****cement**

**QUESTION TWO**

This question is about four chemical compounds.

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

**calcium carbonate ( $\text{CaCO}_3$ )**

**calcium hydrogencarbonate ( $\text{Ca}(\text{HCO}_3)_2$ )**

**carbon dioxide ( $\text{CO}_2$ )**

**methane ( $\text{CH}_4$ )**

| <b>Chemical compound</b> | <b>What we can say about the compound</b>                         |
|--------------------------|---|
| <b>1</b>                 | insoluble in water and deposited as sediment in the oceans        |
| <b>2</b>                 | produced when limestone undergoes thermal decomposition           |
| <b>3</b>                 | reacts with oxygen to produce oxides of both carbon and hydrogen  |
| <b>4</b>                 | soluble compound formed when carbon dioxide reacts with sea water |

**TURN OVER FOR THE NEXT QUESTION**

**Turn over ►**

**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 the properties of four hydrocarbons that are found in crude oil.

| Name of the hydrocarbon | Boiling point |
|-------------------------|---------------|
| ethane                  | - 89 °C       |
| butane                  | 0 °C          |
| pentane                 | + 36 °C       |
| decane                  | + 175 °C      |

Choose from the list the **two** statements that are correct.**decane has the largest molecules****decane will be most volatile****ethane and butane are gases at 20 °C****ethane has the highest boiling point****pentane ignites most easily****QUESTION FOUR**

This question is about what happens when tectonic plates move towards each other.

Which **two** statements are correct?**sea floor spreading occurs****sediments of the continental plate are folded and metamorphosed****the continental plate is subducted****the oceanic plate is forced above the continental plate****volcanoes often occur at the plate boundary**

**NO QUESTIONS APPEAR ON THIS PAGE**

**TURN OVER FOR THE NEXT QUESTION**

**Turn over ►**

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**SECTION C**Questions **FIVE** to **TEN**.

Each of these questions has four parts.

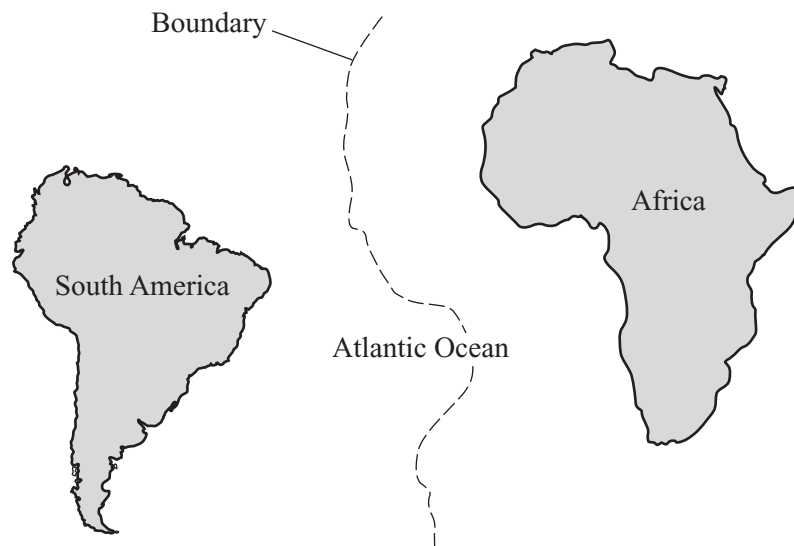
In each part choose only **one** answer.Mark your choices on the answer sheet.

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**QUESTION FIVE**

The diagram shows the present positions of South America and Africa.

The position of the boundary between the tectonic plates on which they lie is also drawn.



**5.1** The patterns of rocks on the east coast of South America and the west coast of Africa are very similar.

This suggests that . . . . .

- A** Africa and South America have been moving slowly towards each other.
- B** Africa and South America were once together and have been moving slowly away from each other.
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**5.2** Tectonic plates are constantly moving.

This movement is caused by . . . . .

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- D the rotation of the Earth.

**5.3** The interior of the Earth remains hot because of . . . . .

- A earthquakes.
- B friction between the core and the mantle.
- C friction between the moving plates.
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**5.4** The plates move with relative speeds of . . . . .

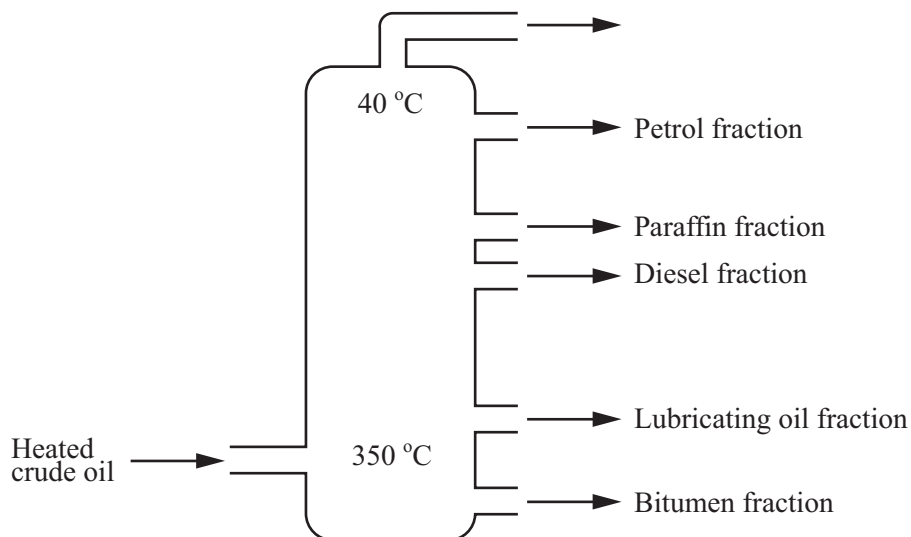
- A a few centimetres a day.
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**TURN OVER FOR THE NEXT QUESTION**

**Turn over ►**

**QUESTION SIX**

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**6.2** The crude oil is heated to about  $350\text{ }^{\circ}\text{C}$  before it enters the fractionating column.

This is so that it will . . . . .

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- A** condenses at different temperatures.
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- C** condenses at 350 °C.
- D** cracks into smaller molecules.

**6.4** The fractions which are collected from the top of the fractionating column . . . . .

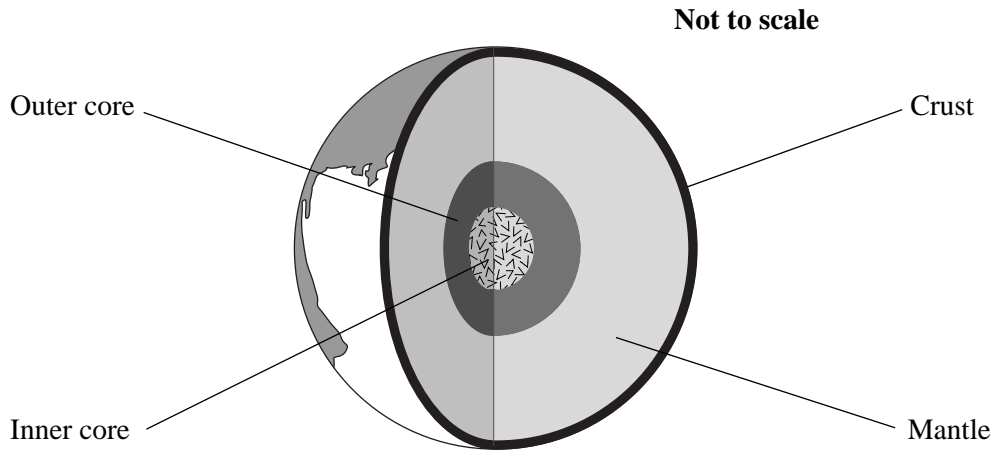
- A** are polymers.
- B** are solids at room temperature.
- C** are useful as fuels.
- D** have high boiling points.

**TURN OVER FOR THE NEXT QUESTION**

**Turn over ►**

**QUESTION SEVEN**

The diagram shows the layered structure of the Earth.



**7.1** The material of the crust . . . . .

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- B** is made up mainly of basaltic rocks.
- C** is made up mainly of granitic rocks.
- D** is more dense than the material in the interior.

**7.2** The lithosphere . . . . .

- A** is a lower layer in the atmosphere.
- B** is a thin layer between the core and the mantle.
- C** is made up of the crust and the upper part of the mantle.
- D** is made up of the mantle and the outer core.

**7.3** The mantle . . . . .

- A** extends more than halfway to the centre of the Earth.
- B** has all the properties of a solid except that it can flow very slowly.
- C** is a runny liquid.
- D** is composed of molten magma.

7.4 The inner core . . . . .

- A is liquid and composed of iron and nickel.
- B is liquid and composed of metamorphic rocks.
- C is solid and composed of iron and nickel.
- D is solid and composed of sedimentary rocks.

**TURN OVER FOR THE NEXT QUESTION**

**Turn over ►**

**QUESTION EIGHT**

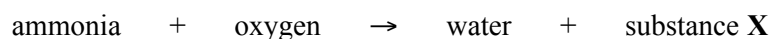
There was little or no oxygen in the Earth's atmosphere until about 2000 million years ago.

From this time the amount of oxygen increased until it reached the present day level.

**8.1** What caused the increase in the amount of oxygen in the Earth's atmosphere?

- A Activity of plants
- B Activity of simple animals
- C Decomposition of carbon dioxide
- D Volcanic activity

**8.2** The oxygen reacted with small amounts of ammonia.



What is substance X?

- A Carbon dioxide
  - B Methane
  - C Nitrogen
  - D Sulphur dioxide
- 8.3** About 800 million years ago, sufficient ozone had been produced for it to form a layer in the Earth's atmosphere.

Ozone is produced from . . . . .

- A ammonia.
- B carbon dioxide.
- C methane.
- D oxygen.

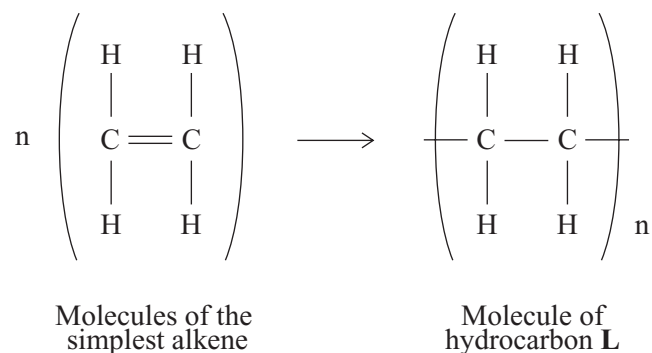
- 8.4** The ozone layer allowed the evolution of new organisms because it . . . . .
- A** filtered out harmful infrared radiation.
  - B** filtered out harmful ultraviolet radiation.
  - C** prevented harmful bacteria from entering the atmosphere.
  - D** prevented oxygen escaping from the atmosphere.

**TURN OVER FOR THE NEXT QUESTION**

**Turn over ►**

## QUESTION NINE

The diagram represents a chemical reaction.



9.1 What is the name of the simplest alkene?

- A Butene
- B Ethane
- C Ethene
- D Methane

9.2 What type of substance is hydrocarbon **L**?

- A A monomer
- B A polymer
- C An alkene
- D An unsaturated hydrocarbon

9.3 The letter 'n' before the molecule of the simplest alkene means . . . . .

- A a large number.
- B a small number.
- C neutral.
- D nine.



9.4 The simplest alkene is unsaturated.

Which line shows the test and the results that will distinguish between an unsaturated and a saturated hydrocarbon?

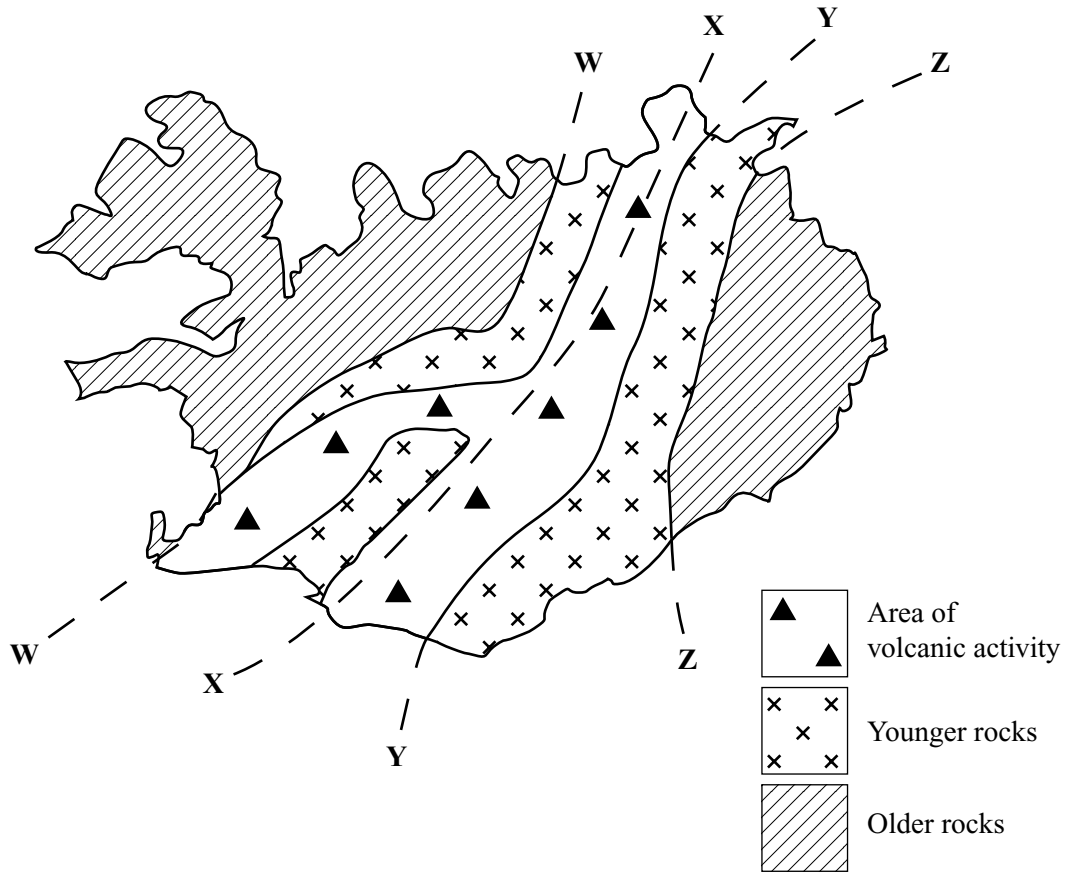
|   | Test                     | Results of Test         |                       |
|---|--------------------------|-------------------------|-----------------------|
|   |                          | Unsaturated hydrocarbon | Saturated hydrocarbon |
| A | shake with bromine water | yellow-brown            | colourless            |
| B | shake with bromine water | colourless              | yellow-brown          |
| C | shake with limewater     | white                   | colourless            |
| D | shake with limewater     | colourless              | white                 |

**TURN OVER FOR THE NEXT QUESTION**

**Turn over ►**

## QUESTION TEN

Iceland is an island in the Atlantic Ocean. It lies on the boundary between two tectonic plates. The diagram shows the main areas of rocks on Iceland.



10.1 Where is the boundary between the two tectonic plates?

- A W — W
- B X — X
- C Y — Y
- D Z — Z

10.2 The two tectonic plates are . . . . .

- A moving away from each other.
- B moving one beneath the other.
- C moving towards each other.
- D sliding past each other.

**10.3** On what type of structure must Iceland lie?

- A A sedimentary basin
- B A subduction zone
- C An oceanic ridge
- D An ocean trench

**10.4** The younger rocks of Iceland are . . . . .

- A igneous and basaltic.
- B igneous and granitic.
- C metamorphic.
- D sedimentary.

**END OF TEST**

**THERE ARE NO QUESTIONS PRINTED ON THIS PAGE**