

Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

General Certificate of Secondary Education
June 2008

SCIENCE A
Unit Chemistry C1b (Oils, Earth and Atmosphere)

CHY1BP



CHEMISTRY
Unit Chemistry C1b (Oils, Earth and Atmosphere)

Monday 23 June 2008 Afternoon 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

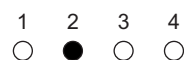
Instructions

- 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 'Chemistry Unit 1b' 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

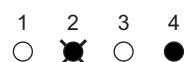
- Use a **black ball-point pen**.

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

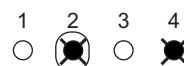


- Do **not** extend beyond the circles.

- 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 ONE

Questions **ONE** to **SIX**.

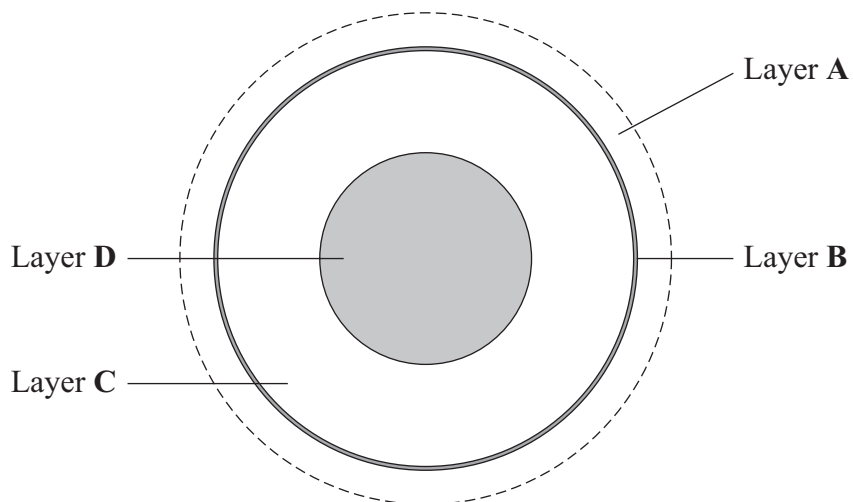
In these questions, match the letters, **A**, **B**, **C** and **D**, with the numbers **1–4**.

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

Mark your choices on the answer sheet.

QUESTION ONE

This question is about the layers in and around the Earth.

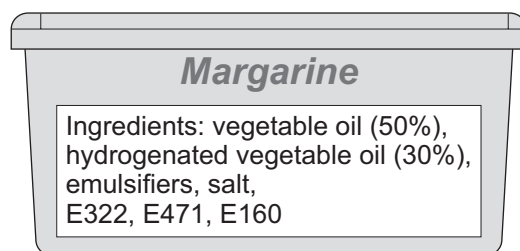


Match layers, **A**, **B**, **C** and **D**, with the numbers **1–4** in the table.

	Layer
1	Atmosphere
2	Crust
3	Mantle
4	Core

QUESTION TWO

The label shows the ingredients in a margarine.



Match substances, **A**, **B**, **C**, and **D**, with the numbers **1–4** in the sentences.

- A** vegetable oil
- B** hydrogenated vegetable oil
- C** an emulsifier
- D** E160

The ingredient that makes this margarine hold its shape at room temperature is ... **1** ...

The ingredient that provides most of the energy in this margarine is ... **2** ...

An additive that gives colour to this margarine is ... **3** ...

The substance that prevents this margarine from separating is ... **4** ...

Turn over for the next question

Turn over ►

QUESTION THREE

The composition of the Earth's atmosphere today is very different from how it was billions of years ago.

Match gases, **A**, **B**, **C** and **D**, with the numbers **1–4** in the table.

A Carbon dioxide

B Nitrogen

C Oxygen

D Water vapour

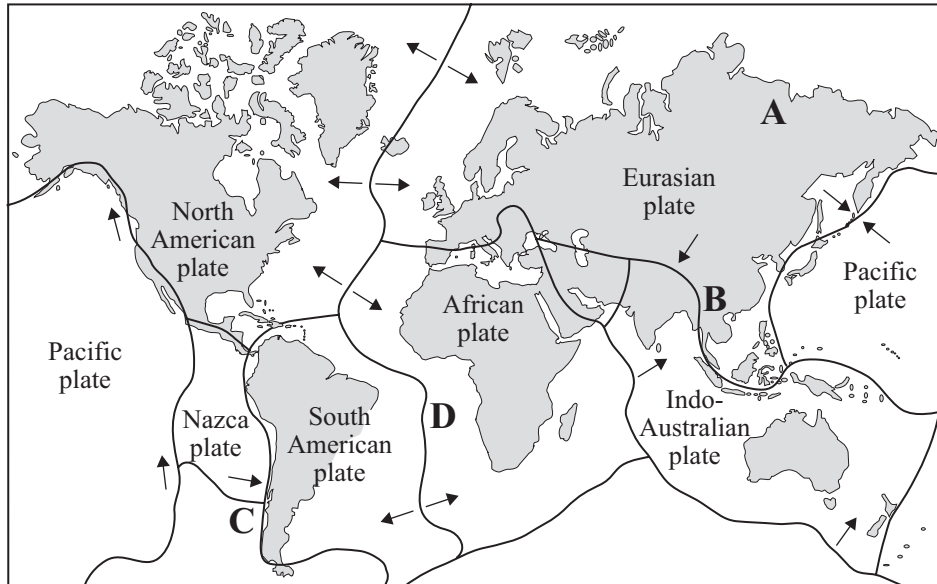
1	the main gas in the present day atmosphere
2	the main gas in the atmosphere billions of years ago
3	the gas that makes up 20% of the present day atmosphere
4	the gas that on cooling, led to the formation of the present day oceans

QUESTION FOUR

The world map shows the location of the main tectonic plates on Earth.

The arrows show the directions in which the tectonic plates move.

Earthquakes often occur at places where tectonic plates come together.



Match locations, **A**, **B**, **C** and **D**, on the map, with the numbers 1–4 in the table.

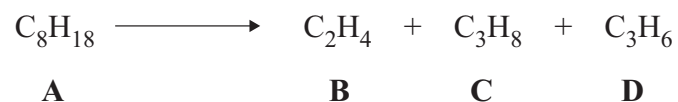
1	the location which is least likely to suffer an earthquake
2	the location where an earthquake could take place due to movement of the Eurasian plate
3	the location that could be affected by the movement of three tectonic plates
4	the location where two plates are moving away from each other

Turn over ►

QUESTION FIVE

Large hydrocarbon molecules can be broken down to produce smaller molecules.

An example is shown below.



Match substances, **A**, **B**, **C** and **D**, with the numbers 1–4 in the table.

1	It is the molecule which contains 11 atoms.
2	It is ethene.
3	It is the monomer from which poly(propene) can be made.
4	It is the alkane with the largest molecules.

QUESTION SIX

This question is about unsaturated hydrocarbons.

Match words, **A**, **B**, **C** and **D**, with the numbers **1–4** in the sentences.

- A** catalysis
- B** polymerisation
- C** combustion
- D** thermal decomposition

Heating large hydrocarbon molecules so that they break down into smaller molecules, such as ethene, is an example of ... **1**

Ethanol is formed when ethene reacts with steam. The reaction is speeded up using phosphoric acid. This reaction is an example of ... **2**

Individual ethene molecules can be made to link together to form very long chains in a process called ... **3**

Ethene reacts with oxygen to produce carbon dioxide and water. This reaction is an example of ... **4**

Turn over for the next question

Turn over ►

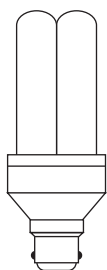
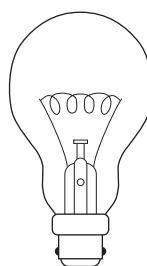
SECTION TWOQuestions **SEVEN** to **NINE**.

Each of these questions has four parts.

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

QUESTION SEVEN

The diagram shows two different light bulbs.

Compact fluorescent
light bulbConventional filament
light bulb**7A** Compact fluorescent light bulbs are discharge tubes.

Which one of the following gases might you expect to find in a compact fluorescent light bulb?

- 1 a noble gas
- 2 carbon dioxide
- 3 hydrogen
- 4 oxygen

The compact fluorescent light bulb (CFL) uses only 25% of the energy used by a conventional filament light bulb.

7B What percentage (%) of energy used for lighting would be saved by replacing the 8 conventional filament light bulbs in a house with 8 CFLs?

- 1 5%
- 2 25%
- 3 75%
- 4 200%

A CFL produces 70% less heat than a conventional filament light bulb.

A CFL is guaranteed to last for 8000 hours; a conventional filament light bulb lasts for only 2000 hours.

CFLs use the same fittings as conventional filament light bulbs.

7C There are many advantages of using CFLs.

What is the most likely reason why CFLs accounted for only 5% of total light bulb sales last year?

- 1 People like to use the extra heat from conventional light bulbs to heat their homes.
- 2 CFLs last too long.
- 3 CFLs are more expensive to buy than conventional filament bulbs.
- 4 CFLs are too difficult to fit into a light socket.

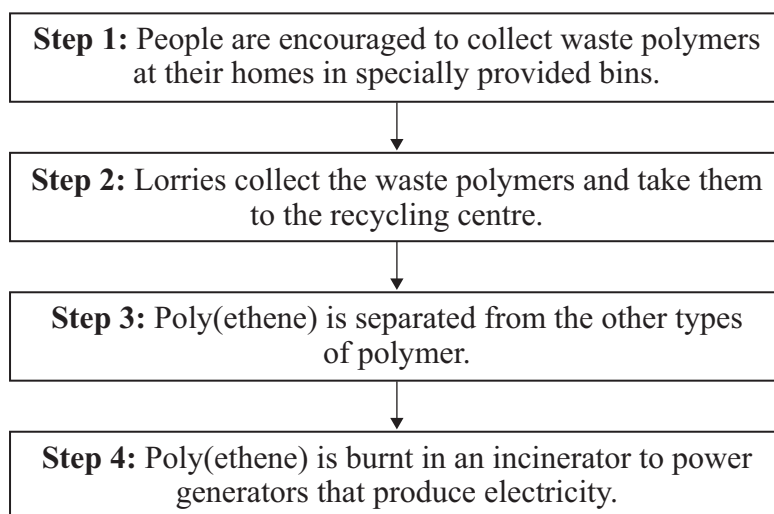
7D Large-scale replacement of conventional filament bulbs with CFLs could result in . . .

- 1 a severe shortage of noble gases.
- 2 light bulbs having to be replaced more often.
- 3 alternative ways of heating homes being needed.
- 4 homes using less energy.

Turn over ►

QUESTION EIGHT

The flow chart shows how the waste poly(ethene) from our homes can be used.



8A One problem associated with **Step 1** is that . . .

- 1 some people do **not** put their waste polymers in the special bins.
- 2 people prefer to burn their waste polymers.
- 3 poly(ethene) is toxic.
- 4 waste polymers rot and begin to smell.

8B One problem associated with **Step 2** is that . . .

- 1 burning diesel fuel in lorries can increase global warming.
- 2 people do **not** know where the recycling centres are.
- 3 the bins of waste polymers are very heavy.
- 4 the lorries are hard to recognise.

8C One problem associated with **Step 3** is that . . .

- 1 all polymers are the same colour.
- 2 polymers **cannot** be melted down.
- 3 polymers are magnetic.
- 4 separating polymers costs money.

8D One reason why all waste polymers are **not** burned in **Step 4** is that . . .

- 1 burning polymers can produce toxic gases.
- 2 polymers are poor conductors of electricity.
- 3 some polymers melt before burning.
- 4 burning polymers produces too much heat.

Turn over for the next question

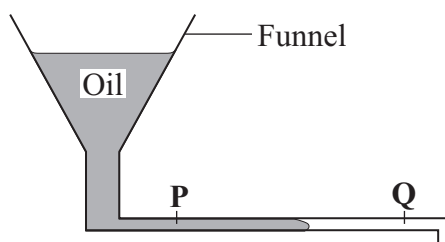
Turn over ►

QUESTION NINE

Viscosity is the ease with which a liquid flows.

The more viscous an oil is, the more slowly it will flow.

A student compared the viscosity of four different oils, **W**, **X**, **Y** and **Z**, at different temperatures. He used the apparatus shown in the diagram.



First he used oil **W**.

- Oil **W** was heated to 20 °C and was then poured into the funnel.
- The time taken for oil **W** to flow from **P** to **Q** was recorded.
- The student repeated the procedure for oil **W** at temperatures of 30 °C, 40 °C and 50 °C.

The student then used oils **X**, **Y** and **Z** in the same way.

The results are shown in the table.

Oil	Time taken for the oil to travel between points P and Q in seconds			
	at 20 °C	at 30 °C	at 40 °C	at 50 °C
W	55	50	45	40
X	35	32	29	26
Y	85	75	80	55
Z	110	100	90	80

9A When testing oil **W** at the four temperatures shown, the dependent variable is . . .

- 1 the choice of oil.
- 2 the time the oil takes to travel between **P** and **Q**.
- 3 the temperature of the oil.
- 4 the distance between **P** and **Q**.

9B A measurement that appears to be anomalous is for . . .

- 1 oil **W** at 40 °C.
- 2 oil **X** at 30 °C.
- 3 oil **Y** at 40 °C.
- 4 oil **Z** at 30 °C.

9C The most viscous oil is . . .

- 1 **W**
- 2 **X**
- 3 **Y**
- 4 **Z**

9D The accuracy of the results would be improved by . . .

- 1 using a wider range of temperatures.
- 2 repeating each procedure.
- 3 maintaining the apparatus at the same temperature as the oil.
- 4 using more oils.

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 ONE

Questions **ONE** and **TWO**.

In these questions, match the letters, **A**, **B**, **C** and **D**, with the numbers **1–4**.

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

Mark your choices on the answer sheet.

QUESTION ONE

This question is about unsaturated hydrocarbons.

Match words, **A**, **B**, **C** and **D**, with the numbers **1–4** in the sentences.

- A** catalysis
- B** polymerisation
- C** combustion
- D** thermal decomposition

Heating large hydrocarbon molecules so that they break down into smaller molecules, such as ethene, is an example of ... **1**

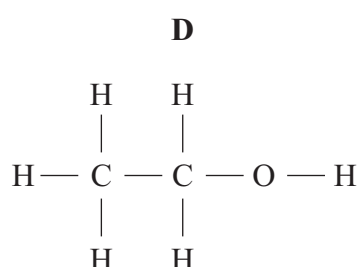
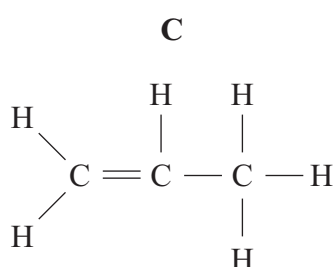
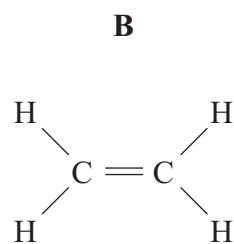
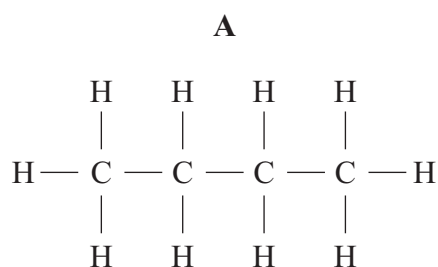
Ethanol is formed when ethene reacts with steam. The reaction is speeded up using phosphoric acid. This reaction is an example of ... **2**

Individual ethene molecules can be made to link together to form very long chains in a process called ... **3**

Ethene reacts with oxygen to produce carbon dioxide and water. This reaction is an example of ... **4**

QUESTION TWO

This question is about carbon compounds.



Match carbon compounds, **A**, **B**, **C** and **D**, with the numbers 1–4 in the table.

What we can say about the carbon compound	
1	It is not a hydrocarbon.
2	It has the molecular formula C ₂ H ₄
3	It is the monomer from which poly(propene) is made.
4	It can be cracked to produce propene.

Turn over ►

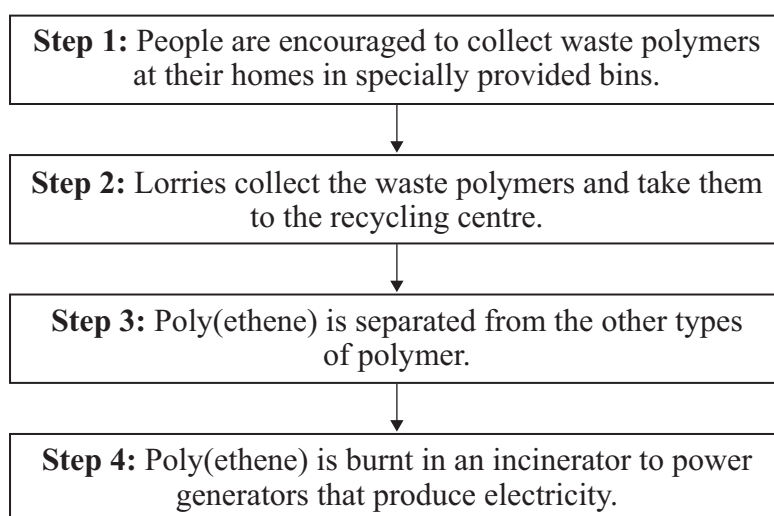
SECTION TWOQuestions **THREE** to **NINE**.

Each of these questions has four parts.

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

QUESTION THREE

The flow chart shows how the waste poly(ethene) from our homes can be used.

**3A** One problem associated with **Step 1** is that . . .

- 1 some people do **not** put their waste polymers in the special bins.
- 2 people prefer to burn their waste polymers.
- 3 poly(ethene) is toxic.
- 4 waste polymers rot and begin to smell.

3B One problem associated with **Step 2** is that . . .

- 1 burning diesel fuel in lorries can increase global warming.
- 2 people do **not** know where the recycling centres are.
- 3 the bins of waste polymers are very heavy.
- 4 the lorries are hard to recognise.

3C One problem associated with **Step 3** is that . . .

- 1 all polymers are the same colour.
- 2 polymers **cannot** be melted down.
- 3 polymers are magnetic.
- 4 separating polymers costs money.

3D One reason why all waste polymers are **not** burned in **Step 4** is that . . .

- 1 burning polymers can produce toxic gases.
- 2 polymers are poor conductors of electricity.
- 3 some polymers melt before burning.
- 4 burning polymers produces too much heat.

Turn over for the next question

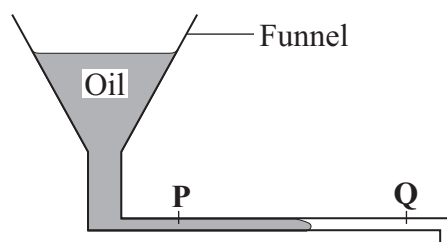
Turn over ►

QUESTION FOUR

Viscosity is the ease with which a liquid flows.

The more viscous an oil is, the more slowly it will flow.

A student compared the viscosity of four different oils, **W**, **X**, **Y** and **Z**, at different temperatures. He used the apparatus shown in the diagram.



First he used oil **W**.

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The results are shown in the table.

Oil	Time taken for the oil to travel between points P and Q in seconds			
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X	35	32	29	26
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4A When testing oil **W** at the four temperatures shown, the dependent variable is . . .

- 1 the choice of oil.
- 2 the time the oil takes to travel between **P** and **Q**.
- 3 the temperature of the oil.
- 4 the distance between **P** and **Q**.

4B A measurement that appears to be anomalous is for . . .

- 1 oil **W** at 40 °C.
- 2 oil **X** at 30 °C.
- 3 oil **Y** at 40 °C.
- 4 oil **Z** at 30 °C.

4C The most viscous oil is . . .

- 1 **W**
- 2 **X**
- 3 **Y**
- 4 **Z**

4D The accuracy of the results would be improved by . . .

- 1 using a wider range of temperatures.
- 2 repeating each procedure.
- 3 maintaining the apparatus at the same temperature as the oil.
- 4 using more oils.

Turn over for the next question

Turn over ►

QUESTION FIVE

This question is about oils and fats. Usually, the higher the degree of unsaturation of an oil or fat, the better it is for our health.

Oils and fats will be taken into our bodies where the average temperature is 37°C . The table below gives information about some oils and fats.

Oil or fat	Total percentage unsaturation	Melting point in $^{\circ}\text{C}$
Peanut oil	34	-2
Grapeseed oil	29	10
Coconut oil	2	25
Shortening	0	46

5A How many of the substances listed in the table will be solid in our bodies?

- 1 one
- 2 two
- 3 three
- 4 four

5B Which of these thermometers would most accurately measure the melting points of the oils and fats in the table?

A thermometer reading from . . .

- 1 0°C to 50°C marked in intervals of 2°C .
- 2 0°C to 50°C marked in intervals of 1°C .
- 3 -10°C to 110°C marked in intervals of 2°C .
- 4 -10°C to 110°C marked in intervals of 1°C .

5C Usually, the healthier an oil or fat is, the lower its melting point.

The reason for this is that the oils and fats with lower melting points . . .

- 1 melt more easily in the body.
- 2 are always higher in nutrients.
- 3 possess more double bonds.
- 4 possess fewer double bonds.

5D If a graph of melting point against food type were plotted then . . .

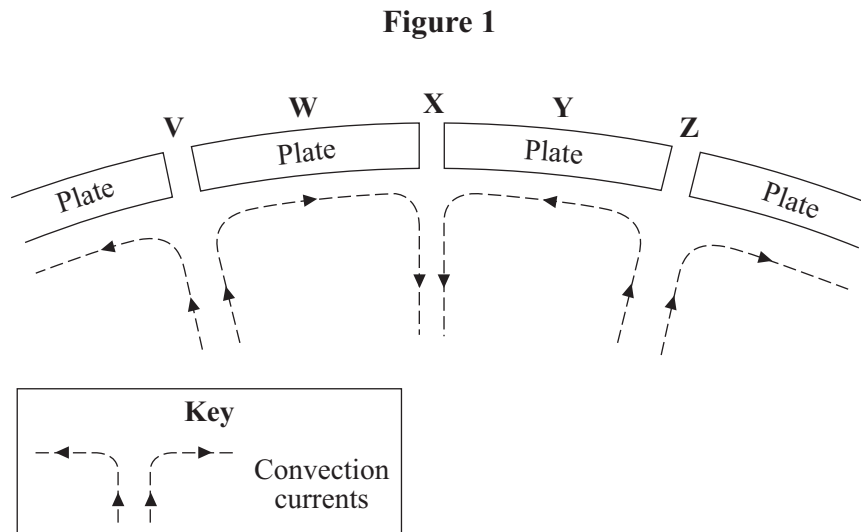
- 1 the independent variable would be categoric.
- 2 the dependent variable would be categoric.
- 3 the independent variable would be continuous.
- 4 the dependent variable would be discrete.

Turn over for the next question

Turn over ►

QUESTION SIX

Figure 1 represents a section close to the surface of the Earth.



6A At which points on the diagram would earthquakes be most likely to occur?

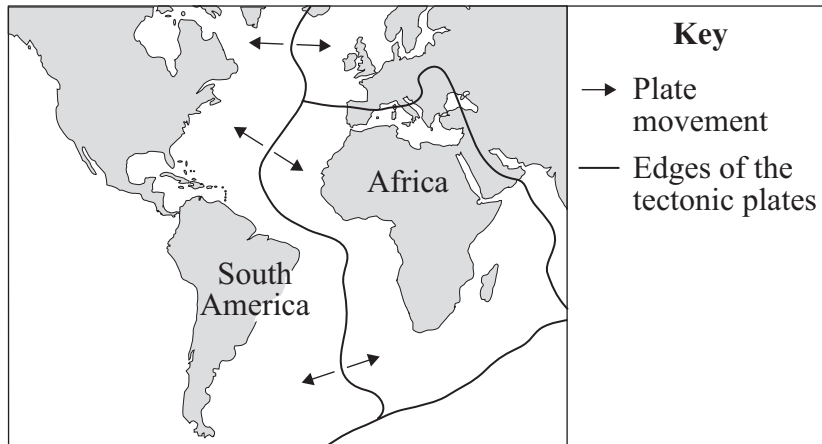
- 1 V, W and Y
- 2 V, X and Z
- 3 W, Y and Z
- 4 X, Y and Z

6B Scientists **cannot** accurately predict when earthquakes will occur because . . .

- 1 plate movement occurs at random intervals.
- 2 plates move only a few centimetres each year.
- 3 plates can move either towards or away from each other.
- 4 plate movement is determined by convection currents.

6C The map shows the positions of Africa and South America today.

There is evidence that millions of years ago, they were joined together.



Which of the positions on **Figure 1** could represent the plate boundary between Africa and South America?

- 1 V and X
- 2 V and Z
- 3 W and X
- 4 W and Z

6D The discovery of tectonic plates brought greater acceptance of the theory that . . .

- 1 the Earth is shrinking.
- 2 the Earth's continents are moving.
- 3 convection currents occur within the Earth's crust.
- 4 the Earth's crust is stable.

Turn over ►

QUESTION SEVEN

This question is about polymers.

Poly(propene) is made from the alkene, propene.

7A Which one of the following statements about the formation of poly(propene) from propene is correct?

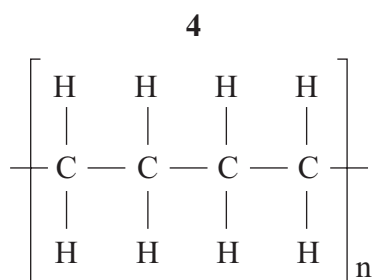
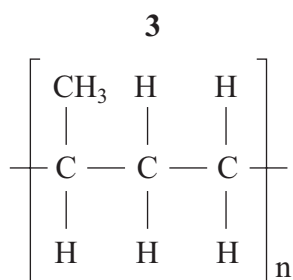
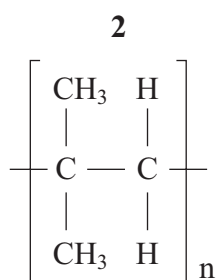
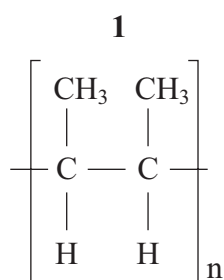
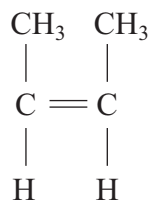
- 1 The product will readily react with bromine.
- 2 The reaction involves thermal decomposition.
- 3 The reaction involves cracking.
- 4 The product is a saturated hydrocarbon.

7B The term thermosoftening is used to describe how poly(propene) behaves on heating.

This means that poly(propene) must therefore . . .

- 1 **not** be used for packaging in warm countries because it will soften.
- 2 contain only short chain molecules which move around easily on heating.
- 3 have chemical bonds between the chains which break on heating.
- 4 be capable of being shaped on heating.

- 7C Which one of the following polymers can be formed by polymerising the alkene with this formula?



- 7D Which one of the following statements about polymer waste is correct?

All polymer waste . . .

- 1 can be easily recycled.
- 2 will biodegrade when placed in landfill sites.
- 3 will contribute to global warming if burned.
- 4 is easily removed from other waste by adding water because the polymer waste will sink to the bottom.

Turn over ►

QUESTION EIGHT

Green plant cells contain many different coloured pigments.

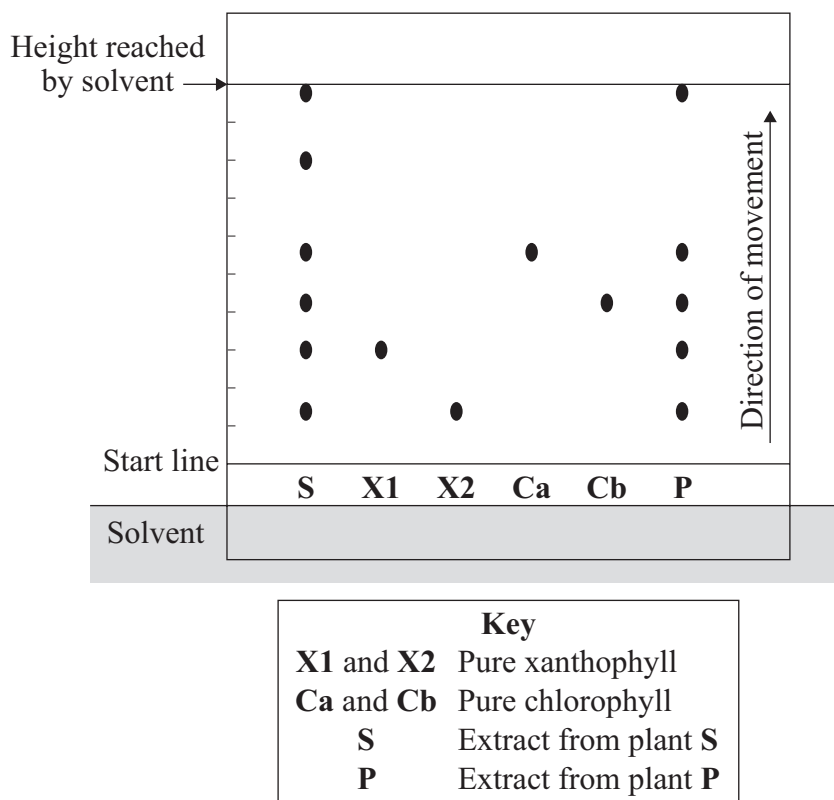
Examples are:

- two types of chlorophyll, **Ca** and **Cb**
- two types of xanthophyll, **X1** and **X2**.

The pigments can be separated by chromatography.

In an experiment, extracts from two plants, **P** and **S**, were compared with pure **Ca**, **Cb**, **X1** and **X2** using chromatography.

The diagram shows the results of the experiment.



8A From this experiment it is possible to deduce that plant **S** contains . . .

- 1 coloured substances **not** identified by this experiment.
- 2 four coloured substances.
- 3 seven coloured substances.
- 4 the same mixture of coloured substances as plant **P**.

8B From this experiment it is possible to deduce that plant **P** . . .

- 1 contains coloured substances that are soluble in the solvent.
- 2 contains substances that could be safely used for colouring food.
- 3 is unhealthy.
- 4 would look identical to plant **S**.

In chromatography, the R_f value = $\frac{\text{distance moved by the substance}}{\text{distance moved by the solvent}}$

8C What is the R_f value for **X1**?

- 1 0.03
- 2 0.16
- 3 0.30
- 4 3.33

8D Two other coloured substances found in plants are:

- carotene R_f value 0.98
- phaeophytin R_f value 0.80

From this information we can deduce that the leaves on plant **S** contain . . .

- 1 both carotene and phaeophytin.
- 2 carotene but **not** phaeophytin.
- 3 phaeophytin but **not** carotene.
- 4 neither carotene nor phaeophytin.

Turn over ►

QUESTION NINE

9A There was little or no nitrogen in Earth's early atmosphere, but a gaseous compound of nitrogen was present in small amounts.

This gaseous compound is . . .

- 1 ammonia.
- 2 carbon dioxide.
- 3 methane.
- 4 sulfur dioxide.

In 1892, Lord Rayleigh compared nitrogen from the air with very pure nitrogen obtained from nitrogen compounds. The density of the nitrogen was:

nitrogen from the air	= 1.2572 grams per litre
nitrogen from nitrogen compounds	= 1.2511 grams per litre.

Rayleigh and Sir William Ramsay proved that atmospheric nitrogen was not pure but contained five other gases, which together made up about 1% of the Earth's atmosphere. The gases were argon (0.94%) and traces of helium, neon, krypton and xenon.

The five gases are similar in that they show no chemical reactions but have different physical properties, eg density, melting point, boiling point.

9B The main reason why scientists did **not** find these five gases in the atmosphere at an earlier date was that . . .

- 1 they have a very low density.
- 2 they are present in only small quantities.
- 3 they are unreactive.
- 4 they are colourless.

9C One way of separating the five gases from each other is by . . .

- 1 passing a mixture of the gases over heated carbon.
- 2 allowing them to settle, according to density, in a glass vessel.
- 3 fractional distillation of the mixture.
- 4 passing a mixture of the gases over a nickel catalyst.

- 9D** From the information given in the question, it is safe to predict that . . .
- 1** nitrogen makes up about 78% of the atmosphere.
 - 2** argon has a density greater than the density of nitrogen.
 - 3** neon, krypton and xenon have a density lower than the density of nitrogen.
 - 4** nitrogen from nitrogen compounds must contain a very light gas such as hydrogen.

END OF TEST

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