AQA GCSE SCIENCE A (CHEMISTRY)

CHEMISTRY



EXAM QUESTION PACK

UNIT C1b OBJECTIVE TEST CHY1BP PAPERS

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Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

General Certificate of Secondary Education
Foundation Tier and Higher Tier
November 2012

Science A

Unit Chemistry C1b (Oils, Earth and Atmosphere)

Chemistry

Unit Chemistry C1b (Oils, Earth and Atmosphere)

CHY1BP

F&H

Tuesday 6 November 2012 Afternoon Session

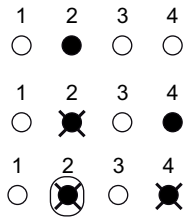
For this paper you must have:
- a black ball-point pen
- an objective test answer sheet.

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.

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You must do **one Tier** only, **either** the Foundation Tier **or** the Higher Tier.
The Higher Tier starts on page 16 of this booklet.

FOUNDATION TIER

Section One

Questions **ONE** to **FIVE**.

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

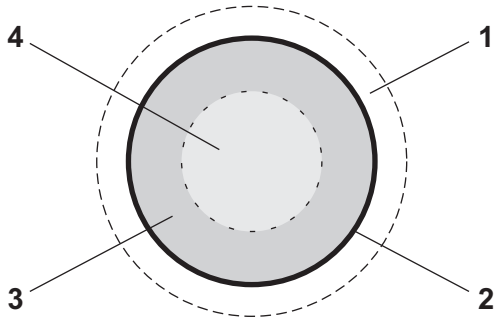
Use **each** answer only **once**.

Mark your choices on the answer sheet.

QUESTION ONE

The diagram shows the layered structure of the Earth.

The outer dotted line marks a layer above the Earth's surface.



Match words, **A**, **B**, **C** and **D**, with the labels **1**–**4** on the diagram.

A Atmosphere

B Core

C Crust

D Mantle

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QUESTION TWO

This question is about four cooking oils.

	Type of cooking oil	Saturated fat %	Unsaturated fat %		Melting point in °C	Energy from 100 g of the oil in kJ
			mono	poly		
A	Corn	13	25	62	–15	3700
B	Olive	11	69	20	–12	3378
C	Rapeseed	12	24	64	5	3696
D	Sunflower	14	19	67	–18	3690

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

1	It has the highest percentage of saturated fat.
2	It has the highest percentage of unsaturated fat.
3	It releases the most energy from 100 g of the oil.
4	It would be the first to turn solid if the oils were cooled from 20 °C.

Turn over for the next question

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QUESTION THREE

This question is about hydrocarbons.

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

A alkanes

B fuels

C monomers

D polymers

Hydrocarbons are cracked to produce smaller molecules.

Some of the products of cracking can be used in cars as . . . **1** . . . .

The products of cracking include alkenes and saturated hydrocarbons called . . . **2** . . . .

Alkenes can be used in reactions to make . . . **3** . . . such as poly(ethene) and poly(propene).

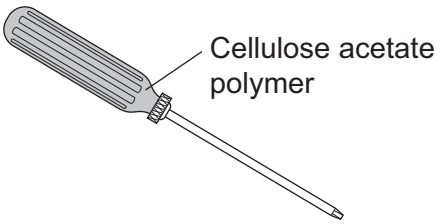
In these reactions, many small molecules known as . . . **4** . . . join together to produce very large molecules.

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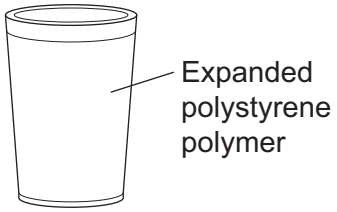
QUESTION FOUR

The drawings show four different objects. Each object is made using a different polymer.

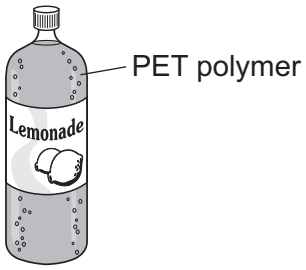
A Screwdriver



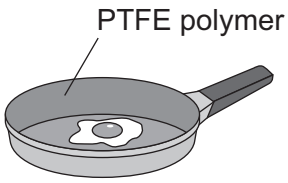
B Disposable coffee cup



C Bottle for soft drinks



D Frying pan



The table below shows some properties of four different polymers.

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

	Properties of the polymer
1	It forms a non-stick surface that can be strongly heated.
2	It is strong, lightweight, transparent and can be recycled.
3	It is strong, rigid and a good electrical insulator.
4	It is a good heat insulator and has a very low density.

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QUESTION FIVE

This question is about the manufacture of margarine spreads from sunflower oil.

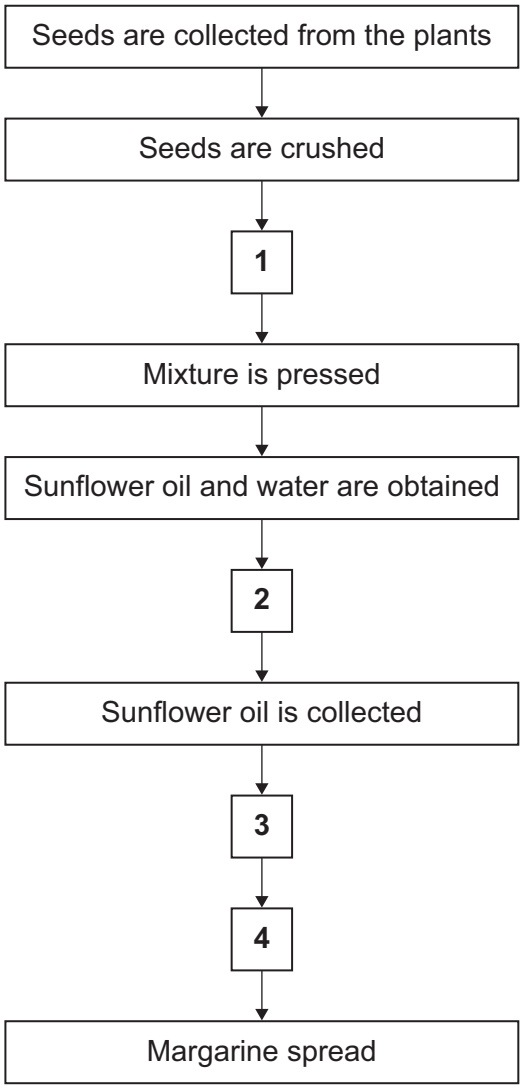
Match statements, **A**, **B**, **C** and **D**, with the numbers **1**–**4** in the flow chart.

A Oil hardens and additives are mixed in.

B Sunflower oil separates from the water.

C Water is added and the mixture is stirred.

D Sunflower oil is reacted with hydrogen.



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Turn over for the next question

Section Two

Questions **SIX** to **NINE**.

Each of these questions has four parts.

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

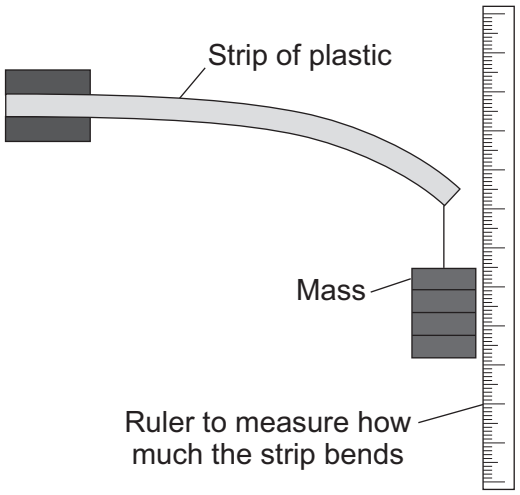
Mark your choices on the answer sheet.

QUESTION SIX

A student used the apparatus shown in the diagram to measure the flexibility of a strip of plastic. The strip of plastic was 5 mm thick.

The student did the test again using the same piece of plastic and recorded the results of both tests.

He did identical tests using three more strips of the same plastic but each with a different thickness. All four strips were the same length.



The results are shown in the table.

	How much the plastic strip bends downwards in mm	
Thickness of the plastic strip in mm	**Test 1**	**Test 2**
5	27	25
10	18	20
15	12	8
20	8	7

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6A The plastic strip giving the most unreliable results is the one with a thickness of . . .

1 5 mm.

2 10 mm.

3 15 mm.

4 20 mm.

6B Which one of the following is controlled to make sure the investigation is a fair test?

1 the mass added

2 the thickness of the plastic strip

3 the width of the ruler

4 the distance the plastic strip bends

6C To improve the reliability of the results, you can . . .

1 use different lengths of plastic strip.

2 use plastic strips with a wider range of thicknesses.

3 ask another student to repeat the tests.

4 do the tests at a higher temperature.

6D Which one of the following correctly describes the relationship in the results?

1 As the thickness increases, the flexibility decreases.

2 The thickness does **not** affect the flexibility.

3 The flexibility is proportional to the mass added.

4 The longer the plastic strip, the less it bends.

Turn over for the next question

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QUESTION SEVEN

The table shows the fats in 100 grams of butter and in 100 grams of a margarine spread called Activo.

Type of fat	Butter	Activo
Total fat of which . . .	81.0 g	80.0 g
saturates	51.2 g	26.3 g
monounsaturates	27.5 g	18.8 g
polyunsaturates	2.3 g	34.9 g

Fats can:

- increase a person's weight and cause obesity
- raise cholesterol levels in the blood.

Most human cholesterol is manufactured in the body; only about 4% is a result of diet.

High cholesterol levels are linked to heart disease.

Saturated fats raise cholesterol levels.
The more unsaturated a fat, the better it is for lowering cholesterol levels.

7A The manufacturing company claims that Activo is healthier than butter.

This claim may not be valid because . . .

1 the company's scientists are unqualified.

2 the company wants to increase sales of Activo.

3 Activo is cheaper than butter.

4 the company is not sure which fats Activo contains.

7B From the information provided, it can be concluded that . . .

1 butter is the main cause of heart disease.

2 heart disease will be reduced by eating Activo instead of butter.

3 all fats will cause heart disease.

4 there is more unsaturated fat in Activo than in butter.

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7C An overweight person ate his normal diet, except that he stopped eating foods containing saturated fats. He was surprised that he continued to gain weight.

This could be because . . .

1 his diet still contained a high level of unsaturated fats.

2 his cholesterol level was reduced.

3 his cholesterol level was unchanged.

4 he was no longer eating any fats.

7D Designing surveys to compare the effects of butter and Activo in causing heart disease is difficult because . . .

1 both butter and Activo contain similar amounts of fat.

2 other factors can cause heart disease.

3 Activo contains more polyunsaturates than butter.

4 people with heart disease will not take part in the survey.

Turn over for the next question

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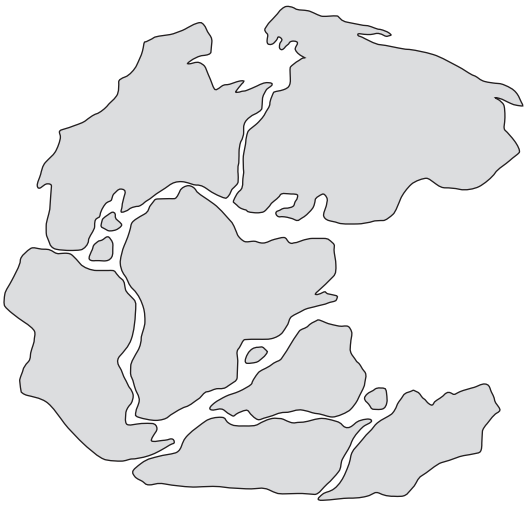
QUESTION EIGHT

Alfred Wegener was a German scientist who worked in the early part of the 20th century.

His theory was that about 250 million years ago all the continents were joined together in a single 'super continent', which he called Pangaea.

He suggested that the super continent split up and that the separate continents drifted away from each other.

Pangaea



8A One piece of evidence that Wegener used was that some continents . . .

1 have similar shapes.

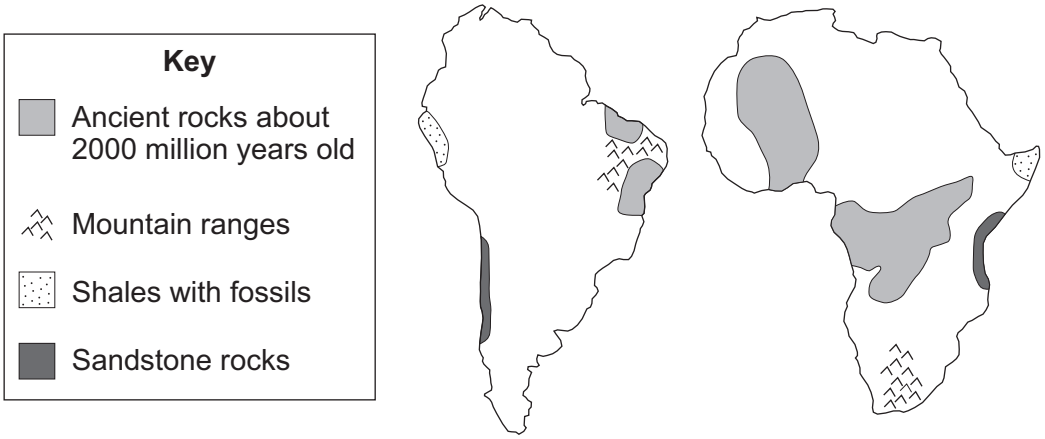
2 have similar weather patterns.

3 have coastlines that fit quite closely together.

4 have similar vegetation.

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8B When Wegener studied the African and South American continents, he found other evidence that these continents had been joined in the past.



One piece of evidence suggested on this diagram is that the two continents have . . .

1 ancient rocks in matching positions.

2 similar patterns of fossils.

3 similar patterns of mountain ranges.

4 similar sandstone rocks.

8C In the early part of the 20th century, many scientists did not accept Wegener's theory because . . .

1 the continents did not have all the same animals.

2 the continents did not have all the same plants.

3 there was no explanation how continents could move.

4 the Earth's crust stayed the same.

8D About 50 years after Wegener put forward his theory, scientists began to accept his ideas.

This was because of evidence that . . .

1 the Earth's crust was shrinking.

2 the Earth's crust was cooling.

3 the Earth's crust was separated into tectonic plates.

4 there was volcanic activity on most coastlines.

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QUESTION NINE

In Britain, we drink about 2 billion litres of bottled water per year.

Use the following information to answer the questions.

Manufacturing the bottles
Many of the bottles are made from a plastic called PET. PET takes about 450 years to biodegrade. PET is made from substances obtained from crude oil.

Getting bottled water to our homes
About 25% of the bottled water is imported. Lorries that deliver bottled water travel up to 2000 km.

The used empty bottles
About 4.5% of household waste is plastic bottles, of which 10% is PET water bottles. The majority of this ends up in landfill sites or is burned.

9A One problem the information suggests is that the substances used to make PET . . .

1 are obtained from a non-renewable raw material.

2 are obtained from a renewable raw material.

3 are dangerous to use.

4 are too expensive.

9B What percentage of household waste is made up of PET water bottles?

1 0.045%

2 0.45%

3 14.5%

4 45.0%

9C An important reason for **not** putting PET bottles in landfill sites is that . . .

1 landfill sites are only used for glass bottles.

2 PET biodegrades very slowly.

3 PET has a low density and is blown over the countryside.

4 PET kills wildlife.

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9D An environmental problem with importing bottled water by road is that . . .

1 it increases the amount of carbon dioxide in the atmosphere.

2 it increases the amount of oxygen in the atmosphere.

3 it takes a long time for the water to get to British households.

4 water from European countries is of poor quality.

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.

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 the manufacture of margarine spreads from sunflower oil.

Match statements, **A**, **B**, **C** and **D**, with the numbers **1**–**4** in the flow chart.

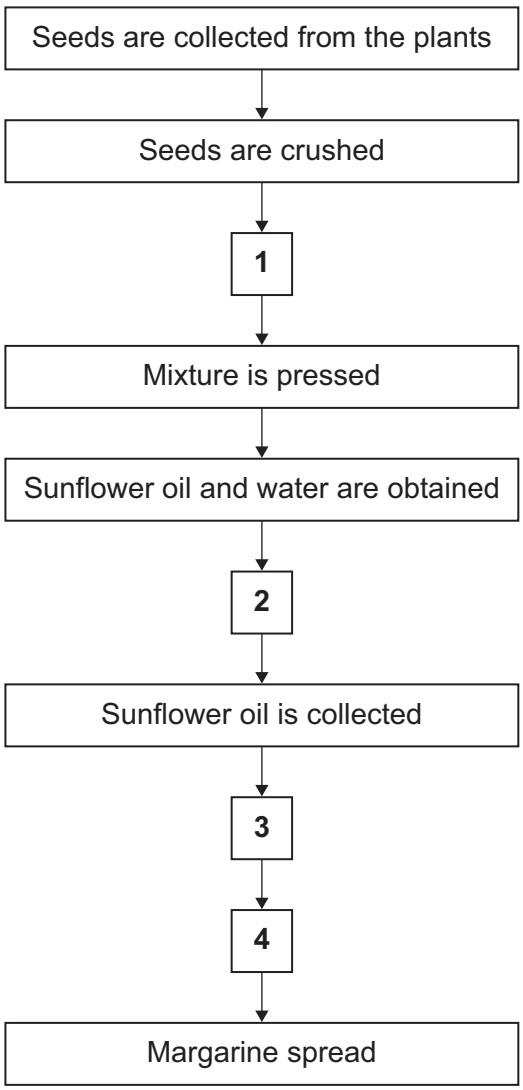
A Oil hardens and additives are mixed in.

B Sunflower oil separates from the water.

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Turn over for the next question

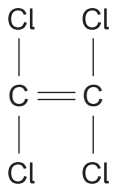
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QUESTION TWO

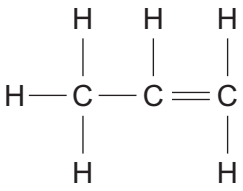
Some plastic waste was taken to a recycling centre. At the recycling centre, the plastic was sorted and treated chemically. The chemical treatment broke down the plastic.

Breaking down the plastic produced new substances. The formulae for some of the substances produced are shown below.

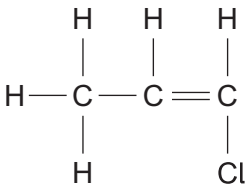
A



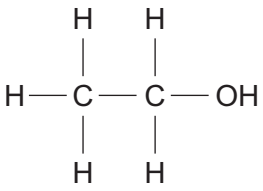
B



C



D



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

1	It is a hydrocarbon.
2	It could be made from propene, C_3H_6
3	It is made when ethene reacts with steam, H_2O
4	It would not produce water vapour if burnt in air.

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Turn over for the next question

Section Two

Questions **THREE** to **NINE**.

Each of these questions has four parts.

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

Mark your choices on the answer sheet.

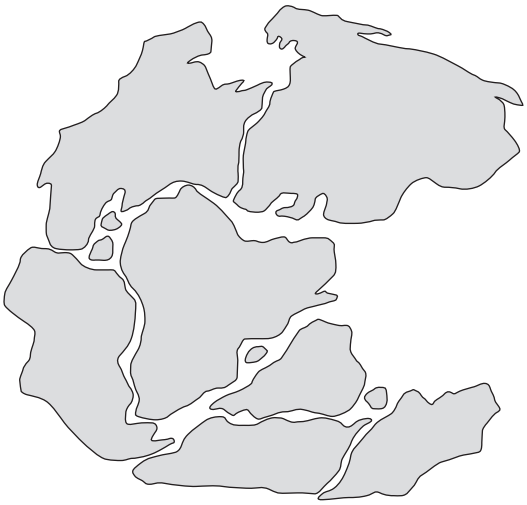
QUESTION THREE

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His theory was that about 250 million years ago all the continents were joined together in a single 'super continent', which he called Pangaea.

He suggested that the super continent split up and that the separate continents drifted away from each other.

Pangaea



3A One piece of evidence that Wegener used was that some continents . . .

1 have similar shapes.

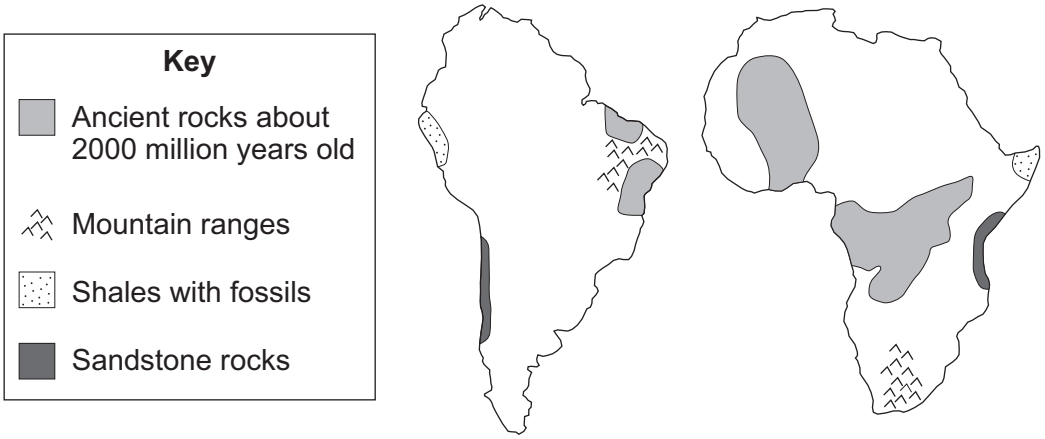
2 have similar weather patterns.

3 have coastlines that fit quite closely together.

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3B When Wegener studied the African and South American continents, he found other evidence that these continents had been joined in the past.



One piece of evidence suggested on this diagram is that the two continents have . . .

1 ancient rocks in matching positions.

2 similar patterns of fossils.

3 similar patterns of mountain ranges.

4 similar sandstone rocks.

3C In the early part of the 20th century, many scientists did not accept Wegener's theory because . . .

1 the continents did not have all the same animals.

2 the continents did not have all the same plants.

3 there was no explanation how continents could move.

4 the Earth's crust stayed the same.

3D About 50 years after Wegener put forward his theory, scientists began to accept his ideas.

This was because of evidence that . . .

1 the Earth's crust was shrinking.

2 the Earth's crust was cooling.

3 the Earth's crust was separated into tectonic plates.

4 there was volcanic activity on most coastlines.

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QUESTION FOUR

In Britain, we drink about 2 billion litres of bottled water per year.

Use the following information to answer the questions.

Manufacturing the bottles
Many of the bottles are made from a plastic called PET. PET takes about 450 years to biodegrade. PET is made from substances obtained from crude oil.

Getting bottled water to our homes
About 25% of the bottled water is imported. Lorries that deliver bottled water travel up to 2000 km.

The used empty bottles
About 4.5% of household waste is plastic bottles, of which 10% is PET water bottles. The majority of this ends up in landfill sites or is burned.

4A One problem the information suggests is that the substances used to make PET . . .

1 are obtained from a non-renewable raw material.

2 are obtained from a renewable raw material.

3 are dangerous to use.

4 are too expensive.

4B What percentage of household waste is made up of PET water bottles?

1 0.045%

2 0.45%

3 14.5%

4 45.0%

4C An important reason for **not** putting PET bottles in landfill sites is that . . .

1 landfill sites are only used for glass bottles.

2 PET biodegrades very slowly.

3 PET has a low density and is blown over the countryside.

4 PET kills wildlife.

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4D An environmental problem with importing bottled water by road is that . . .

1 it increases the amount of carbon dioxide in the atmosphere.

2 it increases the amount of oxygen in the atmosphere.

3 it takes a long time for the water to get to British households.

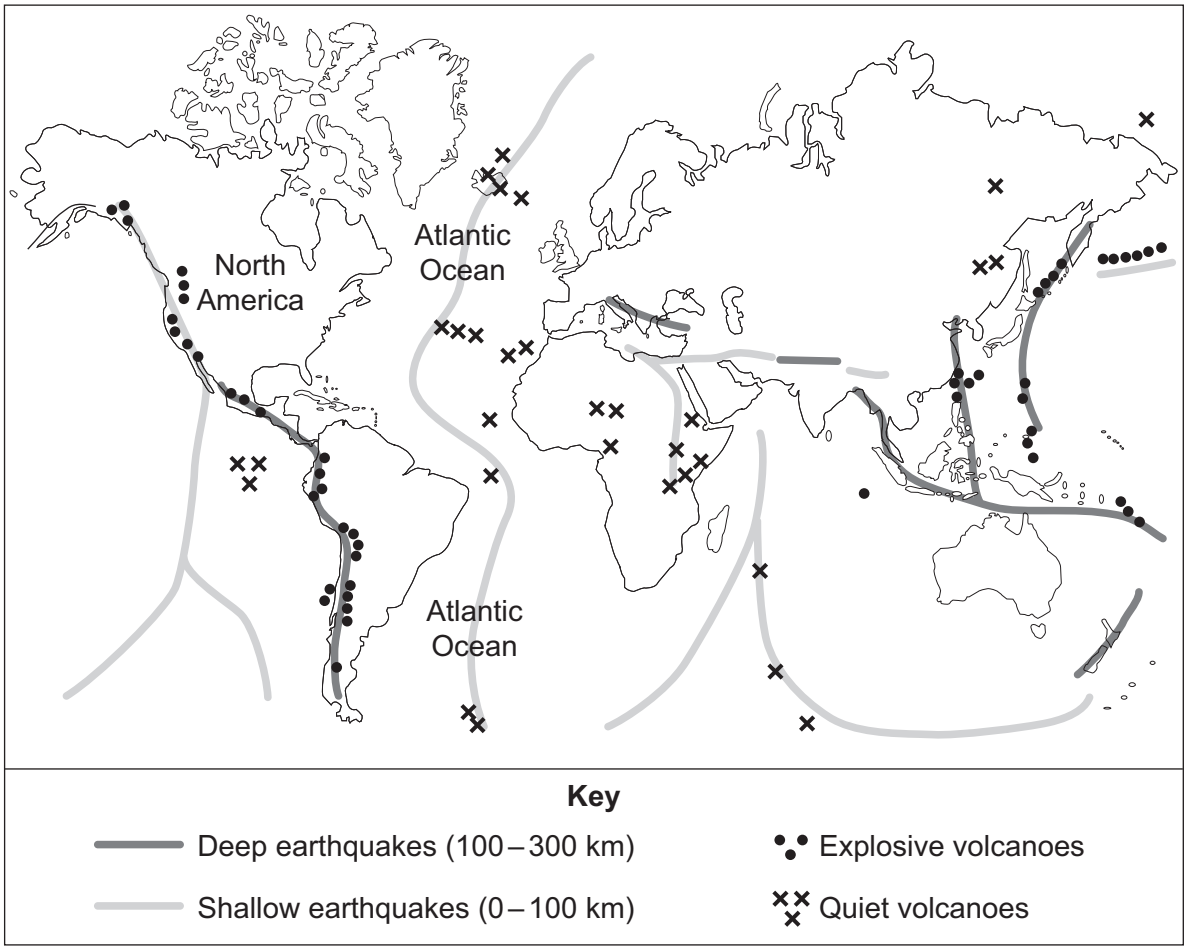
4 water from European countries is of poor quality.

Turn over for the next question

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QUESTION FIVE

The map shows the main areas on Earth where earthquakes and volcanoes occur.



5A What pattern is most clear?

1 Earthquakes and volcanoes always occur in the same areas.

2 Earthquakes and volcanoes always occur at the same time.

3 Explosive volcanoes often occur in the same areas as deep earthquakes.

4 Quiet volcanoes occur only on land masses.

5B There is considerable earthquake activity in the middle of the Atlantic Ocean because . . .

1 there are very deep ocean trenches in this area.

2 it is the boundary between two tectonic plates.

3 it is a zone of explosive volcanic activity.

4 the Earth's crust is very thick under the oceans.

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5C In the past, there have been earthquakes associated with the San Andreas fault in North America. Scientists would like to be able to predict when another earthquake will affect this heavily populated area.

They cannot do this accurately because . . .

1 all the evidence has been destroyed.

2 it is too dangerous to work in the earthquake zone.

3 there are too few scientists to cover the length of the fault.

4 movements along the fault occur at random intervals.

5D Research has shown that magma underneath explosive volcanoes has a high water content. When this magma escapes from the Earth it explodes because all of the water turns to steam.

A high water content in magma indicates a potential explosion because when the magma escapes . . .

1 the temperature decreases.

2 the pressure decreases.

3 the magma is very fluid.

4 the magma is very dense.

Turn over for the next question

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QUESTION SIX

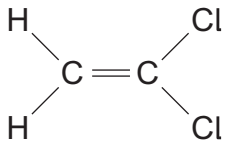
Worldwide, about 20 billion wine bottle stoppers are produced each year.

In recent years, the traditional cork stoppers have been gradually replaced by screw-top stoppers.

Cork is the bark from the cork-oak tree. The cork is cut off about every ten years. Tens of thousands of people in Portugal depend on cork for their jobs. Used cork can be recycled.

A screw-top stopper can be made of aluminium, with a polymer sealant inside. The sealant is usually made of poly(ethene) or poly(vinylidene chloride). Extraction of aluminium from its ores is expensive and a lot of energy is needed. It is difficult to separate the polymer from the aluminium cap to allow aluminium to be recycled.

Vinylidene chloride has the structure:



6A One difference between ethene and vinylidene chloride is that . . .

1 only ethene is an unsaturated compound.

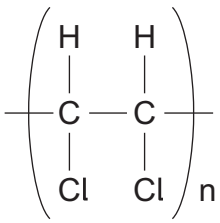
2 only vinylidene chloride will react with iodine.

3 only vinylidene chloride is obtained from crude oil.

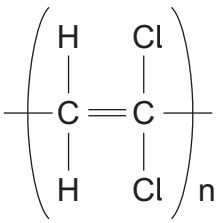
4 only ethene is a hydrocarbon.

6B The formula for poly(vinylidene chloride) is . . .

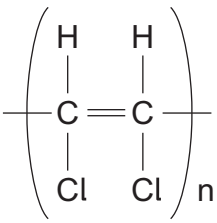
1



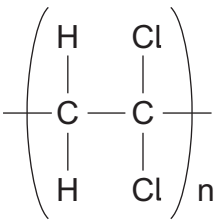
2



3



4



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6C There are two likely consequences of wine companies using metal screw-top stoppers with polymer sealants instead of cork.

Which row in the table correctly shows the two likely consequences?

1	increased use of crude oil	loss of jobs in Portugal
2	reduction in carbon dioxide emissions	loss of jobs in Portugal
3	reduction in carbon dioxide emissions	loss of important forest habitat
4	increased use of crude oil	reduced amount of material put in landfill

6D Scientists are researching the consequences of using screw-top stoppers with polymer sealants instead of cork.

Which row in the table below gives the correct description of an issue and its impact?

	Issue	**Impact**
1	ethical	effect on the price of wine
2	social	effect on some communities
3	environmental	effect on the quality of wine
4	economic	effect on cork forest habitat

Turn over for the next question

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QUESTION SEVEN

Green plant cells contain many different coloured pigments.

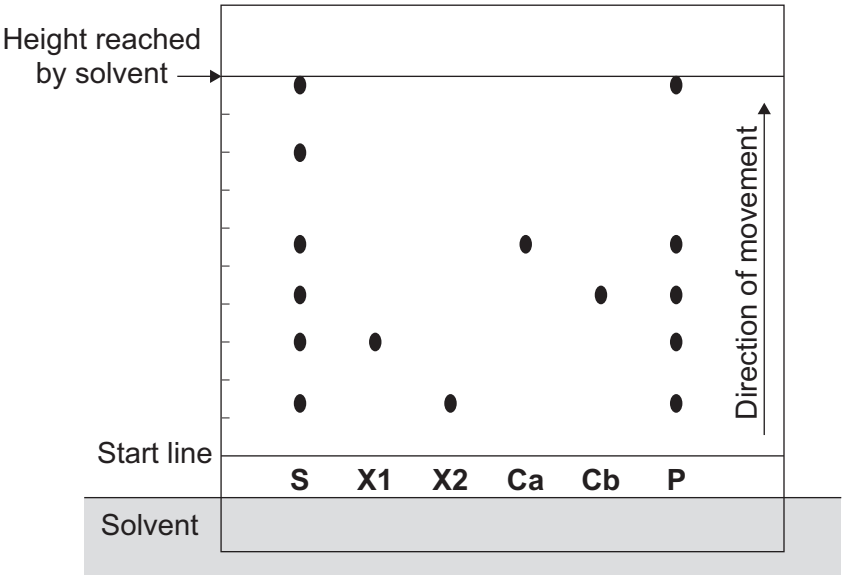
Examples are:

- 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.



Key	
X1 and **X2**	Pure xanthophyll
Ca and **Cb**	Pure chlorophyll
S	Extract from plant **S**
P	Extract from plant **P**

7A 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**.

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7B 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**.

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

7C What is the R_f value for **X1**?

1 0.03

2 0.16

3 0.30

4 3.33

7D 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.

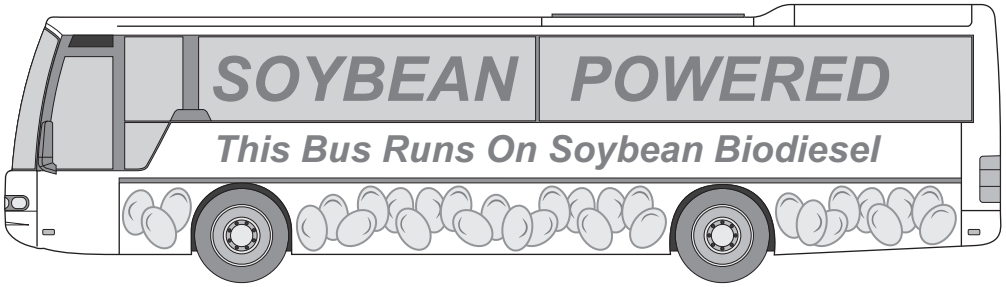
4 neither carotene nor phaeophytin.

Turn over for the next question

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QUESTION EIGHT

Petroleum diesel fuel is made from crude oil.
Biodiesel fuel is made from vegetable oils. In America, soybean and rapeseed oils are used to make biodiesel.



Biodiesel biodegrades in about a quarter of the time needed for petroleum diesel to biodegrade. Biodiesel, when burned, emits more acidic nitrogen oxides but fewer particulates than petroleum diesel.

Three types of fuel containing biodiesel are available in America:

- B100 (100% biodiesel)
- B20 (20% biodiesel; 80% petroleum diesel)
- B2 (2% biodiesel; 98% petroleum diesel).

In a diesel engine, the fuel flows from the fuel tank, along fuel pipes, to the combustion chamber. In the combustion chamber, glow plugs ignite the fuel.

There are some problems using B100. Biodiesel is more viscous than petroleum diesel and is more difficult to ignite (has a lower cetane number than petroleum diesel). In most engines, the biodiesel needs to be pre-heated.

Biodiesel also has a higher melting point than petroleum diesel and so, in winter, can solidify in pipes and filters.

Using B20 gives few problems, and little or no modification to engines is needed.

8A The availability of B2 and B20 may persuade more motorists to use biodiesel.

This could be important because . . .

1 crude oil is non-renewable.

2 biodiesel emissions are less likely to cause acid rain.

3 B100 does not ignite as easily as petroleum diesel.

4 burning biodiesel does not produce any waste gases.

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8B The biodiesel made from vegetable oil should have all the following properties **except** . . .

1 a low viscosity.

2 a high melting point.

3 a high cetane number.

4 a good flow rate.

8C Why are **net** carbon dioxide emissions lower for biodiesel than for petroleum diesel?

1 The carbon dioxide is reused to make fossil fuels.

2 Some vegetable oils produce very little carbon dioxide when they burn.

3 The plants used to make biodiesel take in carbon dioxide for photosynthesis.

4 The carbon dioxide produced by burning biodiesel is very soluble in water.

8D One possible disadvantage of using fuel with a high percentage of biodiesel is that . . .

1 it is non-biodegradable.

2 it could increase the amount of acid rain.

3 it is non-renewable.

4 it could increase global dimming.

Turn over for the next question

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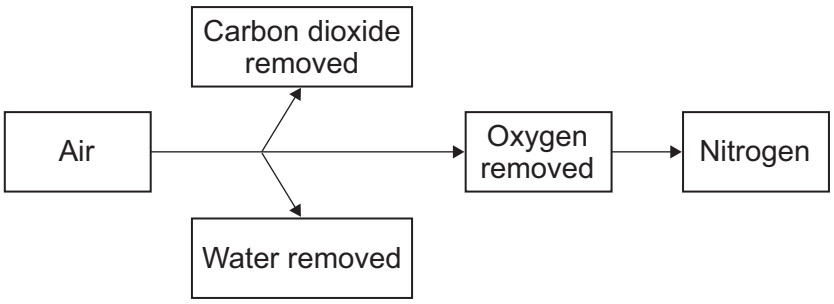
QUESTION NINE

The table below gives information about the gases in the air after the water vapour has been removed.

Gas	Melting point in °C	Boiling point in °C	Abundance in %
Nitrogen	−209	−196	78
Oxygen	−223	−183	21
Carbon dioxide	−57	−57	0.03
Helium	−272	−269	Less than 0.01
Neon	−248	−246	Less than 0.01
Argon	−189	−186	0.9
Krypton	−157	−153	Less than 0.01
Xenon	−112	−108	Less than 0.01

In 1892, scientists believed that the air consisted of three gases, nitrogen, oxygen and carbon dioxide.

Lord Rayleigh extracted nitrogen from the air.



He also collected very pure nitrogen by decomposing ammonium nitrate.

He found that there was a very small difference in the densities of the nitrogen samples from the two different sources.

- Density of nitrogen from the air = 1.2572 g per litre
- Density of nitrogen from ammonium nitrate (NH_4NO_3) = 1.2511 g per litre

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9A A correct conclusion from this information is that . . .

1 hydrogen, a gas with a very low density, is present in the nitrogen from ammonium nitrate.

2 the nitrogen from the air contains a small amount of hydrogen.

3 a gas that is denser than nitrogen is mixed with the nitrogen from the air.

4 some carbon dioxide was given off when the ammonium nitrate was heated.

9B It was several years after 1892 when the other gases in the table were identified.

This was because these other gases . . .

1 are colourless.

2 are unreactive.

3 have a very low density.

4 have very low boiling points.

The separation of gases in the air is done in several stages:

- carbon dioxide is first removed
- the air is then cooled to –200 °C so it liquefies
- the liquefied air is allowed to warm up
- two main fractions, oxygen and nitrogen, are collected
- a third fraction that is mainly argon is also collected.

9C The carbon dioxide is removed before the air is liquefied because . . .

1 it is present only in very small quantities.

2 it is a compound and the other gases are elements.

3 it would solidify during cooling and cause blockages in the pipes.

4 its density is very similar to the density of argon.

9D What is the order in which these fractions boil off from the liquefied air?

1 argon, nitrogen, oxygen

2 oxygen, nitrogen, argon

3 argon, oxygen, nitrogen

4 nitrogen, argon, oxygen

END OF TEST

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There are no questions printed on this page

There are no questions printed on this page

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GCSE

Science A (4461) / Chemistry (4421)

Specification A

CHY1BP, CH1BSF & CH1BSH

Mark Scheme

2012 Examination – November Series

The blank answer sheet for this component can be found at the end of this document.

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This component is an objective test for which the following list indicates the correct answers used in marking the students' responses.

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GCSE

SCIENCE A (4461)/CHEMISTRY (4421)

Objective Test Answer Key

CHY1BP (Oils, Earth and Atmosphere)

November 2012

Foundation Tier

Question	Key		
One	**A**	Atmosphere	**1**
	B	Core	**4**
	C	Crust	**2**
	D	Mantle	**3**
Two	**A**	Oil A	**3**
	B	Oil B	**2**
	C	Oil C	**4**
	D	Oil D	**1**
Three	**A**	alkanes	**2**
	B	fuels	**1**
	C	monomers	**4**
	D	polymers	**3**
Four	**A**	Polymer A	**3**
	B	Polymer B	**4**
	C	Polymer C	**2**
	D	Polymer D	**1**
Five	**A**	Oil hardens and additives are mixed in	**4**
	B	Sunflower oil separates from the water	**2**
	C	Water is added and the mixture is stirred	**1**
	D	Sunflower oil is reacted with hydrogen	**3**

	A	**B**	**C**	**D**
Six	**3**	**1**	**3**	**1**
Seven	**2**	**4**	**1**	**2**
Eight	**3**	**1**	**3**	**3**
Nine	**1**	**2**	**2**	**1**

GCSE

SCIENCE A (4461)/CHEMISTRY (4421)

Objective Test Answer Key

CHY1BP (Oils, Earth and Atmosphere)

November 2012

Higher Tier

Question	Key		
One	**A**	Oil hardens and additives are mixed in	**4**
	B	Sunflower oil separates from the water	**2**
	C	Water is added and the mixture is stirred	**1**
	D	Sunflower oil is reacted with hydrogen	**3**
Two	**A**	Formula A	**4**
	B	Formula B	**1**
	C	Formula C	**2**
	D	Formula D	**3**

	A	B	C	D
Three	**3**	**1**	**3**	**3**
Four	**1**	**2**	**2**	**1**
Five	**3**	**2**	**4**	**2**
Six	**4**	**4**	**1**	**2**
Seven	**1**	**1**	**3**	**1**
Eight	**1**	**2**	**3**	**2**
Nine	**3**	**2**	**3**	**4**

The AQA UMS Conversion Calculator can be found at the following web address:

http://www.aqa.org.uk/umsconversion

GCSE SCIENCE

OTQ3

AQA

Unit : CHY1BP **CHEMISTRY UNIT 1B**

Centre :

Candidate Number : **UCI :**

Candidate Name :

Series : BG12

06-NOV-12

For completion by the Examination Invigilator. **Please fill this circle if the candidate is absent:** ○

HIGHER TIER

Instructions on how to complete this answer sheet are given on the question paper. Please make sure you follow them carefully.

Questions ONE to NINE Choose one response 1 - 4 for each of the parts A - D

QUESTION ONE		1	2	3	4
1A	Oil hardens and additives are mixed in.	○	○	○	○
1B	Sunflower oil separates from the water.	○	○	○	○
1C	Water is added and the mixture is stirred.	○	○	○	○
1D	Sunflower oil is reacted with hydrogen.	○	○	○	○

QUESTION TWO		1	2	3	4
2A	Formula A	○	○	○	○
2B	Formula B	○	○	○	○
2C	Formula C	○	○	○	○
2D	Formula D	○	○	○	○

QUESTION THREE	1	2	3	4
3A	○	○	○	○
3B	○	○	○	○
3C	○	○	○	○
3D	○	○	○	○

QUESTION FOUR	1	2	3	4
4A	○	○	○	○
4B	○	○	○	○
4C	○	○	○	○
4D	○	○	○	○

QUESTION FIVE	1	2	3	4
5A	○	○	○	○
5B	○	○	○	○
5C	○	○	○	○
5D	○	○	○	○

QUESTION SIX	1	2	3	4
6A	○	○	○	○
6B	○	○	○	○
6C	○	○	○	○
6D	○	○	○	○

QUESTION SEVEN	1	2	3	4
7A	○	○	○	○
7B	○	○	○	○
7C	○	○	○	○
7D	○	○	○	○

QUESTION EIGHT	1	2	3	4
8A	○	○	○	○
8B	○	○	○	○
8C	○	○	○	○
8D	○	○	○	○

QUESTION NINE	1	2	3	4
9A	○	○	○	○
9B	○	○	○	○
9C	○	○	○	○
9D	○	○	○	○

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FOUNDATION TIER

Instructions on how to complete this answer sheet are given on the question paper. Please make sure you follow them carefully.

Questions **ONE** to **NINE** Choose one response **1 - 4** for each of the parts **A - D**

QUESTION ONE	1	2	3	4
1A Atmosphere	○	○	○	○
1B Core	○	○	○	○
1C Crust	○	○	○	○
1D Mantle	○	○	○	○

QUESTION TWO	1	2	3	4
2A Corn	○	○	○	○
2B Olive	○	○	○	○
2C Rapeseed	○	○	○	○
2D Sunflower	○	○	○	○

QUESTION THREE	1	2	3	4
3A alkanes	○	○	○	○
3B fuels	○	○	○	○
3C monomers	○	○	○	○
3D polymers	○	○	○	○

QUESTION FOUR	1	2	3	4
4A Screwdriver	○	○	○	○
4B Disposable coffee cup	○	○	○	○
4C Bottle for soft drinks	○	○	○	○
4D Frying pan	○	○	○	○

QUESTION FIVE	1	2	3	4
5A Oil hardens and additives are mixed in.	○	○	○	○
5B Sunflower oil separates from the water.	○	○	○	○
5C Water is added and the mixture is stirred.	○	○	○	○
5D Sunflower oil is reacted with hydrogen.	○	○	○	○

QUESTION SIX	1	2	3	4
6A	○	○	○	○
6B	○	○	○	○
6C	○	○	○	○
6D	○	○	○	○

QUESTION SEVEN	1	2	3	4
7A	○	○	○	○
7B	○	○	○	○
7C	○	○	○	○
7D	○	○	○	○

QUESTION EIGHT	1	2	3	4
8A	○	○	○	○
8B	○	○	○	○
8C	○	○	○	○
8D	○	○	○	○

QUESTION NINE	1	2	3	4
9A	○	○	○	○
9B	○	○	○	○
9C	○	○	○	○
9D	○	○	○	○

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Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

General Certificate of Secondary Education
Foundation Tier and Higher Tier
June 2012

Science A

Unit Chemistry C1b (Oils, Earth and Atmosphere)

Chemistry

Unit Chemistry C1b (Oils, Earth and Atmosphere)

CHY1BP

F&H

Friday 22 June 2012 Afternoon Session

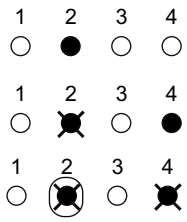
For this paper you must have:
- a black ball-point pen
- an objective test answer sheet.

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.

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You must do **one Tier** only, **either** the Foundation Tier **or** the Higher Tier.
The Higher Tier starts on page 18 of this booklet.

FOUNDATION TIER

Section One

Questions **ONE** to **FIVE**.

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

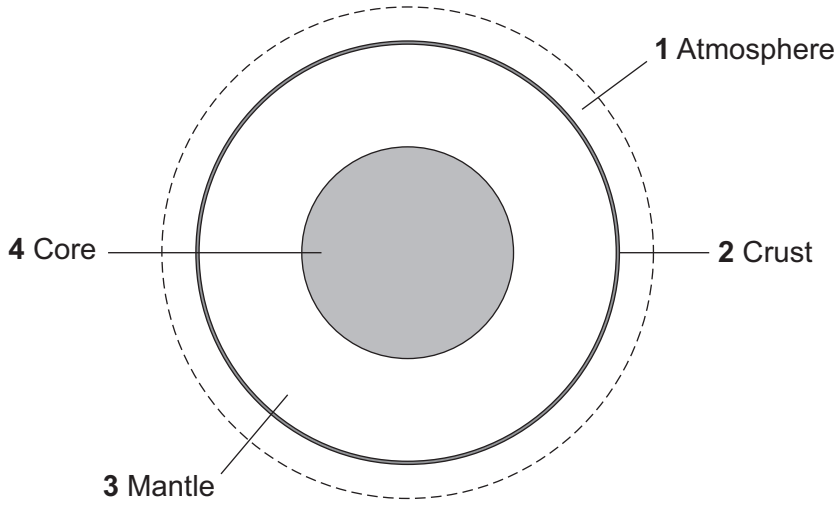
Use **each** answer only **once**.

Mark your choices on the answer sheet.

QUESTION ONE

This question is about the structure of the Earth.

The diagram below shows the layers in and around the Earth.



The Earth's magnetism is thought to be due to the presence of metallic iron and nickel in the centre of the Earth.

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

A where earthquakes occur

B where convection currents occur, causing the tectonic plates to move

C where there is a mixture of gases

D where iron and nickel are found as metals

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QUESTION TWO

This question is about four substances.

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

A bromine

B ethene

C poly(propene)

D water

	Description
1	It forms an emulsion if shaken with an oil
2	It is a polymer
3	It is an unsaturated hydrocarbon
4	It reacts with unsaturated oils to form a colourless compound

Turn over for the next question

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QUESTION THREE

The table shows five noble gases and their boiling points.

Noble gas	Boiling point in °C
Helium	−269
Neon	−246
Argon	−186
Krypton	−152
Xenon	−107

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

A boiling point

B colour

C density

D chemical reactivity

Argon is used in filament lamps because of its low . . . **1** . . . .

In electric discharge tubes, used for advertisement signs, each noble gas glows with a different . . . **2** . . . .

Helium is used in balloons because it has a low . . . **3** . . . .

Xenon has the highest . . . **4** . . . .

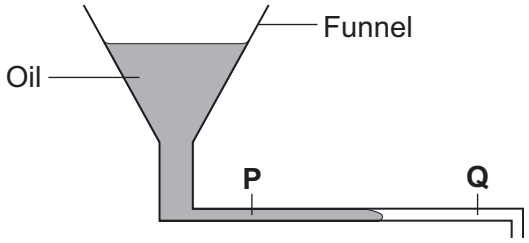
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QUESTION FOUR

Viscosity is a measure of how easily a liquid flows.

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

A student compared the viscosities 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.

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

A the colour of the oil

B the time the oil takes to flow from **P** to **Q**

C the distance between **P** and **Q**

D the four temperatures used for each oil

An independent variable is . . . **1** . . . .

The dependent variable is . . . **2** . . . .

A control variable used to make the investigation fair is . . . **3** . . . .

A variable that does not affect the result of the investigation is . . . **4** . . . .

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QUESTION FIVE

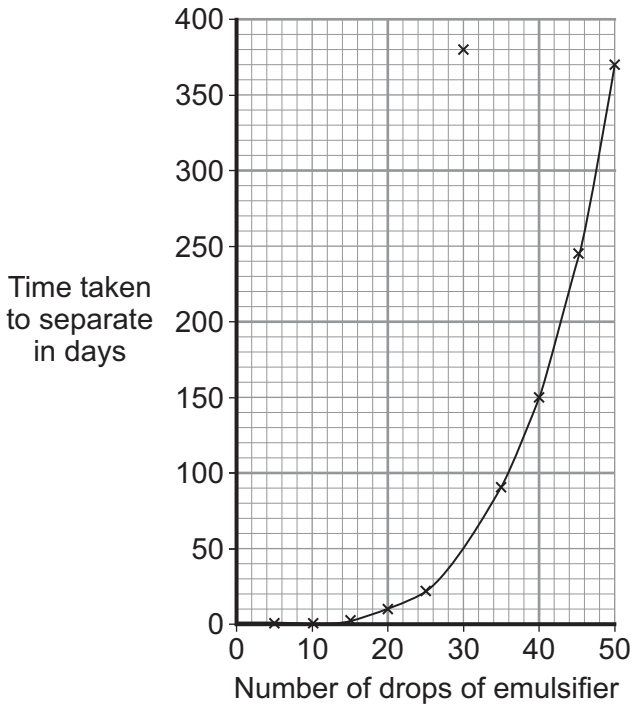
The water and oil used in making a salad dressing will separate if allowed to stand.

A scientist wanted to know how much emulsifier she needed to add to stop the oil and water in salad dressing from separating.

- She mixed equal volumes of oil and water.
- Then she added 5 drops of emulsifier.
- She shook the mixture and timed how long it took for the mixture to begin separating.

She repeated the experiment, adding different numbers of drops of emulsifier each time.

She used her results to plot a line graph.



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

A 38

B 90

C 380

D 600

1	It is an anomalous result
2	It is the time, in days, before separation of the oil and water when 35 drops of emulsifier are used
3	It is the minimum number of drops of emulsifier needed to prevent the salad dressing from separating before reaching 120 days
4	It is a reasonable estimate for the time taken, in days, for the oil and water to separate if 60 drops of emulsifier were used

Turn over for the next question

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Section Two

Questions **SIX** to **NINE**.

Each of these questions has four parts.

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

Mark your choices on the answer sheet.

QUESTION SIX

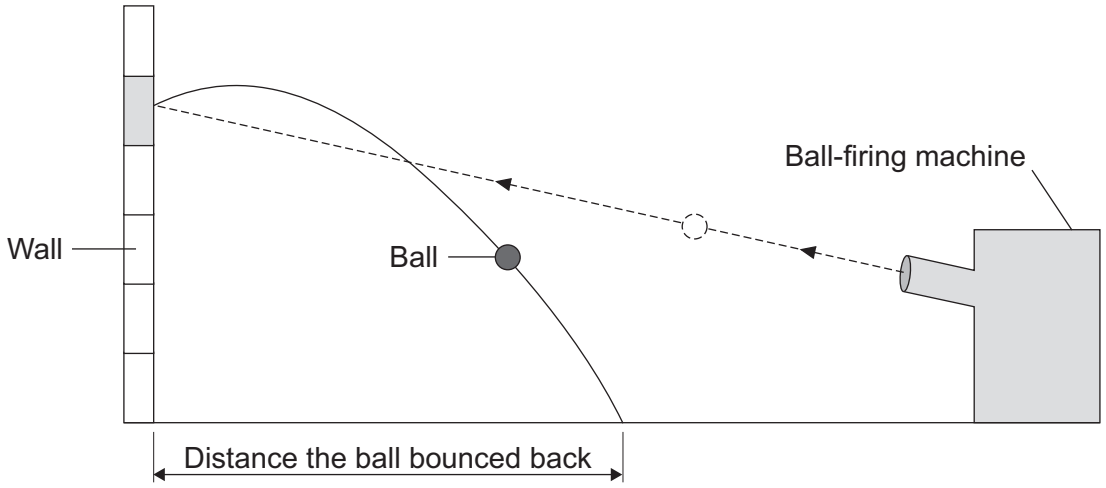
A student compared two balls to find out how well they bounced back from a wall. He used a machine to fire the balls at the wall. The machine was at a fixed distance from the wall.

One ball was made from rubber and the other from a polymer.

The student:

- set the machine to fire the ball at a speed of 2 metres per second
- fired the rubber ball from the machine to a point on a wall
- measured the distance that the ball bounced back from the wall
- repeated the experiment, but made the machine fire the ball at different speeds.

The student repeated the whole experiment using the polymer ball.



The results are shown in the table.

Speed of ball in metres per second	Distance the ball bounced back from the wall in metres	
	Rubber ball	Polymer ball
2	2.1	4.0
4	4.2	8.1
6	7.5	12.1
8	12.8	17.3
10	18.7	20.0

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6A The results show that for each speed . . .

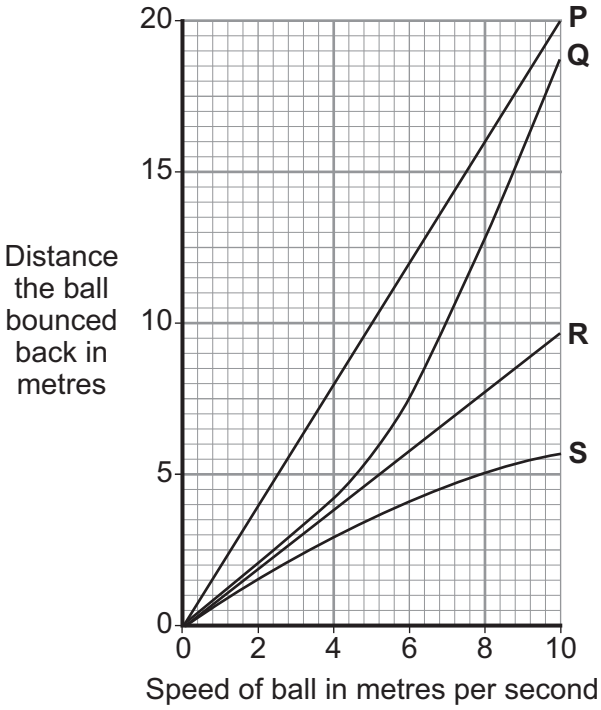
1 the rubber ball bounced back higher than the polymer ball.

2 the polymer ball bounced back further than the rubber ball.

3 the rubber ball and the polymer ball bounced back an equal distance.

4 the rubber ball bounced back further than the polymer ball.

6B Which of the lines, **P**, **Q**, **R** or **S**, on the graph, represents the results for the rubber ball?



1 **P**

2 **Q**

3 **R**

4 **S**

Question 6 continues on the next page

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6C To improve the reliability of the results, the student could repeat the experiment . . .

1 using balls of several different sizes.

2 several times for each speed.

3 using balls made from different polymers.

4 firing the balls at different points on the wall.

6D The student could get more precise measurements if he . . .

1 fired the balls at a higher speed.

2 repeated the experiments and calculated the mean.

3 measured the distances in centimetres.

4 fired the balls at a point higher on the wall.

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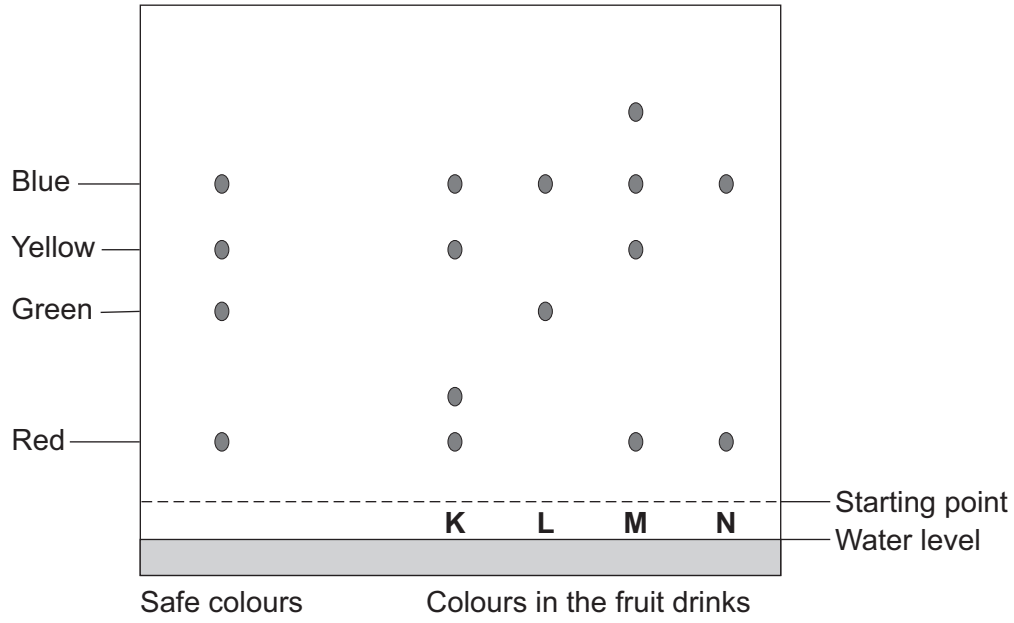
Turn over for the next question

QUESTION SEVEN

A student investigated the colours in four fruit drinks, **K**, **L**, **M** and **N**, using chromatography. The solvent used was water.

The results were compared with those of safe colours allowed in fruit drinks.

The results are shown in the chromatogram.



7A The chromatogram shows that . . .

1 all the fruit drinks contain only two colours.

2 blue, yellow, green and red safe colours are soluble in water.

3 only fruit drink **K** contains more than two colours.

4 fruit drinks **L** and **N** are more dilute than the other fruit drinks.

7B The student should investigate fruit drink **M** more fully because . . .

1 drink **M** contains four colours.

2 the mixture of colours makes drink **M** a dark brown colour.

3 people will not buy a fruit drink containing the colours red, yellow and blue.

4 drink **M** contains a colour that the student has not identified.

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7C The chromatogram for the four fruit drinks shows that . . .

1 only **K** is safe to drink.

2 only **L** and **N** are safe to drink.

3 only **K**, **L** and **N** are safe to drink.

4 **K**, **L**, **M** and **N** are safe to drink.

7D A test shows that a different fruit drink on sale in the shops contains a colour that could be harmful to some people.

What should the manufacturer do **immediately**?

1 give employees protective gloves when handling this fruit drink

2 replace the colour in the fruit drink with another that is safe

3 stop production of all fruit drinks

4 withdraw the fruit drink from all shops and advise the public not to drink it

Turn over for the next question

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QUESTION EIGHT

The equation for the thermal decomposition of a hydrocarbon is:

$$C_7H_{16} \rightarrow C_4H_8 + \text{Substance } \mathbf{E}$$

8A What name is given to this process?

1 combustion

2 condensation

3 cracking

4 hydrogenation

8B In this process, . . .

1 hot gases are mixed with water.

2 hot vapours are passed over a hot catalyst.

3 liquids are mixed with water.

4 liquids are passed over a catalyst.

8C Substance **E** will have the formula . . .

1 CH_4

2 C_3H_6

3 C_3H_8

4 C_9H_{20}

8D The substance with the formula C_4H_8 is . . .

1 an alkane.

2 an alkene.

3 a saturated hydrocarbon.

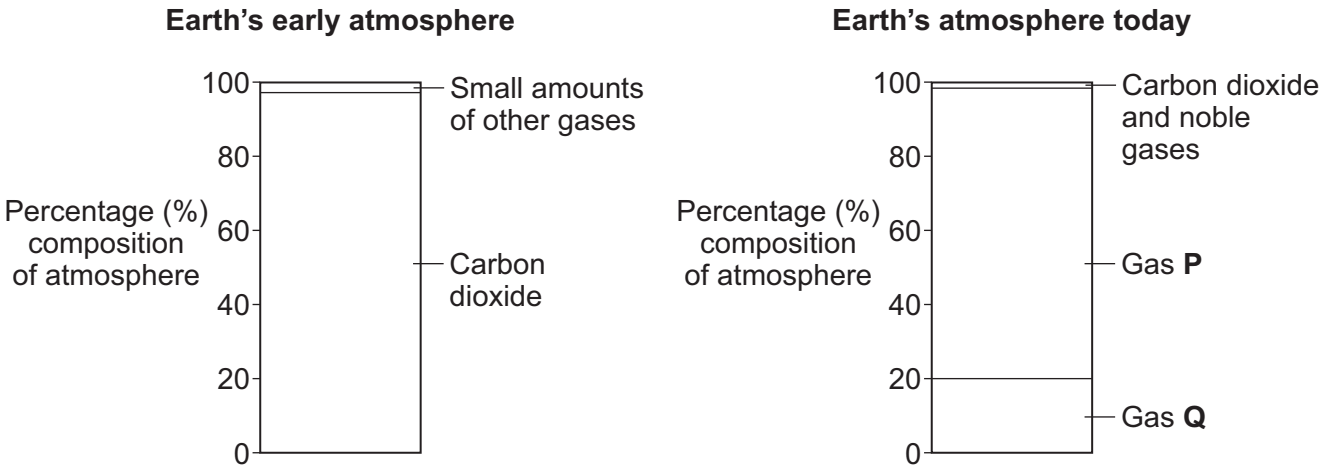
4 a polymer.

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Turn over for the next question

QUESTION NINE

The bar charts show the composition of Earth's early atmosphere and the composition of the Earth's atmosphere today.



9A What is gas **P**?

1 carbon dioxide

2 oxygen

3 nitrogen

4 sulfur dioxide

9B The Earth's early atmosphere is thought to have contained a small amount of a hydrocarbon gas.

This gas is . . .

1 ammonia.

2 methane.

3 hydrogen.

4 helium.

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9C Fossil fuels consist mainly of carbon compounds.

What was the **initial** source of the carbon to form these compounds?

1 the skeletons of dead animals

2 carbonate rocks

3 the atmosphere

4 the oceans

9D There was no oxygen in the Earth's atmosphere until 2 billion years ago because . . .

1 it had been locked up in sedimentary rocks as carbonates.

2 it had been used in the formation of fossil fuels.

3 there were no plants on the Earth's surface.

4 it had reacted with the ammonia to form nitrogen.

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.

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

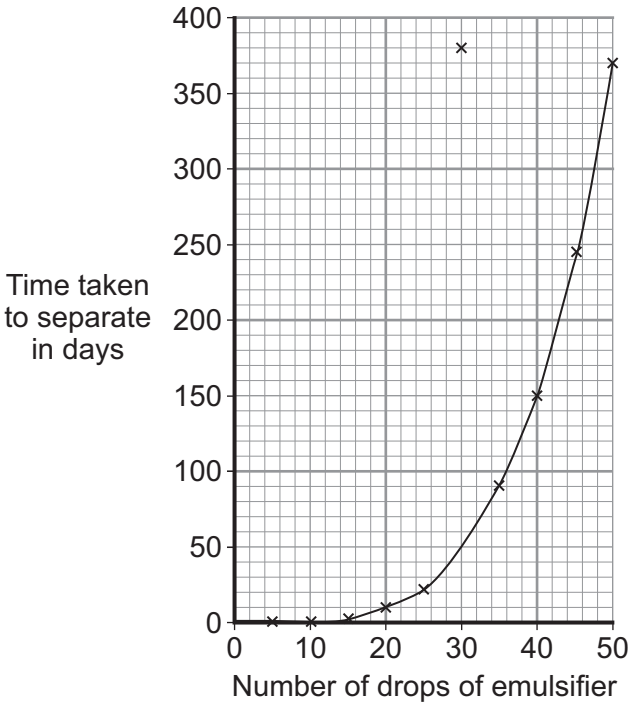
The water and oil used in making a salad dressing will separate if allowed to stand.

A scientist wanted to know how much emulsifier she needed to add to stop the oil and water in salad dressing from separating.

- She mixed equal volumes of oil and water.
- Then she added 5 drops of emulsifier.
- She shook the mixture and timed how long it took for the mixture to begin separating.

She repeated the experiment, adding different numbers of drops of emulsifier each time.

She used her results to plot a line graph.



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

A 38

B 90

C 380

D 600

1	It is an anomalous result
2	It is the time, in days, before separation of the oil and water when 35 drops of emulsifier are used
3	It is the minimum number of drops of emulsifier needed to prevent the salad dressing from separating before reaching 120 days
4	It is a reasonable estimate for the time taken, in days, for the oil and water to separate if 60 drops of emulsifier were used

Turn over for the next question

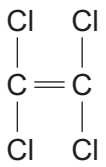
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QUESTION TWO

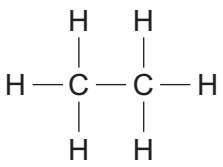
This question is about the formulae of four compounds.

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

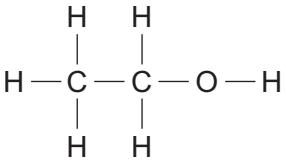
A



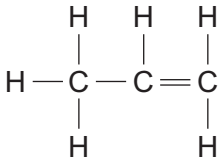
B



C



D



1	It is an unsaturated hydrocarbon.
2	It is a saturated hydrocarbon.
3	It is not a hydrocarbon and will burn to produce carbon dioxide and water vapour.
4	It is not a hydrocarbon but can form a polymer.

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Section Two

Questions **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 equation for the thermal decomposition of a hydrocarbon is:

$$C_7H_{16} \rightarrow C_4H_8 + \text{Substance } \mathbf{E}$$

3A What name is given to this process?

1 combustion

2 condensation

3 cracking

4 hydrogenation

3B In this process, . . .

1 hot gases are mixed with water.

2 hot vapours are passed over a hot catalyst.

3 liquids are mixed with water.

4 liquids are passed over a catalyst.

3C Substance **E** will have the formula . . .

1 CH_4

2 C_3H_6

3 C_3H_8

4 C_9H_{20}

3D The substance with the formula C_4H_8 is . . .

1 an alkane.

2 an alkene.

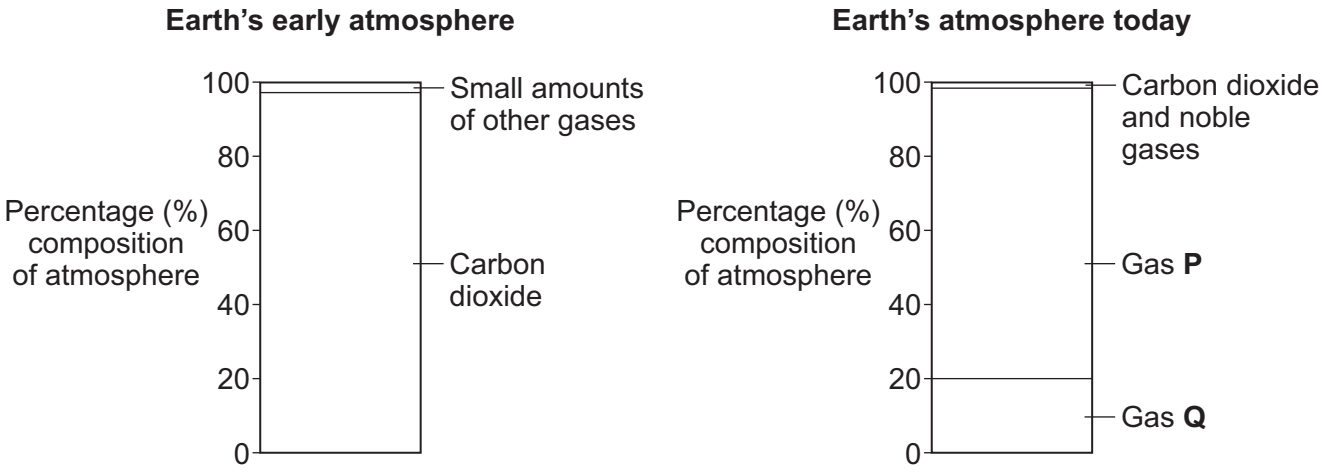
3 a saturated hydrocarbon.

4 a polymer.

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QUESTION FOUR

The bar charts show the composition of Earth's early atmosphere and the composition of the Earth's atmosphere today.



4A What is gas **P**?

1 carbon dioxide

2 oxygen

3 nitrogen

4 sulfur dioxide

4B The Earth's early atmosphere is thought to have contained a small amount of a hydrocarbon gas.

This gas is . . .

1 ammonia.

2 methane.

3 hydrogen.

4 helium.

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4C Fossil fuels consist mainly of carbon compounds.

What was the **initial** source of the carbon to form these compounds?

1 the skeletons of dead animals

2 carbonate rocks

3 the atmosphere

4 the oceans

4D There was no oxygen in the Earth's atmosphere until 2 billion years ago because . . .

1 it had been locked up in sedimentary rocks as carbonates.

2 it had been used in the formation of fossil fuels.

3 there were no plants on the Earth's surface.

4 it had reacted with the ammonia to form nitrogen.

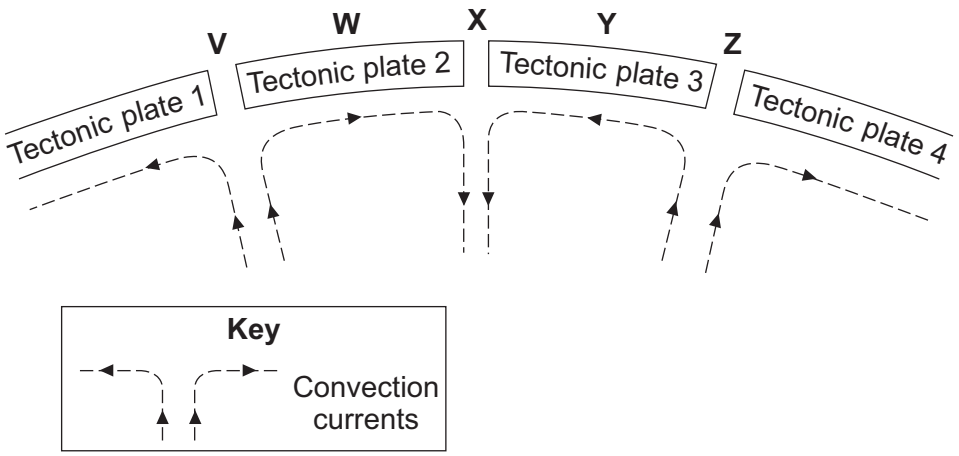
Turn over for the next question

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QUESTION FIVE

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

Figure 1



5A Which row in the table correctly shows the tectonic plates that are moving towards each other, and the speed with which they are moving?

	Tectonic plates moving towards each other	Speed
1	Tectonic plates 3 and 4	A few centimetres a year
2	Tectonic plates 2 and 3	A few metres a year
3	Tectonic plates 2 and 3	A few centimetres a year
4	Tectonic plates 3 and 4	A few metres a year

5B At which points on **Figure 1** would earthquakes be most likely to occur?

1 **V**, **W** and **Y**

2 **V**, **X** and **Z**

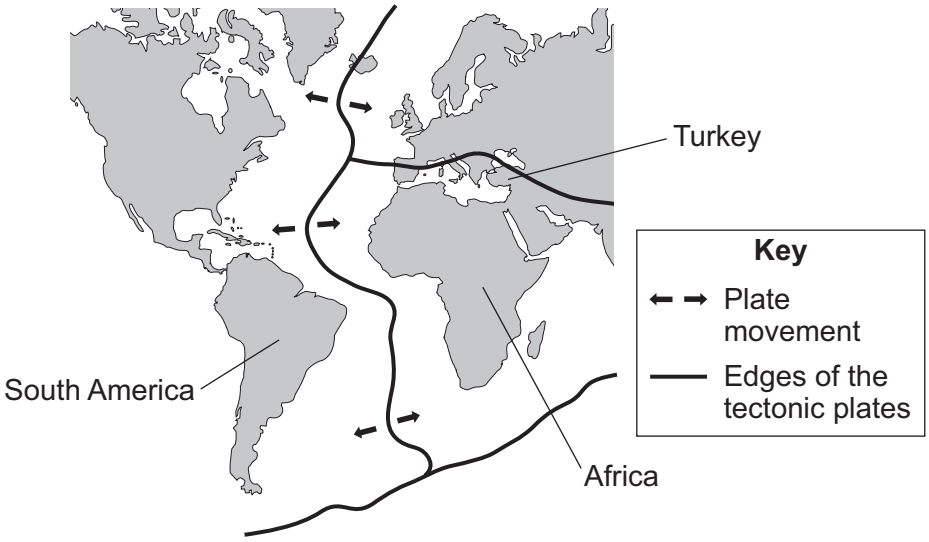
3 **W**, **Y** and **Z**

4 **X**, **Y** and **Z**

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Figure 2 shows some information about tectonic plates.

Figure 2



5C The plate boundary between South America and Africa is shown on **Figure 2**.

Which positions on **Figure 1** could represent this plate boundary?

1 **V** and **X**

2 **V** and **Z**

3 **W** and **X**

4 **W** and **Z**

5D Turkey has a lot of earthquakes.

People are not sure when the next earthquake will happen because . . .

1 earthquakes happen only about every five or ten years.

2 scientists cannot measure the strength of an earthquake accurately.

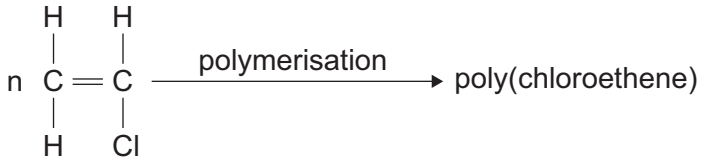
3 the models that scientists use cannot give accurate predictions.

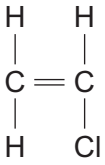
4 tectonic plates move towards or away from each other in different places.

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QUESTION SIX

The equation shows how poly(chloroethene) is made.



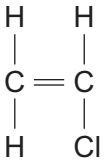
6A n  represents . . .

1 one molecule of chloroethane.

2 one molecule of chloroethene.

3 many molecules of chloroethane.

4 many molecules of chloroethene.

6B The compound  belongs to a series of chemicals.

The general formula for this series of chemicals is . . .

1 C_nH_nCl

2 $C_nH_{2n-1}Cl$

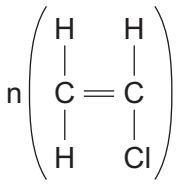
3 $C_nH_{n-1}Cl$

4 $C_nH_{2n}Cl$

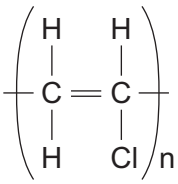
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6C The formula for poly(chloroethene) is . . .

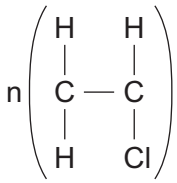
1



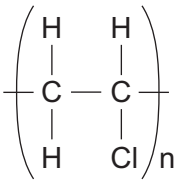
2



3



4



6D The word *thermosoftening* is used to describe how poly(chloroethene) behaves when heated.

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

1 **not** be used for packaging in warm countries because it will become brittle.

2 only contain short chain molecules that move around easily on heating.

3 have chemical bonds between the chains, which strengthen on heating.

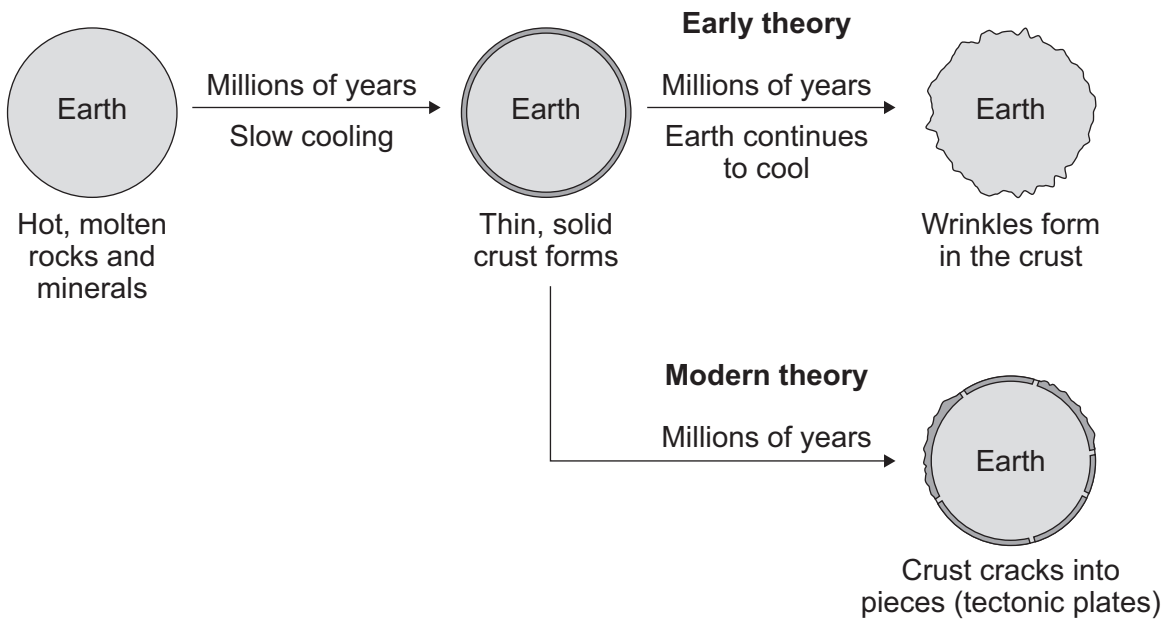
4 be capable of being shaped on heating.

Turn over for the next question

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QUESTION SEVEN

The flow diagram shows two different theories that scientists used to explain the formation of mountain ranges on Earth.



7A How are mountain ranges formed according to the **Early theory**?

1 The Earth cools and shrinks, forming wrinkles in the crust.

2 The Earth heats and expands so molten rock and minerals escape through the crust.

3 The Earth cools and shrinks so the crust cracks into pieces.

4 The Earth heats and expands causing tectonic plates to rise.

7B According to the **Modern theory**, mountain ranges form . . .

1 when tectonic plates float up from the sea bed.

2 when earthquakes cause some of the tectonic plates to rise.

3 because the Earth is heating up, causing tectonic plates to bend.

4 when the tectonic plates move towards each other.

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Scientists have suggested that the Earth has a core, mantle and crust.

One theory is that the core is made of iron and nickel.

A later and controversial theory is that the core is like a nuclear reactor made of the radioactive elements uranium and plutonium.

7C Why are scientists unable to prove which theory about the core is correct?

1 Iron and nickel are also radioactive elements.

2 It is not possible to drill boreholes to the core.

3 Tectonic plates are moving too quickly to allow drilling through the crust.

4 It is too dangerous to drill into the core if it contains radioactive elements.

7D Which row in the table shows how the 'controversial theory' can be used to explain why the Earth's tectonic plates move?

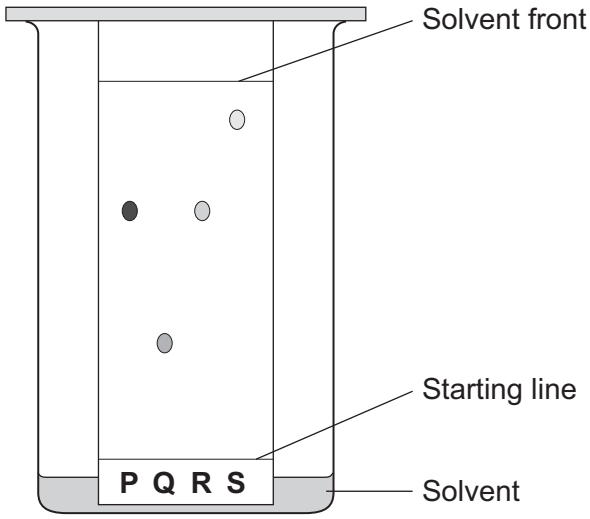
1	core releases energy	convection currents in the mantle move the plates
2	core absorbs energy	convection currents in the mantle move the plates
3	core releases energy	convection currents in the core move the plates
4	core absorbs energy	convection currents in the core move the plates

Turn over for the next question

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QUESTION EIGHT

The diagram shows an investigation using paper chromatography.



As the solvent rises up the paper it moves the colours depending on their attraction for the solvent and the paper.

The greater the attraction of a colour for the solvent and the less the attraction for the paper, the further the colour moves.

An R_f value is defined as:

$$R_f = \frac{\text{distance moved by the colour}}{\text{distance moved by the solvent}}$$

The R_f value for a particular substance is different in different solvents.

8A In the investigation shown in the diagram, what was the R_f value of colour **S**?

1 0.0

2 0.5

3 0.7

4 0.9

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The R_f values for the colours, **P**, **Q**, **R** and **S**, in four different solvents, are shown in the table.

	Solvent			
	Water	**Ethanol**	**Propanone**	**Tetrachloromethane**
Colour P	0.5	0.9	0.7	0.5
Colour Q	0.0	0.8	0.6	0.2
Colour R	0.5	0.7	0.6	0.1
Colour S	0.2	0.6	0.4	0.2

8B From the information on the diagram and in the table, it is correct to say that . . .

1 colours **P** and **R** are the same.

2 colours **Q** and **S** are the same.

3 **P**, **Q**, **R** and **S** are four different colours.

4 chromatography works on any colour.

8C Which colour is **not** soluble in water?

1 **P**

2 **Q**

3 **R**

4 **S**

8D Using the data in the table above, which solvent could be used to separate a mixture of all four colours, **P**, **Q**, **R** and **S**?

1 water

2 ethanol

3 propanone

4 tetrachloromethane

Turn over for the next question

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QUESTION NINE

Read the information about fuels.

- Petroleum diesel fuel is made from crude oil. Biodiesel fuel is made from vegetable oils.
- The use of biodiesel will reduce the amount of crude oil used. However, large areas of agricultural land will be needed to grow the crops from which the vegetable oils are extracted.
- In a diesel engine, the fuel flows from the fuel tank, along fuel pipes, to the combustion chamber where it ignites.
- Biodiesel is thicker than petroleum diesel and is more difficult to ignite (has a lower cetane number).
- Biodiesel also has a higher melting point than petroleum diesel.
- Biodiesel biodegrades in about a quarter of the time that it takes for petroleum diesel to biodegrade.

9A Research into the production and use of biodiesel continues.

The main reason for the research is that . . .

1 many countries have large areas of undeveloped land.

2 crude oil is a non-renewable energy source.

3 no harmful gases are produced when biodiesel burns.

4 biodiesel can only be produced from a small number of plant species.

9B For biodiesel to work effectively in an engine it should have . . .

1 a high melting point.

2 a high viscosity.

3 a high cetane number.

4 a high boiling point.

9C Why are **net** carbon dioxide emissions lower for biodiesel than for petroleum diesel?

1 Plants use carbon dioxide for photosynthesis.

2 There are fewer alkanes in biodiesel.

3 Biodiesel does not contain any hydrocarbons.

4 Plants produce carbon dioxide in respiration.

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9D Spills of fuels from oil tankers cause considerable damage in the marine environment.

Spills of biodiesel are less harmful to the environment than spills of petroleum diesel because biodiesel . . .

1 would float more easily on the water.

2 could be burned more easily on the surface of the water.

3 would not spread over the water as easily.

4 would break down more quickly.

END OF TEST

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There are no questions printed on this page

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GCSE

Science A (4461) / Chemistry (4421)

Specification A

CHY1BP, CH1BSF & CH1BSH

Mark Scheme

2012 Examination – June Series

The blank answer sheet for this component can be found at the end of this document.

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This component is an objective test for which the following list indicates the correct answers used in marking the students' responses.

Further copies of this Mark Scheme are available to download from the AQA Website: www.aqa.org.uk

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GCSE

SCIENCE A (4461)/CHEMISTRY (4421)

Objective Test Answer Key

CHY1BP (Oils, Earth and Atmosphere)

June 2012

Foundation Tier

Question	Key		
One	**A**	where earthquakes occur	**2**
	B	where convection currents occur, causing the tectonic	**3**
	C	where there is a mixture of gases	**1**
	D	where iron and nickel are found as metals	**4**
Two	**A**	bromine	**4**
	B	ethene	**3**
	C	poly(propene)	**2**
	D	water	**1**
Three	**A**	boiling point	**4**
	B	colour	**2**
	C	density	**3**
	D	chemical reactivity	**1**
Four	**A**	the colour of the oil	**4**
	B	the time the oil takes to flow from **P** to **Q**	**2**
	C	the distance between **P** and **Q**	**3**
	D	the four temperatures used for each oil	**1**
Five	**A**	38	**3**
	B	90	**2**
	C	380	**1**
	D	600	**4**

	A	**B**	**C**	**D**
Six	**2**	**2**	**2**	**3**
Seven	**2**	**4**	**2**	**4**
Eight	**3**	**2**	**3**	**2**
Nine	**3**	**2**	**3**	**3**

GCSE

SCIENCE A (4461)/CHEMISTRY (4421)

Objective Test Answer Key

CHY1BP (Oils, Earth and Atmosphere)

June 2012

Higher Tier

Question	Key		
One	**A**	38	**3**
	B	90	**2**
	C	380	**1**
	D	600	**4**
Two	**A**	Formula **A**	**4**
	B	Formula **B**	**2**
	C	Formula **C**	**3**
	D	Formula **D**	**1**

	A	**B**	**C**	**D**
Three	**3**	**2**	**3**	**2**
Four	**3**	**2**	**3**	**3**
Five	**3**	**2**	**2**	**3**
Six	**4**	**2**	**4**	**4**
Seven	**1**	**4**	**2**	**1**
Eight	**4**	**3**	**2**	**2**
Nine	**2**	**3**	**1**	**4**

OTQ3

GCSE SCIENCE

AQA

Unit : CHY1BP **CHEMISTRY UNIT 1B**

Centre :

Candidate Number : **UCI :**

Candidate Name :

Series : 6M12

22-JUN-12

For completion by the Examination Invigilator. **Please fill this circle if the candidate is absent:** ○

HIGHER TIER

Instructions on how to complete this answer sheet are given on the question paper. Please make sure you follow them carefully.

Questions **ONE** to **NINE** Choose one response **1 - 4** for each of the parts **A - D**

QUESTION ONE		1	2	3	4
1A	38	○	○	○	○
1B	90	○	○	○	○
1C	380	○	○	○	○
1D	600	○	○	○	○

QUESTION TWO		1	2	3	4
2A	Formula A	○	○	○	○
2B	Formula B	○	○	○	○
2C	Formula C	○	○	○	○
2D	Formula D	○	○	○	○

QUESTION THREE	1	2	3	4
3A	○	○	○	○
3B	○	○	○	○
3C	○	○	○	○
3D	○	○	○	○

QUESTION FOUR	1	2	3	4
4A	○	○	○	○
4B	○	○	○	○
4C	○	○	○	○
4D	○	○	○	○

QUESTION FIVE	1	2	3	4
5A	○	○	○	○
5B	○	○	○	○
5C	○	○	○	○
5D	○	○	○	○

QUESTION SIX	1	2	3	4
6A	○	○	○	○
6B	○	○	○	○
6C	○	○	○	○
6D	○	○	○	○

QUESTION SEVEN	1	2	3	4
7A	○	○	○	○
7B	○	○	○	○
7C	○	○	○	○
7D	○	○	○	○

QUESTION EIGHT	1	2	3	4
8A	○	○	○	○
8B	○	○	○	○
8C	○	○	○	○
8D	○	○	○	○

QUESTION NINE	1	2	3	4
9A	○	○	○	○
9B	○	○	○	○
9C	○	○	○	○
9D	○	○	○	○

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FOUNDATION TIER

Instructions on how to complete this answer sheet are given on the question paper. Please make sure you follow them carefully.

Questions **ONE** to **NINE** Choose one response **1 - 4** for each of the parts **A - D**

QUESTION ONE		1	2	3	4
1A	where earthquakes occur	○	○	○	○
1B	where convection currents occur, causing the tectonic ...	○	○	○	○
1C	where there is a mixture of gases	○	○	○	○
1D	where iron and nickel are found as metals	○	○	○	○

QUESTION TWO		1	2	3	4
2A	bromine	○	○	○	○
2B	ethene	○	○	○	○
2C	poly(propene)	○	○	○	○
2D	water	○	○	○	○

QUESTION THREE		1	2	3	4
3A	boiling point	○	○	○	○
3B	colour	○	○	○	○
3C	density	○	○	○	○
3D	chemical reactivity	○	○	○	○

QUESTION FOUR		1	2	3	4
4A	the colour of the oil	○	○	○	○
4B	the time the oil takes to flow from P to Q	○	○	○	○
4C	the distance between P and Q	○	○	○	○
4D	the four temperatures used for each oil	○	○	○	○

QUESTION FIVE		1	2	3	4
5A	38	○	○	○	○
5B	90	○	○	○	○
5C	380	○	○	○	○
5D	600	○	○	○	○

QUESTION SIX		1	2	3	4
6A		○	○	○	○
6B		○	○	○	○
6C		○	○	○	○
6D		○	○	○	○

QUESTION SEVEN		1	2	3	4
7A		○	○	○	○
7B		○	○	○	○
7C		○	○	○	○
7D		○	○	○	○

QUESTION EIGHT		1	2	3	4
8A		○	○	○	○
8B		○	○	○	○
8C		○	○	○	○
8D		○	○	○	○

QUESTION NINE		1	2	3	4
9A		○	○	○	○
9B		○	○	○	○
9C		○	○	○	○
9D		○	○	○	○

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Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

General Certificate of Secondary Education
Foundation Tier and Higher Tier
March 2012

Science A

Unit Chemistry C1b (Oils, Earth and Atmosphere)

Chemistry

Unit Chemistry C1b (Oils, Earth and Atmosphere)

CHY1BP

F&H

Thursday 1 March 2012 Morning Session

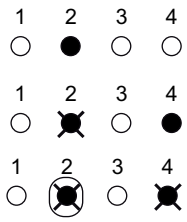
For this paper you must have:
- a black ball-point pen
- an objective test answer sheet.

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 '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 16 of this booklet.

FOUNDATION TIER

Section One

Questions **ONE** to **FIVE**.

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 food additives.

Each type of additive changes a food in some way.

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

A colouring

B emulsifier

C preservative

D sweetener

	Reason for using the additive in the food
1	to make water and oil stay mixed together in salad cream
2	to make soft drinks orange, red or purple
3	to replace sugar in diet drinks
4	to increase the shelf-life of the food

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QUESTION TWO

This question is about four planets, **A**, **B**, **C** and **D**, in the Solar System.

	Planet	Atmosphere	Average surface temperature in °C
A	Venus	96 % carbon dioxide, 4 % nitrogen	460
B	Earth	78 % nitrogen, 21 % oxygen, 0.96 % noble gases, 0.04 % carbon dioxide	14
C	Mars	97 % carbon dioxide, 2 % nitrogen, 1 % noble gases	–46
D	Jupiter	87 % hydrogen, 13 % helium	–121

Match planets, **A**, **B**, **C** and **D**, with the sentences **1**–**4** below.

1 Its atmosphere has the highest percentage of carbon dioxide.

2 It has green plants growing on its surface.

3 Its atmosphere consists of only two elements.

4 It has the highest average surface temperature.

Turn over for the next question

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QUESTION THREE

The table shows the properties of four polymers, **A**, **B**, **C** and **D**.

	Properties
A	is not damaged at high temperatures and has a non-stick surface
B	is strong, does not rot and can be pulled into fibres
C	makes a very light, solid foam that is a good heat insulator
D	is transparent, waterproof and stays flexible over a wide range of temperatures

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

	How the polymer could be used
1	to make disposable cups for hot drinks
2	to make string and rope
3	to make the coating on frying pans
4	to make bags used to store frozen foods

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QUESTION FOUR

The table below shows the masses of some gases produced when one gram of each of the polymers, **A**, **B**, **C** and **D**, is burned in air.

		Combustion products in mg						
	Polymer name	**C_2H_4**	**CH_4**	**CO_2**	**CO***	**NO_2***	**HCN***	**NH_3***
A	Acrylic	5	17	1300	170	45	40	3.0
B	Kevlar	0	0	1850	50	10	14	0.5
C	Nylon	50	25	1200	250	20	30	0
D	Polyester	6	10	1000	350	0	0	0

Toxic gases are marked with *.

Match polymers, **A**, **B**, **C** and **D**, with the statements **1**–**4** below.

1 the polymer that produces the most NH_3

2 the polymer that produces the most alkene

3 the polymer that produces no hydrocarbons

4 the polymer that produces the largest total mass of toxic gases

Turn over for the next question

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QUESTION FIVE

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

An example is shown below.



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

1	It is the hydrocarbon with the largest molecules.
2	It is the molecule that contains exactly 14 atoms.
3	It is the monomer from which poly(ethene) is made.
4	It is the second hydrocarbon in the alkene series.

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Turn over for the next question

Section Two

Questions **SIX** to **NINE**.

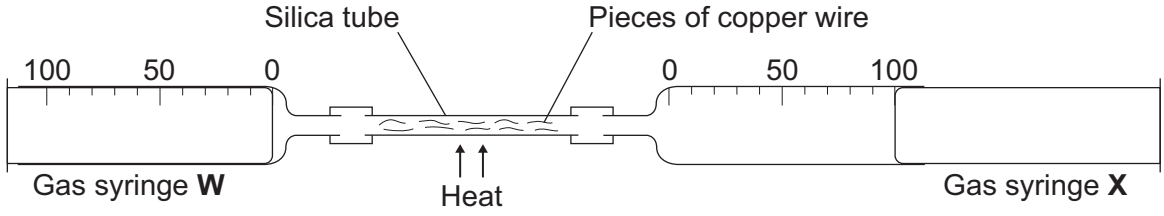
Each of these questions has four parts.

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

Mark your choices on the answer sheet.

QUESTION SIX

A student used this apparatus to investigate the composition of air.



- The student passed 100 cm^3 of dry air from syringe **X** backwards and forwards over heated copper wire inside a silica tube.
- The copper reacted with the oxygen in the dry air.
- After 1 minute, the student pushed all the remaining gas into syringe **X** and allowed the apparatus to cool to room temperature.
- The volume of gas in syringe **X** was then measured and recorded.

The student repeated this procedure seven times for a total of 8 minutes of heating.

The results are given in **Table 1**.

Table 1

Total time of heating in minutes	1	2	3	4	5	6	7	8
Volume of gas in syringe X in cm^3	94	89	85	82	80	79	79	79

6A The volume of gas in syringe **X** did not change after a total of 6 minutes of heating.

The student continued the investigation for a further 2 minutes to make sure that . . .

1 all the copper had reacted.

2 all the water vapour had condensed.

3 all the oxygen in the syringes had reacted.

4 all the carbon dioxide had reacted.

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The student repeated the investigation four times.

The final volume of gas in syringe **X** for each of the five investigations is given in **Table 2**.

Table 2

Investigation	1	2	3	4	5
Final volume of gas in syringe X in cm^3	79	80	78	88	79

6B The student made a random error in one of the investigations.

This could have been because . . .

1 the student did not allow the apparatus to cool before reading the final volume.

2 the student heated the copper wire in the silica tube too strongly.

3 there was a leak in the apparatus, allowing some of the gas to escape.

4 the student did not push all of the gas into syringe **X** before reading the final volume.

6C From the results in **Table 2**, what is the mean (average) final volume, in cm^3, of the gas in syringe **X**?

1 78

2 79

3 80

4 88

6D Copper reacts with oxygen to form copper oxide.

$$2Cu + O_2 \rightarrow 2CuO$$

In each of the investigations 2 grams of copper were heated in the silica tube.

The mass of copper oxide formed would be . . .

1 1 gram.

2 less than 2 grams.

3 2 grams.

4 more than 2 grams.

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QUESTION SEVEN

The table shows some information about five plant oils.

Plant oil	Melting point in °C	Iodine number
Palm	+35	54
Peanut	+3	93
Rapeseed	–5	110
Sunflower	–12	124
Linseed	–24	178

The iodine number is the number of grams of iodine that react with 100 grams of the oil.

7A The data in the table shows that for these plant oils . . .

1 as the iodine number increases, the melting point decreases.

2 all are liquids at room temperature (20 °C).

3 as the iodine number increases, the melting point increases.

4 all are solids at room temperature (20 °C).

7B The relationship between melting point and iodine number would be best shown as . . .

1 a line graph.

2 a bar chart.

3 a pie chart.

4 a scattergram.

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Sunflower oil is a liquid at room temperature. Sunflower spread, made from the oil, is solid at room temperature.

7C This is because the sunflower spread . . .

1 contains artificial colourings.

2 contains more water.

3 has a higher melting point than the oil.

4 is more concentrated than the oil.

7D Sunflower oil contains unsaturated compounds.

Unsaturated compounds are different from saturated compounds because they . . .

1 are more soluble in water.

2 have double carbon carbon bonds in their molecules.

3 have lower iodine numbers.

4 do not react with hydrogen.

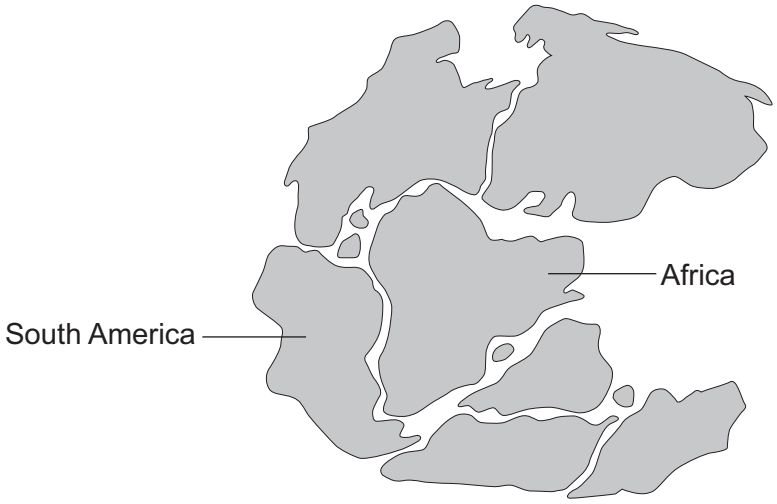
Turn over for the next question

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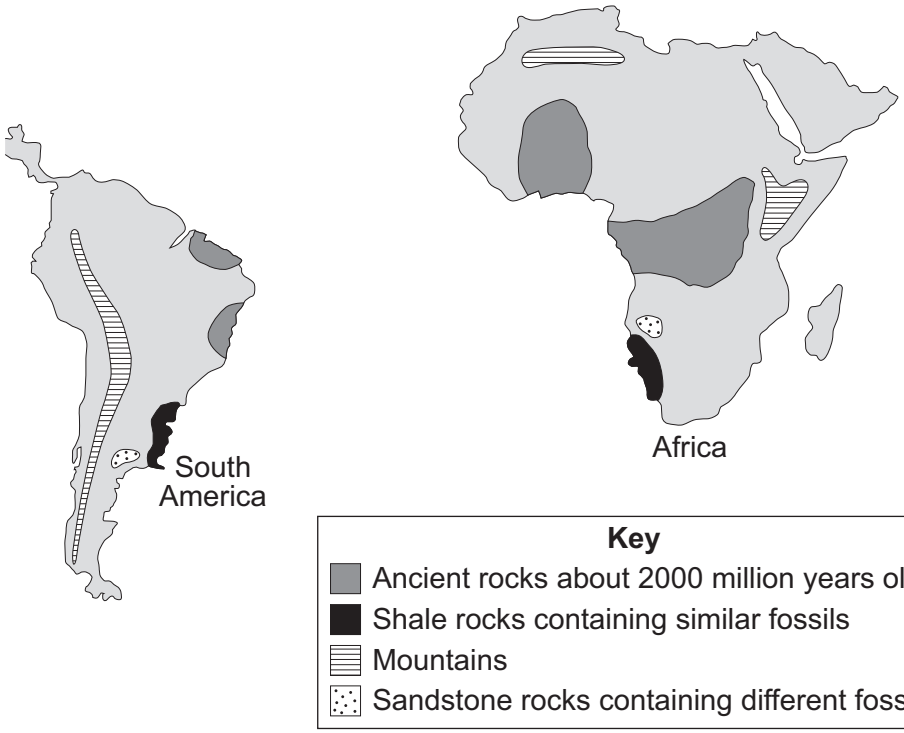
QUESTION EIGHT

The scientist Alfred Wegener studied the continents.

He suggested that all the continents had once been connected and that they drifted apart later on.



Wegener's study of the African and South American continents provided evidence that they had once been connected.



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8A One piece of evidence that Wegener observed was that the two continents . . .

1 are a short distance apart.

2 are of a similar shape and similar size.

3 have a similar climate.

4 have coastlines that could fit together.

8B Which row in the table correctly shows two more pieces of evidence that Africa and South America were once joined?

1	ancient rocks in matching positions on the two continents	shale rocks containing similar fossils
2	different fossils in sandstone rocks	mountains in matching positions on the two continents
3	different fossils in sandstone rocks	shale rocks containing similar fossils
4	ancient rocks in matching positions on the two continents	mountains in matching positions on the two continents

Wegener's theory was not generally accepted when it was first proposed.

8C Why did many scientists disagree with his theory?

1 Animals that live on the two continents are very different.

2 The scientists could not explain how the continents moved.

3 Some of the rocks on the two continents are different.

4 Plants that live on the two continents are very different.

8D Later, most scientists accepted Wegener's theory.

This was because of evidence that . . .

1 volcanic activity could cause continents to move.

2 the Earth's crust is cooling.

3 the Earth's crust is shrinking.

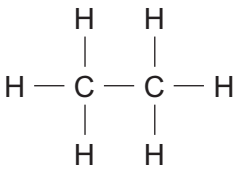
4 the Earth's crust is made up of tectonic plates.

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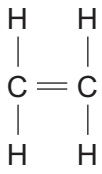
QUESTION NINE

The diagram shows one molecule of each of four compounds, **J**, **K**, **L** and **M**.

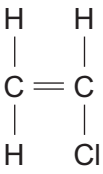
J



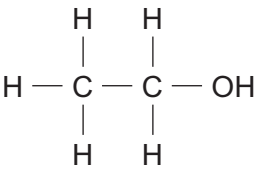
K



L



M



9A Which of the compounds are hydrocarbons?

1 **J** and **K**

2 **K** and **L**

3 **L** and **M**

4 **J**, **K** and **M**

9B Which row in the table describes the bonding in these four compounds?

	Number of bonds to each carbon atom	Number of bonds to each hydrogen atom
1	1	1
2	1	4
3	4	1
4	4	4

9C Two of the compounds can form polymers because . . .

1 their molecules are saturated.

2 they are hydrocarbons.

3 their molecules have a double carbon carbon bond.

4 they are not biodegradable.

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9D Compounds **K** and **L** will change bromine water from yellow-brown to colourless because . . .

1 their molecules are unsaturated.

2 their molecules contain two carbon atoms.

3 their molecules contain only carbon atoms and hydrogen atoms.

4 their molecules can be cracked.

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.

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

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

An example is shown below.

A		**B**		**C**		**D**
C_9H_{20}	$\rightarrow$	C_2H_4	+	C_4H_{10}	+	C_3H_6

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

1	It is the hydrocarbon with the largest molecules.
2	It is the molecule that contains exactly 14 atoms.
3	It is the monomer from which poly(ethene) is made.
4	It is the second hydrocarbon in the alkene series.

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QUESTION TWO

This question is about four chemical reactions.

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

A C_2H_5OH

B $2CO_2 + 2H_2O$

C C_3H_8

D $C_2H_4 + H_2$

$C_2H_4 + 3O_2 \rightarrow$ . . . **1** . . .

$C_2H_6 \rightarrow$ . . . **2** . . .

$C_2H_4 + H_2O \rightarrow$ . . . **3** . . .

$C_3H_6 + H_2 \rightarrow$ . . . **4** . . .

Turn over for the next question

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Section Two

Questions **THREE** to **NINE**.

Each of these questions has four parts.

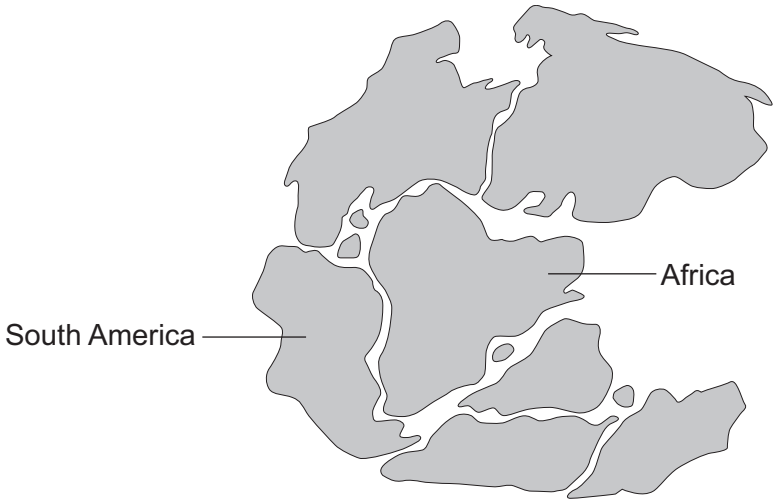
In each part choose only **one** answer.

Mark your choices on the answer sheet.

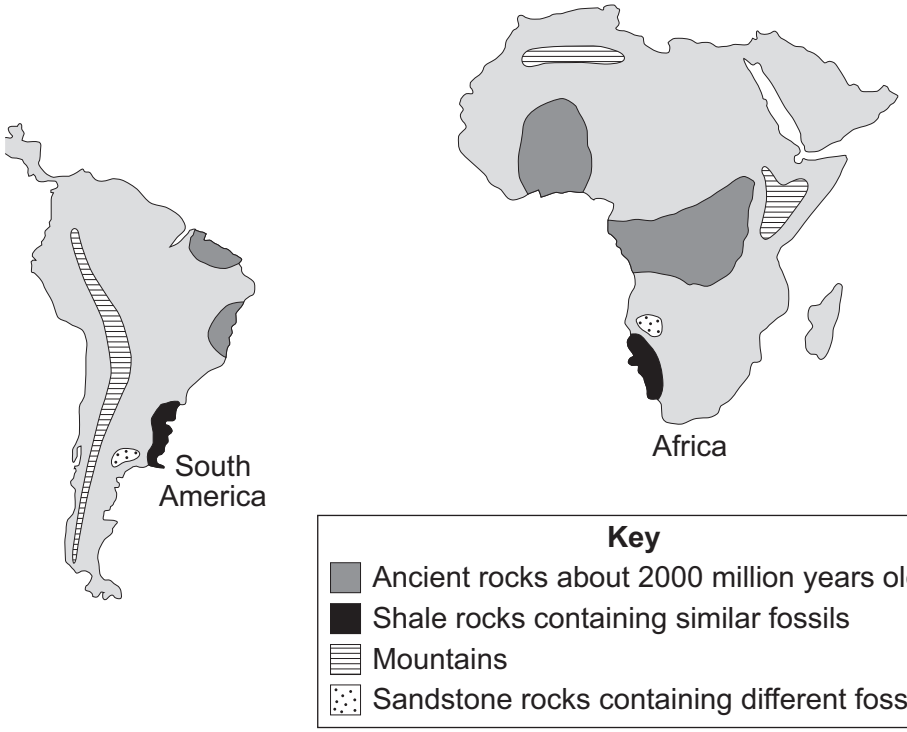
QUESTION THREE

The scientist Alfred Wegener studied the continents.

He suggested that all the continents had once been connected and that they drifted apart later on.



Wegener's study of the African and South American continents provided evidence that they had once been connected.



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3A One piece of evidence that Wegener observed was that the two continents . . .

1 are a short distance apart.

2 are of a similar shape and similar size.

3 have a similar climate.

4 have coastlines that could fit together.

3B Which row in the table correctly shows two more pieces of evidence that Africa and South America were once joined?

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3	different fossils in sandstone rocks	shale rocks containing similar fossils
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Wegener's theory was not generally accepted when it was first proposed.

3C Why did many scientists disagree with his theory?

1 Animals that live on the two continents are very different.

2 The scientists could not explain how the continents moved.

3 Some of the rocks on the two continents are different.

4 Plants that live on the two continents are very different.

3D Later, most scientists accepted Wegener's theory.

This was because of evidence that . . .

1 volcanic activity could cause continents to move.

2 the Earth's crust is cooling.

3 the Earth's crust is shrinking.

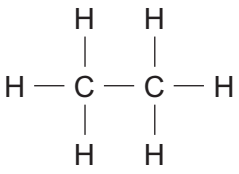
4 the Earth's crust is made up of tectonic plates.

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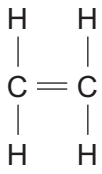
QUESTION FOUR

The diagram shows one molecule of each of four compounds, **J**, **K**, **L** and **M**.

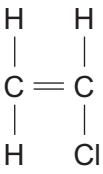
J



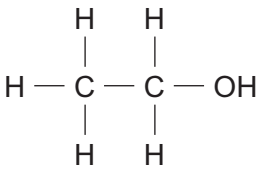
K



L



M



4A Which of the compounds are hydrocarbons?

1 **J** and **K**

2 **K** and **L**

3 **L** and **M**

4 **J**, **K** and **M**

4B Which row in the table describes the bonding in these four compounds?

	Number of bonds to each carbon atom	Number of bonds to each hydrogen atom
1	1	1
2	1	4
3	4	1
4	4	4

4C Two of the compounds can form polymers because . . .

1 their molecules are saturated.

2 they are hydrocarbons.

3 their molecules have a double carbon carbon bond.

4 they are not biodegradable.

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4D Compounds **K** and **L** will change bromine water from yellow-brown to colourless because . . .

1 their molecules are unsaturated.

2 their molecules contain two carbon atoms.

3 their molecules contain only carbon atoms and hydrogen atoms.

4 their molecules can be cracked.

Turn over for the next question

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QUESTION FIVE

In a molecule of ethene, (C_2H_4), one or more of the hydrogen atoms can be replaced by fluorine. Polymers can be made from these monomer molecules that contain fluorine.

Increasing the number of fluorine atoms makes these polymers less reactive.

5A Which of the following monomers would form the **most** reactive polymer?

1 $CHF = CH_2$

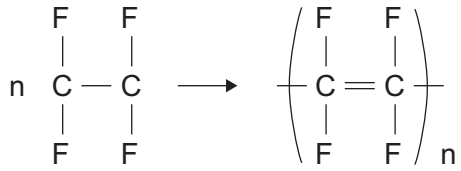
2 $CHF = CF_2$

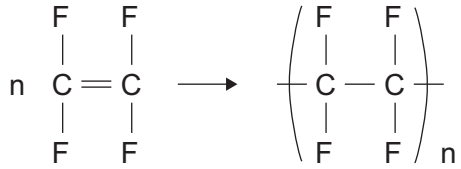
3 $CH_2 = CF_2$

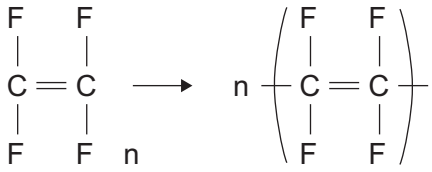
4 $CF_2 = CF_2$

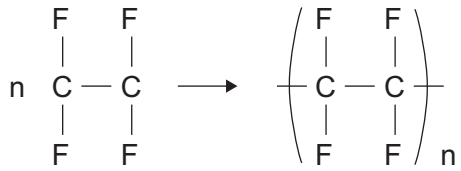
The polymer poly(tetrafluoroethene) formed from the monomer $CF_2 = CF_2$ was discovered accidentally in 1938.

5B Which equation represents the polymerisation of this monomer?

1


2


3


4


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5C Poly(tetrafluoroethene) is a thermosoftening polymer.

This means that this polymer . . .

1 softens when first heated, then hardens, but cannot afterwards be remoulded.

2 can be repeatedly softened by heating and remoulded.

3 contains only small molecules that are rearranged on heating.

4 has weak bonds between the long molecules which become stronger on heating.

5D Pipes to carry corrosive hydrofluoric acid can be made from poly(tetrafluoroethene).

This suggests that this polymer . . .

1 is a good lubricant.

2 does not dissolve in any solvent.

3 is unreactive.

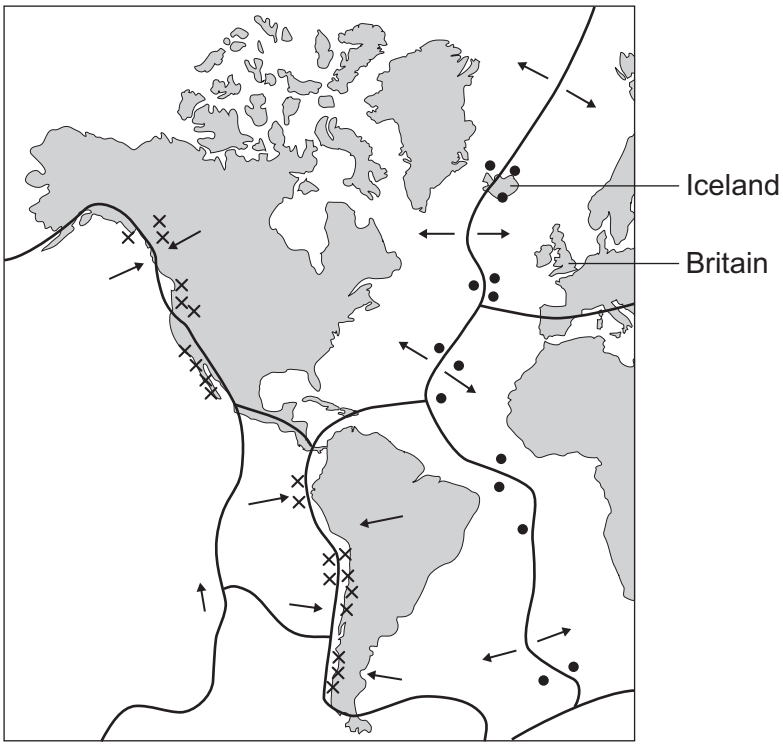
4 is more reactive than hydrofluoric acid.

Turn over for the next question

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QUESTION SIX

The map gives information about tectonic plates and volcanoes in the western hemisphere.



6A What pattern does this information suggest?

1 Explosive volcanoes erupt more frequently than non-explosive volcanoes.

2 Explosive volcanoes usually occur where tectonic plates are moving together.

3 Non-explosive volcanoes occur only along the coasts of continents.

4 Non-explosive and explosive volcanoes are active at the same time.

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6B Where would you expect earthquakes to occur?

1 in the areas where there are explosive volcanoes only

2 where tectonic plates are moving away from each other only

3 at the boundaries between two tectonic plates

4 in ocean areas only

6C Only a few minor earthquakes happen in Britain.

This is because . . .

1 Britain lies on a plate that is not moving.

2 there are no volcanoes in Britain.

3 the oceans around Britain are very shallow.

4 Britain is not close to a plate boundary.

6D Earthquakes happen in Iceland.

Scientists know that, in the future, earthquakes . . .

1 will happen in Iceland but cannot predict when because they occur at random intervals.

2 will not happen in Iceland for many years and cannot predict when because they occur at random intervals.

3 will happen in Iceland but cannot predict when because they occur in five-year or ten-year cycles.

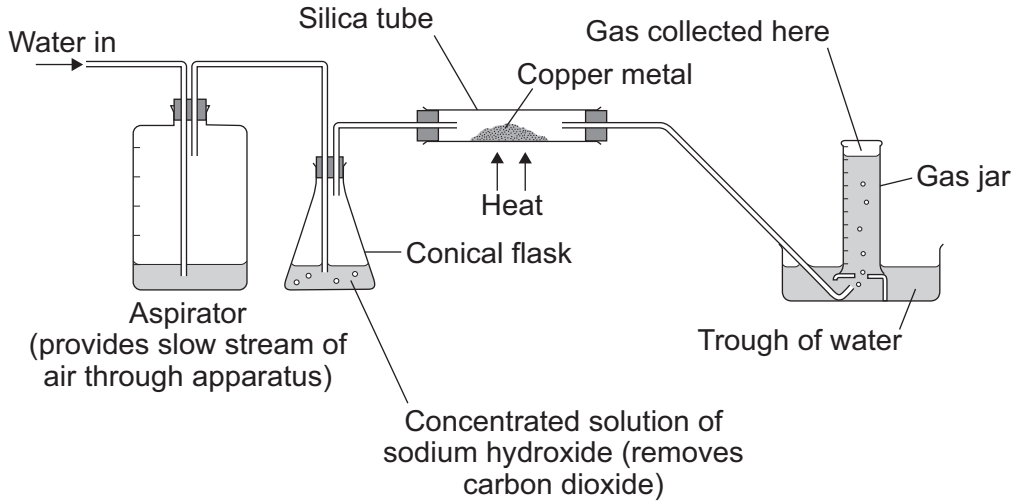
4 will not happen in Iceland for another ten years because it takes so long for pressure to build up.

Turn over for the next question

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QUESTION SEVEN

A student used the apparatus in the diagram below to investigate the composition of air.



7A The student was advised not to collect the gas in the gas jar for 2 minutes.

This is because . . .

1 the gas had not reached room temperature.

2 not all the carbon dioxide from the aspirator would have been removed.

3 the gas collected would contain unchanged air.

4 other gases would be produced as the copper decomposed.

7B After 2 minutes, 1000 cm^3 of air was passed through the apparatus.

Which row in the table correctly shows the volume of gas collected in the gas jar **and** the name of the compound formed in the silica tube?

	Volume of gas collected in the gas jar in cm^3	**Name of the compound formed in the silica tube**
1	80	copper oxide
2	200	copper carbonate
3	800	copper oxide
4	800	copper carbonate

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7C The total volume of gas collected in the gas jar was less than the student expected.

A possible reason is that . . .

1 the gas jar was not completely full of water at the start of the investigation.

2 not all the carbon dioxide had been removed from the air.

3 some copper metal in the silica tube had not reacted.

4 one of the rubber stoppers was not fitted correctly.

7D Which gases will be collected in the gas jar?

1 carbon monoxide and nitrogen only

2 carbon monoxide, nitrogen and noble gases

3 nitrogen and noble gases

4 nitrogen only

Turn over for the next question

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QUESTION EIGHT

The table shows two different processes that are used to make ethanol.

	Process 1	Process 2
Reaction	Fermentation of a sugar solution using yeast	Reaction of ethene with steam
Method	Batch – the reaction vessel is emptied and refilled every few days	Continuous – ethanol flows from the reaction vessel for many years
Product	Dilute solution of ethanol	Pure ethanol
Rate of Production	Slow	Fast

8A The most important advantage of producing the ethanol by **Process 1** is that . . .

1 there is no waste to dispose of.

2 the dilute solution of ethanol is not hazardous to handle.

3 the raw materials are renewable.

4 the reaction vessel can be kept clean.

8B The ethene for **Process 2** is obtained . . .

1 by fractional distillation of crude oil.

2 by cracking alkanes that have large molecules.

3 by cracking alkenes that have large molecules.

4 by polymerisation of small alkene molecules.

8C One advantage of producing ethanol using **Process 2** is that . . .

1 lower temperatures are needed for the reaction.

2 crude oil can be transported in larger quantities than sugar.

3 large quantities can be produced in a short time.

4 no expensive catalysts are needed.

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8D In some countries, many cars are powered by ethanol. These countries produce large amounts of ethanol using **Process 1**.

Production of ethanol using **Process 1** is probably of economic benefit only if a country . . .

1 has large reserves of crude oil.

2 has a large workforce to regularly fill and empty the reaction vessels.

3 has agricultural land and a climate suitable for growing sugar cane.

4 has sufficient wealth to import crude oil.

Turn over for the next question

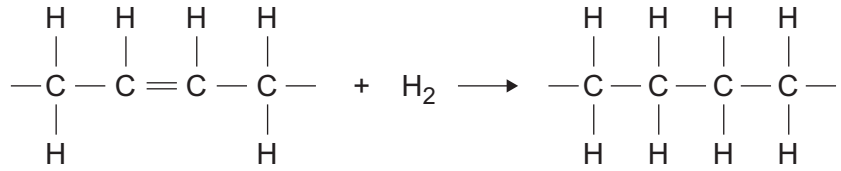
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QUESTION NINE

Most vegetable oils contain unsaturated molecules.

They can be converted into saturated compounds, as shown in **Equation 1**.

Equation 1



Part of an unsaturated molecule in sunflower oil

9A Which one of the following shows the correct conditions for this reaction?

1 react with hydrogen using a nickel catalyst at 60 °C

2 vaporise and pass the vapours over a hot iron catalyst

3 react with oxygen using a nickel catalyst below 37 °C

4 vaporise and pass the vapours over a nickel catalyst below 37 °C

9B Compared with the unsaturated compound in sunflower oil, the saturated compound produced in **Equation 1** . . .

1 has a softer consistency.

2 has a higher melting point.

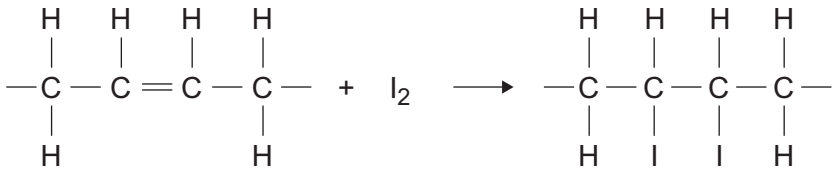
3 has more carbon atoms in each molecule.

4 has fewer hydrogen atoms in each molecule.

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Iodine reacts with the double carbon carbon bond in unsaturated hydrocarbons, as shown in **Equation 2**.

Equation 2



The iodine number is the number of grams of iodine that will react with 100 grams of the unsaturated hydrocarbon.

9C Which of the following is a true statement?

1 the higher the iodine number, the smaller the oil molecules

2 the higher the iodine number, the larger the oil molecules

3 the higher the iodine number, the fewer double bonds in each oil molecule

4 the higher the iodine number, the more double bonds in each oil molecule

9D 2.5 grams of iodine was added to 1.0 grams of a vegetable oil. When the reaction finished, 1.0 grams of iodine was left unreacted.

What is the iodine number of this vegetable oil?

1 100

2 150

3 200

4 250

END OF TEST

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There are no questions printed on this page

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GCSE

Science A (4461) / Chemistry (4421)

Specification A

CHY1BP, CH1BSF & CH1BSH

Mark Scheme

2012 Examination – March Series

The blank answer sheet for this component can be found at the end of this document.

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This component is an objective test for which the following list indicates the correct answers used in marking the students' responses.

Further copies of this Mark Scheme are available to download from the AQA Website: www.aqa.org.uk

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GCSE

SCIENCE A (4461)/CHEMISTRY (4421)

Objective Test Answer Key

CHY1BP (Oils, Earth and Atmosphere)

March 2012

Foundation Tier

Question	Key		
One	**A**	colouring	**2**
	B	emulsifier	**1**
	C	preservative	**4**
	D	sweetener	**3**
Two	**A**	Venus	**4**
	B	Earth	**2**
	C	Mars	**1**
	D	Jupiter	**3**
Three	**A**	is not damaged at high temperatures and has a . . .	**3**
	B	is strong, does not rot and can be pulled into fibres	**2**
	C	makes a very light, solid foam that is a good heat insulator	**1**
	D	is transparent, waterproof and stays flexible over a wide range . . .	**4**
Four	**A**	Acrylic	**1**
	B	Kevlar	**3**
	C	Nylon	**2**
	D	Polyester	**4**
Five	**A**	molecule A	**1**
	B	molecule B	**3**
	C	molecule C	**2**
	D	molecule D	**4**

	A	B	C	D
Six	**3**	**1**	**2**	**4**
Seven	**1**	**1**	**3**	**2**
Eight	**4**	**1**	**2**	**4**
Nine	**1**	**3**	**3**	**1**

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GCSE

SCIENCE A (4461)/CHEMISTRY (4421)

Objective Test Answer Key

CHY1BP (Oils, Earth and Atmosphere)

March 2012

Higher Tier

Question	Key		
One	**A**	molecule A	**1**
	B	molecule B	**3**
	C	molecule C	**2**
	D	molecule D	**4**
Two	**A**	product A	**3**
	B	products B	**1**
	C	product C	**4**
	D	products D	**2**

	A	B	C	D
Three	**4**	**1**	**2**	**4**
Four	**1**	**3**	**3**	**1**
Five	**1**	**2**	**2**	**3**
Six	**2**	**3**	**4**	**1**
Seven	**3**	**3**	**4**	**3**
Eight	**3**	**2**	**3**	**3**
Nine	**1**	**2**	**4**	**2**

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AQA

Unit : CHY1BP **CHEMISTRY UNIT 1B**

Centre :

Candidate Number : **UCI :**

Candidate Name :

Series : 3G12

01-MAR-12

For completion by the Examination Invigilator. **Please fill this circle if the candidate is absent:** ○

HIGHER TIER

Instructions on how to complete this answer sheet are given on the question paper. Please make sure you follow them carefully.

Questions **ONE** to **NINE** Choose one response **1 - 4** for each of the parts **A - D**

QUESTION ONE

		1	2	3	4
1A	Molecule A	○	○	○	○
1B	Molecule B	○	○	○	○
1C	Molecule C	○	○	○	○
1D	Molecule D	○	○	○	○

QUESTION TWO

		1	2	3	4
2A	Product A	○	○	○	○
2B	Product B	○	○	○	○
2C	Product C	○	○	○	○
2D	Product D	○	○	○	○

QUESTION THREE

	1	2	3	4
3A	○	○	○	○
3B	○	○	○	○
3C	○	○	○	○
3D	○	○	○	○

QUESTION FOUR

	1	2	3	4
4A	○	○	○	○
4B	○	○	○	○
4C	○	○	○	○
4D	○	○	○	○

QUESTION FIVE

	1	2	3	4
5A	○	○	○	○
5B	○	○	○	○
5C	○	○	○	○
5D	○	○	○	○

QUESTION SIX

	1	2	3	4
6A	○	○	○	○
6B	○	○	○	○
6C	○	○	○	○
6D	○	○	○	○

QUESTION SEVEN

	1	2	3	4
7A	○	○	○	○
7B	○	○	○	○
7C	○	○	○	○
7D	○	○	○	○

QUESTION EIGHT

	1	2	3	4
8A	○	○	○	○
8B	○	○	○	○
8C	○	○	○	○
8D	○	○	○	○

QUESTION NINE

	1	2	3	4
9A	○	○	○	○
9B	○	○	○	○
9C	○	○	○	○
9D	○	○	○	○

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FOUNDATION TIER

Instructions on how to complete this answer sheet are given on the question paper. Please make sure you follow them carefully.

Questions **ONE** to **NINE** Choose one response **1 - 4** for each of the parts **A - D**

QUESTION ONE	1	2	3	4
1A colouring	○	○	○	○
1B emulsifier	○	○	○	○
1C preservative	○	○	○	○
1D sweetener	○	○	○	○

QUESTION TWO	1	2	3	4
2A Venus	○	○	○	○
2B Earth	○	○	○	○
2C Mars	○	○	○	○
2D Jupiter	○	○	○	○

QUESTION THREE	1	2	3	4
3A Polymer A	○	○	○	○
3B Polymer B	○	○	○	○
3C Polymer C	○	○	○	○
3D Polymer D	○	○	○	○

QUESTION FOUR	1	2	3	4
4A Acrylic	○	○	○	○
4B Kevlar	○	○	○	○
4C Nylon	○	○	○	○
4D Polyester	○	○	○	○

QUESTION FIVE	1	2	3	4
5A Molecule A	○	○	○	○
5B Molecule B	○	○	○	○
5C Molecule C	○	○	○	○
5D Molecule D	○	○	○	○

QUESTION SIX	1	2	3	4
6A	○	○	○	○
6B	○	○	○	○
6C	○	○	○	○
6D	○	○	○	○

QUESTION SEVEN	1	2	3	4
7A	○	○	○	○
7B	○	○	○	○
7C	○	○	○	○
7D	○	○	○	○

QUESTION EIGHT	1	2	3	4
8A	○	○	○	○
8B	○	○	○	○
8C	○	○	○	○
8D	○	○	○	○

QUESTION NINE	1	2	3	4
9A	○	○	○	○
9B	○	○	○	○
9C	○	○	○	○
9D	○	○	○	○

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Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

General Certificate of Secondary Education
Foundation Tier and Higher Tier
November 2011

Science A

Unit Chemistry C1b (Oils, Earth and Atmosphere)

Chemistry

Unit Chemistry C1b (Oils, Earth and Atmosphere)

CHY1BP

F&H

Tuesday 15 November 2011 Morning Session

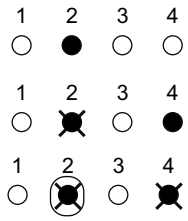
For this paper you must have:
- a black ball-point pen
- an objective test answer sheet.

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 '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 **FIVE**.

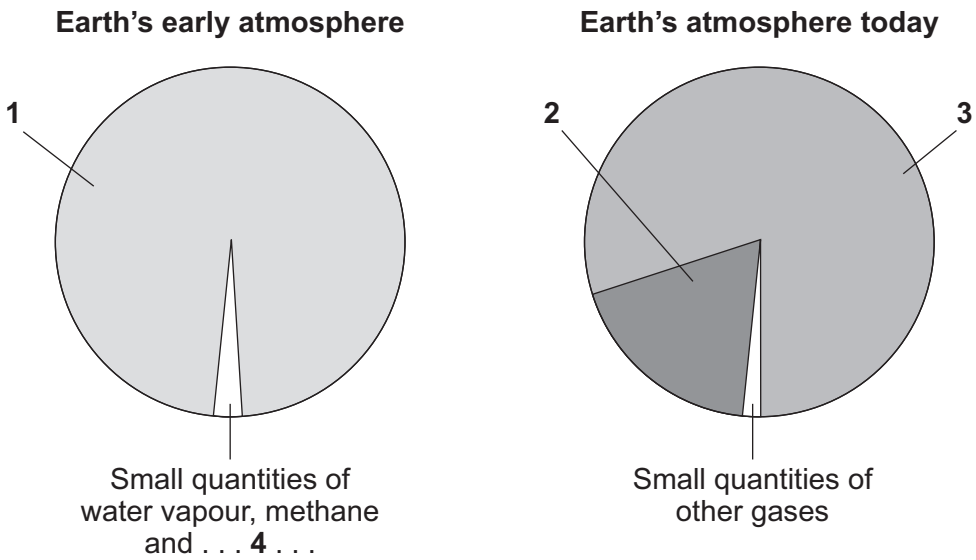
In these questions, match the letters, **A**, **B**, **C** and **D**, with the numbers **1–4**.

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

Mark your choices on the answer sheet.

QUESTION ONE

The pie charts show the gases in Earth's early atmosphere and in Earth's atmosphere today.



Match gases, **A**, **B**, **C** and **D**, with the labels **1–4** on the pie charts.

A ammonia

B carbon dioxide

C nitrogen

D oxygen

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QUESTION TWO

Different polymers have different properties.

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

A can withstand high temperatures and is non-stick

B can be stretched into fibres

C makes a very light, solid foam which is a good heat insulator

D strong, rigid and a good electrical insulator

	Uses
1	to make disposable cups for hot drinks
2	to make the coating on frying pans
3	to make shirts and trousers
4	to make the handles of tools

QUESTION THREE

This question is about vegetable oils.

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

A burned in oxygen

B reacted with bromine water

C reacted with hydrogen

D shaken with water

Vegetable oils are . . . **1** . . . to form emulsions.

Vegetable oils are . . . **2** . . . to become harder.

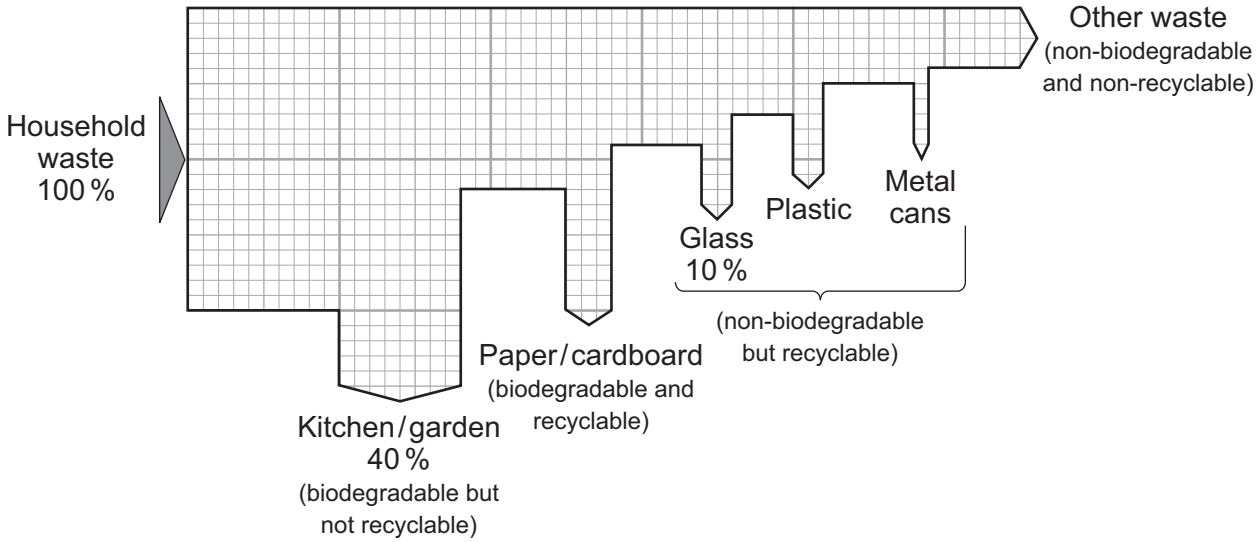
Vegetable oils are . . . **3** . . . to release energy.

Vegetable oils are . . . **4** . . . to test for unsaturation.

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QUESTION FOUR

The diagram shows the composition of typical household waste.



Match percentages (%), **A**, **B**, **C** and **D**, with the numbers **1–4** in the table.

A 5 %

B 10 %

C 40 %

D 55 %

	Percentage (%)
1	the percentage of waste that is plastic
2	the percentage of waste that is metal
3	the percentage of waste that is recyclable
4	the percentage of waste that is biodegradable

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QUESTION FIVE

The table shows the abundance in the Earth's atmosphere of each of four noble gases.

Noble gas	Abundance (percentage in the atmosphere by volume)
Argon	0.9300
Neon	0.0018
Helium	0.0005
Krypton	0.0001

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

A abundance

B colour

C density

D reactivity

Argon is used in filament lamps because of its low chemical . . . **1** . . . .

Neon is used in electric discharge tubes for advertising signs because it produces a bright . . . **2** . . . .

Helium is used in balloons because it has a low . . . **3** . . . .

Krypton is the noble gas in the table with the lowest . . . **4** . . . .

Turn over for the next question

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Section Two

Questions **SIX** to **NINE**.

Each of these questions has four parts.

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

Mark your choices on the answer sheet.

QUESTION SIX

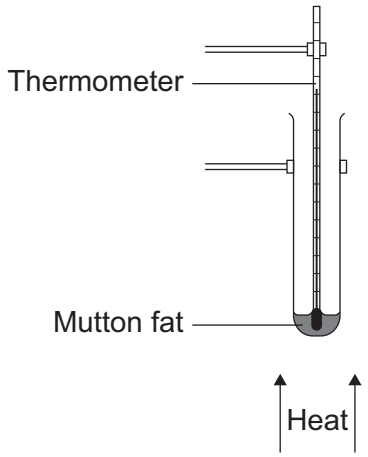
The melting points of most fats are below 100 °C.

A student wanted to measure the melting point of mutton fat.

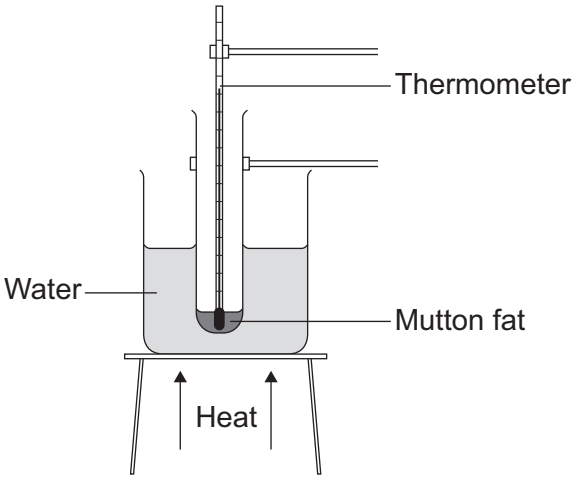
The student first used the equipment shown below as **Apparatus 1**. He was only able to estimate the melting point over a range of about 10 °C.

He then used the equipment shown as **Apparatus 2**. He was now able to measure the melting point more accurately.

Apparatus 1



Apparatus 2



6A One reason that **Apparatus 2** was an improvement over **Apparatus 1** is that . . .

1 a higher temperature can be achieved.

2 the temperature of the mutton fat rises more slowly.

3 the water boils before the mutton fat.

4 the water reaches a higher temperature than the mutton fat.

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Using **Apparatus 2**, the student measured the melting point of the mutton fat three times.

The student then repeated the experiment for some more fats and oils.

The results are shown in the table.

Fat or oil	Melting point in °C		
	Test 1	Test 2	Test 3
Mutton fat	45	44	42
Beef fat	35	37	32
Coconut oil	26	25	25
Palm oil	37	34	37

6B The independent variable in each experiment is . . .

1 the temperature of the water.

2 the melting point of the fat or oil.

3 the fat or oil used.

4 the amount of heat applied.

6C The student obtained the most reliable results for . . .

1 beef fat.

2 coconut oil.

3 mutton fat.

4 palm oil.

6D The melting point of peanut oil is between 0 °C and 20 °C.

How could the student modify **Apparatus 2** so that it could be used to find the melting point of peanut oil?

1 use a smaller quantity of oil in the tube

2 heat the water more gently

3 use a mixture of ice and water in the beaker

4 use a more accurate thermometer

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QUESTION SEVEN

Scientists working for a plastics company tested three different types of poly(ethene) to see how much they would stretch before tearing.

7A The scientists used identical apparatus, equal-sized pieces of poly(ethene), and carried out all the tests at the same temperature.

They did this so that . . .

1 all the variables were kept the same.

2 it was easier and cheaper to carry out the tests.

3 all the measurements would be accurate.

4 only the independent variable would affect the results.

7B Cling film, a very thin sheet of poly(ethene), is used to wrap sandwiches.

Which row in the table shows two properties of poly(ethene) that make it suitable for use as cling film?

	Property 1	**Property 2**
1	tears when stretched	is easily coloured and printed
2	is easily coloured and printed	is transparent
3	is transparent	is airtight
4	is airtight	easily melts when heated

7C Sandwiches could be wrapped in paper and packed in paper bags.

Paper is made from wood. When a tree is cut down, another tree can be planted to replace it.

An advantage of using paper instead of cling film is that . . .

1 the use of paper bags is sustainable.

2 paper is non-biodegradable.

3 paper has been used for hundreds of years.

4 paper does not blow about in the wind like plastic.

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7D Poly(ethene) can be recycled.

A problem that has to be overcome at the recycling centre is that poly(ethene) . . .

1 is mixed with other polymers.

2 is difficult to melt down.

3 is a poor conductor of electricity.

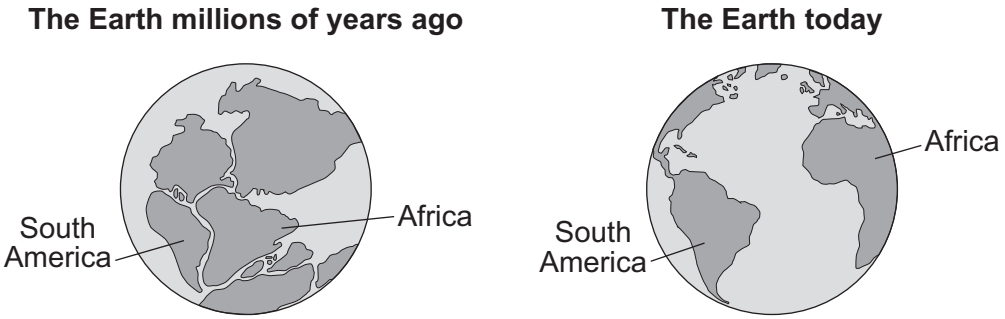
4 is not biodegradable.

Turn over for the next question

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QUESTION EIGHT

The diagram shows the positions of Africa and South America millions of years ago and today.



8A Alfred Wegener put forward a theory to explain the change in their positions.

His theory was that . . .

1 the continents had drifted apart.

2 the continents had been forced apart by earthquakes.

3 volcanic eruptions had caused them to separate.

4 the shrinking crust had forced them apart.

8B At the time, many scientists did not accept Wegener's theory.

Why did they doubt his theory?

1 They thought that the Earth's crust was too thick.

2 They had no way to explain how the continents could move.

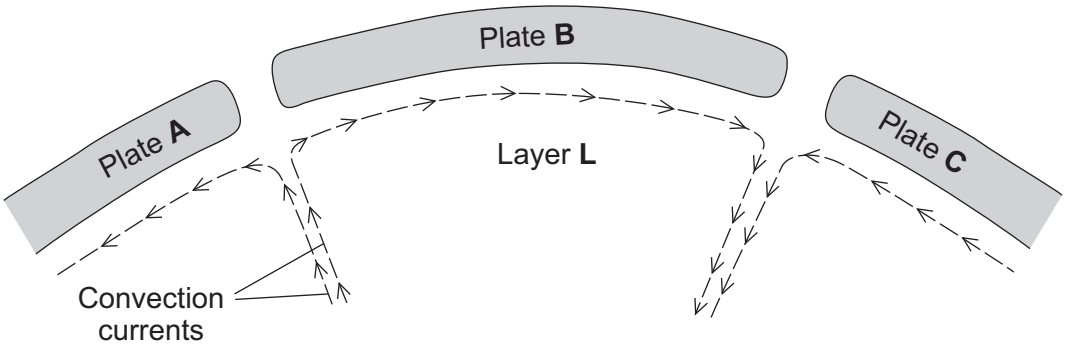
3 They thought that the Earth was expanding.

4 They thought that the continents moved too slowly.

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The discovery of tectonic plates made many more scientists accept Wegener's theory.

The diagram below represents the area near to the Earth's surface.



8C Which row in the table correctly names the parts of the Earth in the plates and in Layer **L**?

	Plates	**Layer L**
1	crust	mantle
2	crust and upper mantle	core
3	crust	core
4	crust and upper mantle	mantle

8D Which plates are moving towards each other?

1 plates **A** and **B**

2 plates **B** and **C**

3 plates **A** and **C**

4 plates **A**, **B** and **C**

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QUESTION NINE

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

An example is shown below.

Hydrocarbon **K** (large molecule) $\rightarrow$ C_6H_{12} + C_3H_6 + C_3H_8

9A What are the conditions needed for this reaction to take place most successfully?

1 heat hydrocarbon **K** vapour over a hot catalyst

2 heat hydrocarbon **K** vapour with hydrogen

3 heat hydrocarbon **K** with a dilute acid

4 heat hydrocarbon **K** at 40 °C

9B The formula for hydrocarbon **K** is . . .

1 C_9H_{18}

2 $C_{12}H_{24}$

3 $C_{12}H_{26}$

4 $C_{26}H_{12}$

9C Which row in the table shows the products that react with bromine water and the colour change seen when they react?

	Product(s)	**Colour change**
1	C_6H_{12} and C_3H_6	from yellow-brown to colourless
2	C_3H_6 and C_3H_8	from yellow-brown to colourless
3	C_6H_{12} and C_3H_6	from colourless to yellow-brown
4	C_3H_8 only	from yellow-brown to colourless

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9D Two of the products can form polymers because . . .

1 they are obtained from crude oil by fractional distillation.

2 they are saturated compounds.

3 their molecules have a double carbon carbon bond.

4 they vaporise at temperatures below 20 °C.

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.

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

The table shows the abundance in the Earth's atmosphere of each of four noble gases.

Noble gas	Abundance (percentage in the atmosphere by volume)
Argon	0.9300
Neon	0.0018
Helium	0.0005
Krypton	0.0001

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

A abundance

B colour

C density

D reactivity

Argon is used in filament lamps because of its low chemical . . . **1** . . . .

Neon is used in electric discharge tubes for advertising signs because it produces a bright . . . **2** . . . .

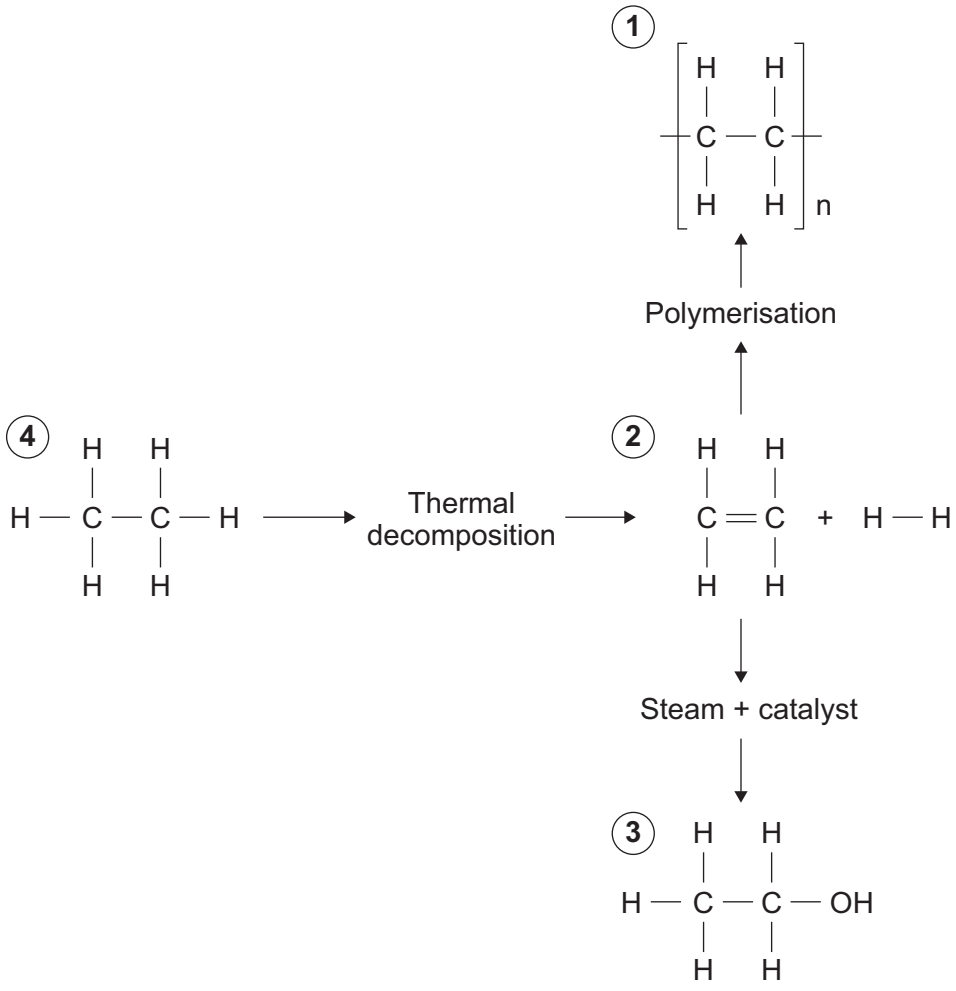
Helium is used in balloons because it has a low . . . **3** . . . .

Krypton is the noble gas in the table with the lowest . . . **4** . . . .

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QUESTION TWO

The flow chart shows a series of chemical reactions.



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

A Ethane

B Ethanol

C Ethene

D Poly(ethene)

Turn over ▶

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Section Two

Questions **THREE** to **NINE**.

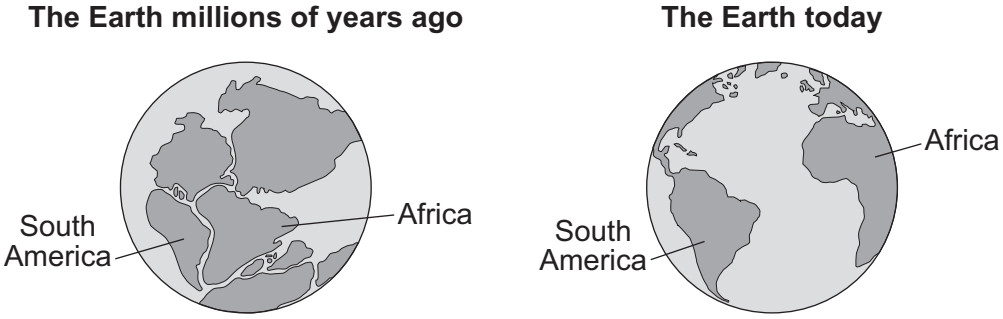
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QUESTION THREE

The diagram shows the positions of Africa and South America millions of years ago and today.



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His theory was that . . .

1 the continents had drifted apart.

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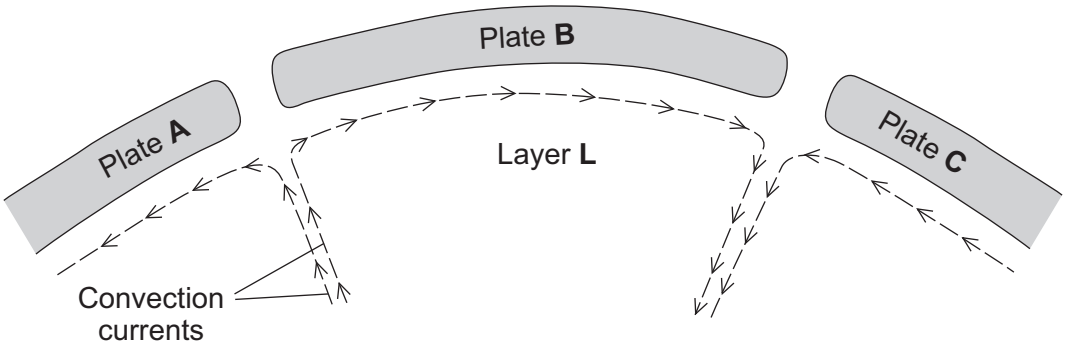
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	Plates	**Layer L**
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3	crust	core
4	crust and upper mantle	mantle

3D Which plates are moving towards each other?

1 plates **A** and **B**

2 plates **B** and **C**

3 plates **A** and **C**

4 plates **A**, **B** and **C**

Turn over ▶

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QUESTION FOUR

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

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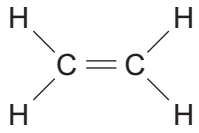
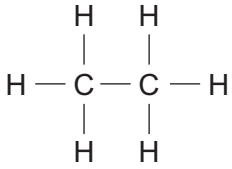
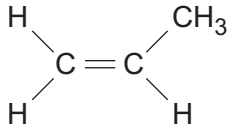
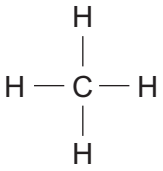
Turn over for the next question

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QUESTION FIVE

Polymers have properties that depend on what they are made from and the conditions under which they are made.

5A Which row in the table contains two molecules that are both easily made into polymers?

1	C_3H_6	
2	C_4H_{10}	
3	C_5H_{12}	
4	C_4H_8	

Poly(ethene) was first produced by heating ethene under high pressure and to high temperatures. Later, it was found that poly(ethene) could be produced at much lower temperatures and pressures if an aluminium catalyst was used.

5B An advantage of using a catalyst is that the poly(ethene) could be . . .

1 improved by including aluminium in its structure.

2 manufactured with different alkenes.

3 manufactured by polymerisation of ethane.

4 more economic to produce.

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5C The poly(ethene) produced using lower temperatures and pressures has a higher density.

This has enabled manufacturers to . . .

1 develop a wider range of products.

2 use different types of monomer to make poly(ethene).

3 use the polymers as fuels.

4 develop products that do not burn.

5D Many products are made using poly(ethene).

Which of the following is likely to be the most environmentally friendly way to deal with these products when they become waste?

1 allow the poly(ethene) to biodegrade

2 put the poly(ethene) in landfill sites

3 burn the poly(ethene) and use the energy released to produce electricity

4 melt the poly(ethene) and make new products

Turn over for the next question

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QUESTION SIX

The atmosphere is made up of many different gases.

The abundance, melting points, and the boiling points of the noble gases are given in the table.

Noble gas	Abundance (percentage in the atmosphere by volume)	Melting point in °C	Boiling point in °C
Helium	0.0005	–272	–269
Neon	0.0018	–248	–229
Argon	0.93	–189	–186
Krypton	0.0001	–157	–153
Xenon	0.000009	–112	–108

6A Which of the following statements about the gases in the atmosphere is correct?

1 There is about 10 times as much argon as krypton.

2 There is about 20 times as much oxygen as argon.

3 There is about 4 times as much oxygen as nitrogen.

4 There is about 5 times as much nitrogen as oxygen.

6B Which noble gas is liquid over the largest temperature range?

1 neon

2 krypton

3 helium

4 argon

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6C Which row in the table below correctly describes the properties of the noble gases?

	Melting point / boiling point	Use	Position in the periodic table
1	Melting point above room temperature (20 °C)	Provides a reactive atmosphere	In group 0
2	Melting point below room temperature (20 °C)	Provides an unreactive atmosphere	In group 7
3	Boiling point below room temperature	Provides a reactive atmosphere	In group 1
4	Boiling point is higher than the melting point	Provides an unreactive atmosphere	In group 0

6D The average concentration of carbon dioxide in the atmosphere is about 390 parts per million (0.039 %).

Which row in the table below shows the best way to measure this amount?

	Instrument reading to . . .	How readings are taken and used
1	10 parts per million	In several locations in a small area and take an average
2	2 parts per million	Average the highest and lowest values obtained
3	10 parts per million	Take values from industrialised areas and take an average
4	2 parts per million	Average the values taken over a large number of randomly selected locations

Turn over for the next question

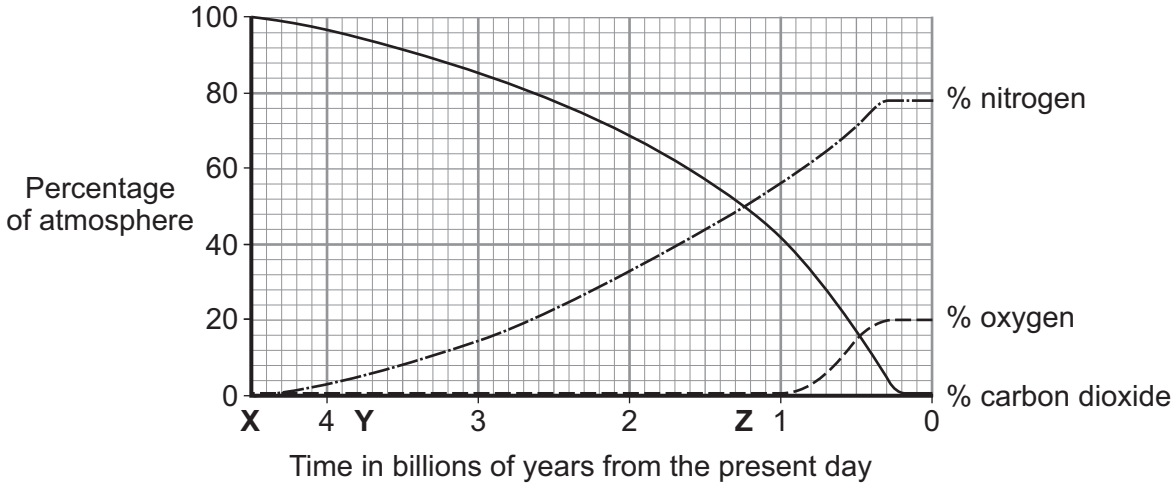
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QUESTION SEVEN

This question is about changes in the Earth's atmosphere that have occurred over time.

The Earth's early atmosphere was mainly carbon dioxide with small amounts of methane and ammonia.

The graph shows how the percentages of carbon dioxide, nitrogen and oxygen may have changed over time.



7A About how many years after the Earth was formed (**X**) did the percentage of carbon dioxide in the atmosphere fall to 60 %?

1 1.3 billion years

2 1.6 billion years

3 2.4 billion years

4 2.9 billion years

7B At a particular stage in the Earth's formation, some of the iron on its surface was oxidised.

What gas in the atmosphere could **not** have caused this change?

1 nitrogen

2 carbon dioxide

3 oxygen

4 water vapour

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7C Between times **Y** and **Z**, the amount of carbon dioxide in the atmosphere was reduced.

Which of the following statements could explain this reduction?

Most of the carbon dioxide . . .

1 dissolved in the oceans.

2 was absorbed by plants.

3 was absorbed to form carbonate rocks in the mantle.

4 became locked up in coal, oil and natural gas.

7D The graph showing the percentages of the various gases has . . .

1 categoric variables plotted against a discrete variable.

2 discrete variables plotted against a continuous variable.

3 continuous variables plotted against a continuous variable.

4 continuous variables plotted against a discrete variable.

Turn over for the next question

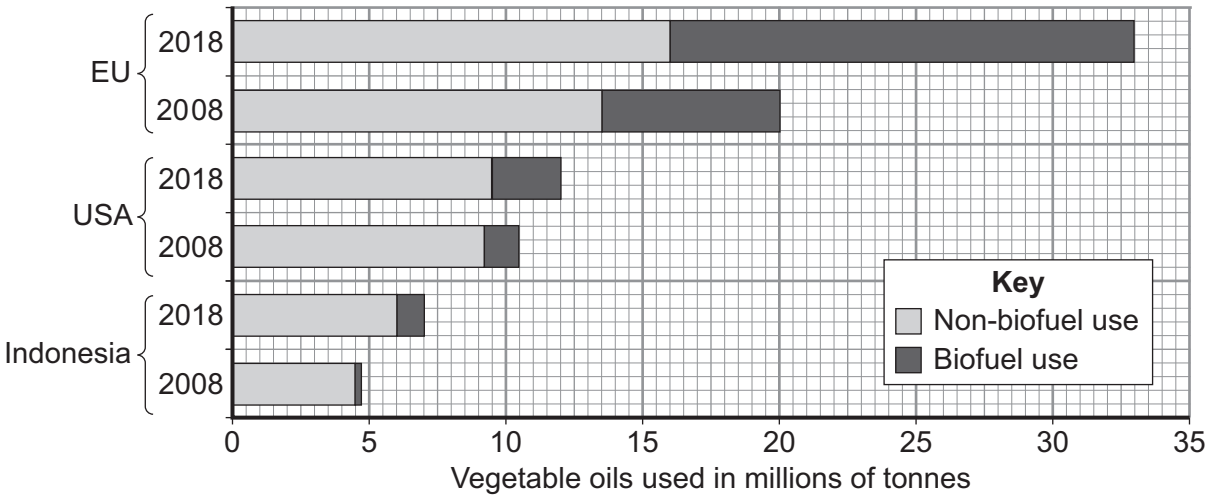
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QUESTION EIGHT

Vegetable oils are an important raw material for the production of biofuels.
An increase in the proportion of vegetable oils used for biofuels will reduce a country's dependence on crude oil.

However, large areas of agricultural land will be needed to grow the crops from which the oils are extracted.

The bar chart shows the use of vegetable oils in the European Union (EU), the USA and Indonesia in 2008. It also shows the projected use of vegetable oils in 2018. Indonesia is a country in south-east Asia.



8A What is the projected proportion of vegetable oils that will be used in the USA in 2018 to produce biofuels?

1 0.21

2 0.29

3 0.36

4 0.48

8B What is the projected percentage increase in the use of biofuels in the EU between 2008 and 2018?

1 22 %

2 75 %

3 162 %

4 250 %

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8C The main environmental reason for the projected increase in the use of biofuels is . . .

1 the increase in the price of crude oil.

2 pressure to meet targets for reduced carbon dioxide emissions.

3 the discovery of large areas of unused agricultural land.

4 that biofuels do not produce any harmful waste gases when they burn.

8D Some pressure groups argue against the increased use of biofuels. They make many statements in support of their cause.

Which of the following is probably a false statement?

Increased use of biofuels will . . .

1 result in the loss of some animal and plant species.

2 create food shortages in some parts of the world.

3 cause water shortages in some countries.

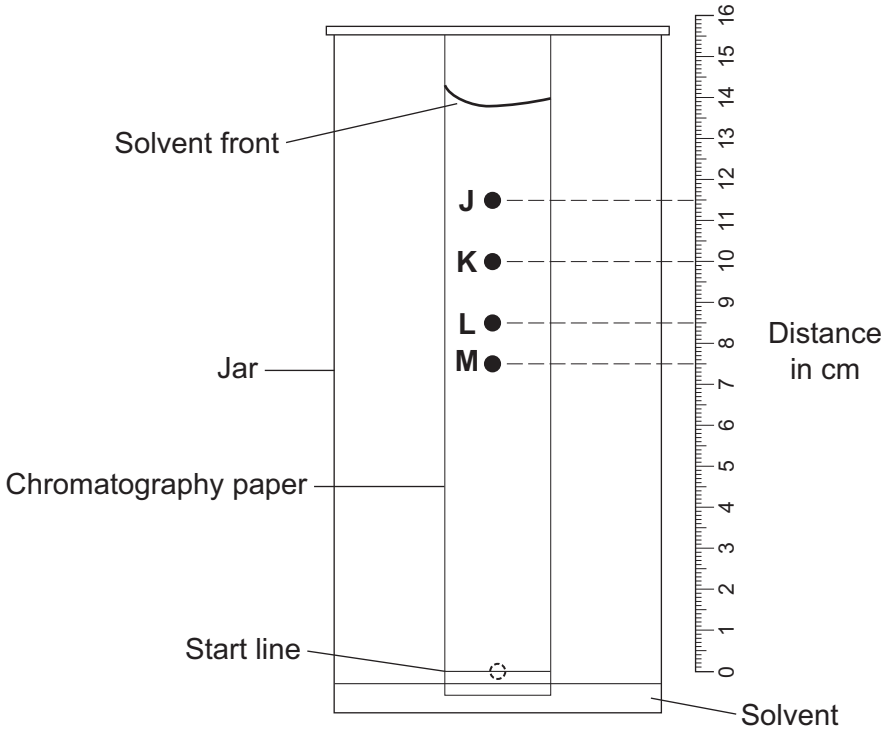
4 cause petroleum diesel prices to rise.

Turn over for the next question

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QUESTION NINE

The colours from a sweet were dissolved in a solvent. A spot of the solution was put onto some chromatography paper. The paper was then placed in a jar. After a period of time, the colours were separated as shown in the diagram.



$$\text{the } R_f \text{ value for a colour} = \frac{\text{distance moved by the colour}}{\text{distance moved by the solvent}}$$

The substance responsible for a colour can be identified by using its R_f value. This tells you where to look on the chromatogram for this colour.

9A Amaranth has an R_f value of 0.54.

Which of the colours is possibly amaranth?

1 **J**

2 **K**

3 **L**

4 **M**

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Indigo carmine has an R_f value of 0.58 and amaranth has an R_f value of 0.54.

9B There must be some doubt about whether a particular spot is indigo carmine or amaranth because . . .

1 the solvent front is not straight.

2 the length of time the chromatography paper was in the solvent is not known.

3 the scale is marked in 10 mm divisions.

4 only colours from one sweet were used.

9C The test was done four times for one particular colour.
R_f values of 0.51, 0.53, 0.58 and 0.61 were obtained.

This data tells us that . . .

1 the colour is amaranth.

2 the colour is indigo carmine.

3 the colour could be indigo carmine or amaranth.

4 the method cannot detect different colours.

9D It is recommended that indigo carmine should not be eaten by children.

The evidence from this investigation should lead to . . .

1 these sweets being banned.

2 further investigation with additional chemical tests.

3 these sweets being banned for children only.

4 this test being repeated more times.

END OF TEST

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GCSE

Science A (4461) / Chemistry (4421)

Specification A

CHY1BP, CH1BSF & CH1BSH

Mark Scheme

2011 Examination – November Series

The blank answer sheet for this component can be found at the end of this document.

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This component is an objective test for which the following list indicates the correct answers used in marking the students' responses.

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GCSE

SCIENCE A (4461)/CHEMISTRY (4421)

Objective Test Answer Key

CHY1BP (Oils, Earth and Atmosphere)

November 2011

Foundation Tier

Question	Key		
One	**A**	ammonia	**4**
	B	carbon dioxide	**1**
	C	nitrogen	**3**
	D	oxygen	**2**
Two	**A**	can withstand high temperatures and is non-stick	**2**
	B	can be stretched into fibres	**3**
	C	makes a very light, solid foam which is a good . . .	**1**
	D	strong, rigid and a good electrical insulator	**4**
Three	**A**	burned in oxygen	**3**
	B	reacted with bromine water	**4**
	C	reacted with hydrogen	**2**
	D	shaken with water	**1**
Four	**A**	5 %	**2**
	B	10 %	**1**
	C	40 %	**3**
	D	55 %	**4**
Five	**A**	abundance	**4**
	B	colour	**2**
	C	density	**3**
	D	reactivity	**1**

	A	**B**	**C**	**D**
Six	**2**	**3**	**2**	**3**
Seven	**4**	**3**	**1**	**1**
Eight	**1**	**2**	**4**	**2**
Nine	**1**	**3**	**1**	**3**

GCSE

SCIENCE A (4461)/CHEMISTRY (4421)

Objective Test Answer Key

CHY1BP (Oils, Earth and Atmosphere)

November 2011

Higher Tier

Question	Key		
One	**A**	abundance	**4**
	B	colour	**2**
	C	density	**3**
	D	reactivity	**1**
Two	**A**	Ethane	**4**
	B	Ethanol	**3**
	C	Ethene	**2**
	D	Poly(ethene)	**1**

	A	**B**	**C**	**D**
Three	**1**	**2**	**4**	**2**
Four	**1**	**3**	**1**	**3**
Five	**1**	**4**	**1**	**4**
Six	**2**	**1**	**4**	**4**
Seven	**4**	**1**	**1**	**3**
Eight	**1**	**3**	**2**	**4**
Nine	**4**	**1**	**3**	**2**

The AQA UMS Conversion Calculator can be found at the following web address:

http://www.aqa.org.uk/umsconversion

AQA

Unit : CHY1BP **CHEMISTRY UNIT 1B**

Centre :

Candidate Number : **UCI :**

Candidate Name :

Series : BG11

15-NOV-11

For completion by the Examination Invigilator. **Please fill this circle if the candidate is absent:** ○

HIGHER TIER

Instructions on how to complete this answer sheet are given on the question paper. Please make sure you follow them carefully.

Questions **ONE** to **NINE** Choose one response **1 - 4** for each of the parts **A - D**

QUESTION ONE		1	2	3	4
1A	abundance	○	○	○	○
1B	colour	○	○	○	○
1C	density	○	○	○	○
1D	reactivity	○	○	○	○

QUESTION TWO		1	2	3	4
2A	Ethane	○	○	○	○
2B	Ethanol	○	○	○	○
2C	Ethene	○	○	○	○
2D	Poly(ethene)	○	○	○	○

QUESTION THREE	1	2	3	4
3A	○	○	○	○
3B	○	○	○	○
3C	○	○	○	○
3D	○	○	○	○

QUESTION FOUR	1	2	3	4
4A	○	○	○	○
4B	○	○	○	○
4C	○	○	○	○
4D	○	○	○	○

QUESTION FIVE	1	2	3	4
5A	○	○	○	○
5B	○	○	○	○
5C	○	○	○	○
5D	○	○	○	○

QUESTION SIX	1	2	3	4
6A	○	○	○	○
6B	○	○	○	○
6C	○	○	○	○
6D	⊙	○	○	○

QUESTION SEVEN	1	2	3	4
7A	○	○	○	○
7B	○	○	○	○
7C	○	○	○	○
7D	○	○	○	○

QUESTION EIGHT	1	2	3	4
8A	○	○	○	○
8B	○	○	○	○
8C	○	○	○	○
8D	○	○	○	○

QUESTION NINE	1	2	3	4
9A	○	○	○	○
9B	○	○	○	○
9C	○	○	○	○
9D	○	○	○	○

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FOUNDATION TIER

Instructions on how to complete this answer sheet are given on the question paper. Please make sure you follow them carefully.

Questions **ONE** to **NINE** Choose one response **1 - 4** for each of the parts **A - D**

QUESTION ONE	1	2	3	4
1A ammonia	○	○	○	○
1B carbon dioxide	○	○	○	○
1C nitrogen	○	○	○	○
1D oxygen	○	○	○	○

QUESTION TWO	1	2	3	4
2A can withstand high temperatures and is non-stick	○	○	○	○
2B can be stretched into fibres	○	○	○	○
2C makes a light, solid foam which is a good heat insulator	○	○	○	○
2D strong, rigid and a good electrical insulator	○	○	○	○

QUESTION THREE	1	2	3	4
3A burned in oxygen	○	○	○	○
3B reacted with bromine water	○	○	○	○
3C reacted with hydrogen	○	○	○	○
3D shaken with water	○	○	○	○

QUESTION FOUR	1	2	3	4
4A 5%	○	○	○	○
4B 10%	○	○	○	○
4C 40%	○	○	○	○
4D 55%	○	○	○	○

QUESTION FIVE	1	2	3	4
5A abundance	○	○	○	○
5B colour	○	○	○	○
5C density	○	○	○	○
5D reactivity	○	○	○	○

QUESTION SIX	1	2	3	4
6A	○	○	○	○
6B	○	○	○	○
6C	○	○	○	○
6D	○	○	○	○

QUESTION SEVEN	1	2	3	4
7A	○	○	○	○
7B	○	○	○	○
7C	○	○	○	○
7D	○	○	○	○

QUESTION EIGHT	1	2	3	4
8A	○	○	○	○
8B	○	○	○	○
8C	○	○	○	○
8D	○	○	○	○

QUESTION NINE	1	2	3	4
9A	○	○	○	○
9B	○	○	○	○
9C	○	○	○	○
9D	○	○	○	○

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Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

General Certificate of Secondary Education
Foundation Tier and Higher Tier
June 2011

Science A

Unit Chemistry C1b (Oils, Earth and Atmosphere)

Chemistry

Unit Chemistry C1b (Oils, Earth and Atmosphere)

CHY1BP

F&H

Tuesday 28 June 2011 Morning Session

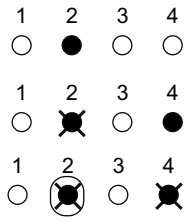
For this paper you must have:
- a black ball-point pen
- an objective test answer sheet.

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 '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.

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You must do **one Tier** only, **either** the Foundation Tier **or** the Higher Tier.
The Higher Tier starts on page 16 of this booklet.

FOUNDATION TIER

Section One

Questions **ONE** to **FIVE**.

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

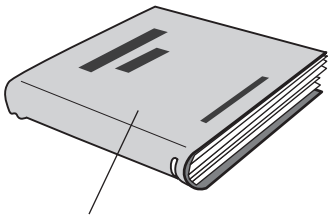
Use **each** answer only **once**.

Mark your choices on the answer sheet.

QUESTION ONE

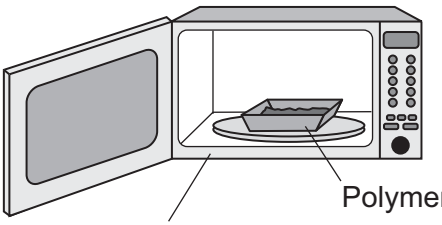
The drawings show four different ways in which polymers are used.

A



Polymer (dust cover)

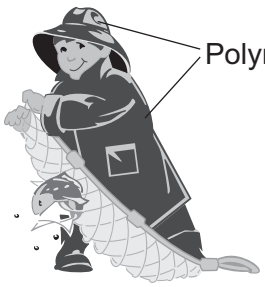
B



Polymer (tray)

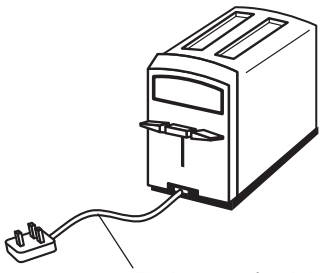
Microwave oven

C



Polymer (coat and hat)

D



Polymer (cable cover)

For each of the uses shown, the polymer must have particular properties.

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The table shows the properties of four different polymers.

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

	Properties of the polymer
1	flexible, and must be a good electrical insulator
2	heat resistant and resistant to chemical attack
3	transparent, hard wearing and flexible
4	waterproof, breathable, flexible and can be coloured

Turn over for the next question

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QUESTION TWO

This question is about four vegetable oils, **A**, **B**, **C** and **D**.

	Vegetable oil	Mass of the oil that can be extracted from 100 kg of seeds of the plant	Saturated fat %	Unsaturated fat %	
				mono	poly
A	Corn	6 kg	13	25	62
B	Olive	40 kg	11	69	20
C	Rapeseed	35 kg	12	24	64
D	Sunflower	32 kg	14	19	67

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

1	It contains the most saturated fat.
2	It contains 88 % unsaturated fat.
3	It contains the largest percentage of unsaturated fat.
4	Its seeds produce the least oil.

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QUESTION THREE

This question is about the Earth's tectonic plates.

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

A volcanic eruptions

B convection currents

C continental drift

D radioactive processes

Millions of years ago, there was just one large land mass on Earth. The land mass split up into smaller land masses and these moved apart.

The movement of the smaller land masses is called . . . **1** . . . .

The land masses are on tectonic plates. The tectonic plates change position because in the Earth's mantle there are . . . **2** . . . .

The movement of the tectonic plates is caused by heat released from natural . . . **3** . . . .

At the boundary between tectonic plates, there are sometimes . . . **4** . . . .

Turn over for the next question

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QUESTION FOUR

This question is about hydrocarbons.

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

A alkenes

B polymers

C monomers

D alkanes

Hydrocarbons are cracked to produce both saturated and unsaturated hydrocarbons.

The saturated hydrocarbons that are used as fuels are called . . . **1** . . . .

The unsaturated hydrocarbons are called . . . **2** . . . .

Compounds, such as poly(ethene) and poly(propene), that have very long chain molecules are called . . . **3** . . . .

Long chain molecules are made when many small molecules join together. These small molecules are called . . . **4** . . . .

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QUESTION FIVE

This question is about sunflower oil.

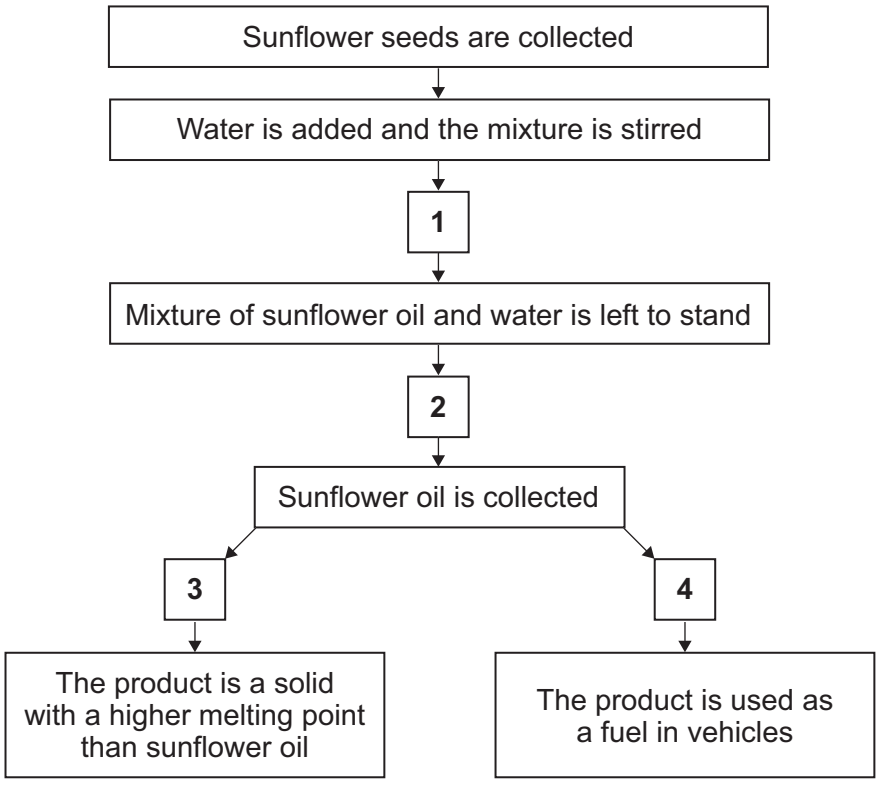
Match statements, **A**, **B**, **C** and **D**, with the numbers **1–4** in the flow chart.

A Sunflower oil separates as a layer above the water.

B Sunflower oil is reacted with hydrogen at 60 °C.

C Sunflower oil is mixed with petroleum diesel.

D Mixture of sunflower seeds and water is pressed.



Turn over for the next question

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Section Two

Questions **SIX** to **NINE**.

Each of these questions has four parts.

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

Mark your choices on the answer sheet.

QUESTION SIX

This question is about unsaturated oils.

A student tested four oils, **K**, **L**, **M** and **N**, to find out which was the most unsaturated.

The student:

- used the same volume of each of the oils for all the tests.
- added bromine water from a burette to oil **K** and shook the mixture.
- continued until the bromine water was no longer decolourised.
- recorded the volume of bromine water added.
- repeated this two more times for oil **K**.

He then repeated the same procedure for oils **L**, **M** and **N**.

His results are given in the table.

Oil tested	Volume of bromine water added in cm^3		
	Test 1	**Test 2**	**Test 3**
K	20.1	20.2	20.2
L	42.2	44.2	46.2
M	25.6	26.3	27.0
N	15.8	16.5	14.3

6A The student used the burette to measure the volume of bromine water to the nearest . . .

1 0.1 cm^3

2 0.2 cm^3

3 1.0 cm^3

4 2.0 cm^3

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6B The student obtained the largest range of burette readings for oil . . .

1 **K**

2 **L**

3 **M**

4 **N**

6C The student obtained the most precise results for oil . . .

1 **K**

2 **L**

3 **M**

4 **N**

6D A valid conclusion from his experiment is that . . .

1 four oils were tested.

2 oil **N** was the most unsaturated.

3 all four of the oils were unsaturated.

4 all oils react with bromine.

Turn over for the next question

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QUESTION SEVEN

Biodiesel can be used as a fuel for vehicles. Biodiesel is made from vegetable oils. It can be used instead of diesel oil that is obtained from petroleum (crude oil).

Here is some more information about biodiesel.

- It contains much less sulfur than petroleum diesel.
- It is not hazardous to store.
- It is about the same price as petroleum diesel.
- It does not flow easily at low temperatures.
- It releases less energy than petroleum diesel when used as a fuel.
- It is difficult to ignite.

7A Biodiesel is a fuel because it . . .

1 is cheap.

2 is not hazardous when handled.

3 causes no pollution when burnt.

4 releases energy when burnt.

7B Tax is charged on petroleum diesel, but not on biodiesel.

The decision not to have tax charged on biodiesel is made by . . .

1 engine manufacturers to sell more of their engines.

2 politicians to encourage people to buy it.

3 scientists to help protect crude oil reserves.

4 petrol companies to increase sales of fuel.

7C The use of biodiesel is continuing to increase.

One reason is because . . .

1 it is easy to store.

2 it can be used at all temperatures.

3 less agricultural land is required to grow plants for food.

4 it is a sustainable fuel.

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7D At present, there is more petroleum diesel used than biodiesel.

This is because petroleum diesel . . .

1 can be obtained from only a few places in the world.

2 contains more sulfur.

3 is more readily available.

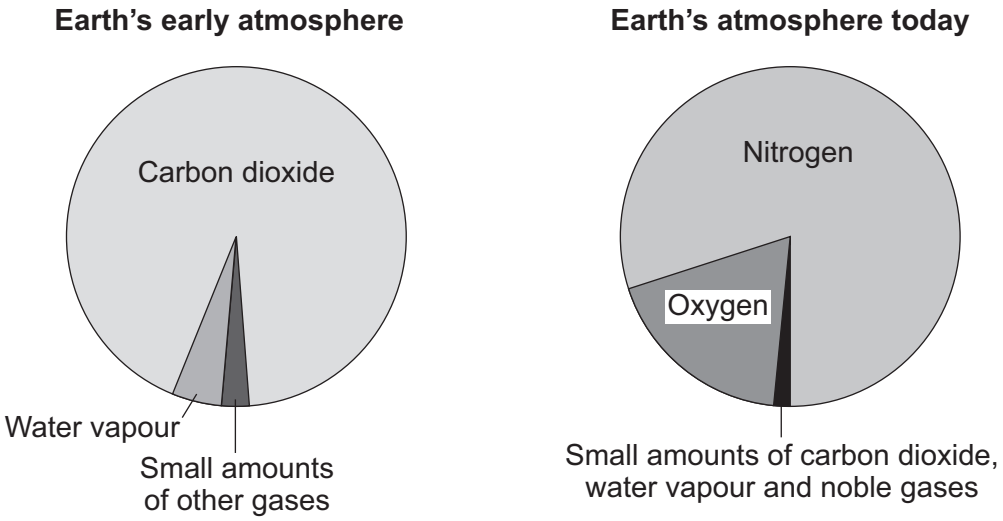
4 is more expensive.

Turn over for the next question

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QUESTION EIGHT

The pie charts show the amounts of gases in the Earth's early atmosphere and in the Earth's atmosphere today.



8A Very small amounts of a hydrocarbon gas are thought to have been in the Earth's early atmosphere.

This gas is . . .

1 ammonia, NH_3

2 helium, He

3 methane, CH_4

4 oxygen, O_2

8B As the Earth's early atmosphere was forming, it contained water vapour.

Which row in the table shows where the water vapour came from **and** why the quantity in the atmosphere reduced?

	Water vapour came from	**Water vapour reduced because**
1	evaporation from the ground.	it condensed to form the oceans.
2	evaporation from the ground.	there was less rainfall.
3	volcanic activity.	it condensed to form the oceans.
4	volcanic activity.	there was less rainfall.

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8C Why was there no oxygen in the Earth's early atmosphere?

1 There was no carbon dioxide for the plants to use to make oxygen.

2 Living organisms had used up the oxygen.

3 There were no plants on Earth.

4 Oxygen is a very reactive gas.

8D The quantity of carbon dioxide in the Earth's atmosphere today is very different from the quantity that was in the Earth's early atmosphere.

One of the reasons why it is very different is that . . .

1 there are a lot of cars on our roads today.

2 it is locked up as carbon in fossil fuels.

3 most homes use fossil fuels for central heating.

4 plants produce carbon dioxide by photosynthesis.

Turn over for the next question

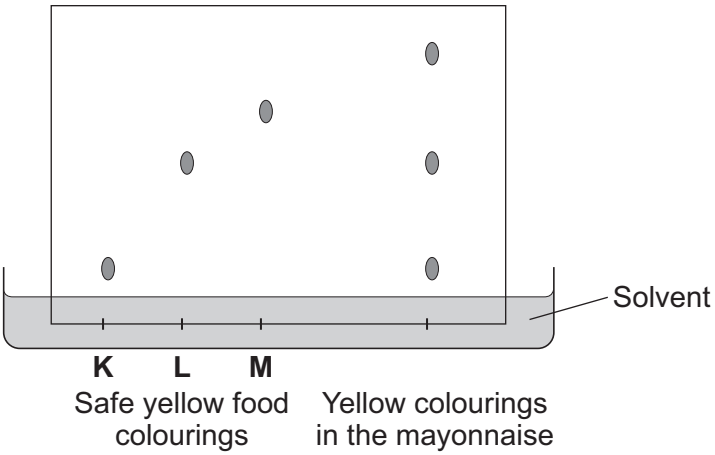
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QUESTION NINE

This ingredients list was on a jar of mayonnaise.

Ingredients
Water
Rapeseed oil
Sugar
Egg yolk
Cornflower
Vinegar
Colourings
Preservative E202

A test was used to find out if the yellow colourings in the mayonnaise were safe to eat.
The result of the test is shown below.



9A The test to detect and identify the colours is called . . .

1 distillation.

2 extraction.

3 vaporisation.

4 chromatography.

9B The test results show that in the mayonnaise . . .

1 none of the colourings is safe.

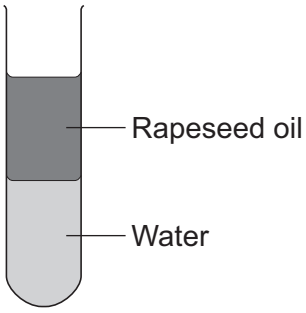
2 only one of the colourings is safe.

3 two of the colourings are safe.

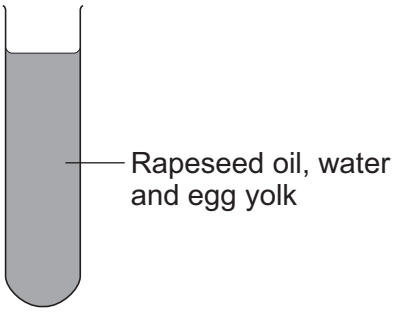
4 all of the colourings are safe.

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9C The diagrams show an experiment using some of the ingredients in the mayonnaise.



Mixture of rapeseed oil and water, shaken then left to stand



Mixture of rapeseed oil, water and egg yolk, shaken then left to stand

The results of the experiment suggest that . . .

1 rapeseed oil dissolves in water.

2 rapeseed oil is unsuitable for use in mayonnaise.

3 egg yolk is an emulsifier.

4 egg yolk improves the colour of the mayonnaise.

9D The preservative in the mayonnaise has an E-number.

This means that this preservative . . .

1 is a natural ingredient.

2 adds to the flavour of the mayonnaise.

3 is a permitted additive.

4 improves the appearance of the mayonnaise.

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.

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 sunflower oil.

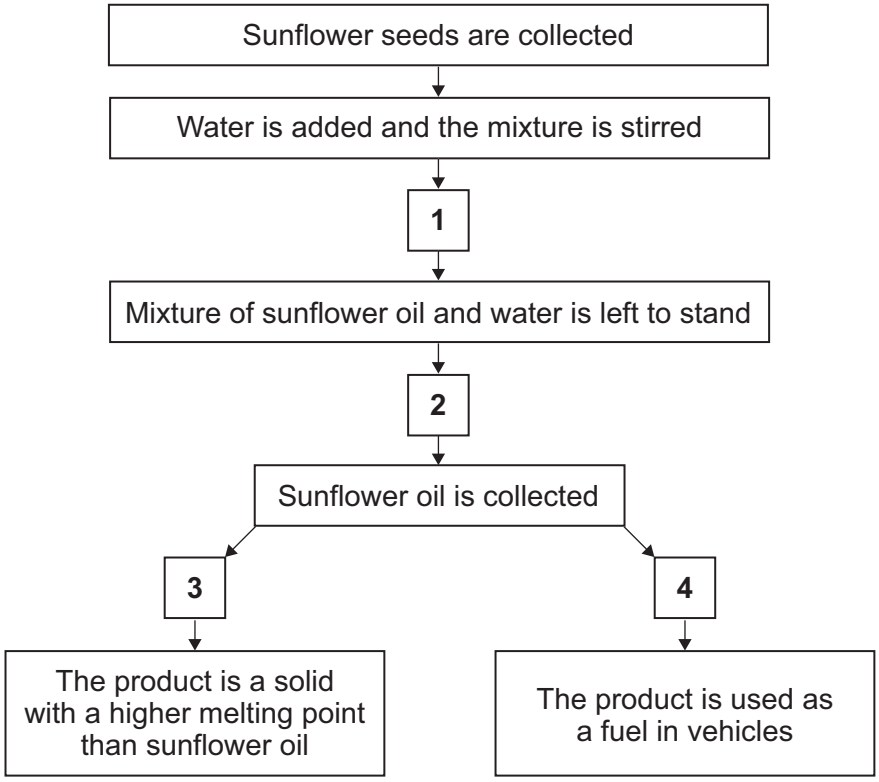
Match statements, **A**, **B**, **C** and **D**, with the numbers **1–4** in the flow chart.

A Sunflower oil separates as a layer above the water.

B Sunflower oil is reacted with hydrogen at 60 °C.

C Sunflower oil is mixed with petroleum diesel.

D Mixture of sunflower seeds and water is pressed.



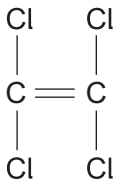
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QUESTION TWO

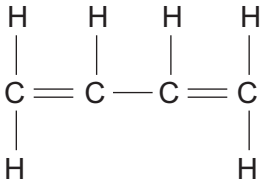
This question is about four carbon compounds.

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

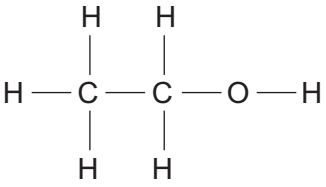
A



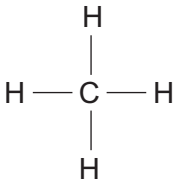
B



C



D



	Description
1	It is not a hydrocarbon but burns to give carbon dioxide and water.
2	It is a saturated hydrocarbon used as a fuel.
3	It will not produce water vapour if it burns.
4	It belongs to a group of compounds with the general formula C_nH_{2n-2}

Turn over for the next question

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Section Two

Questions **THREE** to **NINE**.

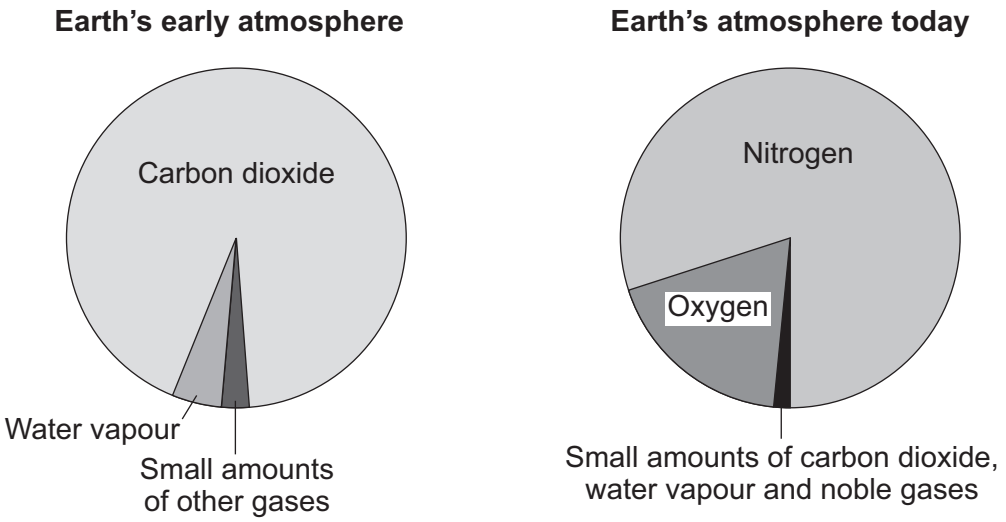
Each of these questions has four parts.

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

Mark your choices on the answer sheet.

QUESTION THREE

The pie charts show the amounts of gases in the Earth's early atmosphere and in the Earth's atmosphere today.



3A Very small amounts of a hydrocarbon gas are thought to have been in the Earth's early atmosphere.

This gas is . . .

1 ammonia, NH_3

2 helium, He

3 methane, CH_4

4 oxygen, O_2

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3B As the Earth's early atmosphere was forming, it contained water vapour.

Which row in the table shows where the water vapour came from **and** why the quantity in the atmosphere reduced?

	Water vapour came from	**Water vapour reduced because**
1	evaporation from the ground.	it condensed to form the oceans.
2	evaporation from the ground.	there was less rainfall.
3	volcanic activity.	it condensed to form the oceans.
4	volcanic activity.	there was less rainfall.

3C Why was there no oxygen in the Earth's early atmosphere?

1 There was no carbon dioxide for the plants to use to make oxygen.

2 Living organisms had used up the oxygen.

3 There were no plants on Earth.

4 Oxygen is a very reactive gas.

3D The quantity of carbon dioxide in the Earth's atmosphere today is very different from the quantity that was in the Earth's early atmosphere.

One of the reasons why it is very different is that . . .

1 there are a lot of cars on our roads today.

2 it is locked up as carbon in fossil fuels.

3 most homes use fossil fuels for central heating.

4 plants produce carbon dioxide by photosynthesis.

Turn over for the next question

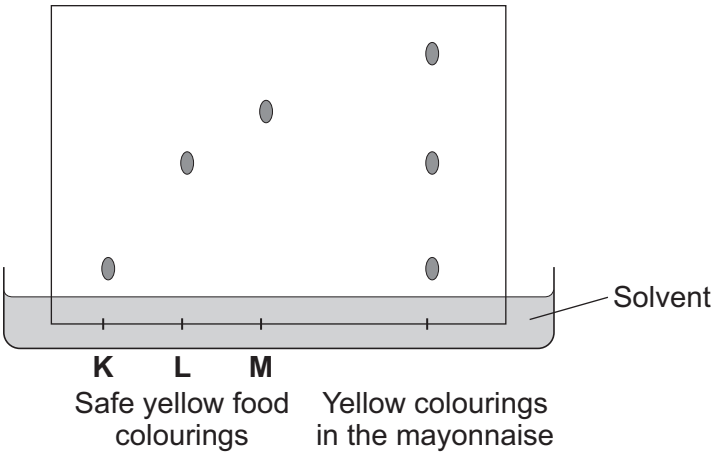
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QUESTION FOUR

This ingredients list was on a jar of mayonnaise.

Ingredients
Water
Rapeseed oil
Sugar
Egg yolk
Cornflower
Vinegar
Colourings
Preservative E202

A test was used to find out if the yellow colourings in the mayonnaise were safe to eat.
The result of the test is shown below.



4A The test to detect and identify the colours is called . . .

1 distillation.

2 extraction.

3 vaporisation.

4 chromatography.

4B The test results show that in the mayonnaise . . .

1 none of the colourings is safe.

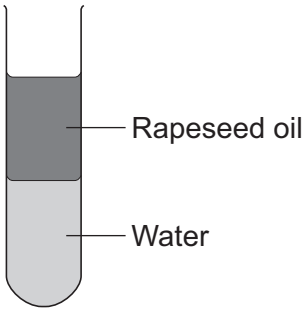
2 only one of the colourings is safe.

3 two of the colourings are safe.

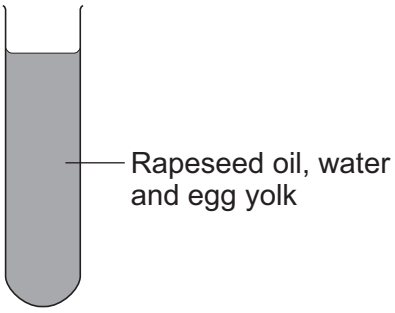
4 all of the colourings are safe.

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4C The diagrams show an experiment using some of the ingredients in the mayonnaise.



Mixture of rapeseed oil and water, shaken then left to stand



Mixture of rapeseed oil, water and egg yolk, shaken then left to stand

The results of the experiment suggest that . . .

1 rapeseed oil dissolves in water.

2 rapeseed oil is unsuitable for use in mayonnaise.

3 egg yolk is an emulsifier.

4 egg yolk improves the colour of the mayonnaise.

4D The preservative in the mayonnaise has an E-number.

This means that this preservative . . .

1 is a natural ingredient.

2 adds to the flavour of the mayonnaise.

3 is a permitted additive.

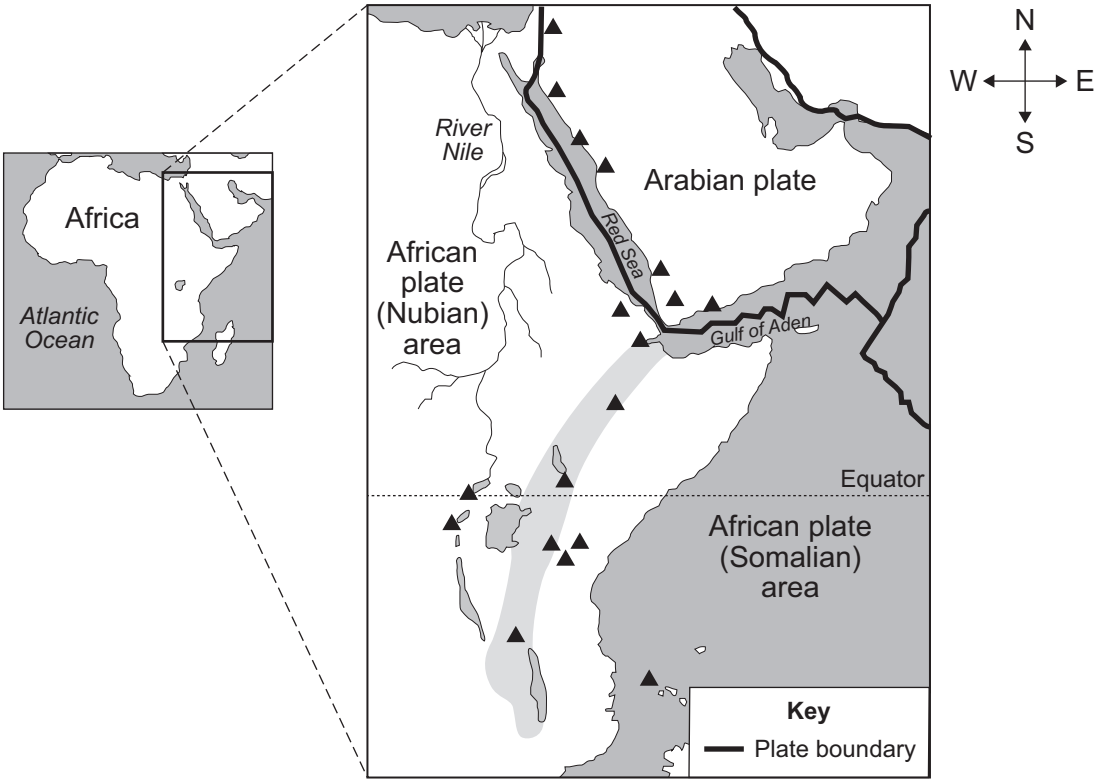
4 improves the appearance of the mayonnaise.

Turn over for the next question

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QUESTION FIVE

The map shows a part of East Africa.



This part of Africa is gradually being split into separate areas of land along the plate boundary which runs from north west to south east.

The process began about 30 million years ago, resulting in the formation of the Red Sea.

5A The separation in this area was caused by . . .

1 convection currents moving the Arabian plate away from the African plate.

2 the ocean moving the Arabian plate away from the African plate.

3 convection currents forcing the Arabian and African plates together.

4 shrinking of the Earth's crust as it cooled.

5B From their positions, the triangles (▲) on the map most likely represent . . .

1 mountains.

2 volcanoes.

3 lakes.

4 villages.

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On the African plate, the Somalian area is beginning to move away from the Nubian area to form a new plate boundary in the zone which has the lighter shading on the map.

5C The Red Sea is about 300 km wide. The new Somalian and Nubian plates are expected to move apart at a similar rate to the Arabian and African plates.

A reasonable estimate for the formation of a sea of similar width to the Red Sea would be . . .

1 1 thousand years.

2 30 thousand years.

3 300 thousand years.

4 30 million years.

5D Where in this region, and when, would you expect earthquakes to occur?

1 along the Equator, every ten years

2 close to plate boundaries, every twenty years

3 close to plate boundaries, but it is difficult to predict when

4 in the shaded area, when the plates stop moving

Turn over for the next question

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QUESTION SIX

The question is about vegetable oils.

6A Many vegetable oils contain unsaturated compounds.

This means that . . .

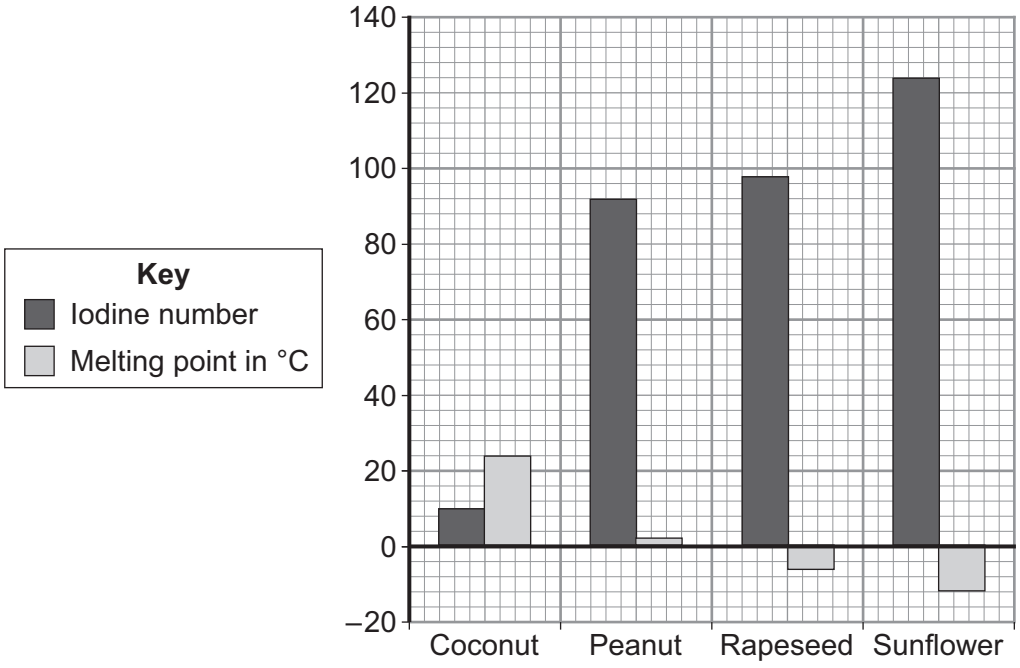
1 they are soluble in water.

2 they can form an emulsion with water.

3 they contain double carbon carbon bonds.

4 they do not contain single carbon carbon bonds.

The chart shows some information about four vegetable oils.



The iodine number of a vegetable oil is the number of grams of iodine that will react with 100 g of the oil.

The higher the iodine number, the more unsaturated the compounds are in the vegetable oil.

6B The bar chart indicates that the lower the melting point of a vegetable oil, . . .

1 the less iodine it will react with.

2 the more unsaturated compounds are in the oil.

3 the lower the iodine number.

4 the more saturated compounds are in the oil.

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6C How much iodine will 1 g of coconut oil react with?

1 0.01 g

2 0.1 g

3 1.0 g

4 10.0 g

6D Which row in the table describes what happens when a vegetable oil reacts with hydrogen **and** correctly describes how the product is different from the vegetable oil?

	Reaction of vegetable oil with hydrogen	**Product**
1	increase in compounds with C = C	harder
2	increase in compounds with C = C	softer
3	decrease in compounds with C = C	harder
4	decrease in compounds with C = C	softer

Turn over for the next question

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QUESTION SEVEN

About 90 % of the world's supply of ethanol is produced by using yeast for the fermentation of sugars obtained from plants. A solution of about 8 % ethanol in water is obtained.
Ethanol can be used to produce ethene.

Reaction **P** shows carbon dioxide being removed from the atmosphere by plants to make sugar.
Reaction **Q** shows carbon dioxide being released by yeast into the atmosphere during respiration.
Reaction **R** shows the formation of ethene from ethanol.

Reaction **P** $6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$

Reaction **Q** $C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2$

Reaction **R** $C_2H_5OH \rightarrow C_2H_4 + H_2O$

7A In these reactions, what is the net change in the number of molecules of carbon dioxide in the atmosphere during the production of one molecule of ethene?

1 1

2 2

3 4

4 6

Ethanol can also be produced by the reaction of ethene with steam.

This is a continuous process because the reactants flow steadily into the reactor and the ethanol flows out.

7B How is the ethene for this process obtained?

1 by fractional distillation of crude oil

2 by cracking fractions from crude oil

3 by polymerisation of crude oil

4 by vaporisation of crude oil

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7C An advantage of producing ethanol from ethene rather than by fermentation is that . . .

1 higher temperatures are required.

2 catalysts are used.

3 the ethanol is purer.

4 the reaction is slower.

7D It may be better to obtain ethene from biologically-produced ethanol rather than from crude oil.

One reason for this is that . . .

1 ethene can be produced in unlimited quantities.

2 crude oil is a non-renewable resource.

3 poly(ethene) made from biologically produced ethanol will be biodegradable.

4 the fermentation of sugar is done in batches, whereas production of ethene from crude oil is continuous.

Turn over for the next question

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QUESTION EIGHT

This question is about the cracking of hydrocarbons.

8A Which of the following is a correctly balanced equation for the cracking of $C_{15}H_{32}$ in which two different alkenes are produced?

1 $C_{15}H_{32} \rightarrow 2C_2H_4 + C_3H_6 + C_8H_{18}$

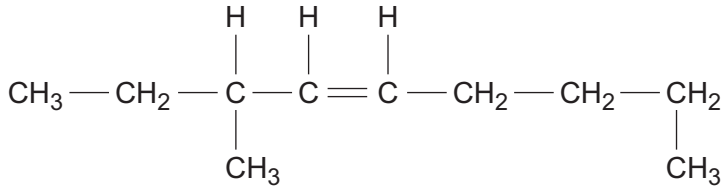
2 $C_{15}H_{32} \rightarrow 2CH_4 + C_3H_6 + C_4H_{10} + C_6H_{12}$

3 $C_{15}H_{32} \rightarrow 2C_3H_6 + C_9H_{20}$

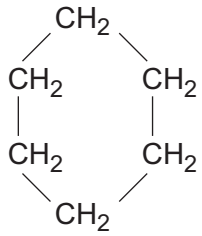
4 $C_{15}H_{32} \rightarrow C_4H_{10} + C_5H_{10} + C_6H_{14}$

8B Which of the following hydrocarbons that could be produced by the cracking of C_9H_{20} has the general formula C_nH_{2n} and decolourises bromine water?

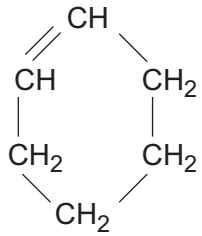
1



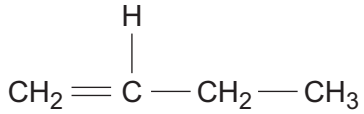
2



3



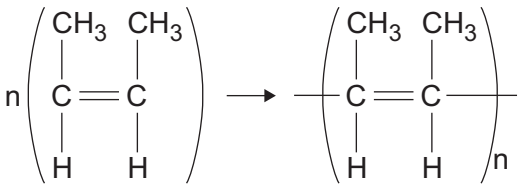
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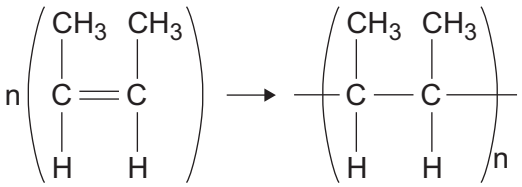
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8C Which of the following equations represents the polymerisation of butene?

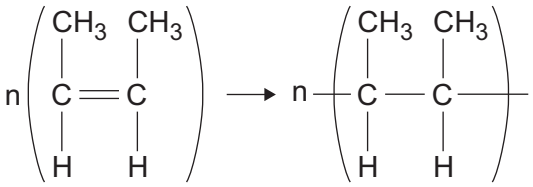
1



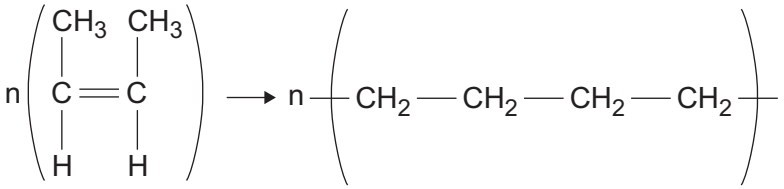
2



3



4

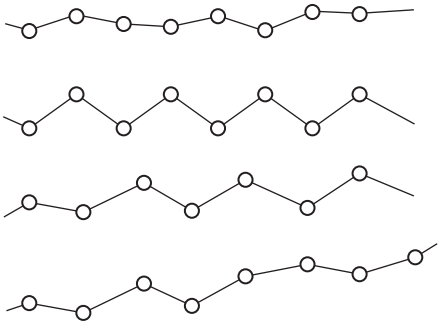


Question 8 continues on the next page

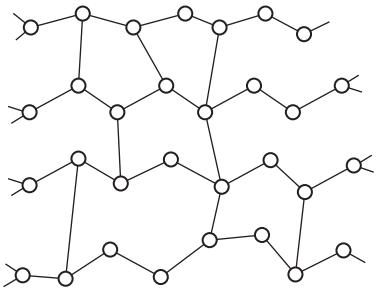
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8D The diagram shows the structures of a thermosoftening polymer and a thermosetting polymer.

Thermosoftening polymer



Thermosetting polymer



Which row in the table describes the properties of the two types of polymer?

	Thermosoftening polymer		**Thermosetting polymer**	
	Property 1	**Property 2**	**Property 1**	**Property 2**
1	Polymer molecules able to slide	Chemical bonds between the chains	Melt on heating	Short chain lengths
2	Long chain lengths	No chemical bonds between the chains	Chemical bonds between the chains	Polymer molecules able to slide
3	Long chain lengths	No chemical bonds between the chains	Do not melt on heating	Chemical bonds between the chains
4	Chemical bonds between the chains	Melt on heating	No chemical bonds between the chains	Long chain lengths

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Turn over for the next question

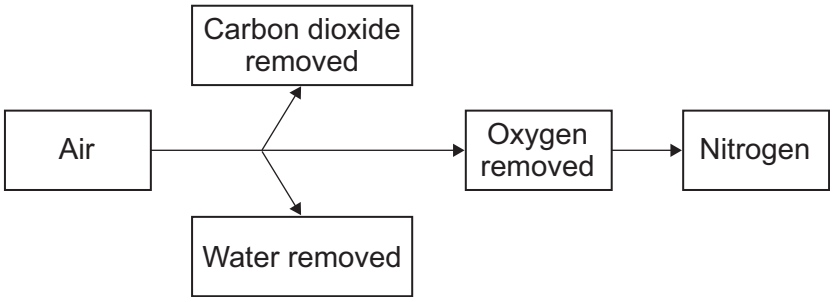
QUESTION NINE

The table below gives information about the gases in the air after removal of any water vapour.

Gas	Melting point in °C	Boiling point in °C	Abundance in %
Nitrogen	−209	−196	78
Oxygen	−223	−183	21
Carbon dioxide	−57	−57	0.03
Helium	−272	−269	Less than 0.1
Neon	−248	−246	Less than 0.1
Argon	−189	−186	0.9
Krypton	−157	−153	Less than 0.1
Xenon	−112	−108	Less than 0.1

In 1892, scientists believed that the air consisted of three gases, nitrogen, oxygen and carbon dioxide.

Lord Rayleigh extracted nitrogen from the air.



He also collected very pure nitrogen by heating ammonium nitrate.

He found that there was a slight difference in the densities of the nitrogen samples from the two different sources.

- Density of nitrogen from the air = 1.2572 g per litre
- Density of nitrogen from ammonium nitrate (NH_4NO_3) = 1.2511 g per litre

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9A A correct conclusion from this information is that . . .

1 hydrogen, a gas with a very low density, is present in the nitrogen from ammonium nitrate.

2 the nitrogen from the air contains a small amount of hydrogen.

3 a gas that is heavier than nitrogen is mixed with the nitrogen from the air.

4 some carbon dioxide was given off when the ammonium nitrate was heated.

9B It was several years after 1892 when the other gases in the table were identified.

This was because these other gases . . .

1 are colourless.

2 have a very low density.

3 are unreactive.

4 have very low boiling points.

The separation of gases in the air is done in several stages:

- carbon dioxide is first removed
- the air is then cooled to –200 °C so that it liquefies
- the liquefied air is allowed to warm up
- two main fractions, oxygen and nitrogen, are collected
- a third fraction that is mainly argon is also collected.

9C Why is the carbon dioxide removed before the air is liquefied?

1 It is present only in very small quantities.

2 It is a compound and the other gases are elements.

3 It would solidify during cooling and cause blockages in the pipes.

4 Its density is very similar to the density of argon.

9D What is the order in which these fractions boil off from the liquefied air?

1 argon, nitrogen, oxygen

2 oxygen, nitrogen, argon

3 nitrogen, argon, oxygen

4 argon, oxygen, nitrogen

END OF TEST

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GCSE

Science A (4461) / Chemistry (4421)

Specification A

CHY1BP, CH1BSF & CH1BSH

Mark Scheme

2011 Examination – June Series

The blank answer sheet for this component can be found at the end of this document.

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This component is an objective test for which the following list indicates the correct answers used in marking the candidates' responses.

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GCSE

SCIENCE A (4461)/CHEMISTRY (4421)

Objective Test Answer Key

CHY1BP (Oils, Earth and Atmosphere)

June 2011

Foundation Tier

Question	Key		
One	**A**	polymer (dust cover)	**3**
	B	polymer (tray)	**2**
	C	polymer (coat and hat)	**4**
	D	polymer (cable cover)	**1**
Two	**A**	corn	**4**
	B	olive	**3**
	C	rapeseed	**2**
	D	sunflower	**1**
Three	**A**	volcanic eruptions	**4**
	B	convection currents	**2**
	C	continental drift	**1**
	D	radioactive processes	**3**
Four	**A**	alkenes	**2**
	B	polymers	**3**
	C	monomers	**4**
	D	alkanes	**1**
Five	**A**	Sunflower oil separates as a layer above the water	**2**
	B	Sunflower oil is reacted with hydrogen at 60 °C	**3**
	C	Sunflower oil is mixed with petroleum diesel	**4**
	D	Mixture of sunflower seeds and water is pressed	**1**

	A	**B**	**C**	**D**
Six	**1**	**2**	**1**	**3**
Seven	**4**	**2**	**4**	**3**
Eight	**3**	**3**	**3**	**2**
Nine	**4**	**3**	**3**	**3**

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GCSE

SCIENCE A (4461)/CHEMISTRY (4421)

Objective Test Answer Key

CHY1BP (Oils, Earth and Atmosphere)

June 2011

Higher Tier

Question	Key		
One	**A**	Sunflower oil separates as a layer above the water	**2**
	B	Sunflower oil is reacted with hydrogen at 60 °C	**3**
	C	Sunflower oil is mixed with petroleum diesel	**4**
	D	Mixture of sunflower seeds and water is pressed	**1**
Two	**A**	compound A	**3**
	B	compound B	**4**
	C	compound C	**1**
	D	compound D	**2**

	A	**B**	**C**	**D**
Three	**3**	**3**	**3**	**2**
Four	**4**	**3**	**3**	**3**
Five	**1**	**2**	**4**	**3**
Six	**3**	**2**	**2**	**3**
Seven	**2**	**2**	**3**	**2**
Eight	**1**	**4**	**2**	**3**
Nine	**3**	**3**	**3**	**3**

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GCSE SCIENCE

AQA

Unit : CHY1BP **CHEMISTRY UNIT 1B**

Centre :

Candidate Number : **UCI :**

Candidate Name :

Series : 6M11

28-JUN-11

For completion by the Examination Invigilator. **Please fill this circle if the candidate is absent:** ○

HIGHER TIER

Instructions on how to complete this answer sheet are given on the question paper. Please make sure you follow them carefully.

Questions **ONE** to **NINE** Choose one response **1 - 4** for each of the parts **A - D**

QUESTION ONE

		1	2	3	4
1A	Sunflower oil separates as a layer above the water.	○	○	○	○
1B	Sunflower oil is reacted with hydrogen at 60 degrees C.	○	○	○	○
1C	Sunflower oil is mixed with petroleum diesel.	○	○	○	○
1D	Mixture of sunflower seeds and water is pressed.	○	○	○	○

QUESTION TWO

		1	2	3	4
2A	Compound A	○	○	○	○
2B	Compound B	○	○	○	○
2C	Compound C	○	○	○	○
2D	Compound D	○	○	○	○

QUESTION THREE

	1	2	3	4
3A	○	○	○	○
3B	○	○	○	○
3C	○	○	○	○
3D	○	○	○	○

QUESTION FOUR

	1	2	3	4
4A	○	○	○	○
4B	○	○	○	○
4C	○	○	○	○
4D	○	○	○	○

QUESTION FIVE

	1	2	3	4
5A	○	○	○	○
5B	○	○	○	○
5C	○	○	○	○
5D	○	○	○	○

QUESTION SIX

	1	2	3	4
6A	○	○	○	○
6B	○	○	○	○
6C	○	○	○	○
6D	○	○	○	○

QUESTION SEVEN

	1	2	3	4
7A	○	○	○	○
7B	○	○	○	○
7C	○	○	○	○
7D	○	○	○	○

QUESTION EIGHT

	1	2	3	4
8A	○	○	○	○
8B	○	○	○	○
8C	○	○	○	○
8D	○	○	○	○

QUESTION NINE

	1	2	3	4
9A	○	○	○	○
9B	○	○	○	○
9C	○	○	○	○
9D	○	○	○	○

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FOUNDATION TIER

Instructions on how to complete this answer sheet are given on the question paper. Please make sure you follow them carefully.

Questions **ONE** to **NINE** Choose one response **1 - 4** for each of the parts **A - D**

QUESTION ONE	1	2	3	4
1A Polymer (dust cover)	○	○	○	○
1B Polymer (tray)	○	○	○	○
1C Polymer (coat and hat)	○	○	○	○
1D Polymer (cable cover)	○	○	○	○

QUESTION TWO	1	2	3	4
2A Corn	○	○	○	○
2B Olive	○	○	○	○
2C Rapeseed	○	○	○	○
2D Sunflower	○	○	○	○

QUESTION THREE	1	2	3	4
3A volcanic eruptions	○	○	○	○
3B convection currents	○	○	○	○
3C continental drift	○	○	○	○
3D radioactive processes	○	○	○	○

QUESTION FOUR	1	2	3	4
4A alkenes	○	○	○	○
4B polymers	○	○	○	○
4C monomers	○	○	○	○
4D alkanes	○	○	○	○

QUESTION FIVE	1	2	3	4
5A Sunflower oil separates as a layer above the water.	○	○	○	○
5B Sunflower oil is reacted with hydrogen at 60 degrees C.	○	○	○	○
5C Sunflower oil is mixed with petroleum diesel.	○	○	○	○
5D Mixture of sunflower seeds and water is pressed.	○	○	○	○

QUESTION SIX	1	2	3	4
6A	○	○	○	○
6B	○	○	○	○
6C	○	○	○	○
6D	○	○	○	○

QUESTION SEVEN	1	2	3	4
7A	○	○	○	○
7B	○	○	○	○
7C	○	○	○	○
7D	○	○	○	○

QUESTION EIGHT	1	2	3	4
8A	○	○	○	○
8B	○	○	○	○
8C	○	○	○	○
8D	○	○	○	○

QUESTION NINE	1	2	3	4
9A	○	○	○	○
9B	○	○	○	○
9C	○	○	○	○
9D	○	○	○	○

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General Certificate of Secondary Education
Foundation Tier and Higher Tier
March 2011

Science A

Unit Chemistry C1b (Oils, Earth and Atmosphere)

Chemistry

Unit Chemistry C1b (Oils, Earth and Atmosphere)

CHY1BP

F&H

Wednesday 2 March 2011 Morning Session

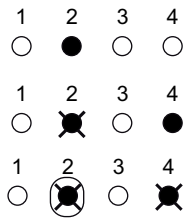
For this paper you must have:
- a black ball-point pen
- an objective test answer sheet.

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 '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.

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You must do **one Tier** only, **either** the Foundation Tier **or** the Higher Tier.
The Higher Tier starts on page 16 of this booklet.

FOUNDATION TIER

Section One

Questions **ONE** to **FIVE**.

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

The Earth's atmosphere is made up of 78 % nitrogen.

The table shows the next four most abundant gases, two of which are noble gases.

	Gas	Percentage (%) in the atmosphere by volume	Boiling point in ºC
A	Oxygen	21.0	–183
B	Argon	0.930	–185
C	Carbon dioxide	0.030	–78
D	Neon	0.005	–246

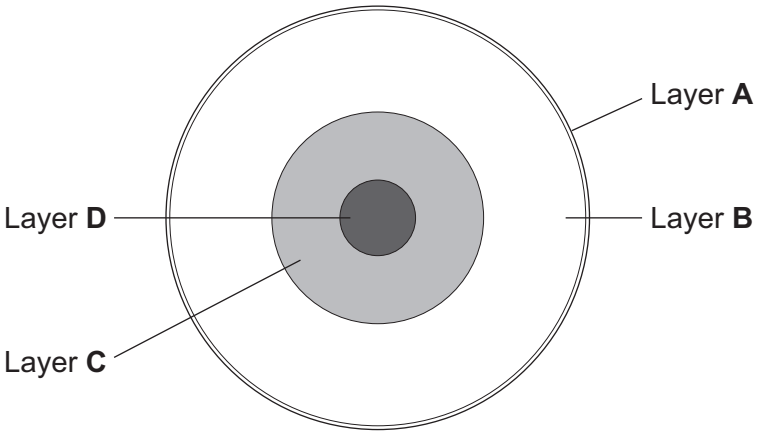
Match gases, **A**, **B**, **C** and **D**, with the numbers **1–4** in the table below.

1	It is the gas that is a compound.
2	It is the most abundant noble gas.
3	It is the gas with the lowest boiling point.
4	It is the gas needed for fuels to burn.

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QUESTION TWO

The diagram and table give information about layers of the Earth.



Layer	Volume (%)	Density in g per cm^3
A	1.5	2.7–3.0
B	82.3	3.3–5.8
C	15.4	9.4–12.3
D	0.8	13.0–13.5

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

1	It is the outermost layer of the Earth.
2	It is the layer with the smallest volume.
3	It is the layer called the mantle.
4	It is the layer with the greatest range of density.

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QUESTION THREE

The table shows some information about four vegetable oils, **A**, **B**, **C** and **D**.

	Fat content			
Vegetable oil	**Percentage (%) of saturated fat**	**Percentage (%) of unsaturated fat**	**Energy from 100 g of the oil in kJ**	**Iodine number**
A	11	89	3696	100
B	12	88	3378	60
C	13	87	3710	120
D	14	86	3700	130

A high iodine number indicates a large number of double bonds in a molecule of the oil.

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

1	It contains the highest percentage of unsaturated fat.
2	It releases the most energy from 100 g of oil.
3	It is the oil with the smallest number of double bonds in each molecule.
4	It is the oil that would react completely with the largest volume of iodine solution.

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QUESTION FOUR

This question is about vegetable oils.

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

A bromine

B hydrogen

C nickel

D water

An emulsion forms when oil is shaken with . . . **1** . . . .

Unsaturated oils can be detected because they decolourise . . . **2** . . . .

Unsaturated oils harden when they react with . . . **3** . . . .

This hardening of unsaturated oils needs a temperature of 60 °C and a . . . **4** . . . catalyst.

Turn over for the next question

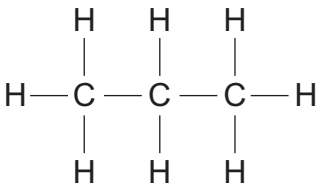
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QUESTION FIVE

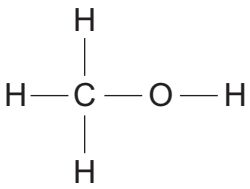
This question is about the formulae of four compounds.

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

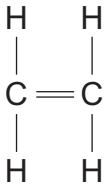
A



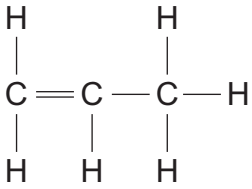
B



C



D



1	It is the alkene used to make ethanol.
2	It is a saturated hydrocarbon useful as a fuel.
3	It is not a hydrocarbon but burns to produce carbon dioxide and water vapour.
4	It belongs to the group with the general formula C_nH_{2n} where n = 3.

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Turn over for the next question

Section Two

Questions **SIX** to **NINE**.

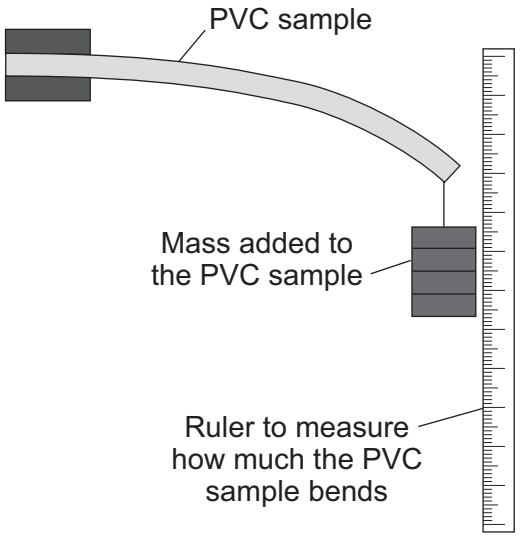
Each of these questions has four parts.

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

Mark your choices on the answer sheet.

QUESTION SIX

A scientist investigated how much the plastic polyvinyl chloride (PVC) bends when a mass is added. He used the apparatus shown in the diagram.



He measured the bending of PVC samples containing different percentages of an added chemical called a plasticiser. The PVC samples were all the same size.

The results are shown in the table.

Percentage (%) of plasticiser added to PVC	Bending of PVC sample in mm				
	Test 1	Test 2	Test 3	Test 4	Mean
0	17	18	16	8	17
5	23	22	24	23	23
10	29	27	29	27	28

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6A As the plasticiser percentage increases, the bending of the PVC samples . . .

1 remains the same.

2 increases.

3 decreases.

4 increases and then decreases.

6B The scientist did the test four times for each percentage of plasticiser added, . . .

1 to control all of the variables.

2 to decrease the time needed.

3 to improve reliability.

4 to increase the precision.

6C The mean bending value for 0 % plasticiser is shown in the table as 17 mm.

The reason is that . . .

1 17 mm was the first reading taken.

2 17 mm was the most common reading.

3 when all values are added together and divided by 4, 17 mm is obtained.

4 the reading for Test 4 is an anomalous value and is ignored.

6D Plasticiser is **not** added to the PVC used to make doors because . . .

1 too much would be needed.

2 it would be too toxic.

3 the doors would be biodegradable.

4 the doors need to be rigid.

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QUESTION SEVEN

The table below shows some data on fats, **K**, **L**, **M** and **N**.

Fats	Type	Melting point in ^{o}C
K	Saturated	+63
L	Monounsaturated	+4
M	Polyunsaturated	–5
N	Polyunsaturated	–11

7A Which of the fats has the lowest melting point?

1 **K**

2 **L**

3 **M**

4 **N**

7B Which of the fats will not react with iodine?

1 **K**

2 **L**

3 **M**

4 **N**

7C Unsaturated fats and oils are healthier than saturated fats and oils.

Which of the following statements is **not** true?

1 Scientists can find out if an oil is unsaturated.

2 Scientists can show that unsaturated oils are healthier.

3 Scientists can prevent people from eating unhealthy foods.

4 Scientists can change unsaturated oils to saturated oils.

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7D It is thought that eating too much saturated fat can cause health problems.

Some people say that saturated fats and oils are unhealthy.

Who is likely to give the most reliable advice?

1 a Year 11 student at school

2 a farmer

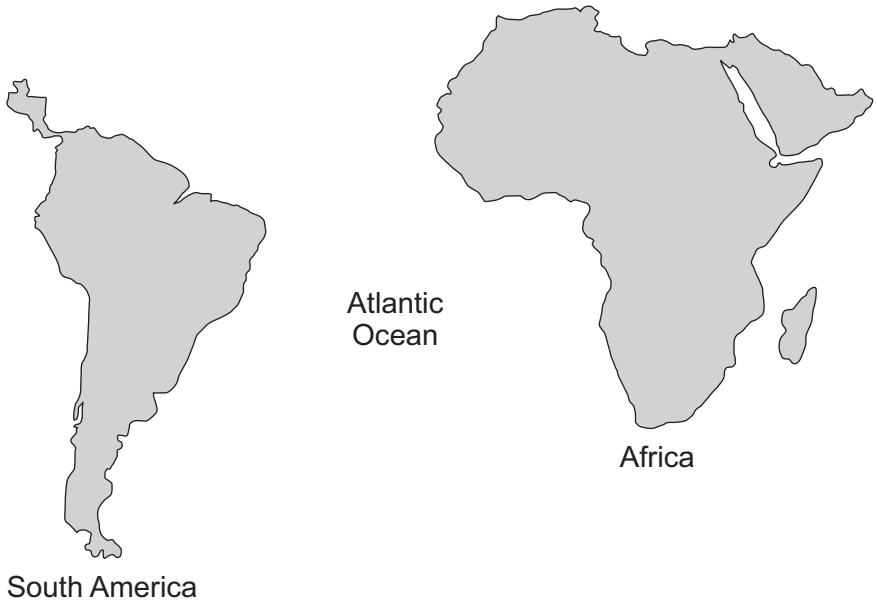
3 a supermarket manager

4 a research scientist

Turn over for the next question

QUESTION EIGHT

The diagram shows the positions of South America and Africa.



Early in the 20th century, a scientist called Alfred Wegener put forward a theory that South America and Africa had once been joined together, but had since moved apart.

8A Many scientists at the time did not accept Wegener's theory because . . .

1 some of the rocks on the two continents were different.

2 they thought that the two continents were moving towards each other.

3 they were unable to explain how the continents could move.

4 they thought that the Earth's crust was expanding.

8B About 50 years later, more scientists began to accept Wegener's theory.

This was because of evidence that . . .

1 the continents have similar shapes.

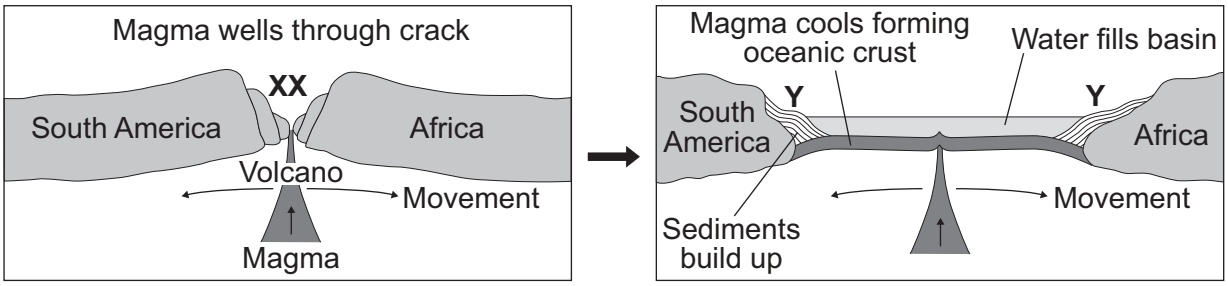
2 the continents have different rocks and fossils.

3 the Earth's crust is made up of tectonic plates.

4 the Earth's crust is cracking as it expands.

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The diagrams below show how the two continents were originally arranged and how they moved apart.



8C What do we now believe causes the continents to move apart?

1 volcanic activity

2 earthquakes

3 ocean currents

4 convection currents

8D One result of the movement of the continents from **XX** to **YY**, as shown in the diagrams is . . .

1 mountain building.

2 sea-floor spreading.

3 crustal shrinking.

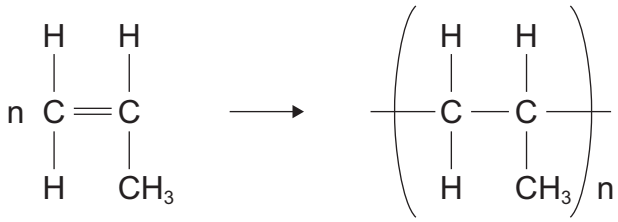
4 subduction.

Turn over for the next question

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QUESTION NINE

The equation shows a chemical reaction.



Small molecules of hydrocarbon **X**

Large molecule of hydrocarbon **Y**

9A Hydrocarbon **X** is . . .

1 an alkane.

2 a polymer.

3 an alkene.

4 a catalyst.

9B Hydrocarbon **Y** is . . .

1 an unsaturated compound.

2 a polymer.

3 an alkene.

4 a monomer.

9C Poly(propene) is a thermosoftening polymer so it **cannot** be used to make . . .

1 buckets.

2 food containers.

3 non-stick coating for frying pans.

4 washing-up bowls.

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9D Putting poly(propene) and other polymer waste into landfill creates a problem because this type of waste . . .

1 is very lightweight and blows about.

2 is not biodegradable.

3 does not dissolve in water.

4 is very dense and sinks deep underground.

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.

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**.

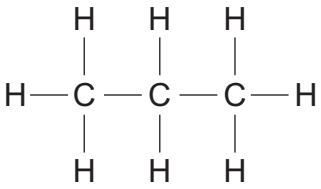
Mark your choices on the answer sheet.

QUESTION ONE

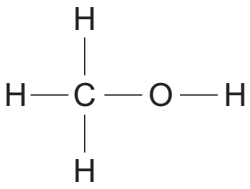
This question is about the formulae of four compounds.

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

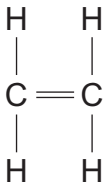
A



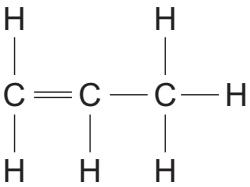
B



C



D

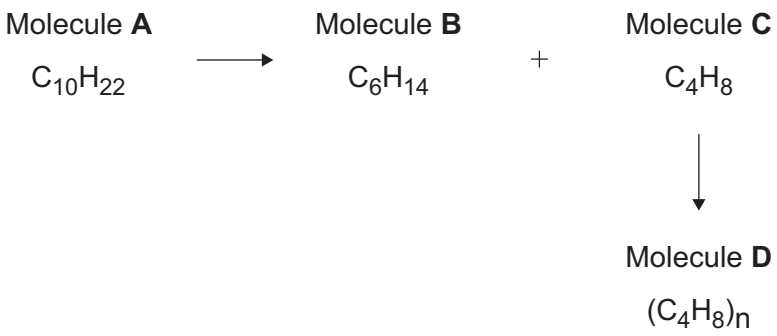


1	It is the alkene used to make ethanol.
2	It is a saturated hydrocarbon useful as a fuel.
3	It is not a hydrocarbon but burns to produce carbon dioxide and water vapour.
4	It belongs to the group with the general formula C_nH_{2n} where n = 3.

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QUESTION TWO

This question is about hydrocarbons.



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

Molecule . . . **1** . . . has been cracked.

Molecule . . . **2** . . . is an alkene.

Molecule . . . **3** . . . is a polymer.

Molecule . . . **4** . . . is the alkane in the reactions with the smallest molecules.

Turn over for the next question

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Section Two

Questions **THREE** to **NINE**.

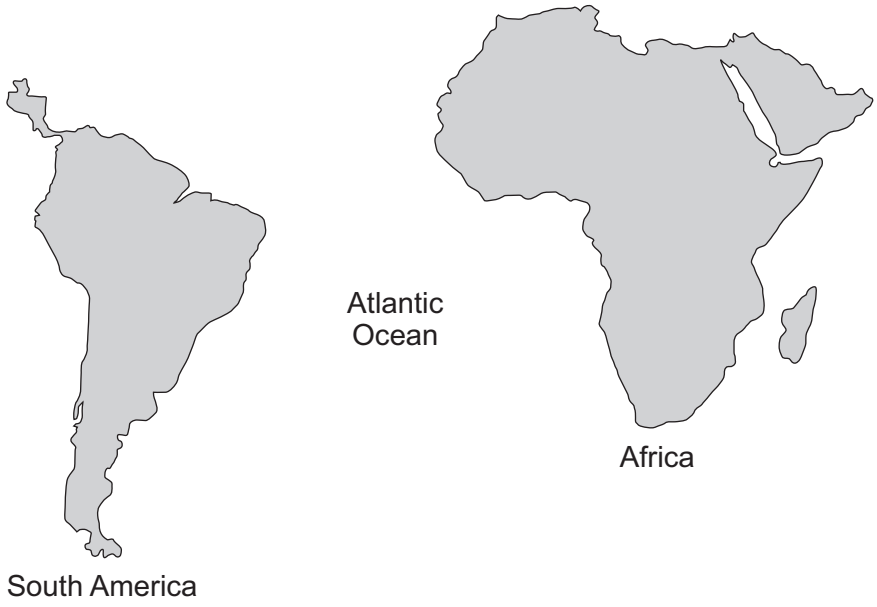
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In each part choose only **one** answer.

Mark your choices on the answer sheet.

QUESTION THREE

The diagram shows the positions of South America and Africa.



Early in the 20th century, a scientist called Alfred Wegener put forward a theory that South America and Africa had once been joined together, but had since moved apart.

3A Many scientists at the time did not accept Wegener's theory because . . .

1 some of the rocks on the two continents were different.

2 they thought that the two continents were moving towards each other.

3 they were unable to explain how the continents could move.

4 they thought that the Earth's crust was expanding.

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3B About 50 years later, more scientists began to accept Wegener's theory.

This was because of evidence that . . .

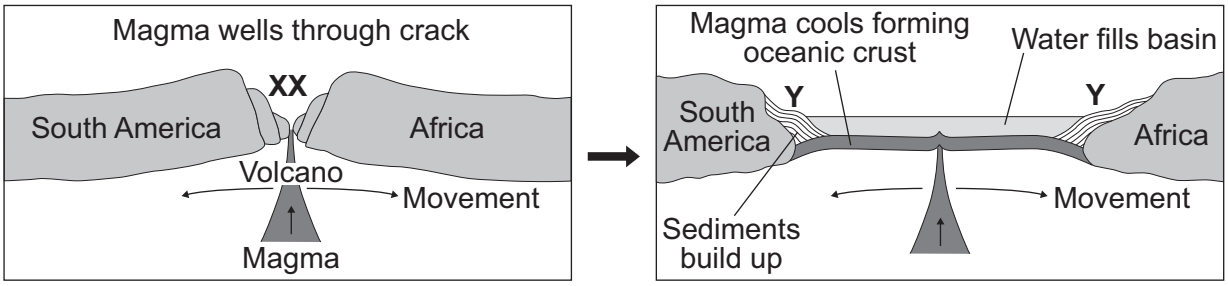
1 the continents have similar shapes.

2 the continents have different rocks and fossils.

3 the Earth's crust is made up of tectonic plates.

4 the Earth's crust is cracking as it expands.

The diagrams below show how the two continents were originally arranged and how they moved apart.



3C What do we now believe causes the continents to move apart?

1 volcanic activity

2 earthquakes

3 ocean currents

4 convection currents

3D One result of the movement of the continents from **XX** to **YY**, as shown in the diagrams is . . .

1 mountain building.

2 sea-floor spreading.

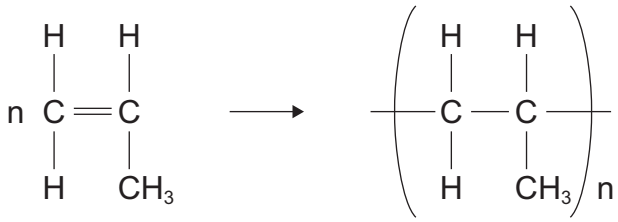
3 crustal shrinking.

4 subduction.

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QUESTION FOUR

The equation shows a chemical reaction.



Small molecules of hydrocarbon **X**

Large molecule of hydrocarbon **Y**

4A Hydrocarbon **X** is . . .

1 an alkane.

2 a polymer.

3 an alkene.

4 a catalyst.

4B Hydrocarbon **Y** is . . .

1 an unsaturated compound.

2 a polymer.

3 an alkene.

4 a monomer.

4C Poly(propene) is a thermosoftening polymer so it **cannot** be used to make . . .

1 buckets.

2 food containers.

3 non-stick coating for frying pans.

4 washing-up bowls.

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4D Putting poly(propene) and other polymer waste into landfill creates a problem because this type of waste . . .

1 is very lightweight and blows about.

2 is not biodegradable.

3 does not dissolve in water.

4 is very dense and sinks deep underground.

Turn over for the next question

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QUESTION FIVE

The table gives information about some of the gases in air.

Name	Formula	Melting point in ºC	Boiling point in ºC
Helium	He	–272.2	–269.0
Oxygen	O_2	–219.0	–183.0
Nitrogen	N_2	–210.0	–195.9
Argon	Ar	–189.0	–185.9
Carbon dioxide	CO_2	–78.5	–78.5
Water vapour	H_2O	0.0	100.0

To separate these gases, they are compressed and cooled.

- Water is first removed.
- Carbon dioxide is then removed by absorption.
- The gases remaining are cooled to –200 ºC.

5A Why are water vapour and carbon dioxide first removed?

1 They are both compounds and the rest are elements.

2 They both contribute to global warming.

3 They would both solidify and block the pipes.

4 The carbon dioxide would dissolve in the water.

5B After the removal of water and carbon dioxide, which row in the table below shows the physical states of the remaining elements at –200 ºC?

	Helium	Oxygen	Nitrogen	Argon
1	gas	liquid	liquid	solid
2	liquid	gas	solid	liquid
3	gas	liquid	solid	solid
4	solid	gas	liquid	gas

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5C After the removal of water and carbon dioxide, which of the gases remaining would stay liquid over the greatest temperature range?

1 helium

2 oxygen

3 nitrogen

4 argon

5D After the gases are cooled to −200 °C and then allowed to warm up, which of the following gives the order in which they would vaporise?

1 oxygen, nitrogen, argon

2 nitrogen, argon, oxygen

3 argon, nitrogen, oxygen

4 oxygen, argon, nitrogen

Turn over for the next question

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QUESTION SIX

Plant oils can be hardened for use in making margarine. A company selected five plant oils to test for their amount of unsaturation.

The company scientists added iodine solution to the oils to obtain iodine numbers. Iodine numbers show how many grams of iodine react with 100 g of the oil.

Plant oils with lower iodine numbers are:

- harder
- less unsaturated.

The company's results are shown in the table.

Plant oil	Melting point in ºC	Iodine number
Palm	+35	54
Peanut	+3	93
Cotton seed	−1	105
Soybean	−16	130
Linseed	−24	178

6A The company concluded that for all plant oils, as the melting point decreases, the amount of unsaturation increases.

This conclusion is **not** valid because . . .

1 some of the oils are solid at room temperature (20 ºC).

2 the company tested only a limited number of plant oils.

3 the results indicate that as the melting point decreases, the amount of unsaturation decreases.

4 some of the oils are from seeds and others are from nuts.

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6B The results may have been affected by the brown colour of some of the oils.

This is because the brown colour could have . . .

1 reacted with the iodine.

2 changed the iodine colour produced.

3 made the loss of colour of the iodine difficult to see.

4 reacted with the double bonds in the oil.

6C The best way for the results to be reliable **and** unbiased would have been for . . .

1 the company scientists to use more modern equipment.

2 the company scientists to repeat the experiments with more sensitive equipment.

3 independent scientists to repeat the experiment with more modern equipment.

4 independent scientists to repeat the company's tests.

6D Which row in the table below correctly describes the conditions that the company would use to make sunflower oil suitable for use in margarine?

	Condition 1	Condition 2	Condition 3
1	Add emulsifiers	Do not let the temperature rise above 60 ºC	Use a nickel catalyst
2	Add hydrogen	Warm the mixture above 37 ºC	Add compounds with E-numbers
3	Add oxygen	Do not let the temperature rise above 37 ºC	Use a nickel catalyst
4	Add hydrogen	Warm the mixture above 60 ºC	Use a nickel catalyst

Turn over for the next question

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QUESTION SEVEN

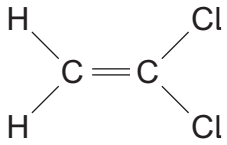
Worldwide, about 20 billion wine bottle stoppers are produced each year.

In recent years, the traditional cork stoppers have been gradually replaced by screw-top stoppers.

Cork is the bark from the cork-oak tree, which is cut off about every ten years. Tens of thousands of people in rural Portugal depend on cork for their livelihoods. Used cork can be recycled.

A screw-top stopper can be made of aluminium, inside which is a polymer sealant. The sealant is usually made of poly(ethene) or poly(vinylidene chloride). Extraction of aluminium from its ores is expensive and a lot of energy is required. It is difficult to separate the polymer from the aluminium cap to allow aluminium to be recycled.

Vinylidene chloride has the structure:



7A One difference between ethene and vinylidene chloride is that . . .

1 only ethene is an unsaturated compound.

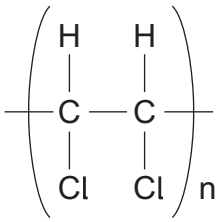
2 only vinylidene chloride will react with iodine.

3 only vinylidene chloride is obtained from crude oil.

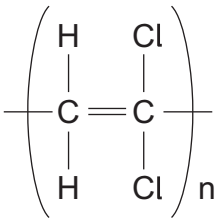
4 only ethene is a hydrocarbon.

7B The formula for poly(vinylidene chloride) is . . .

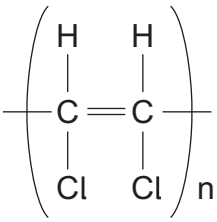
1



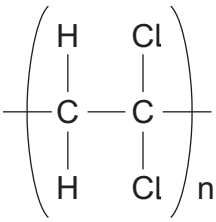
2



3



4



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7C There are two likely consequences of wine companies using metal screw-top stoppers with polymer sealants instead of cork.

Which row in the table correctly shows the two likely consequences?

1	increased use of crude oil	loss of employment in rural Portugal
2	reduction in carbon dioxide emissions	loss of employment in rural Portugal
3	reduction in carbon dioxide emissions	loss of important forest habitat
4	increased use of crude oil	reduced amount of material to landfill

7D Scientists are researching the consequences of using screw-top stoppers with polymer sealants instead of cork.

Which row in the table below gives the correct description of an issue and its impact?

	Issue	**Impact**
1	ethical	effect on the price of wine
2	social	effect on the rural communities
3	environmental	effect on the quality of wine
4	economic	effect on cork forest habitat

Turn over for the next question

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QUESTION EIGHT

Some vehicles which normally use petroleum diesel fuel can also use a mixture of biodiesel and petroleum diesel.

Petroleum diesel is made from crude oil.
Biodiesel is made from a variety of vegetable oils: for example, soybean, palm and rapeseed.
This means that large areas of land are needed to grow crops from which to extract the vegetable oils for the production of biodiesel.

8A Research into the production and use of biodiesel continues.

The main reason for this is that . . .

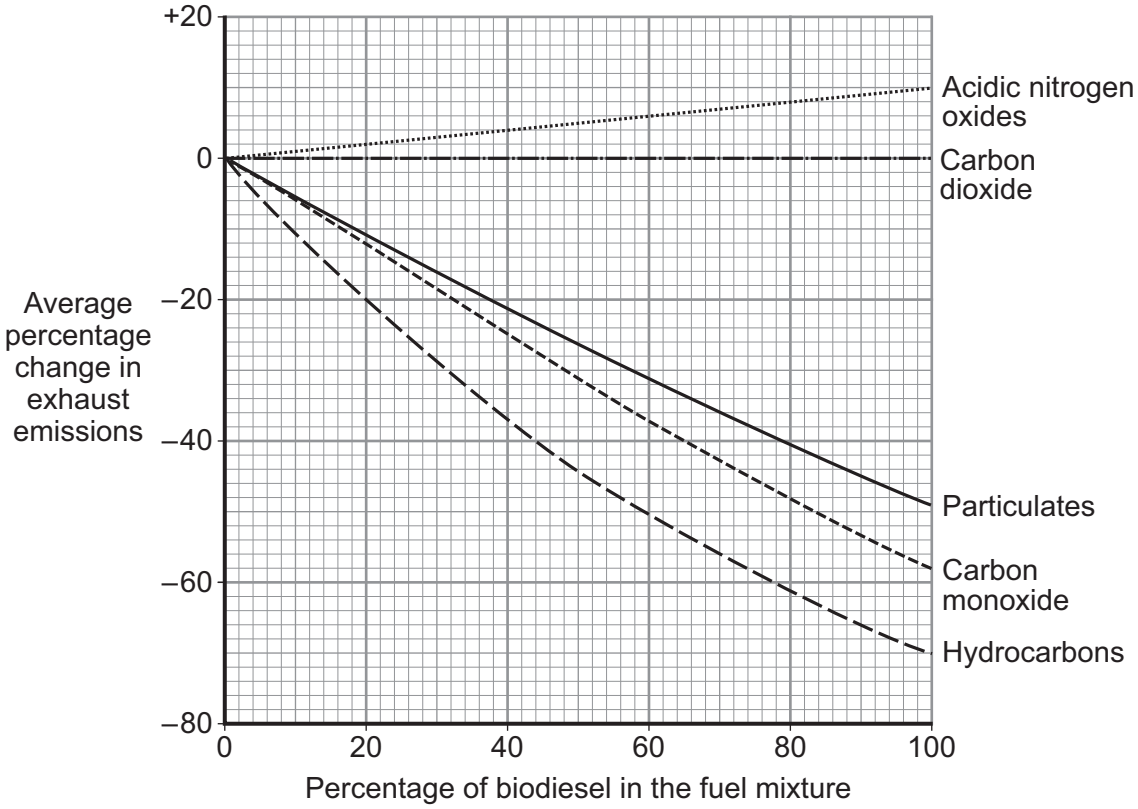
1 unused food crops are being wasted in some developing countries.

2 large, new oilfields have been discovered in Europe.

3 crude oil is a non-renewable energy source.

4 car manufacturers are making cars that run only on biodiesel.

The graph shows the average percentage change in exhaust emissions from vehicles using different mixtures of petroleum diesel and biodiesel.



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8B Some scientists claim that net carbon dioxide emissions are lower for biodiesel than for petroleum diesel.

What is the basis for this argument?

1 Biodiesel produces less carbon dioxide when it burns.

2 Plants take up carbon dioxide as they grow.

3 Biodiesel is not a carbon compound.

4 Plants release carbon dioxide in respiration.

8C The graph indicates that when compared with 100 % petroleum diesel, a fuel mixture of equal volumes of petroleum diesel and biodiesel will . . .

1 reduce nitrogen oxides by about 5 %.

2 increase both particulates and carbon monoxide by about 25 %.

3 reduce hydrocarbons by about 45 %.

4 reduce carbon dioxide by about 5 %.

8D One possible disadvantage of using fuel with a high percentage of biodiesel is that . . .

1 it is non-biodegradable.

2 it could increase the amount of acid rain.

3 it is non-renewable.

4 it could increase global dimming.

Turn over for the next question

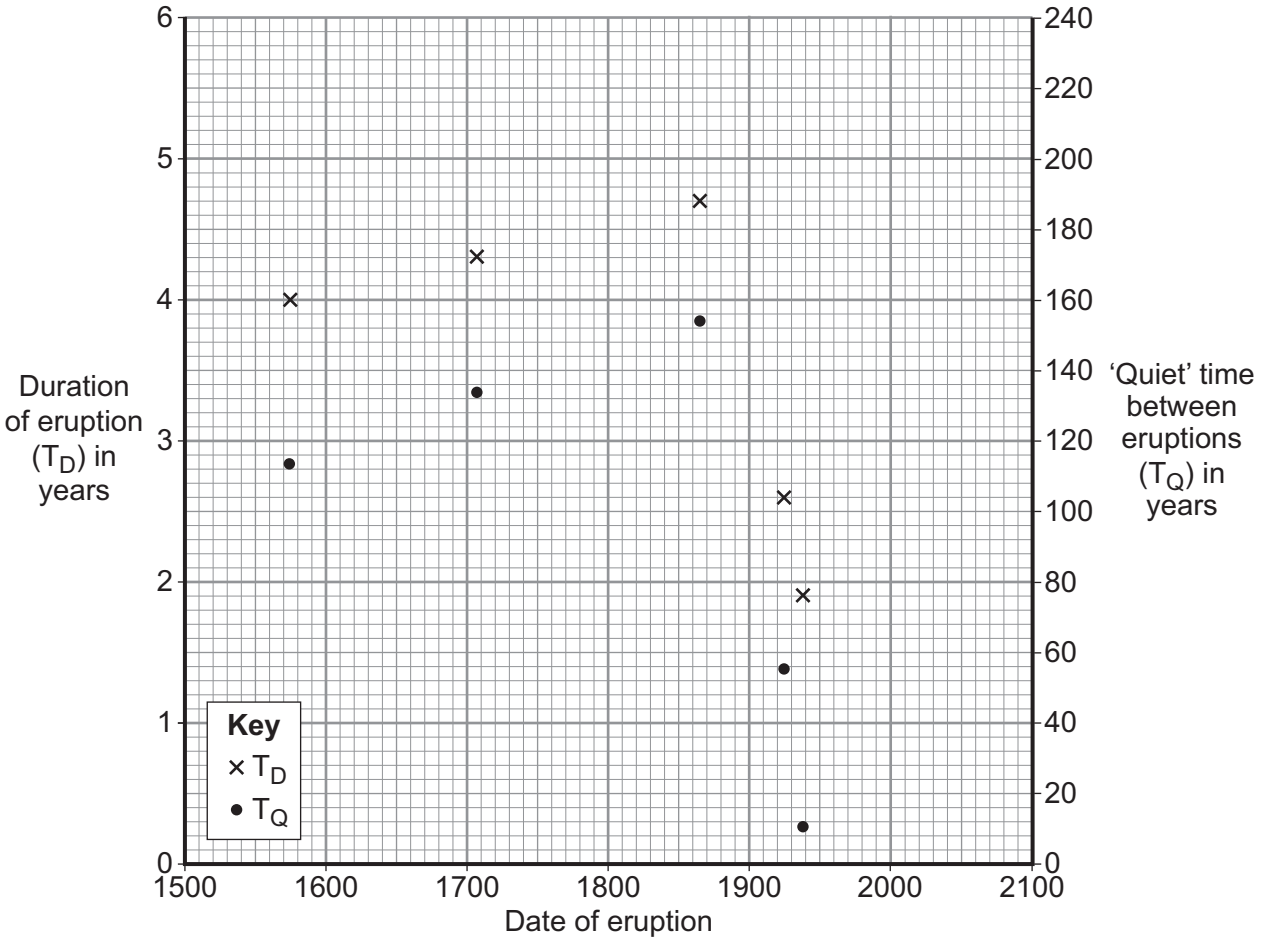
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QUESTION NINE

Use the information given to answer this question.

Santorini is a Greek island. Many volcanic eruptions have occurred there over thousands of years.

The graph refers to the major eruptions which have occurred there during the past 500 years.
T_D is the duration time for each major eruption (the time for which it lasts).
T_Q is the quiet time between the end of each major eruption and the start of the next one.



9A It is probable that the island of Santorini . . .

1 lies at the centre of a large tectonic plate.

2 will be unaffected by earthquakes.

3 is close to a boundary between tectonic plates.

4 will reduce in size as the Earth shrinks.

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9B The graph indicates that . . .

1 another eruption should have occurred around 1950.

2 major eruptions occur at regular intervals of time.

3 the longer the quiet time (T_Q), the longer the eruption is likely to be.

4 the volcano is gradually becoming extinct so it is unlikely to erupt again.

9C The mean quiet time (T_Q) for the volcano is 93.4 years.

With this information available, scientists . . .

1 can predict when the next major eruption will occur and how long it is likely to last.

2 can predict when the next major eruption will occur but not how long it is likely to last.

3 cannot predict when the next major eruption will occur but can say how long it is likely to last.

4 cannot predict when the next major eruption will occur or how long it is likely to last.

9D The last major eruption occurred in 1939.

Suppose that the next eruption occurs in 2060, it would be most likely to last for . . .

1 6 months.

2 1 year.

3 4 years.

4 6 years.

END OF TEST

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There are no questions printed on this page

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Version 1.0: 01/04/2011

GCSE

Science A (4461) / Chemistry (4421)

Specification A

CHY1BP, CH1BSF & CH1BSH

Mark Scheme

2011 Examination – March Series

The blank answer sheet for this component can be found at the end of this document.

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This component is an objective test for which the following list indicates the correct answers used in marking the candidates' responses.

Further copies of this Mark Scheme are available to download from the AQA Website: www.aqa.org.uk

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GCSE

SCIENCE A (4461) / CHEMISTRY (4421)

Objective Test Answer Key

CHY1BP (Oils, Earth and Atmosphere)

March 2011

Foundation Tier

Question	Key		
One	**A**	Oxygen	**4**
	B	Argon	**2**
	C	Carbon dioxide	**1**
	D	Neon	**3**
Two	**A**	Layer **A**	**1**
	B	Layer **B**	**3**
	C	Layer **C**	**4**
	D	Layer **D**	**2**
Three	**A**	Vegetable oil **A**	**1**
	B	Vegetable oil **B**	**3**
	C	Vegetable oil **C**	**2**
	D	Vegetable oil **D**	**4**
Four	**A**	bromine	**2**
	B	hydrogen	**3**
	C	nickel	**4**
	D	water	**1**
Five	**A**	Formula **A**	**2**
	B	Formula **B**	**3**
	C	Formula **C**	**1**
	D	Formula **D**	**4**

	A	**B**	**C**	**D**
Six	**2**	**3**	**4**	**4**
Seven	**4**	**1**	**3**	**4**
Eight	**3**	**3**	**4**	**2**
Nine	**3**	**2**	**3**	**2**

GCSE

SCIENCE A (4461) / CHEMISTRY (4421)

Objective Test Answer Key

CHY1BP (Oils, Earth and Atmosphere)

March 2011

Higher Tier

Question	Key		
One	**A**	Formula **A**	**2**
	B	Formula **B**	**3**
	C	Formula **C**	**1**
	D	Formula **D**	**4**
Two	**A**	Molecule **A**	**1**
	B	Molecule **B**	**4**
	C	Molecule **C**	**2**
	D	Molecule **D**	**3**

	A	**B**	**C**	**D**
Three	**3**	**3**	**4**	**2**
Four	**3**	**2**	**3**	**2**
Five	**3**	**1**	**2**	**2**
Six	**2**	**3**	**4**	**4**
Seven	**4**	**4**	**1**	**2**
Eight	**3**	**2**	**3**	**2**
Nine	**3**	**3**	**4**	**3**

OTQ3

GCSE SCIENCE

AQA

Unit : CHY1BP **CHEMISTRY UNIT 1B**

Centre :

Candidate Number : **UCI :**

Candidate Name :

Series : 3G11

02-MAR-11

For completion by the Examination Invigilator. **Please fill this circle if the candidate is absent:** ○

HIGHER TIER

Instructions on how to complete this answer sheet are given on the question paper. Please make sure you follow them carefully.

Questions **ONE** to **NINE** Choose one response **1 - 4** for each of the parts **A - D**

QUESTION ONE		1	2	3	4
1A	Formula A	○	○	○	○
1B	Formula B	○	○	○	○
1C	Formula C	○	○	○	○
1D	Formula D	○	○	○	○

QUESTION TWO		1	2	3	4
2A	Molecule A	○	○	○	○
2B	Molecule B	○	○	○	○
2C	Molecule C	○	○	○	○
2D	Molecule D	○	○	○	○

QUESTION THREE	1	2	3	4
3A	○	○	○	○
3B	○	○	○	○
3C	○	○	○	○
3D	○	○	○	○

QUESTION FOUR	1	2	3	4
4A	○	○	○	○
4B	○	○	○	○
4C	○	○	○	○
4D	○	○	○	○

QUESTION FIVE	1	2	3	4
5A	○	○	○	○
5B	○	○	○	○
5C	○	○	○	○
5D	○	○	○	○

QUESTION SIX	1	2	3	4
6A	○	○	○	○
6B	○	○	○	○
6C	○	○	○	○
6D	○	○	○	○

QUESTION SEVEN	1	2	3	4
7A	○	○	○	○
7B	○	○	○	○
7C	○	○	○	○
7D	○	○	○	○

QUESTION EIGHT	1	2	3	4
8A	○	○	○	○
8B	○	○	○	○
8C	○	○	○	○
8D	○	○	○	○

QUESTION NINE	1	2	3	4
9A	○	○	○	○
9B	○	○	○	○
9C	○	○	○	○
9D	○	○	○	○

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FOUNDATION TIER

Instructions on how to complete this answer sheet are given on the question paper. Please make sure you follow them carefully.

Questions **ONE** to **NINE** Choose one response **1 - 4** for each of the parts **A - D**

QUESTION ONE	1	2	3	4
1A Oxygen	○	○	○	○
1B Argon	○	○	○	○
1C Carbon dioxide	○	○	○	○
1D Neon	○	○	○	○

QUESTION TWO	1	2	3	4
2A Layer A	○	○	○	○
2B Layer B	○	○	○	○
2C Layer C	○	○	○	○
2D Layer D	○	○	○	○

QUESTION THREE	1	2	3	4
3A Vegetable oil A	○	○	○	○
3B Vegetable oil B	○	○	○	○
3C Vegetable oil C	○	○	○	○
3D Vegetable oil D	○	○	○	○

QUESTION FOUR	1	2	3	4
4A bromine	○	○	○	○
4B hydrogen	○	○	○	○
4C nickel	○	○	○	○
4D water	○	○	○	○

QUESTION FIVE	1	2	3	4
5A Formula A	○	○	○	○
5B Formula B	○	○	○	○
5C Formula C	○	○	○	○
5D Formula D	○	○	○	○

QUESTION SIX	1	2	3	4
6A	○	○	○	○
6B	○	○	○	○
6C	○	○	○	○
6D	○	○	○	○

QUESTION SEVEN	1	2	3	4
7A	○	○	○	○
7B	○	○	○	○
7C	○	○	○	○
7D	○	○	○	○

QUESTION EIGHT	1	2	3	4
8A	○	○	○	○
8B	○	○	○	○
8C	○	○	○	○
8D	○	○	○	○

QUESTION NINE	1	2	3	4
9A	○	○	○	○
9B	○	○	○	○
9C	○	○	○	○
9D	○	○	○	○

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Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

General Certificate of Secondary Education
Foundation Tier and Higher Tier
November 2010

Science A

Unit Chemistry C1b (Oils, Earth and Atmosphere)

Chemistry

Unit Chemistry C1b (Oils, Earth and Atmosphere)

CHY1BP

F&H

Thursday 11 November 2010 Afternoon Session

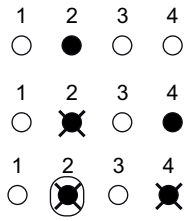
For this paper you must have:
- a black ball-point pen
- an objective test answer sheet.

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.

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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 **FIVE**.

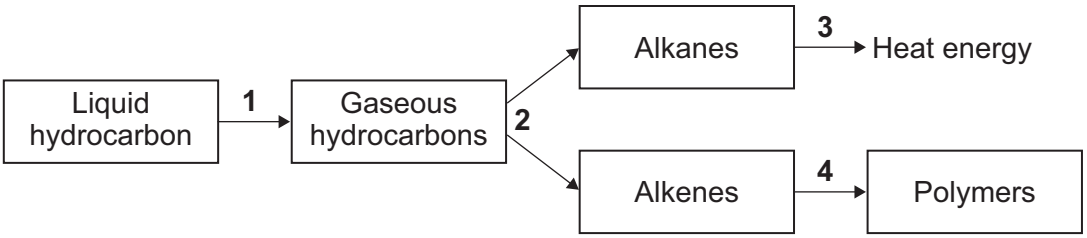
In these questions, match the letters, **A**, **B**, **C** and **D**, with the numbers **1–4**.

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

Mark your choices on the answer sheet.

QUESTION ONE

The flow chart is about hydrocarbons.



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

A Crack

B Evaporate

C Polymerise

D Burn

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QUESTION TWO

This question is about some of the noble gases found in the Earth's atmosphere.

	Gas	Percentage (%) in the atmosphere	Melting point in ºC	Boiling point in ºC	Density in g per cm^3
A	Argon	0.9	–189	–186	0.0037
B	Helium	0.0005	–272	–269	0.0002
C	Neon	0.002	–248	–246	0.0009
D	Xenon	0.000009	–112	–109	0.0059

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

The noble gas with the highest density is . . . **1** . . . .

The most abundant noble gas is . . . **2** . . . .

The noble gas with the smallest temperature range between melting point and boiling point is . . . **3** . . . .

The noble gas with the lowest boiling point is . . . **4** . . . .

Turn over for the next question

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QUESTION THREE

We can get plant oils from crushed plants.

This is a two-stage process.

Stage 1

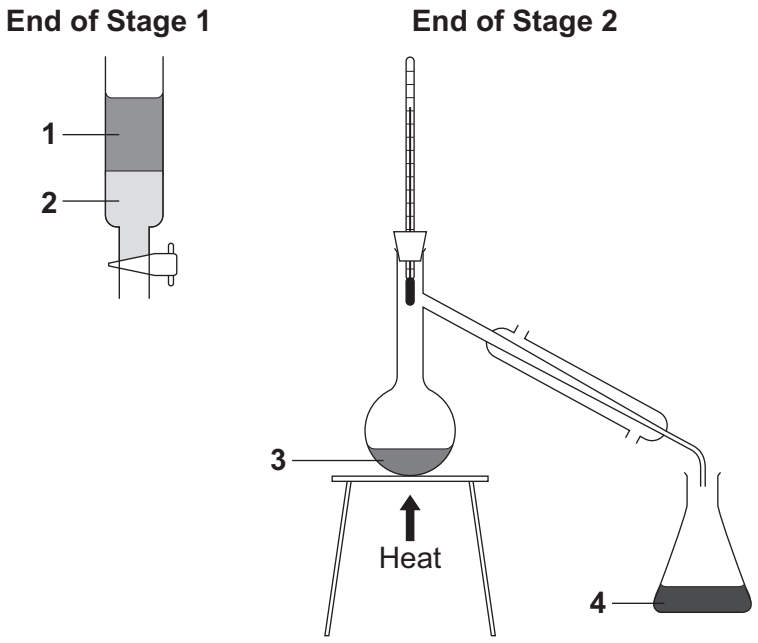
Shake up the crushed mixture with a solvent and water. This separates the oil from the crushed mixture.

- Only the oil dissolves in the solvent.
- The liquids are filtered from the solids.
- The oil and solvent mixture floats on water.

Stage 2

Use simple distillation to separate the oil from the solvent.

- The solvent has a lower boiling point than the oil.



Match words, **A**, **B**, **C** and **D**, with the labels **1–4** on the diagrams.

A the oil and solvent mixture

B the plant oil

C the water

D the solvent

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QUESTION FOUR

This question is about four planets, **A**, **B**, **C** and **D**, in the Solar System.

	Planet	Atmosphere	Average surface temperature in °C
A	Venus	97 % carbon dioxide, 3 % nitrogen	460
B	Earth	78 % nitrogen, 21 % oxygen, 1 % noble gases	14
C	Mars	96 % carbon dioxide, 2 % nitrogen, 2 % noble gases	–46
D	Jupiter	87 % hydrogen, 13 % helium	–121

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

1	Its atmosphere has the highest percentage of carbon dioxide.
2	It has green plants growing on its surface.
3	It has the lowest surface temperature.
4	Its atmosphere contains nitrogen, but at the lowest percentage.

QUESTION FIVE

This question is about vegetable oils.

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

A chromatography

B combustion

C hydrogenation

D unsaturation

Vegetable oils are important foods and fuels.

Artificial colours in foods are usually detected by . . . **1** . . . .

Reacting oils with bromine will show the degree of . . . **2** . . . in the oil.

The melting points of vegetable oils can be increased by . . . **3** . . . .

Oils release heat energy by the process of . . . **4** . . . .

Turn over ▶

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Section Two

Questions **SIX** to **NINE**.

Each of these questions has four parts.

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

Mark your choices on the answer sheet.

QUESTION SIX

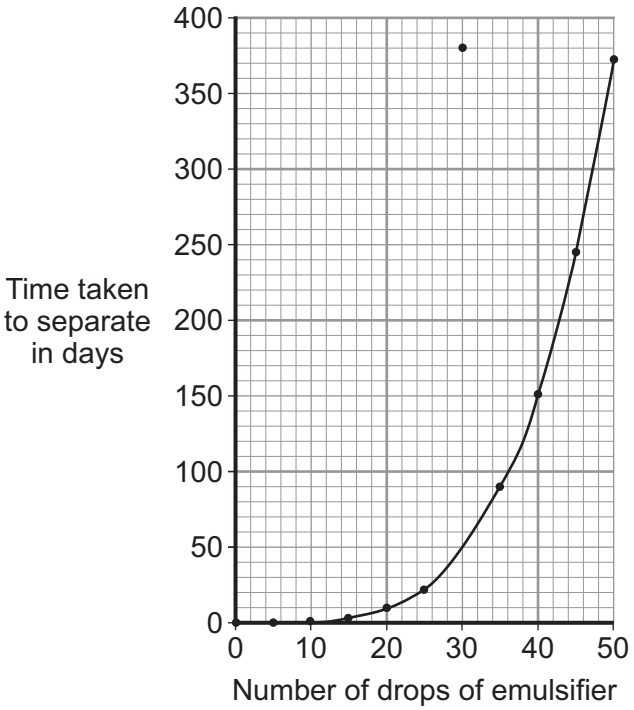
The water and oil used in making a salad dressing will separate if the salad dressing is left to stand.

A scientist at a food company wanted to know how much emulsifier she needed to add to prevent oil and water from separating.

- She mixed equal volumes of oil and water.
- Then she added drops of emulsifier.
- She shook the mixture and timed how long it took for the mixture to begin separating.

She recorded her results in a table and plotted a line graph.

Number of drops of emulsifier	0	5	10	15	20	25	30	35	40	45	50
Time taken to separate in days	0	0	1	3	10	23	380	90	152	244	372



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6A The scientist decided to ignore her result for 30 drops of emulsifier.

This was because . . .

1 380 is not on the 'Time taken to separate in days' axis on the graph.

2 the result does not fit the pattern.

3 the result was lower than expected.

4 380 days was the highest value recorded.

6B Using her graph, she decided that an accurate time of separation for 30 drops of emulsifier was . . .

1 27 days.

2 30 days.

3 50 days.

4 380 days.

6C To make all her results more reliable, she should . . .

1 repeat only the 30 drops of emulsifier experiment.

2 not use her first results and repeat the whole investigation.

3 repeat the whole investigation and compare both sets of results.

4 measure the drops of emulsifier more accurately.

6D The salad dressing has a shelf-life of 120 days.

The graph shows that the minimum amount of emulsifier needed to prevent the salad dressing from separating before 120 days is . . .

1 18 drops.

2 28 drops.

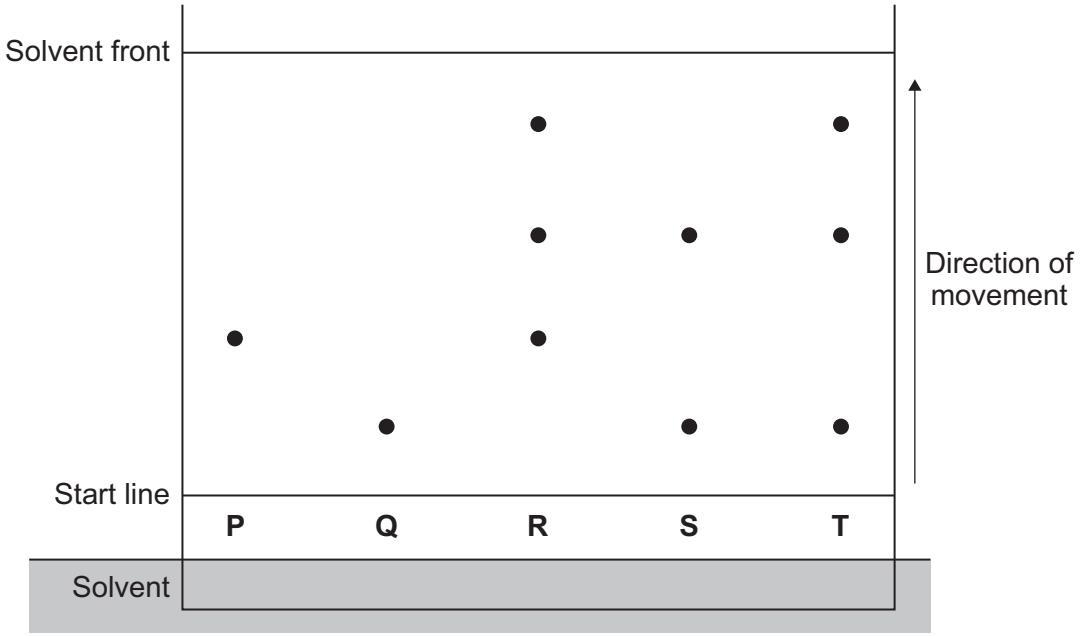
3 38 drops.

4 48 drops.

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QUESTION SEVEN

Chromatography is used to identify and compare five food colourings, **P**, **Q**, **R**, **S** and **T**.
The five food colourings are used to coat chocolate sweets.



7A Which food colourings are mixtures of three colours?

1 **P** and **R**

2 **Q** and **S**

3 **R** and **T**

4 **S** and **P**

7B Food colouring **P** was analysed and was found to be toxic.

Which other food colouring is toxic?

1 **Q**

2 **R**

3 **S**

4 **T**

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7C Food colourings are used to coat chocolate sweets . . .

1 to make the sweets cost more.

2 to increase the shelf-life.

3 to make the sweets more attractive.

4 to increase the number of additives.

7D An E-number is used to identify a permitted food . . .

1 additive.

2 element.

3 mixture.

4 oil.

Turn over for the next question

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QUESTION EIGHT

There are radioactive substances inside the Earth.

Radioactive substances decay (break down). The decay of radioactive substances releases heat.

8A This information disproves a theory that scientists used to believe.

What was this theory?

1 Mountains formed when the Earth's crust was shrinking.

2 The Earth is not a sphere but is a cube.

3 The Earth's crust is made of tectonic plates.

4 The Earth has several layers.

8B The release of heat . . .

1 reduces the rate of weathering and erosion of old mountain ranges.

2 causes the Earth's crust to get thinner.

3 causes convection currents in the Earth's mantle.

4 causes the Earth to decrease in size.

Earthquakes often happen at various points close to the line shown on the map.



8C Earthquakes probably happen in this region because . . .

1 the Earth's crust is very thick.

2 there are large oilfields.

3 the Earth's crust is shrinking.

4 there is a boundary between two tectonic plates.

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8D Scientists expect more earthquakes in this region.

Scientists are unable to predict exactly when the next earthquake will happen because . . .

1 earthquakes happen every two or three years.

2 earthquakes happen at random intervals.

3 earthquakes often happen in areas a long way from cities.

4 earthquakes usually happen under the sea.

Turn over for the next question

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QUESTION NINE

The equation shows the thermal decomposition of a hydrocarbon.

$$C_6H_{14} \longrightarrow \underset{\text{Ethene}}{C_2H_4} + \text{Substance } \mathbf{K}$$

9A What is the formula for substance **K**?

1 CH_4

2 C_2H_6

3 C_4H_{10}

4 C_8H_{18}

9B Ethene, C_2H_4 is . . .

1 an alkane.

2 an alkene.

3 a saturated hydrocarbon.

4 a polymer.

9C Ethene, C_2H_4 can form polymers because . . .

1 it contains both carbon atoms and hydrogen atoms.

2 it contains twice as many carbon atoms as hydrogen atoms.

3 the carbon atoms and hydrogen atoms are linked by single bonds.

4 there is a double bond between the carbon atoms.

9D Poly(ethene) is used to make shopping bags.

A problem with poly(ethene) is that . . .

1 it is not waterproof.

2 it cannot be coloured.

3 it is not broken down by microorganisms.

4 it is a thermosetting polymer.

END OF TEST

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There are no questions printed on this page

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 vegetable oils.

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

A chromatography

B combustion

C hydrogenation

D unsaturation

Vegetable oils are important foods and fuels.

Artificial colours in foods are usually detected by . . . **1** . . . .

Reacting oils with bromine will show the degree of . . . **2** . . . in the oil.

The melting points of vegetable oils can be increased by . . . **3** . . . .

Oils release energy by the process of . . . **4** . . . .

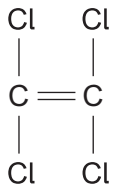
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QUESTION TWO

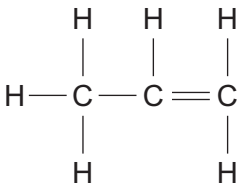
Plastic waste was taken to a recycling centre. At the recycling centre, the plastic was sorted and treated chemically. The chemical treatment broke down the plastic.

Breaking down the plastic produced new substances. The formulae for some of the substances produced are shown below.

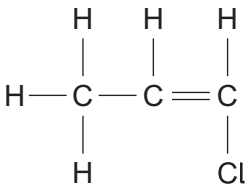
A



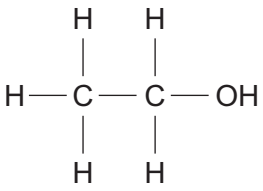
B



C



D



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

1	It is a hydrocarbon.
2	It could be made from propene, C_3H_6
3	It is formed by reacting ethene with steam, H_2O
4	It would not produce water vapour if burnt in air.

Turn over for the next question

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Section Two

Questions **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

There are radioactive substances inside the Earth.

Radioactive substances decay (break down). The decay of radioactive substances releases heat.

3A This information disproves a theory that scientists used to believe.

What was this theory?

1 Mountains formed when the Earth's crust was shrinking.

2 The Earth is not a sphere but is a cube.

3 The Earth's crust is made of tectonic plates.

4 The Earth has several layers.

3B The release of heat . . .

1 reduces the rate of weathering and erosion of old mountain ranges.

2 causes the Earth's crust to get thinner.

3 causes convection currents in the Earth's mantle.

4 causes the Earth to decrease in size.

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Earthquakes often happen at various points close to the line shown on the map.



3C Earthquakes probably happen in this region because . . .

1 the Earth's crust is very thick.

2 there are large oilfields.

3 the Earth's crust is shrinking.

4 there is a boundary between two tectonic plates.

3D Scientists expect more earthquakes in this region.

Scientists are unable to predict exactly when the next earthquake will happen because . . .

1 earthquakes happen every two or three years.

2 earthquakes happen at random intervals.

3 earthquakes often happen in areas a long way from cities.

4 earthquakes usually happen under the sea.

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QUESTION FOUR

The equation shows the thermal decomposition of a hydrocarbon.

$$C_6H_{14} \longrightarrow \underset{\text{Ethene}}{C_2H_4} + \text{Substance } \mathbf{K}$$

4A What is the formula for substance **K**?

1 CH_4

2 C_2H_6

3 C_4H_{10}

4 C_8H_{18}

4B Ethene, C_2H_4 is . . .

1 an alkane.

2 an alkene.

3 a saturated hydrocarbon.

4 a polymer.

4C Ethene, C_2H_4 can form polymers because . . .

1 it contains both carbon atoms and hydrogen atoms.

2 it contains twice as many carbon atoms as hydrogen atoms.

3 the carbon atoms and hydrogen atoms are linked by single bonds.

4 there is a double bond between the carbon atoms.

4D Poly(ethene) is used to make shopping bags.

A problem with poly(ethene) is that . . .

1 it is not waterproof.

2 it cannot be coloured.

3 it is not broken down by microorganisms.

4 it is a thermosetting polymer.

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QUESTION FIVE

This question is about recycling plastic.

5A Many people think that plastic products should be recycled because . . .

1 plastics are made from non-renewable resources.

2 recycling will encourage more people to use paper bags.

3 all plastics can be easily melted.

4 all plastics give off toxic chemicals if buried in the ground.

5B To decide if recycling plastic is the best way to dispose of plastic waste, we should . . .

1 ask people shopping at a local supermarket that sells products wrapped in plastic packaging.

2 ask a company that recycles plastics.

3 compare the environmental and cost implications of recycling with the use of new plastic.

4 read articles in an environmental magazine.

5C Many plastic products, such as computer keyboards, are sent to China for recycling. Workers separate valuable components from the plastics. The plastics are used to make toys.

The plastic products are sent to China because . . .

1 British workers do not have the correct equipment to remove the valuable components.

2 wages are generally lower in China than in Britain.

3 there are social issues concerning the recycling of plastic in Britain.

4 Britain has enough plastic reserves.

5D Some environmentalists are concerned about British waste plastic being recycled in China to make toys because . . .

1 we make better quality toys in Britain.

2 the recycling will take much longer.

3 China makes large quantities of plastic toys.

4 transporting plastic waste to China will increase carbon dioxide emissions.

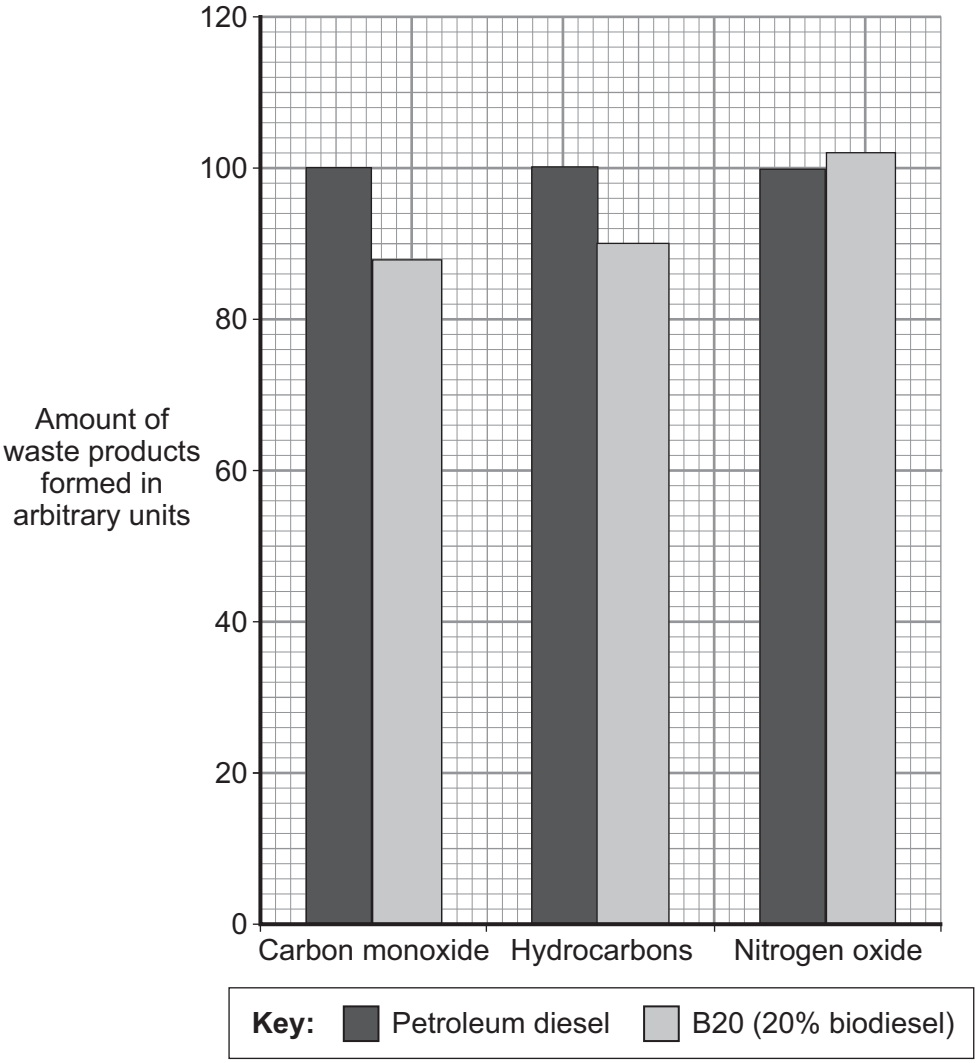
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QUESTION SIX

Petroleum diesel fuel is made from crude oil. Biodiesel fuel is made from vegetable oils.

Some diesel cars can use petroleum diesel mixed with different amounts of biodiesel.
For example, B20 is 20 % biodiesel and 80 % petroleum diesel.

The bar chart shows the waste products from burning petroleum diesel and B20. The amounts of the three waste products are shown for each fuel.



6A Which of the following is a correct statement about these waste products?

1 They are all oxides.

2 They all contain carbon.

3 They are all elements.

4 They are all compounds.

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6B When B20 burns in a diesel engine, the other waste products are likely to be . . .

1 carbon dioxide, oxygen and water vapour.

2 nitrogen, water vapour and sulfur dioxide.

3 carbon dioxide, water vapour and sulfur dioxide.

4 oxygen, water vapour and sulfur dioxide.

6C Which row in the table shows a correct advantage and a correct disadvantage of using B20 instead of petroleum diesel?

	Advantage of using B20	**Disadvantage of using B20**
1	It is partly renewable.	It produces a greater amount of all harmful waste products.
2	It is unsaturated.	It is non-biodegradable.
3	It is partly renewable.	It produces an increased amount of nitrogen oxide.
4	It is hydrogenated.	It produces more carbon monoxide.

6D B100 is 100 % biodiesel. Net carbon dioxide emissions are lower for B100 than for petroleum diesel.

This is because . . .

1 the carbon dioxide is used by plants for photosynthesis.

2 vegetable oils produce very little carbon dioxide when they burn.

3 biodiesel does not contain any hydrocarbons.

4 carbon dioxide dissolves in the oceans.

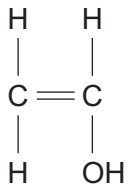
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QUESTION SEVEN

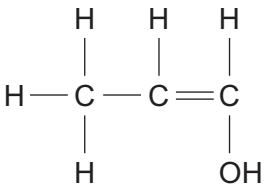
This question is about compounds that contain a double carbon carbon bond.

7A The structures of ethenol and propenol are shown below.

Ethenol



Propenol



Ethenol and propenol belong to a family of compounds with the general formula . . .

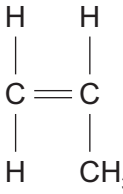
1 C_nH_nOH

2 $C_nH_{2n}OH$

3 $C_nH_{2n-1}OH$

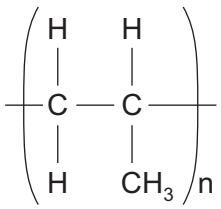
4 $C_nH_{2n+1}OH$

The formula for propene can be shown as:

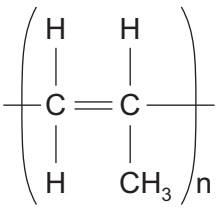


7B The polymer, poly(propene), will have the formula:

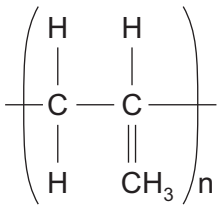
1



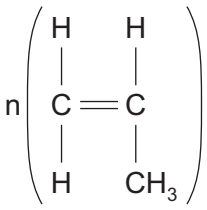
2



3



4



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7C Which statement about propene and poly(propene) is correct?

1 Both compounds are unsaturated.

2 Only poly(propene) reacts with bromine.

3 Only poly(propene) could be produced by cracking oil fractions.

4 Only propene reacts with hydrogen.

7D Poly(propene) is a thermosoftening polymer.

This means that . . .

1 it can be moulded into many shapes.

2 it softens when heated and hardens when it cools.

3 it hardens when it is heated to give a rigid structure.

4 it is resistant to heat.

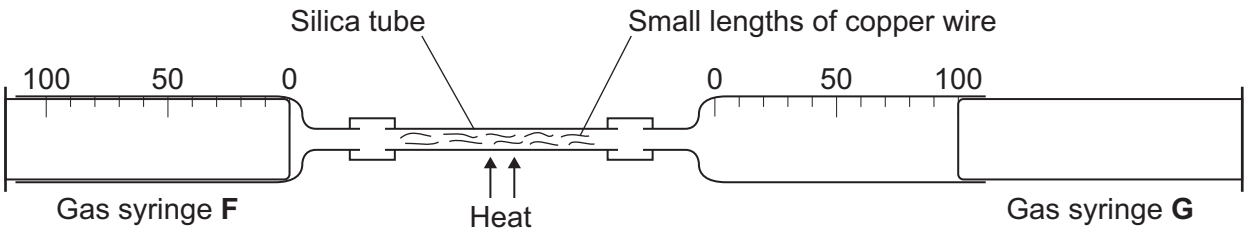
Turn over for the next question

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QUESTION EIGHT

Some students used this equipment to find the answer to the question:

What percentage (%) of the air is oxygen?



The students heated the copper wire inside the silica tube. The syringes were used to push air backwards and forwards between the two syringes, until the volume of gases in the syringes stopped changing.

The equation for the reaction is:

$$\underset{\text{(Pink)}}{2Cu} + O_2 \longrightarrow \underset{\text{(Black)}}{2CuO}$$

They pushed all the gas that remained into gas syringe **G**. When the gas had cooled to room temperature, they measured its final volume.

8A The equipment was cooled to room temperature before the final volume was measured . . .

1 to make sure that there were no other variables affecting the measurements.

2 to make sure that all of the oxygen in the sample was used up.

3 to make the measurements more precise.

4 to stop any further reaction.

8B The most accurate answer to the question 'What percentage (%) of the air is oxygen?' would be obtained . . .

1 by weighing the amount of solid product that remained at the end of the experiment.

2 by repeating the experiment using different diameters of copper wire.

3 when all the copper in the silica tube had turned black by the end of the experiment.

4 when there was still some pink copper left in the silica tube at the end of the experiment.

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8C In the students' first experiment, the final volume they recorded was 82 cm^3. When the students repeated the experiment with a new 100 cm^3 sample of air, the final volume was 72 cm^3.

The difference in final volume was because . . .

1 there was a leak from the apparatus.

2 the students did not put enough new copper in the tube in the repeat experiment.

3 there was more oxygen in the second sample.

4 the students did not heat the copper for long enough in the repeat experiment.

8D If the experiment could be carried out with an air sample similar to that of the Earth's early atmosphere, we would expect . . .

1 a larger decrease in the volume of the air sample.

2 an increase in the volume of the air sample.

3 no change in the volume of the air sample.

4 more copper wire would be needed to use all the oxygen in the air sample.

Turn over for the next question

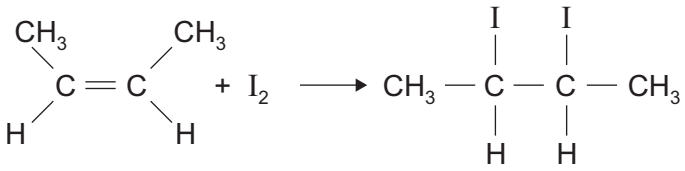
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QUESTION NINE

Unsaturated oils have double carbon carbon bonds. Most vegetable oils are unsaturated.

9A Iodine reacts with the double carbon carbon bonds in unsaturated compounds.

For example:



The more iodine that reacts, the higher the iodine number of the unsaturated compound.

Which of the following statements is true?

1 The higher the iodine number, the fewer double bonds in each oil molecule.

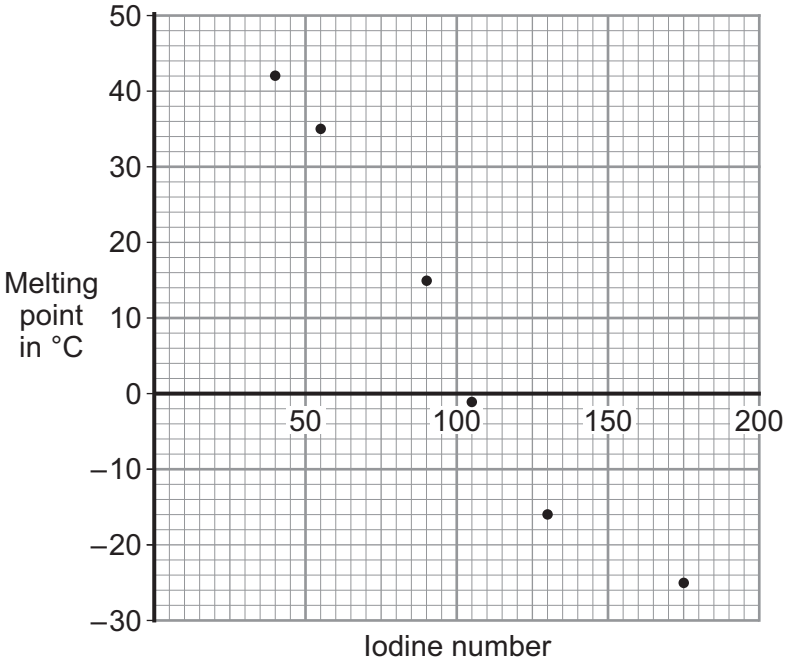
2 The higher the iodine number, the more double bonds in each oil molecule.

3 The higher the iodine number, the shorter the oil molecules.

4 The higher the iodine number, the longer the oil molecules.

9B Student **X** collects some data about the melting points and iodine numbers of several vegetable oils.

The graph shows the data of student **X**.



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What conclusion can student **X** make from this data?

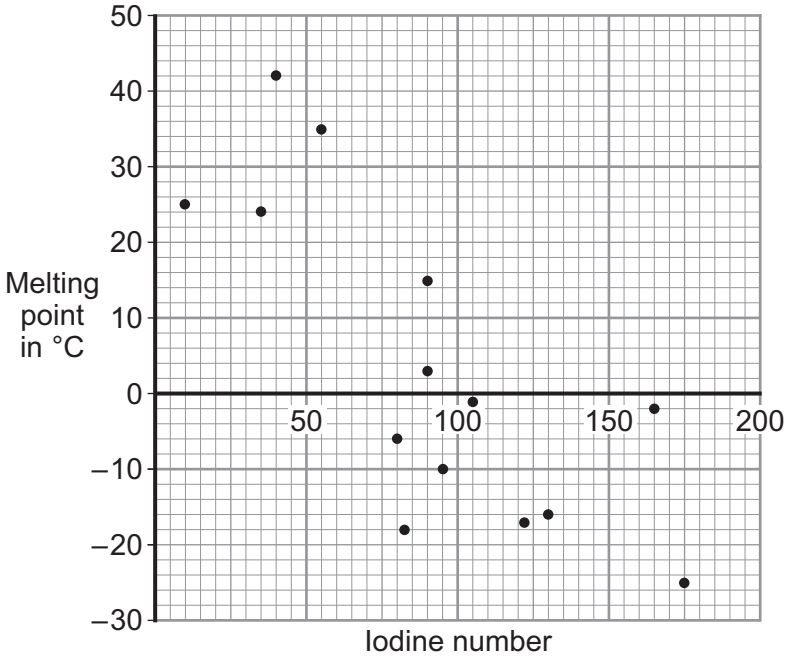
1 There is no relationship between iodine number and melting point.

2 There is a trend for oils with high iodine numbers to have high melting points.

3 There is a trend for oils with high iodine numbers to have low melting points.

4 Vegetable oils do not have iodine numbers greater than 200.

9C Student **Y** does the same task. He collects data from a greater number of vegetable oils and draws the graph below.



What conclusion can you make by comparing the graphs of the two students?

1 Some of the data collected by student **X** is anomalous.

2 Student **X** has collected enough data to make a valid conclusion.

3 Student **X** has experimented with only selected vegetable oils.

4 Student **Y** can predict the melting point of a vegetable oil from its iodine number.

9D Oils with a high iodine number are often called *drying oils*. This is because they tend to harden in contact with air. The hardening is caused when unsaturated molecules join together.

What sort of reaction is this?

1 evaporation

2 hydrogenation

3 polymerisation

4 cracking

END OF TEST

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ASSESSMENT and QUALIFICATIONS ALLIANCE

GCSE

Science A (4461) / Chemistry (4421)

Specification A

CHY1BP, CH1BSF & CH1BSH

Mark Scheme

2010 Examination – November Series

The blank answer sheet for this component can be found at the end of this document.

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This component is an objective test for which the following list indicates the correct answers used in marking the candidates' responses.

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GCSE

SCIENCE A (4461) / CHEMISTRY (4421)

Objective Test Answer Key

CHY1BP (Oils, Earth and Atmosphere)

November 2010

Foundation Tier

Question	Key		
One	**A**	Crack	**2**
	B	Evaporate	**1**
	C	Polymerise	**4**
	D	Burn	**3**
Two	**A**	Argon	**2**
	B	Helium	**4**
	C	Neon	**3**
	D	Xenon	**1**
Three	**A**	the oil and solvent mixture	**1**
	B	the plant oil	**3**
	C	the water	**2**
	D	the solvent	**4**
Four	**A**	Venus	**1**
	B	Earth	**2**
	C	Mars	**4**
	D	Jupiter	**3**
Five	**A**	chromatography	**1**
	B	combustion	**4**
	C	hydrogenation	**3**
	D	unsaturation	**2**

	A	B	C	D
Six	**2**	**3**	**3**	**3**
Seven	**3**	**2**	**3**	**1**
Eight	**1**	**3**	**4**	**2**
Nine	**3**	**2**	**4**	**3**

GCSE

SCIENCE A (4461) / CHEMISTRY (4421)

Objective Test Answer Key

CHY1BP (Oils, Earth and Atmosphere)

November 2010

Higher Tier

Question	Key		
One	**A**	chromatography	**1**
	B	combustion	**4**
	C	hydrogenation	**3**
	D	unsaturation	**2**
Two	**A**	Formula **A**	**4**
	B	Formula **B**	**1**
	C	Formula **C**	**2**
	D	Formula **D**	**3**

	A	**B**	**C**	**D**
Three	**1**	**3**	**4**	**2**
Four	**3**	**2**	**4**	**3**
Five	**1**	**3**	**2**	**4**
Six	**4**	**3**	**3**	**1**
Seven	**3**	**1**	**4**	**2**
Eight	**1**	**4**	**1**	**3**
Nine	**2**	**3**	**3**	**3**

AQA

Unit : CHY1BP CHEMISTRY UNIT 1B

Centre :

Candidate Number : **UCI :**

Series : BG10

Candidate Name :

For completion by the Examination Invigilator. **Please fill this circle if the candidate is absent:** ○

HIGHER TIER

Instructions on how to complete this answer sheet are given on the question paper. Please make sure you follow them carefully.

Questions **ONE** to **NINE** Choose one response **1 - 4** for each of the parts **A - D**

QUESTION ONE

		1	2	3	4
1A	chromatography	○	○	○	○
1B	combustion	○	○	○	○
1C	hydrogenation	○	○	○	○
1D	unsaturation	○	○	○	○

QUESTION TWO

		1	2	3	4
2A	Formula A	○	○	○	○
2B	Formula B	○	○	○	○
2C	Formula C	○	○	○	○
2D	Formula D	○	○	○	○

QUESTION THREE

	1	2	3	4
3A	○	○	○	○
3B	○	○	○	○
3C	○	○	○	○
3D	○	○	○	○

QUESTION FOUR

	1	2	3	4
4A	○	○	○	○
4B	○	○	○	○
4C	○	○	○	○
4D	○	○	○	○

QUESTION FIVE

	1	2	3	4
5A	○	○	○	○
5B	○	○	○	○
5C	○	○	○	○
5D	○	○	○	○

QUESTION SIX

	1	2	3	4
6A	○	○	○	○
6B	○	○	○	○
6C	○	○	○	○
6D	○	○	○	○

QUESTION SEVEN

	1	2	3	4
7A	○	○	○	○
7B	○	○	○	○
7C	○	○	○	○
7D	○	○	○	○

QUESTION EIGHT

	1	2	3	4
8A	○	○	○	○
8B	○	○	○	○
8C	○	○	○	○
8D	○	○	○	○

QUESTION NINE

	1	2	3	4
9A	○	○	○	○
9B	○	○	○	○
9C	○	○	○	○
9D	○	○	○	○

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FOUNDATION TIER

Instructions on how to complete this answer sheet are given on the question paper. Please make sure you follow them carefully.

Questions **ONE** to **NINE** Choose one response **1 - 4** for each of the parts **A - D**

QUESTION ONE	1	2	3	4
1A Crack	○	○	○	○
1B Evaporate	○	○	○	○
1C Polymerise	○	○	○	○
1D Burn	○	○	○	○

QUESTION TWO	1	2	3	4
2A Argon	○	○	○	○
2B Helium	○	○	○	○
2C Neon	○	○	○	○
2D Xenon	○	○	○	○

QUESTION THREE	1	2	3	4
3A the oil and solvent mixture	○	○	○	○
3B the plant oil	○	○	○	○
3C the water	○	○	○	○
3D the solvent	○	○	○	○

QUESTION FOUR	1	2	3	4
4A Venus	○	○	○	○
4B Earth	○	○	○	○
4C Mars	○	○	○	○
4D Jupiter	○	○	○	○

QUESTION FIVE	1	2	3	4
5A chromatography	○	○	○	○
5B combustion	○	○	○	○
5C hydrogenation	○	○	○	○
5D unsaturation	○	○	○	○

QUESTION SIX	1	2	3	4
6A	○	○	○	○
6B	○	○	○	○
6C	○	○	○	○
6D	○	○	○	○

QUESTION SEVEN	1	2	3	4
7A	○	○	○	○
7B	○	○	○	○
7C	○	○	○	○
7D	○	○	○	○

QUESTION EIGHT	1	2	3	4
8A	○	○	○	○
8B	○	○	○	○
8C	○	○	○	○
8D	○	○	○	○

QUESTION NINE	1	2	3	4
9A	○	○	○	○
9B	○	○	○	○
9C	○	○	○	○
9D	○	○	○	○

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Other Names										
Candidate Signature										

General Certificate of Secondary Education
Foundation Tier and Higher Tier
June 2010

Science A

Unit Chemistry C1b (Oils, Earth and Atmosphere)

Chemistry

Unit Chemistry C1b (Oils, Earth and Atmosphere)

CHY1BP

F&H

Monday 28 June 2010 Morning Session

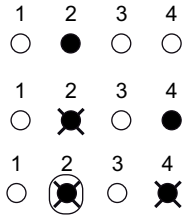
For this paper you must have:
- a black ball-point pen
- an objective test answer sheet.

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 '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.

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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.

FOUNDATION TIER

Section One

Questions **ONE** to **FIVE**.

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

The table shows some information about four of the gases, **A**, **B**, **C** and **D**, in the Earth's atmosphere.

	Gas	Percentage (%) in the atmosphere	Melting point in °C	Boiling point in °C	Density in g per litre
A	Nitrogen	78	−210	−196	1.25
B	Oxygen	20	−218	−183	1.43
C	Carbon dioxide	0.04	−57	−78	1.98
D	Argon	1	−189	−186	1.78

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

The gas with the highest density is . . . **1** . . . .

The gas that makes up the largest percentage of the atmosphere is . . . **2** . . . .

The gas with the lowest melting point is . . . **3** . . . .

The gas with the smallest difference between its melting point and its boiling point is . . . **4** . . . .

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QUESTION TWO

This question is about the Earth and its structure.

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

A mantle

B core

C atmosphere

D crust

Since the Earth was formed, the percentages of the gases in the . . . **1** . . . have changed.

At the centre of the Earth is the . . . **2** . . . .

The middle layer of the Earth where convection currents form is the . . . **3** . . . .

It was once thought that mountain ranges formed because the . . . **4** . . . was shrinking.

QUESTION THREE

The following table lists some properties of four different polymers, **A**, **B**, **C** and **D**.

Polymer	Maximum working temperature in °C	Appearance	Flexibility	Breaking strength
A	250	Grey	Medium	High
B	80	White	High	High
C	70	Transparent	Low	High
D	110	Transparent	High	Low

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

	Most suitable polymer for
1	non-stick coating for cooking pans
2	spectacle lenses
3	cling film (for covering food)
4	toothbrush bristles

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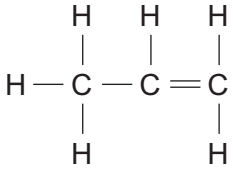
QUESTION FOUR

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

An example is shown below.

$$\underset{\textbf{A}}{C_{10}H_{22}} \longrightarrow \underset{\textbf{B}}{C_2H_4} + \underset{\textbf{C}}{C_5H_{12}} + \underset{\textbf{D}}{C_3H_6}$$

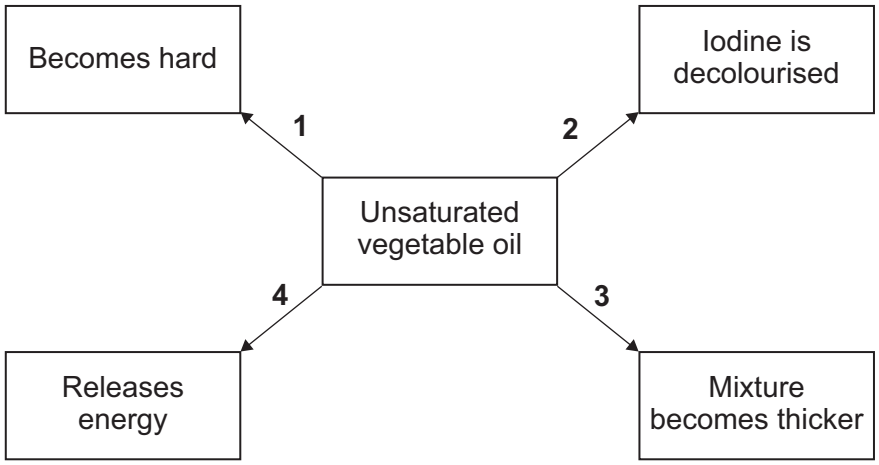
Match hydrocarbons, **A**, **B**, **C** and **D**, with the numbers **1–4** in the table.

1	It has molecules with 17 atoms.
2	It is ethene.
3	It can be represented by 
4	It is the alkane with the largest molecules.

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QUESTION FIVE

The diagram shows what happens to an unsaturated vegetable oil when it is treated in different ways.



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

A Burn in oxygen

B Test for unsaturation

C Add water and shake vigorously

D React with hydrogen

Turn over for the next question

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Section Two

Questions **SIX** to **NINE**.

Each of these questions has four parts.

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

Mark your choices on the answer sheet.

QUESTION SIX

Scientists have tried to predict when and where earthquakes will happen, but they have had limited success. Although they know which regions will have earthquakes, they cannot be precise about the exact place and time.

To gain scientific information, scientists put measuring instruments deep into the Earth's crust where tectonic plates meet.

They have measured tremors which are small vibrations from deep underground. They have found that these tremors occur a short time before earthquakes.

6A The link between tremors and an earthquake occurring is an example of a . . .

1 variable.

2 measurement.

3 calibration.

4 relationship.

6B Scientists could conclude that there is a link between tremors and earthquakes by . . .

1 looking on the internet for information on tremors and earthquakes.

2 collecting more data on both tremors and earthquakes.

3 counting the number of tremors in a year.

4 measuring each earthquake on the Richter scale.

6C The link between tremors and earthquakes is difficult to prove because . . .

1 it is impossible to control other variables.

2 data is not available for tremors.

3 tremors cannot be measured.

4 earthquakes and tremors happen far too often.

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6D It is difficult to predict the exact time and place of an earthquake.

This is because scientists do **not** know . . .

1 what causes tectonic plates to move.

2 where tectonic plates are touching.

3 how all the forces act on tectonic plates.

4 how far tectonic plates move per year.

Turn over for the next question

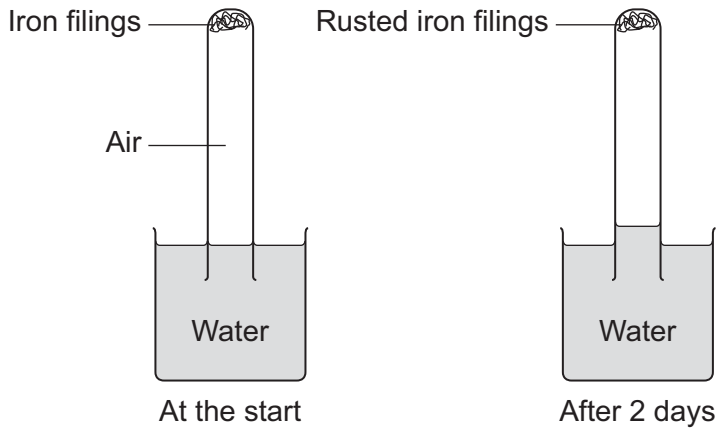
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QUESTION SEVEN

The experiment below can be used to estimate the percentage of oxygen in the air.

- Damp iron filings are placed into a 150 mm long test tube.
- The test tube is inverted and then placed in a beaker of water.
- The test tube is then left for one week.
- The height of the water in the test tube is measured every day.

Rusting is a reaction between iron, oxygen and water.
The water rises up the test tube to replace the oxygen that has reacted.



These are the results of the experiment.

Day	0	1	2	3	4	5	6	7
Height of the water in the test tube in mm	0	9	16	20	23	25	25	25

7A At what height will the water be after another seven days?

1 25 mm

2 50 mm

3 just below the iron filings

4 the top of the test tube

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7B In this experiment, the height of the water in the test tube is the dependent variable.

This is because . . .

1 it is dependent on an accurate measurement being carried out.

2 it changes due to the changes in another variable.

3 it is the value that is measured first.

4 it is not dependent on any other variable.

7C A student used the experiment described to find the percentage of oxygen in the air. He was unsure about his result.

The student could check the reliability of the results by . . .

1 using fewer iron filings.

2 using colder water.

3 repeating the experiment.

4 using already rusted iron filings.

7D Another student did the experiment with more iron filings in the test tube.

One reason for doing this is because . . .

1 the reaction would be much slower.

2 the volume of oxygen reacting would be much greater.

3 there would be less air in the test tube.

4 it would confirm that all the oxygen had reacted.

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QUESTION EIGHT

This equation shows the thermal decomposition of a hydrocarbon.

$$C_8H_{18} \longrightarrow \text{an alkane} + \text{an alkene}$$

8A What is the name of this process?

1 polymerisation

2 cracking

3 combustion

4 hydrogenation

8B In this decomposition, . . .

1 the hydrocarbon vapour is heated with iodine.

2 the hydrocarbon is mixed with hydrogen and heated.

3 the hydrocarbon vapour is passed over a hot catalyst.

4 the hydrocarbon is liquefied, then passed over a catalyst.

8C The alkene produced . . .

1 is an unsaturated compound.

2 has molecules in which each carbon atom has two bonds.

3 is unreactive.

4 will burn to produce carbon dioxide and hydrogen.

8D Poly(ethene) is a polymer that is made from an alkene.

The polymer is . . .

1 produced by thermal decomposition.

2 a thermosoftening polymer.

3 produced by cracking.

4 biodegradable.

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QUESTION NINE

Palm oil and sunflower oil are vegetable oils.

9A Sunflower oil is more unsaturated than palm oil.

This means that . . .

1 sunflower oil is thicker than palm oil at the same temperature.

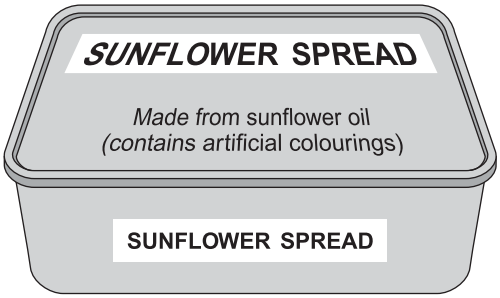
2 palm oil does not react with bromine or iodine.

3 sunflower oil is more useful as a fuel than palm oil.

4 1 cm^3 of sunflower oil will decolourise more bromine water than 1 cm^3 of palm oil.

9B Sunflower oil is liquid at 20 °C. The sunflower spread made from the oil is solid at 20 °C.

This is because the sunflower spread . . .



1 still contains sunflower seeds.

2 contains water between its molecules.

3 has a higher melting point than the oil.

4 forms a layer on top of the oil.

9C Additives in the sunflower spread . . .

1 are listed as ingredients only if they are artificial.

2 are added only to improve the colour of the sunflower spread.

3 are added to improve the appearance, taste and shelf-life of the sunflower spread.

4 are added so that they can be given E-numbers.

9D An artificial colour in the sunflower spread could be identified by . . .

1 distillation.

2 chromatography.

3 filtration.

4 decomposition.

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.

HIGHER TIER

Section One

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

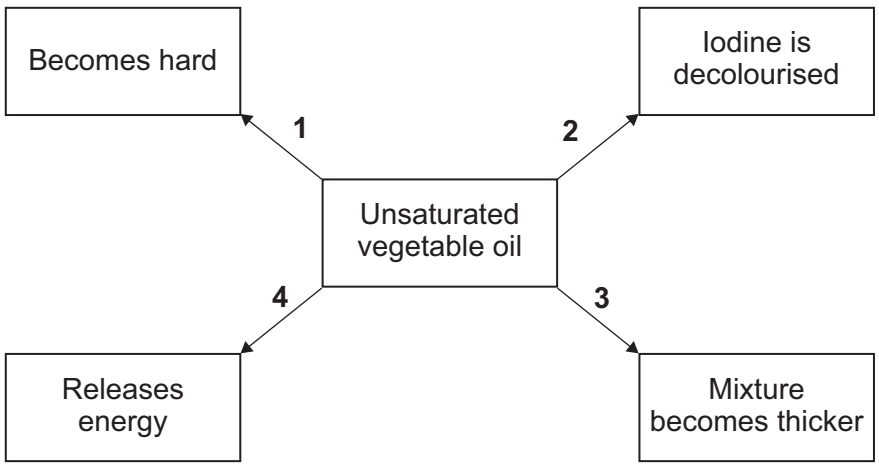
In these questions, match the letters, **A**, **B**, **C** and **D**, with the numbers **1–4**.

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

Mark your choices on the answer sheet.

QUESTION ONE

The diagram shows what happens to an unsaturated vegetable oil when it is treated in different ways.



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

A Burn in oxygen

B Test for unsaturation

C Add water and shake vigorously

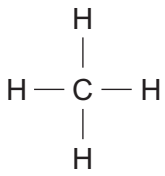
D React with hydrogen

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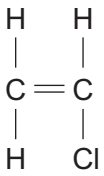
QUESTION TWO

This question is about the formulae of four carbon compounds, **A**, **B**, **C** and **D**.

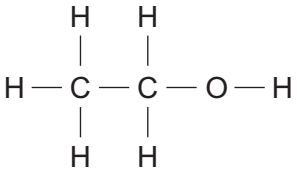
A



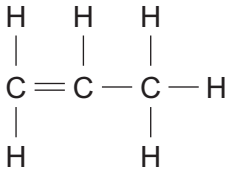
B



C



D



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

1	It is an unsaturated hydrocarbon.
2	It is the alkane that was present in Earth's early atmosphere.
3	It is made by reacting ethene with steam.
4	It is the monomer from which the polymer, poly(chloroethene) is made.

Turn over for the next question

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Section Two

Questions **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

This equation shows the thermal decomposition of a hydrocarbon.

$$C_8H_{18} \longrightarrow \text{an alkane} + \text{an alkene}$$

3A What is the name of this process?

1 polymerisation

2 cracking

3 combustion

4 hydrogenation

3B In this decomposition, . . .

1 the hydrocarbon vapour is heated with iodine.

2 the hydrocarbon is mixed with hydrogen and heated.

3 the hydrocarbon vapour is passed over a hot catalyst.

4 the hydrocarbon is liquefied, then passed over a catalyst.

3C The alkene produced . . .

1 is an unsaturated compound.

2 has molecules in which each carbon atom has two bonds.

3 is unreactive.

4 will burn to produce carbon dioxide and hydrogen.

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3D Poly(ethene) is a polymer that is made from an alkene.

The polymer is . . .

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2 a thermosoftening polymer.

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4 biodegradable.

Turn over for the next question

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QUESTION FOUR

Palm oil and sunflower oil are vegetable oils.

4A Sunflower oil is more unsaturated than palm oil.

This means that . . .

1 sunflower oil is thicker than palm oil at the same temperature.

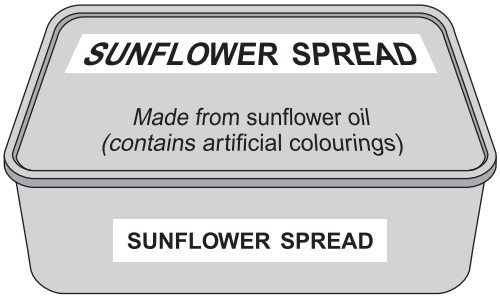
2 palm oil does not react with bromine or iodine.

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4B Sunflower oil is liquid at 20 °C. The sunflower spread made from the oil is solid at 20 °C.

This is because the sunflower spread . . .



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4D An artificial colour in the sunflower spread could be identified by . . .

1 distillation.

2 chromatography.

3 filtration.

4 decomposition.

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Turn over for the next question

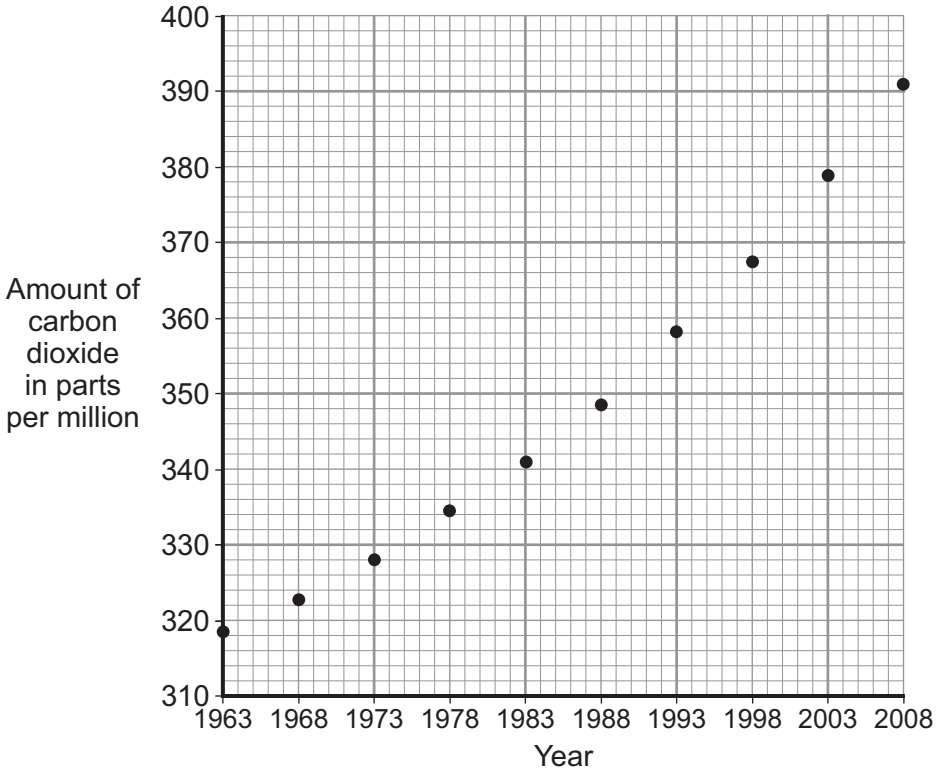
QUESTION FIVE

Scientists have been measuring the amount of carbon dioxide in the atmosphere high above a remote island in the Pacific Ocean.

The table shows some data that they collected over 45 years.

The data is plotted on the graph.

Year	1963	1968	1973	1978	1983	1988	1993	1998	2003	2008
Amount of carbon dioxide in parts per million	318.9	323.1	328.0	334.2	340.9	348.9	358.1	367.7	378.8	391.0



5A What is the best way of showing the trend in the amount of carbon dioxide on the graph?

1 Draw a series of straight lines linking one point to the next.

2 Add points between those already plotted to estimate the missing years.

3 Draw a bar chart.

4 Draw a smooth curve as close as possible to the points.

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5B What does the data show about the amounts of carbon dioxide above the island?

1 The amount of carbon dioxide has increased at an increasing rate since 1963.

2 Recent efforts to slow the increase in the amount of carbon dioxide have been successful.

3 Amounts of carbon dioxide before 1963 were lower than 300 parts per million.

4 The amount of carbon dioxide has increased because there are now more cars on the island.

5C Is there enough data to support the theory that global carbon dioxide levels have increased over the period studied?

1 No, because the scientists would need to measure the amount of carbon dioxide every year to be certain.

2 Yes, because it is obvious that the amount of carbon dioxide is the same all over the world.

3 No, because data from many different sites worldwide would be needed to make sure.

4 Yes, because the amount of carbon dioxide went up every time a measurement was made.

5D Scientists have compared the amount of carbon dioxide in the atmosphere today with the amount they estimate there was during the first billion years of the Earth's existence.

They think that . . .

1 there is more carbon dioxide today because of the burning of fossil fuels.

2 there is less carbon dioxide today because a lot became trapped in carbonate rocks.

3 the amount of carbon dioxide has remained much the same until very recently.

4 there was no carbon dioxide to begin with because there were no humans to burn fuels.

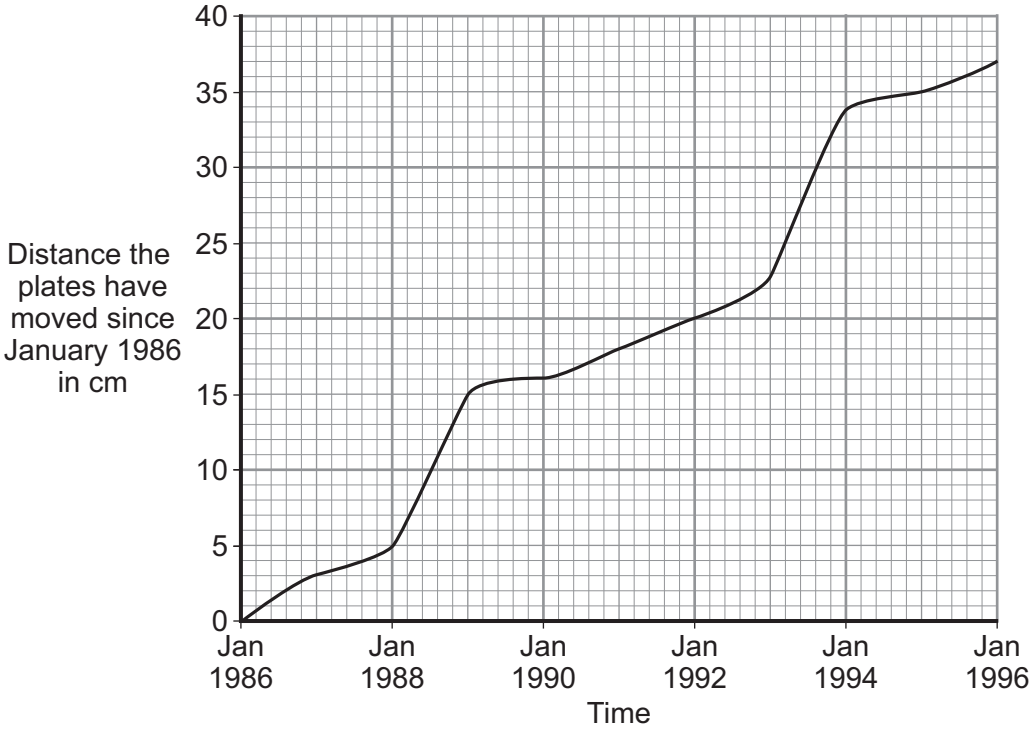
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QUESTION SIX

In California, the San Andreas Fault marks the boundary between two tectonic plates. The plates are sliding past each other.

Scientists can measure how far the land moves on one side of the fault relative to the other.

The graph shows the results of a 10-year study which the scientists began in January 1986.



6A Which row in the table below correctly describes the distance variable in this study?

1	Dependent	Continuous
2	Independent	Categoric
3	Dependent	Categoric
4	Independent	Continuous

6B In which two years is it likely that there were earthquakes along the fault?

1 in 1988 and in 1990

2 in 1988 and in 1993

3 in 1990 and in 1994

4 in 1990 and in 1995

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6C The points on the graph do not lie on a straight line.

This is because . . .

1 the movement is impossible to measure accurately.

2 the movement of the tectonic plates occurs randomly.

3 the points have not been plotted accurately enough.

4 the measurements were made only once a year.

6D If a line of best fit had been extended into the future, would it have enabled scientists to predict earthquakes after 1996?

1 Yes, because lines of best fit are good at predicting values outside measured ranges.

2 No, because a line of best fit is difficult to draw with this data.

3 Yes, because earthquakes occur at regular intervals.

4 No, because a line of best fit shows only average movement, not specific events.

Turn over for the next question

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QUESTION SEVEN

Biofuels are made from plants. Ethanol is an example of a biofuel. It can be made by fermentation of material from a variety of plants.

These claims were published on an ethanol producer's website:

- ethanol can be made from maize
- motorists who use ethanol instead of petrol will save money
- using ethanol helps to reduce greenhouse gas emissions
- making ethanol is not responsible for the increase in global food prices
- future biofuels will remove concern about effects on food production.

7A Why is the ethanol producer claiming that using ethanol helps to reduce greenhouse gas emissions?

It is because . . .

1 ethanol is not a fossil fuel.

2 crops take in carbon dioxide as they grow.

3 fermentation uses very little energy.

4 when ethanol burns it does not produce carbon dioxide.

7B There is a debate about whether land should be used for crops to produce food or crops to produce fuel.

Which of the following is a correct statement?

1 Crops used to produce food are different from those used to produce fuels.

2 Both food and fuel provide a lot of energy.

3 Demand for biofuels will increase if the price of fossil fuels falls.

4 The debate is only about economics.

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7C The claims on the website could be criticised.

Which is a valid criticism?

1 The use of biofuels increases global warming.

2 There is a connection between biofuel production and food prices.

3 Ethanol can be made from maize.

4 Ethanol production can be from crops or from ethene.

7D Which row in the table correctly describes the nature of some of the information on the website?

	Information	Description
1	Ethanol can be made from maize	Political
2	Savings to consumer	Technological
3	Reduction in greenhouse gas emissions	Environmental
4	Not responsible for increase in food prices	Ethical

Turn over for the next question

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QUESTION EIGHT

Four hydrocarbons, **K**, **L**, **M** and **N**, were each analysed to measure their carbon and hydrogen content.

The results are shown in the table.

	Hydrocarbon			
	K	**L**	**M**	**N**
Number of hydrogen atoms in each molecule	8	20	8	12
Number of carbon atoms in each molecule	4	10	16	5

8A From the table we can deduce that . . .

1 none of the four is an alkene.

2 **K** and **L** are alkenes.

3 only **M** is an alkene.

4 only **N** is an alkene.

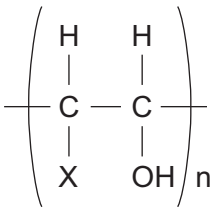
8B Hydrocarbon **N** cannot be used to make a polymer because its molecules . . .

1 are too short.

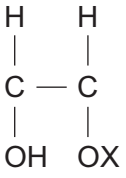
2 have an odd number of carbon atoms.

3 have fewer carbon atoms than hydrogen atoms.

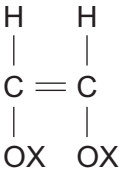
4 do not have a carbon carbon double bond.

8C The polymer with the formula  where 'n' is a large number, could be made from the monomer . . .

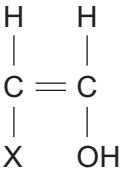
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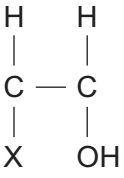
2



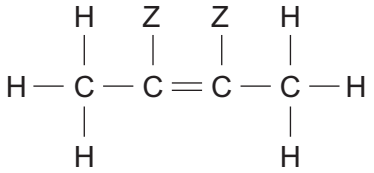
3



4



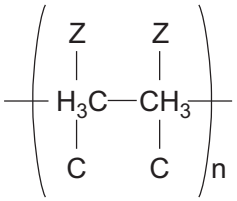
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8D The monomer  is made into a polymer.

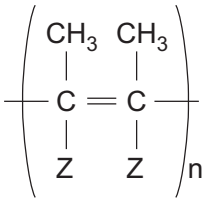
In the formulae below, 'n' is a large number.

The polymer may be represented as . . .

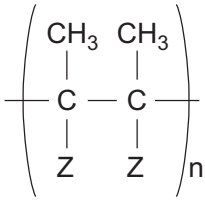
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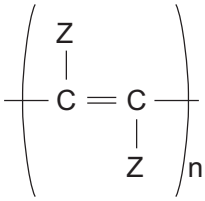
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4



Turn over for the next question

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QUESTION NINE

'Food miles' is the distance that food is transported from the time of its production until it reaches the consumer.

Environmentalists are concerned that food miles are increasing and that this is causing increased carbon dioxide emissions.

The table shows some of the social costs of transporting food to and within the UK in 2002.
At the time there were about 32 million vehicles on UK roads, 25 million of which were cars.

The values shown are an indication of the damage to the environment caused by the transport of food. The larger the number, the greater the environmental damage.

Type of transport	Carbon dioxide emissions	Reduction in air quality	Noise from transport	Congestion due to transport
Lorry	120	170	120	1400
Van	30	50	30	1100
Car	50	20	40	2600
Train	0	20	0	0

9A Which one of the following would explain the difference between the congestion values due to 'Vans' and 'Cars'?

1 A van will cover more distance than a car on a tank of fuel.

2 Cars will travel down more minor roads than vans.

3 Vans can carry larger loads than cars.

4 There are more cars than vans on UK roads.

9B The table shows that there is no damage caused by carbon dioxide emissions from trains. This is because the trains referred to in the table are electric trains.

This is misleading, mainly because . . .

1 it does not take into account the lighting used at railway stations.

2 the carbon dioxide emissions given off by railway staff travelling to work should also be included.

3 carbon dioxide is given off when electricity is generated using fossil fuels.

4 the environmental effect of driving goods to railway stations should be included.

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9C Haulage companies suggest that transporting goods by lorries is preferable to using vans.

If all environmental aspects are considered, how many vans cause as much environmental damage as one lorry?

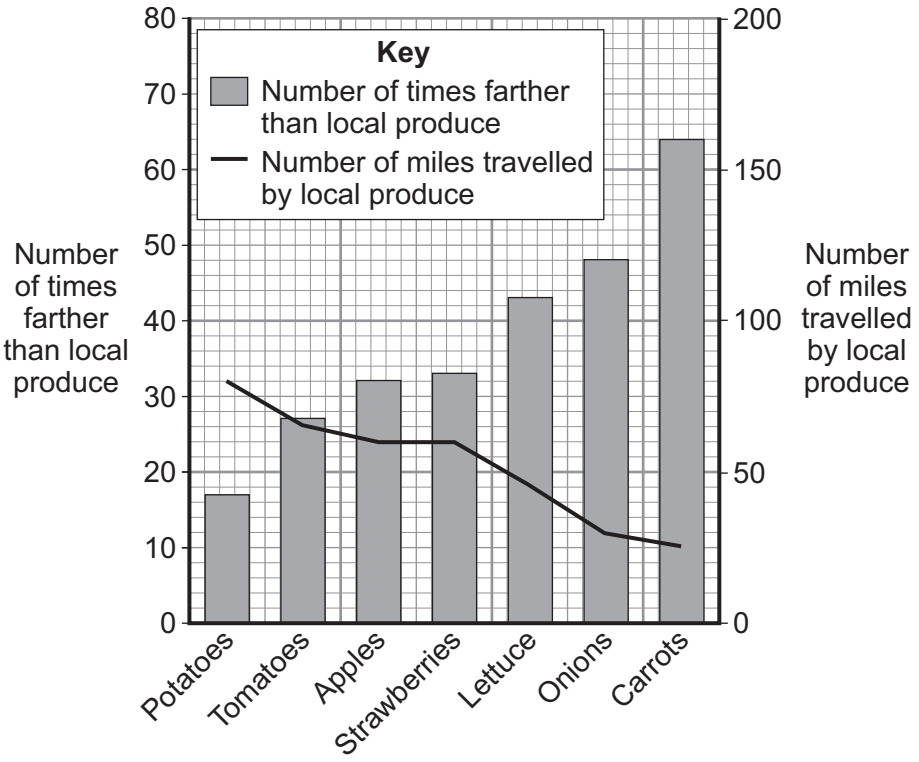
1 less than one

2 between one and two

3 between two and three

4 between three and four

9D The graph shows the relative distances travelled when transporting food to the UK from a distant source compared with locally produced food.



Which food from a distant source travels the least food miles compared with when it is produced locally?

1 potatoes

2 strawberries

3 lettuce

4 carrots

END OF TEST

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There are no questions printed on this page

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Version 1:0: 26/07/10

ASSESSMENT and QUALIFICATIONS ALLIANCE

GCSE

Science A (4461)

Specification A

CHY1BP, CH1BSF & CH1BSH

Mark Scheme

2010 Examination – June Series

The blank answer sheet for this component can be found at the end of this document.

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This component is an objective test for which the following list indicates the correct answers used in marking the candidates' responses.

Further copies of this Mark Scheme are available to download from the AQA Website: www.aqa.org.uk

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GCSE
SCIENCE A (4461) / CHEMISTRY (4421)
Objective Test Answer Key
CHY1BP (Oils, Earth and Atmosphere)
June 2010
Foundation Tier

Question	*Key*		
One	**A**	Nitrogen	**2**
	B	Oxygen	**3**
	C	Carbon dioxide	**1**
	D	Argon	**4**
Two	**A**	mantle	**3**
	B	core	**2**
	C	atmosphere	**1**
	D	crust	**4**
Three	**A**	Polymer **A**	**1**
	B	Polymer **B**	**4**
	C	Polymer **C**	**2**
	D	Polymer **D**	**3**
Four	**A**	Hydrocarbon **A**	**4**
	B	Hydrocarbon **B**	**2**
	C	Hydrocarbon **C**	**1**
	D	Hydrocarbon **D**	**3**
Five	**A**	Burn in oxygen	**4**
	B	Test for unsaturation	**2**
	C	Add water and shake vigorously	**3**
	D	React with hydrogen	**1**

	A	**B**	**C**	**D**
Six	**4**	**2**	**1**	**3**
Seven	**1**	**2**	**3**	**4**
Eight	**2**	**3**	**1**	**2**
Nine	**4**	**3**	**3**	**2**

GCSE
SCIENCE A (4461) / CHEMISTRY (4421)
Objective Test Answer Key
CHY1BP (Oils, Earth and Atmosphere)
June 2010
Higher Tier

Question	*Key*		
One	**A**	Burn in oxygen	**4**
	B	Test for unsaturation	**2**
	C	Add water and shake vigorously	**3**
	D	React with hydrogen	**1**
Two	**A**	Formula **A**	**2**
	B	Formula **B**	**4**
	C	Formula **C**	**3**
	D	Formula **D**	**1**

	A	**B**	**C**	**D**
Three	**2**	**3**	**1**	**2**
Four	**4**	**3**	**3**	**2**
Five	**4**	**1**	**3**	**2**
Six	**1**	**2**	**2**	**4**
Seven	**2**	**2**	**2**	**3**
Eight	**2**	**4**	**3**	**3**
Nine	**4**	**3**	**2**	**1**

AQA

Unit : CHY1BP **CHEMISTRY UNIT 1B**

Centre :

Candidate Number : **UCI :**

Candidate Name :

Series : 6M10

28-JUN-10

For completion by the Examination Invigilator. **Please fill this circle if the candidate is absent:** ○

HIGHER TIER

Instructions on how to complete this answer sheet are given on the question paper. Please make sure you follow them carefully.

Questions **ONE** to **NINE** Choose one response **1 - 4** for each of the parts **A - D**

QUESTION ONE		1	2	3	4
1A	Burn in oxygen	○	○	○	○
1B	Test for unsaturation	○	○	○	○
1C	Add water and shake vigorously	○	○	○	○
1D	React with hydrogen	○	○	○	○

QUESTION TWO		1	2	3	4
2A	Formula A	○	○	○	○
2B	Formula B	○	○	○	○
2C	Formula C	○	○	○	○
2D	Formula D	○	○	○	○

QUESTION THREE	1	2	3	4
3A	○	○	○	○
3B	○	○	○	○
3C	○	○	○	○
3D	○	○	○	○

QUESTION FOUR	1	2	3	4
4A	○	○	○	○
4B	○	○	○	○
4C	○	○	○	○
4D	○	○	○	○

QUESTION FIVE	1	2	3	4
5A	○	○	○	○
5B	○	○	○	○
5C	○	○	○	○
5D	○	○	○	○

QUESTION SIX	1	2	3	4
6A	○	○	○	○
6B	○	○	○	○
6C	○	○	○	○
6D	○	○	○	○

QUESTION SEVEN	1	2	3	4
7A	○	○	○	○
7B	○	○	○	○
7C	○	○	○	○
7D	○	○	○	○

QUESTION EIGHT	1	2	3	4
8A	○	○	○	○
8B	○	○	○	○
8C	○	○	○	○
8D	○	○	○	○

QUESTION NINE	1	2	3	4
9A	○	○	○	○
9B	○	○	○	○
9C	○	○	○	○
9D	○	○	○	○

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FOUNDATION TIER

Instructions on how to complete this answer sheet are given on the question paper. Please make sure you follow them carefully.

Questions **ONE** to **NINE** Choose one response **1 - 4** for each of the parts **A - D**

QUESTION ONE

		1	2	3	4
1A	Nitrogen	○	○	○	○
1B	Oxygen	○	○	○	○
1C	Carbon dioxide	○	○	○	○
1D	Argon	○	○	○	○

QUESTION TWO

		1	2	3	4
2A	mantle	○	○	○	○
2B	core	○	○	○	○
2C	atmosphere	○	○	○	○
2D	crust	○	○	○	○

QUESTION THREE

		1	2	3	4
3A	Polymer A	○	○	○	○
3B	Polymer B	○	○	○	○
3C	Polymer C	○	○	○	○
3D	Polymer D	○	○	○	○

QUESTION FOUR

		1	2	3	4
4A	Hydrocarbon A	○	○	○	○
4B	Hydrocarbon B	○	○	○	○
4C	Hydrocarbon C	○	○	○	○
4D	Hydrocarbon D	○	○	○	○

QUESTION FIVE

		1	2	3	4
5A	Burn in oxygen	○	○	○	○
5B	Test for unsaturation	○	○	○	○
5C	Add water and shake vigorously	○	○	○	○
5D	React with hydrogen	○	○	○	○

QUESTION SIX

	1	2	3	4
6A	○	○	○	○
6B	○	○	○	○
6C	○	○	○	○
6D	○	○	○	○

QUESTION SEVEN

	1	2	3	4
7A	○	○	○	○
7B	○	○	○	○
7C	○	○	○	○
7D	○	○	○	○

QUESTION EIGHT

	1	2	3	4
8A	○	○	○	○
8B	○	○	○	○
8C	○	○	○	○
8D	○	○	○	○

QUESTION NINE

	1	2	3	4
9A	○	○	○	○
9B	○	○	○	○
9C	○	○	○	○
9D	○	○	○	○

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Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

General Certificate of Secondary Education
Foundation Tier and Higher Tier
March 2010

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

Chemistry
Unit Chemistry C1b (Oils, Earth and Atmosphere)

CHY1BP

F&H

Wednesday 3 March 2010 Morning Session

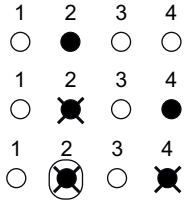
For this paper you must have:
- a black ball-point pen
- an objective test answer sheet.

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 '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.

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You must do **one Tier** only, **either** the Foundation Tier **or** the Higher Tier.
The Higher Tier starts on page 16 of this booklet.

FOUNDATION TIER

SECTION ONE

Questions **ONE** to **FIVE**.

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 gases.

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

A oxygen

B nitrogen

C carbon dioxide

D helium

1	It makes up about 20% of the Earth's atmosphere today.
2	It is locked up as carbonates in sedimentary rocks.
3	It is found in Group 0 of the periodic table.
4	It makes up about 80% of the Earth's atmosphere today.

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QUESTION TWO

Many food additives are given E-numbers.

- Colourings have E-numbers from 100 to 199.
- Preservatives have E-numbers from 200 to 299.
- Substances to stop food from reacting with oxygen have E–numbers from 300 to 399.
- Emulsifying agents have E-numbers from 400 to 499.

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

A E150

B E210

C E300

D E450

1	used to make gravy mixture brown in colour
2	used to stop salad dressing from separating
3	used to stop fruit from going brown in the air
4	used to increase the shelf-life of jam

Turn over for the next question

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QUESTION THREE

Some vehicles can use biodiesel fuel. Many plants are a source of biodiesel.

Linseed is a plant that can produce about 400 litres of biodiesel per hectare.

Producing all the biodiesel needed by the USA from linseed would need 25 % of their arable land. Arable land is land that can be used to grow plants for food.

The table gives some data on four other plants.

	Plant	Amount of biodiesel produced in litres per hectare	Type of land where plant will grow
A	Maize	100	Arable
B	Sunflower	800	Arable
C	Coconut	3 000	Arable
D	Algae	14 000	Desert

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

1	This plant uses no arable land.
2	This plant would need half as much arable land as linseed to produce all the biodiesel needed in the USA.
3	This plant would need all of the arable land in the USA to produce all the biodiesel needed in the USA.
4	This plant would need arable land but it would use the smallest amount.

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QUESTION FOUR

The table below shows the masses of some gases given off when one gram of each of the polymers, **A**, **B**, **C** and **D**, are burnt in air.

		Combustion products in mg						
	Polymer name	**C_2H_4**	**CH_4**	**CO_2**	**CO***	**NO_2***	**HCN***	**NH_3***
A	Kevlar	–	–	1850	50	10	14	0.5
B	Acrylic	5	17	1300	170	45	40	3.0
C	66 Nylon	50	25	1200	250	20	30	–
D	Polyester	6	10	1000	350	–	–	–

Toxic gases are marked with *.

Match polymers, **A**, **B**, **C** and **D**, with the numbers **1–4** below.

1 the polymer that produces the most HCN

2 the polymer that produces the most ethene

3 the polymer that produces no hydrocarbons

4 the polymer that produces the largest total mass of toxic gases

Turn over for the next question

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QUESTION FIVE

This question is about the extraction and uses of soybean oil.

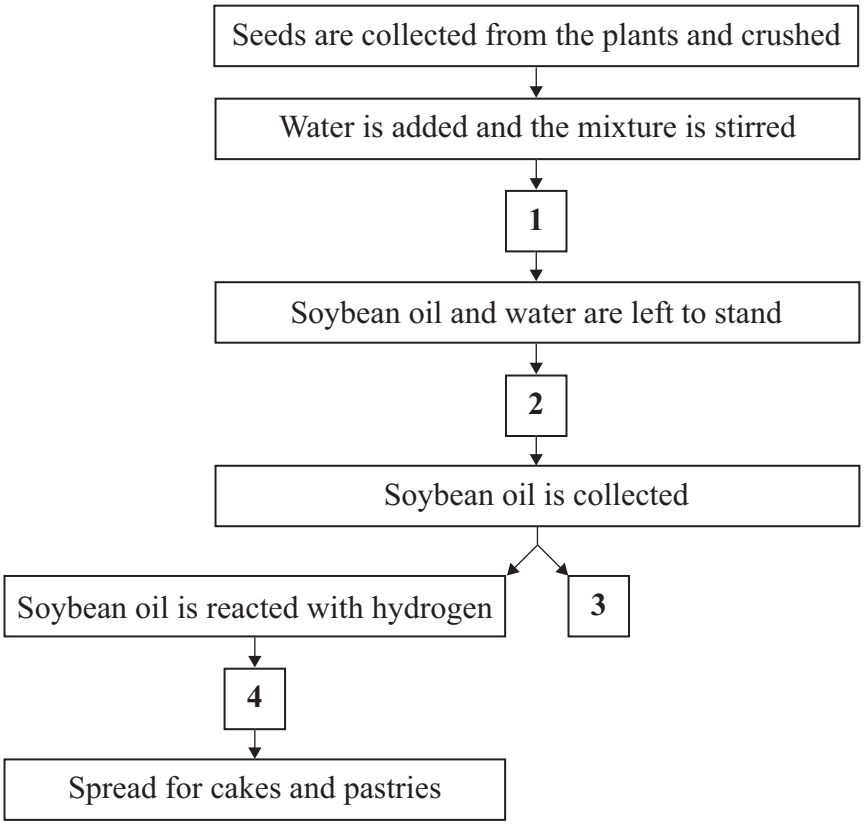
Match statements, **A**, **B**, **C** and **D**, with the numbers **1–4** in the flow chart.

A The modified oil solidifies and additives are mixed in

B Soybean oil is used as biofuel in vehicles

C Soybean oil separates from the water

D Mixture of soybean seeds and water is pressed



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Turn over for the next question

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SECTION TWO

Questions **SIX** to **NINE**.

Each of these questions has four parts.

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

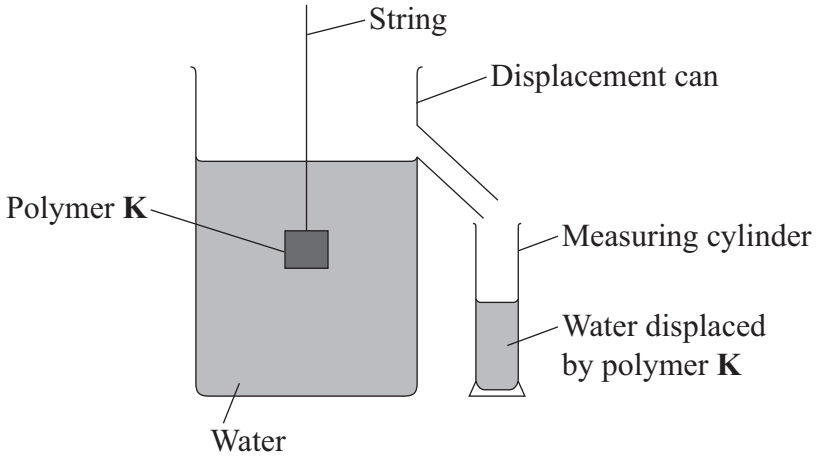
Mark your choices on the answer sheet.

QUESTION SIX

Some polymers can be used for tooth fillings. A good polymer should not shrink in the tooth cavity.

A scientist tested a polymer, **K**, to see how much it shrinks when it sets.

- He made a sample of the polymer in a container with a volume of 10 cm^3 exactly.
- He allowed the polymer to set hard.
- He removed the polymer from the container and measured its volume again, using the apparatus shown.
- He repeated the test three times.



The scientist then tested three different polymers, **L**, **M** and **N**, in exactly the same way.

The results are shown in the table.

Polymer	Volume of water displaced in cm^3			
	Test 1	Test 2	Test 3	Test 4
K	9.6	9.8	9.7	9.8
L	7.8	8.2	8.9	10.2
M	9.2	9.5	9.6	10.0
N	9.2	9.6	8.5	9.7

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6A Which statement about the results is correct?

1 All four polymers would be equally good as dental fillings.

2 Polymer **K** shows the most consistent results.

3 Polymer **L** is the best for dental fillings because it gives the highest values.

4 If the third test is ignored, polymer **N** is the best polymer for dental fillings.

6B Which one of the following could be the reason for the reading of 10.2 cm^3 for polymer **L**, **Test 4**?

1 The piece of string was too long.

2 The polymer was dropped into the water in the displacement can.

3 At the start, the water was below the level of the spout.

4 Some water had evaporated.

6C One of the tests on polymer **M** gives a volume of 10.0 cm^3.

Does this mean it is the best polymer?

1 Yes, because it has given the volume needed.

2 No, because a single result should not be relied upon.

3 Yes, because it would be the highest value that could be obtained.

4 No, because the first test is always the most accurate.

6D Any polymer used for dental fillings should **not** be biodegradable because it would . . .

1 cost too much to make.

2 be poisonous.

3 shrink too much.

4 break down after it has been put in place.

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QUESTION SEVEN

Until about 150 years ago, many scientists thought that the mountain ranges and valleys on the Earth had hardly changed since the Earth was formed.

One theory about how new mountain ranges may have formed involves the following events.
They are **not** in the correct order.

W – As the core shrinks, it makes the crust wrinkle; the tops of the wrinkles become the mountains.
X – The outer layer of molten rock cooled to form the solid Earth's crust.
Y – The Earth began as a huge ball of molten rock.
Z – The molten core continues to cool and it shrinks as it cools.

7A The best sequence for these events is . . .

1 **Y**, **Z**, **W**, **X**.

2 **Y**, **X**, **Z**, **W**.

3 **Y**, **W**, **X**, **Z**.

4 **Y**, **X**, **W**, **Z**.

7B One reason that this theory is **not** now accepted is because we know that . . .

1 the Earth's crust is divided into plates.

2 earthquakes produce mountain ranges.

3 all mountain ranges are formed by active volcanoes.

4 wrinkles in the Earth's crust can only form low hills.

7C Scientists now think that mountain ranges are formed . . .

1 by the Earth's crust expanding as it heats up.

2 by earthquakes in the mantle.

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

4 by weathering and erosion of old mountain ranges.

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7D It is now accepted that the interior of the Earth remains hot because of . . .

1 friction between the moving tectonic plates.

2 volcanic activity at the plate boundaries.

3 friction between the core and the mantle.

4 natural radioactive processes.

Turn over for the next question

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QUESTION EIGHT

The two equations below show reactions involving hydrocarbons.

$$C_{11}H_{24} \rightarrow C_2H_4 + C_4H_8 + C_5H_{12}$$

$$C_4H_{10} \rightarrow 2C_2H_4 + H_2$$

8A The reactions are examples of . . .

1 condensation.

2 polymerisation.

3 cracking.

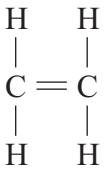
4 hydrogenation.

8B The hydrocarbon C_2H_4 can be represented by . . .

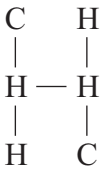
1



2



3



4



8C In the equations, the two hydrocarbons that are alkenes are . . .

1 C_2H_4 and C_4H_8

2 C_2H_4 and C_4H_{10}

3 C_2H_4 and C_5H_{12}

4 $C_{11}H_{24}$ and C_4H_{10}

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8D Which of the hydrocarbons is used to make poly(ethene)?

1 C_2H_4

2 C_4H_8

3 C_4H_{10}

4 C_5H_{12}

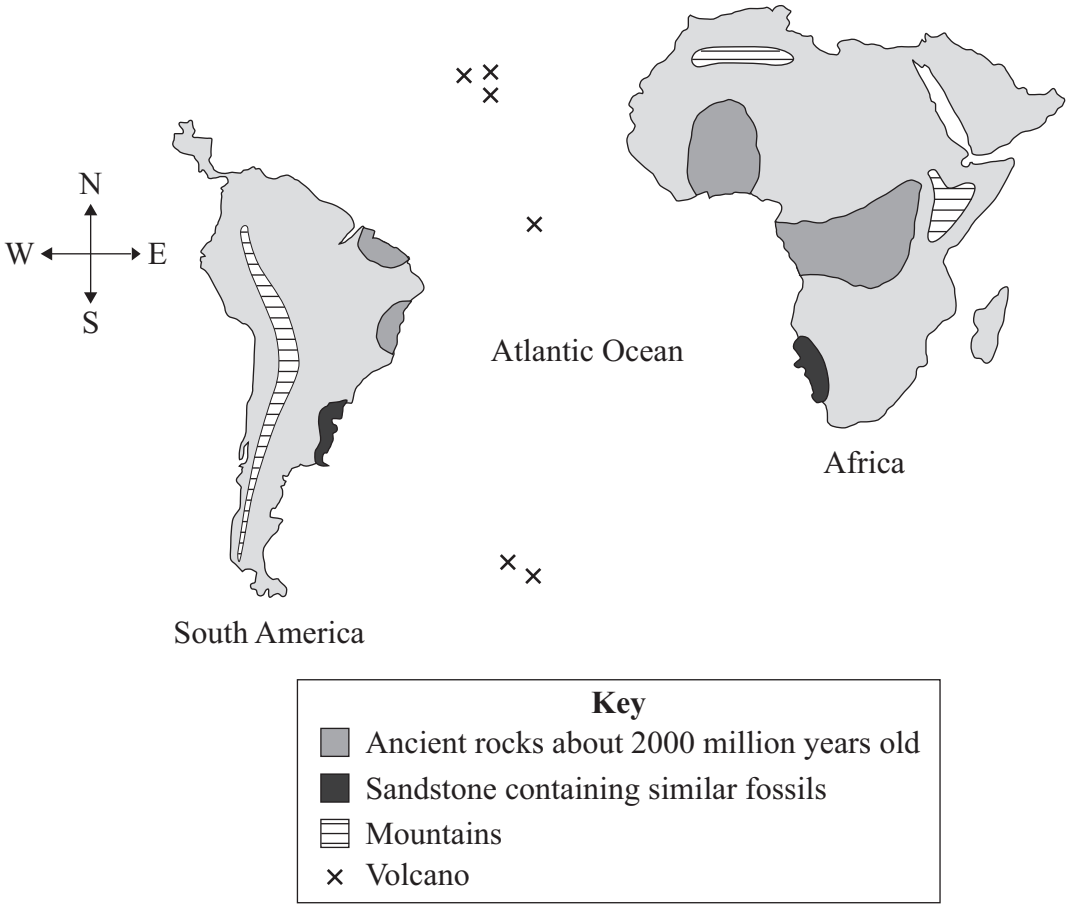
Turn over for the next question

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QUESTION NINE

The diagram shows the positions of the continents of South America and Africa today.

Some of the rock formations are also shown.



9A The shape of the east coast of South America suggests that it would fit into the west coast of Africa.

This could indicate that . . .

1 Africa is slowly sliding past South America.

2 sea levels in the Atlantic Ocean are gradually rising.

3 the two land masses are slowly moving together.

4 Africa and South America were once joined.

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9B Early in the twentieth century, an accepted theory was that millions of years ago there had been a land bridge connecting South America and Africa.

What evidence is there on the diagram that could have given rise to this theory?

1 There are mountain ranges on both continents.

2 There are ancient rocks on both continents.

3 South America and Africa are quite close together.

4 There are similar fossils in the rocks on the two continents.

9C South America and Africa are on different tectonic plates.

From the evidence on the diagram, where is the boundary between these tectonic plates?

1 along the east coast of South America

2 from north to south through the middle of the Atlantic Ocean

3 from east to west across the Atlantic Ocean

4 along the west coast of Africa

9D The Atlantic Ocean is about 5000 km wide. It is estimated that it has been widening by about 2 cm every year since it first formed.

The time taken for the Atlantic Ocean to reach its present width is about . . .

1 1000 years.

2 25 000 years.

3 250 million years.

4 1000 million years.

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.

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 the extraction and uses of soybean oil.

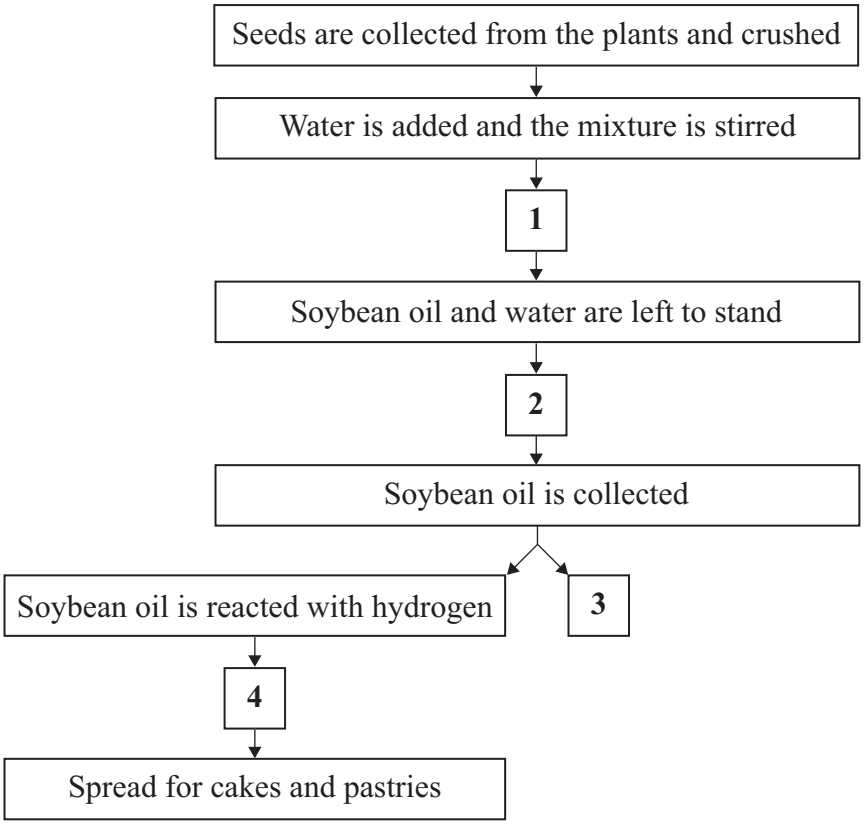
Match statements, **A**, **B**, **C** and **D**, with the numbers **1–4** in the flow chart.

A The modified oil solidifies and additives are mixed in

B Soybean oil is used as biofuel in vehicles

C Soybean oil separates from the water

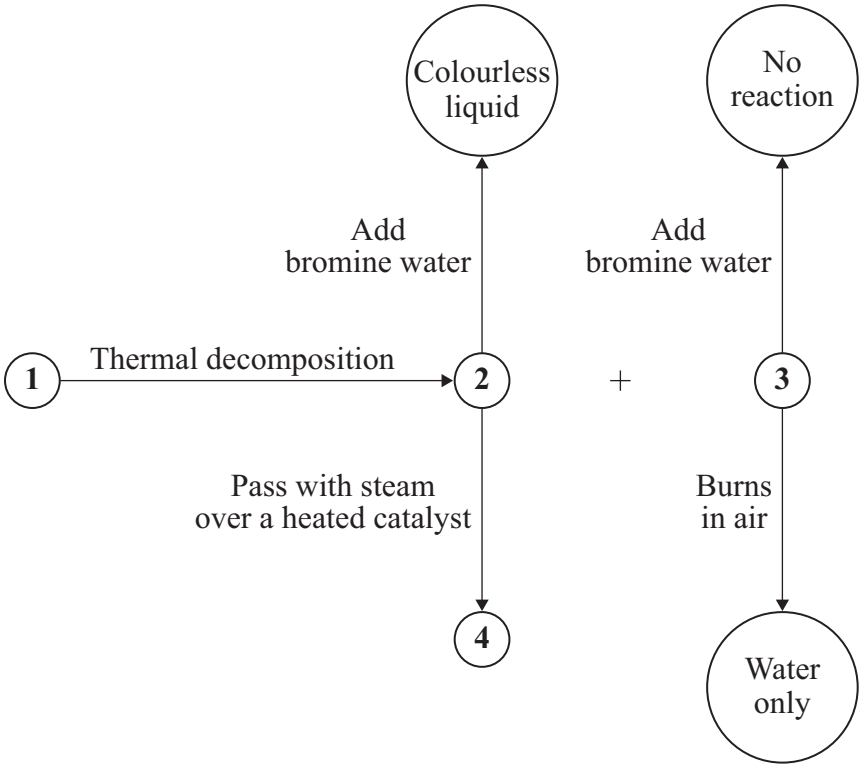
D Mixture of soybean seeds and water is pressed



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QUESTION TWO

The flow chart shows a series of chemical reactions.



Match chemicals, **A**, **B**, **C** and **D**, with the numbers **1–4** in the flow chart.

A Ethane

B Ethene

C Ethanol

D Hydrogen

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SECTION TWO

Questions **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 two equations below show reactions involving hydrocarbons.

$$C_{11}H_{24} \rightarrow C_2H_4 + C_4H_8 + C_5H_{12}$$

$$C_4H_{10} \rightarrow 2C_2H_4 + H_2$$

3A The reactions are examples of . . .

1 condensation.

2 polymerisation.

3 cracking.

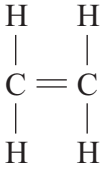
4 hydrogenation.

3B The hydrocarbon C_2H_4 can be represented by . . .

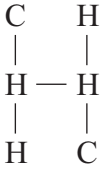
1



2



3



4



3C In the equations, the two hydrocarbons that are alkenes are . . .

1 C_2H_4 and C_4H_8

2 C_2H_4 and C_4H_{10}

3 C_2H_4 and C_5H_{12}

4 $C_{11}H_{24}$ and C_4H_{10}

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3D Which of the hydrocarbons is used to make poly(ethene)?

1 C_2H_4

2 C_4H_8

3 C_4H_{10}

4 C_5H_{12}

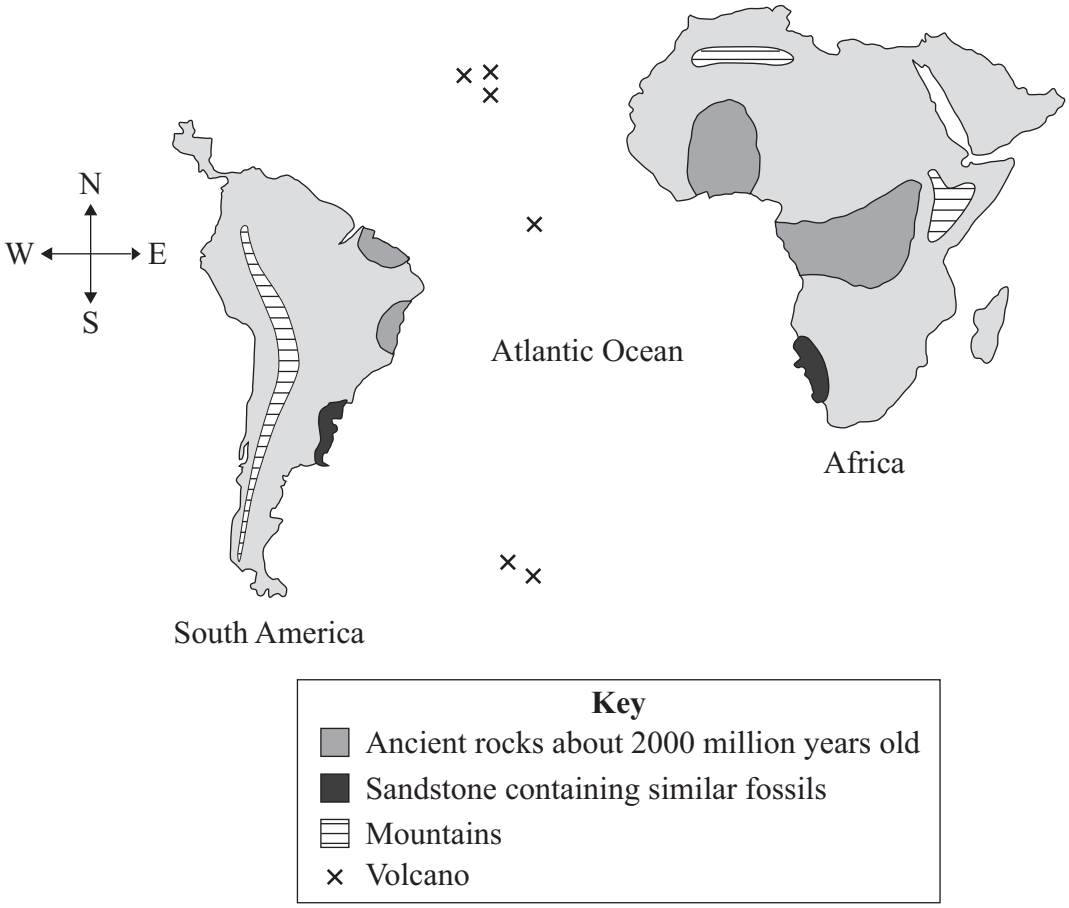
Turn over for the next question

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QUESTION FOUR

The diagram shows the positions of the continents of South America and Africa today.

Some of the rock formations are also shown.



4A The shape of the east coast of South America suggests that it would fit into the west coast of Africa.

This could indicate that . . .

1 Africa is slowly sliding past South America.

2 sea levels in the Atlantic Ocean are gradually rising.

3 the two land masses are slowly moving together.

4 Africa and South America were once joined.

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4B Early in the twentieth century, an accepted theory was that millions of years ago there had been a land bridge connecting South America and Africa.

What evidence is there on the diagram that could have given rise to this theory?

1 There are mountain ranges on both continents.

2 There are ancient rocks on both continents.

3 South America and Africa are quite close together.

4 There are similar fossils in the rocks on the two continents.

4C South America and Africa are on different tectonic plates.

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3 from east to west across the Atlantic Ocean

4 along the west coast of Africa

4D The Atlantic Ocean is about 5000 km wide. It is estimated that it has been widening by about 2 cm every year since it first formed.

The time taken for the Atlantic Ocean to reach its present width is about . . .

1 1000 years.

2 25 000 years.

3 250 million years.

4 1000 million years.

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QUESTION FIVE

Some properties of two forms of poly(ethene) are shown in the table.

Polymer	Density in kg per m^3	Tensile strength in MPa
Low-density poly(ethene) – LDPE	925	16
High-density poly(ethene) – HDPE	950	28

The molecules of low-density poly(ethene) and high-density poly(ethene) are represented in the diagrams.

Low-density poly(ethene) – LDPE



High-density poly(ethene) – HDPE



5A The reason for the differences in strength and density between LDPE and HDPE is that . . .

1 they contain different elements in their structure.

2 they were made under different conditions.

3 they have different colours added.

4 different monomers are used to make the chains.

5B HDPE has a higher density than LDPE because . . .

1 it is stronger.

2 more plastic is used to make LDPE.

3 the polymer molecules pack closer together in HDPE.

4 LDPE has shorter polymer chains.

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5C Which is the most appropriate method for disposal of a non-biodegradable polymer such as poly(ethene)?

1 freeze it so that it returns to the original monomer

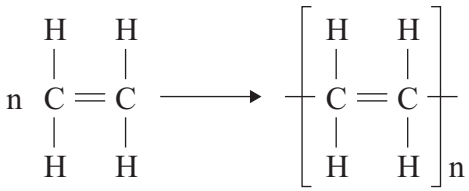
2 dispose of it at sea

3 bury it in the ground

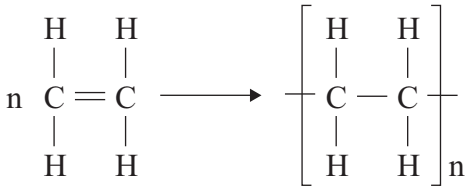
4 break it down by adding microorganisms

5D Which one of the following is the correct balanced equation for the polymerisation of ethene to form poly(ethene)?

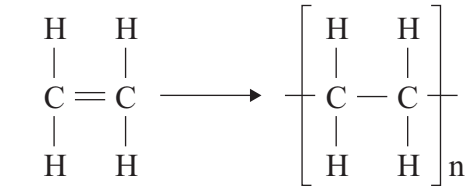
1



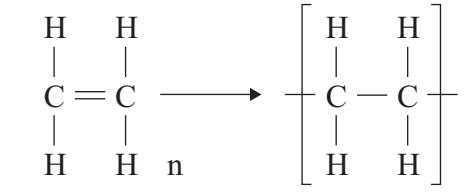
2



3



4



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QUESTION SIX

Recycling of plastic bottles increased between 1994 and 2005.

Year	Tonnes of plastic bottles recycled
1994	2 000
1995	4 000
1996	5 000
1997	6 000
1998	9 000
1999	10 000
2000	11 000
2001	13 000
2002	18 000
2003	25 000
2004	38 000
2005	63 000

6A If the rate of recycling plastic bottles continued to follow this trend, the quantity recycled in 2006 would have been . . .

1 70 000 tonnes.

2 99 000 tonnes.

3 200 000 tonnes.

4 350 000 tonnes.

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6B Between which two years was there the greatest percentage growth in recycling plastic bottles?

1 1994 to 1995

2 1999 to 2000

3 2002 to 2003

4 2004 to 2005

6C The data in the table on page 24, could be presented as a bar chart.

Which row of the table below gives the correct data types for tonnes of plastic bottles and the year?

	Tonnes of plastic bottles	**Year**
1	Continuous	Categoric
2	Discrete	Continuous
3	Categoric	Continuous
4	Continuous	Discrete

6D The government should encourage the recycling of plastic bottles because . . .

1 there is an unlimited supply of the raw material.

2 landfill sites cannot take plastic bottles.

3 plastic bottles are made from a non-renewable raw material.

4 plastic bottles may decompose after use.

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QUESTION SEVEN

This question is about the Earth.

7A The density of the Earth's crust is about 2800 kg per m^3, but the overall density of the Earth is about 5500 kg per m^3.

A valid conclusion from this information is that . . .

1 the mantle is denser than the crust.

2 the core is denser than the crust.

3 the average density of the core and mantle is greater than the density of the crust.

4 the average density of the core and mantle is less than the density of the crust.

7B The rocks of the mantle are semi-molten because of . . .

1 the heat retained from when the Earth was first formed from the Sun.

2 the frictional forces between the core and the mantle.

3 the decay of radioactive substances in the mantle.

4 the atmosphere absorbing radiation from the Sun.

7C Earthquakes occur at plate boundaries because . . .

1 the plates expand against each other due to the heat of the magma.

2 the plates move past each other due to convection currents in the mantle.

3 the plates slowly contract away from each other as the Earth cools.

4 the plates push past each other due to the expansion of the core.

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7D Scientists can predict the regions where earthquakes will occur, but not when they will occur.

This is because . . .

1 earthquakes occur at random intervals.

2 earthquakes usually occur deep in the oceans.

3 earthquakes occur in ten-year or twenty-year cycles.

4 earthquakes occur infrequently and vary in strength.

Turn over for the next question

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QUESTION EIGHT

All the gases in the Earth's atmosphere can be separated by this method:

- remove the carbon dioxide
- cool the air down to a very low temperature so that it liquefies
- allow the liquefied gases to warm up
- collect the gases as they boil off at different temperatures.

The table below gives some information about the gases in the Earth's atmosphere.

Gas	Melting point in °C	Boiling point in °C	Abundance in %
Oxygen	−223	−183	21
Nitrogen	−209	−196	78
Carbon dioxide	−57	−57	0.03
Helium	−272	−269	Less than 0.1
Neon	−248	−246	Less than 0.1
Argon	−189	−186	0.9
Krypton	−157	−153	Less than 0.1
Xenon	−112	−108	Less than 0.1

8A In this method of separation, carbon dioxide is always removed from the air before it is liquefied because . . .

1 it would react with the other gases present.

2 it would solidify during cooling and block up the pipes.

3 it is a greenhouse gas and would warm up the apparatus.

4 it is a heavy gas and would not separate properly from the mixture.

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8B How many of the gases listed in the table (excluding carbon dioxide), would be liquid at –150 °C?

1 None

2 1

3 2

4 3

8C Argon is the cheapest of the noble gases to produce because . . .

1 there is high demand for it for use in light bulbs.

2 it is the most abundant of the noble gases.

3 it is the gas that vaporises most easily and so requires the least energy to remove it.

4 it is an unreactive gas so it can easily be separated from the other gases in the air.

8D Earth's early atmosphere contained a high percentage (%) of carbon dioxide.

One reason for the reduction of the percentage of carbon dioxide is that carbon dioxide . . .

1 has dissolved in the oceans.

2 has been reduced to carbon monoxide.

3 has decomposed to form carbon and oxygen.

4 has been released by plants.

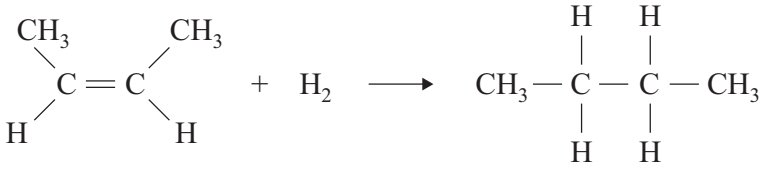
Turn over for the next question

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QUESTION NINE

Unsaturated oils contain double carbon carbon bonds. If an unsaturated hydrocarbon is heated with hydrogen gas and a nickel catalyst, the following reaction takes place.

Unsaturated hydrocarbon **Saturated hydrocarbon**



9A What is this process called?

1 cracking

2 polymerisation

3 hydrogenation

4 combustion

9B An unsaturated oil is made into a saturated compound.

The saturated compound . . .

1 contains fewer hydrogen atoms in its molecules.

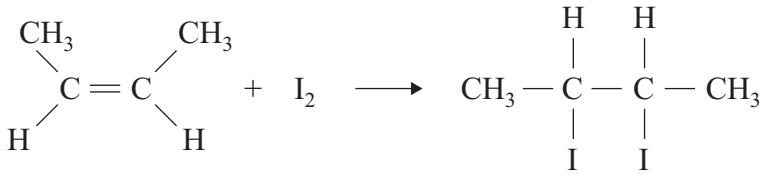
2 has a higher melting point.

3 feels softer but has the same melting point.

4 would be more useful as a fuel for vehicles.

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9C Iodine (I_2) reacts with unsaturated hydrocarbons as shown in the equation.



The iodine number is the number of grams of iodine that will react with 100 g of the unsaturated hydrocarbon. The higher the iodine number, the more unsaturated the hydrocarbon is.

3 g of iodine are added to 1 g of a vegetable oil. When the reaction has finished, 1.2 g of iodine are left unreacted.

What is the iodine number of the oil?

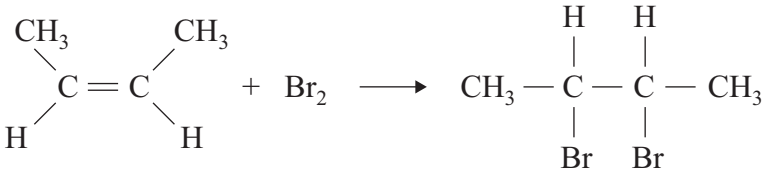
1 120

2 180

3 240

4 300

9D Bromine (Br_2) reacts with unsaturated hydrocarbons in the same way as iodine.



If bromine water is added drop-by-drop to a sample of vegetable oil, the bromine will be decolourised until all the double carbon carbon bonds have reacted.

A sample of an oil with an iodine number of 150 decolourises 25 drops of bromine water. The same amount of another vegetable oil decolourises 6 drops of the same bromine water.

What is the iodine number of the second oil?

1 30

2 36

3 40

4 45

END OF TEST

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There are no questions printed on this page

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Version 1:0: 09/04/10

ASSESSMENT and QUALIFICATIONS ALLIANCE

GCSE

Science A (4461)

Specification A

CHY1BP, CH1BSF & CH1BSH

Mark Scheme

2010 Examination – March Series

The blank answer sheet for this component can be found at the end of this document.

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This component is an objective test for which the following list indicates the correct answers used in marking the candidates' responses.

Further copies of this Mark Scheme are available to download from the AQA Website: www.aqa.org.uk

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GCSE
SCIENCE A (4461)/CHEMISTRY (4421)
Objective Test Answer Key
CHY1BP (Oils, Earth and Atmosphere)
March 2010
Foundation Tier

Question	*Key*		
One	**A**	oxygen	**1**
	B	nitrogen	**4**
	C	carbon dioxide	**2**
	D	helium	**3**
Two	**A**	E150	**1**
	B	E210	**4**
	C	E300	**3**
	D	E450	**2**
Three	**A**	Maize	**3**
	B	Sunflower	**2**
	C	Coconut	**4**
	D	Algae	**1**
Four	**A**	Kevlar	**3**
	B	Acrylic	**1**
	C	66 Nylon	**2**
	D	Polyester	**4**
Five	**A**	The modified oil solidifies and additives are mixed in	**4**
	B	Soybean oil is used as biofuel in vehicles	**3**
	C	Soybean oil separates from the water	**2**
	D	Mixture of soybean seeds and water is pressed	**1**

	A	**B**	**C**	**D**
Six	**2**	**2**	**2**	**4**
Seven	**2**	**1**	**3**	**4**
Eight	**3**	**2**	**1**	**1**
Nine	**4**	**4**	**2**	**3**

GCSE
SCIENCE A (4461)/CHEMISTRY (4421)
Objective Test Answer Key
CHY1BP (Oils, Earth and Atmosphere)
March 2010
Higher Tier

Question	*Key*		
One	**A**	The modified oil solidifies and additives are mixed in	**4**
	B	Soybean oil is used as biofuel in vehicles	**3**
	C	Soybean oil separates from the water	**2**
	D	Mixture of soybean seeds and water is pressed	**1**
Two	**A**	Ethane	**1**
	B	Ethene	**2**
	C	Ethanol	**4**
	D	Hydrogen	**3**

	A	**B**	**C**	**D**
Three	**3**	**2**	**1**	**1**
Four	**4**	**4**	**2**	**3**
Five	**2**	**3**	**3**	**2**
Six	**2**	**1**	**4**	**3**
Seven	**3**	**3**	**2**	**1**
Eight	**2**	**1**	**2**	**1**
Nine	**3**	**2**	**2**	**2**

AQA

Unit : CHY1BP **CHEMISTRY UNIT 1B**

Centre :

Candidate Number : **UCI :**

Candidate Name :

Series : 3G10

03-MAR-10

For completion by the Examination Invigilator. **Please fill this circle if the candidate is absent:** ○

HIGHER TIER

Instructions on how to complete this answer sheet are given on the question paper. Please make sure you follow them carefully.

Questions **ONE** to **NINE** Choose one response **1 - 4** for each of the parts **A - D**

QUESTION ONE		1	2	3	4
1A	The modified oil solidifies and additives are mixed in	○	○	○	○
1B	Soybean oil is used as biofuel in vehicles	○	○	○	○
1C	Soybean oil separates from the water	○	○	○	○
1D	Mixture of soybean seeds and water is pressed	○	○	○	○

QUESTION TWO		1	2	3	4
2A	Ethane	○	○	○	○
2B	Ethene	○	○	○	○
2C	Ethanol	○	○	○	○
2D	Hydrogen	○	○	○	○

QUESTION THREE	1	2	3	4
3A	○	○	○	○
3B	○	○	○	○
3C	○	○	○	○
3D	○	○	○	○

QUESTION FOUR	1	2	3	4
4A	○	○	○	○
4B	○	○	○	○
4C	○	○	○	○
4D	○	○	○	○

QUESTION FIVE	1	2	3	4
5A	○	○	○	○
5B	○	○	○	○
5C	○	○	○	○
5D	○	○	○	○

QUESTION SIX	1	2	3	4
6A	○	○	○	○
6B	○	○	○	○
6C	○	○	○	○
6D	○	○	○	○

QUESTION SEVEN	1	2	3	4
7A	○	○	○	○
7B	○	○	○	○
7C	○	○	○	○
7D	○	○	○	○

QUESTION EIGHT	1	2	3	4
8A	○	○	○	○
8B	○	○	○	○
8C	○	○	○	○
8D	○	○	○	○

QUESTION NINE	1	2	3	4
9A	○	○	○	○
9B	○	○	○	○
9C	○	○	○	○
9D	○	○	○	○

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FOUNDATION TIER

Instructions on how to complete this answer sheet are given on the question paper. Please make sure you follow them carefully.

Questions **ONE** to **NINE** Choose one response **1 - 4** for each of the parts **A - D**

QUESTION ONE	1	2	3	4
1A oxygen	○	○	○	○
1B nitrogen	○	○	○	○
1C carbon dioxide	○	○	○	○
1D helium	○	○	○	○

QUESTION TWO	1	2	3	4
2A E150	○	○	○	○
2B E210	○	○	○	○
2C E300	○	○	○	○
2D E450	○	○	○	○

QUESTION THREE	1	2	3	4
3A Maize	○	○	○	○
3B Sunflower	○	○	○	○
3C Coconut	○	○	○	○
3D Algae	○	○	○	○

QUESTION FOUR	1	2	3	4
4A Kevlar	○	○	○	○
4B Acrylic	○	○	○	○
4C 66 Nylon	○	○	○	○
4D Polyester	○	○	○	○

QUESTION FIVE	1	2	3	4
5A The modified oil solidifies and additives are mixed in	○	○	○	○
5B Soybean oil is used as biofuel in vehicles	○	○	○	○
5C Soybean oil separates from the water	○	○	○	○
5D Mixture of soybean seeds and water is pressed	○	○	○	○

QUESTION SIX	1	2	3	4
6A	○	○	○	○
6B	○	○	○	○
6C	○	○	○	○
6D	○	○	○	○

QUESTION SEVEN	1	2	3	4
7A	○	○	○	○
7B	○	○	○	○
7C	○	○	○	○
7D	○	○	○	○

QUESTION EIGHT	1	2	3	4
8A	○	○	○	○
8B	○	○	○	○
8C	○	○	○	○
8D	○	○	○	○

QUESTION NINE	1	2	3	4
9A	○	○	○	○
9B	○	○	○	○
9C	○	○	○	○
9D	○	○	○	○

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Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

General Certificate of Secondary Education
Foundation Tier and Higher Tier
November 2009

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

Chemistry
Unit Chemistry C1b (Oils, Earth and Atmosphere)

CHY1BP

F&H

Thursday 19 November 2009 Morning Session

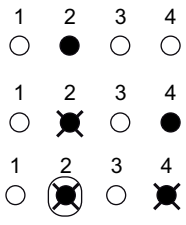
For this paper you must have:
- a black ball-point pen
- an objective test answer sheet.

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 '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.

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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 **FIVE**.

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 table shows some information about four types of vegetable oil, **A**, **B**, **C** and **D**.

	Fat content as a percentage (%) of the vegetable oil			
Vegetable oil	**Saturated fat**	**Monounsaturated fat**	**Polyunsaturated fat**	**Melting point in °C**
A	14	9	77	–12
B	52	36	12	35
C	12	24	64	5
D	13	67	20	–18

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

1	It contains the lowest percentage (%) of monounsaturated fat.
2	It has the lowest melting point.
3	It has the highest melting point.
4	It contains the highest percentage (%) of unsaturated fat.

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QUESTION TWO

This question is about some of the gases in the Earth's atmosphere.

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

A oxygen

B nitrogen

C carbon dioxide

D helium

The most abundant gas in the Earth's atmosphere is . . . **1** . . . .

The gas used to fill party balloons because it is less dense than air is . . . **2** . . . .

The burning of fossil fuels uses . . . **3** . . . gas from the air, and releases . . . **4** . . . gas into the air.

Turn over for the next question

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QUESTION THREE

The table gives some information about layers of the Earth.

	Name of layer	Thickness in km	Volume as a percentage (%) of the Earth's volume	Density in g per cm^3
A	Crust	5 – 65	1.5	2.7–3.0
B	Mantle	2835	82.3	3.3 – 5.8
C	Outer core	2250	15.4	9.4 – 12.3
D	Inner core	1220	0.8	13.0 – 13.5

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

1	It is the thickest layer.
2	It is the layer with the smallest volume.
3	It is the layer that has the largest range of density.
4	It is the solid layer made up of tectonic plates.

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QUESTION FOUR

The main ingredients in salad cream are water, vegetable oil, egg and vinegar.

Salad cream also contains food additives.

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

A a preservative

B a colouring

C an emulsifier

D a vegetable oil

The ingredient that provides the most energy is . . . **1** . . . .

The ingredient that keeps the water and vegetable oils mixed together is . . . **2** . . . .

Potassium sorbate is an additive to increase the shelf-life. It is . . . **3** . . . .

E160 is an additive to improve the appearance. It is . . . **4** . . . .

QUESTION FIVE

This question is about extracting lavender oil from lavender plants.

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

A condenses

B boils

C evaporates

D floats

The crushed lavender plants are mixed with water in a distillation flask and heated until the mixture . . . **1** . . . .

The lavender oil and some water . . . **2** . . . .

The vapour is allowed to cool and it . . . **3** . . . .

The lavender oil rises to the surface of the water where it . . . **4** . . . .
The lavender oil is separated from the water and collected.

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SECTION TWO

Questions **SIX** to **NINE**.

Each of these questions has four parts.

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

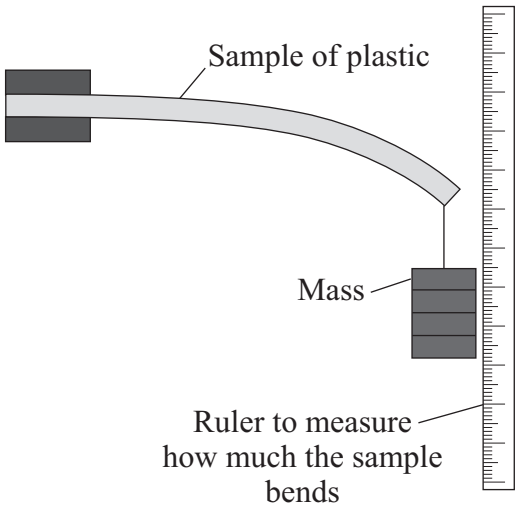
Mark your choices on the answer sheet.

QUESTION SIX

A student used the apparatus shown in the diagram to measure the flexibility of a strip of plastic with a thickness of 5 mm.

The student did the test again using the same piece of plastic and recorded the results of both tests.

He carried out identical tests using three more strips of the same plastic but each with a different thickness. All four strips were the same length.



The results are shown in the table.

	How much the plastic strip bends downwards in mm	
Plastic thickness in mm	**Test 1**	**Test 2**
5	27	25
10	18	20
15	12	8
20	8	7

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6A The plastic that provides the most unreliable pair of results is that with the thickness of . . .

1 5 mm.

2 10 mm.

3 15 mm.

4 20 mm.

6B Which one of the following is controlled to ensure that it is a fair test?

1 the mass added

2 the thickness of the plastic strip

3 the width of the ruler

4 the distance the plastic bends

6C To improve the reliability of the results, you can . . .

1 use different lengths of plastic.

2 use a larger range of plastic thicknesses.

3 ask another student to repeat the tests.

4 do the tests at a higher temperature.

6D Which one of the following correctly describes the relationship in the results?

1 As the thickness increases, the flexibility decreases.

2 The thickness does **not** affect the flexibility.

3 The flexibility is proportional to the mass added.

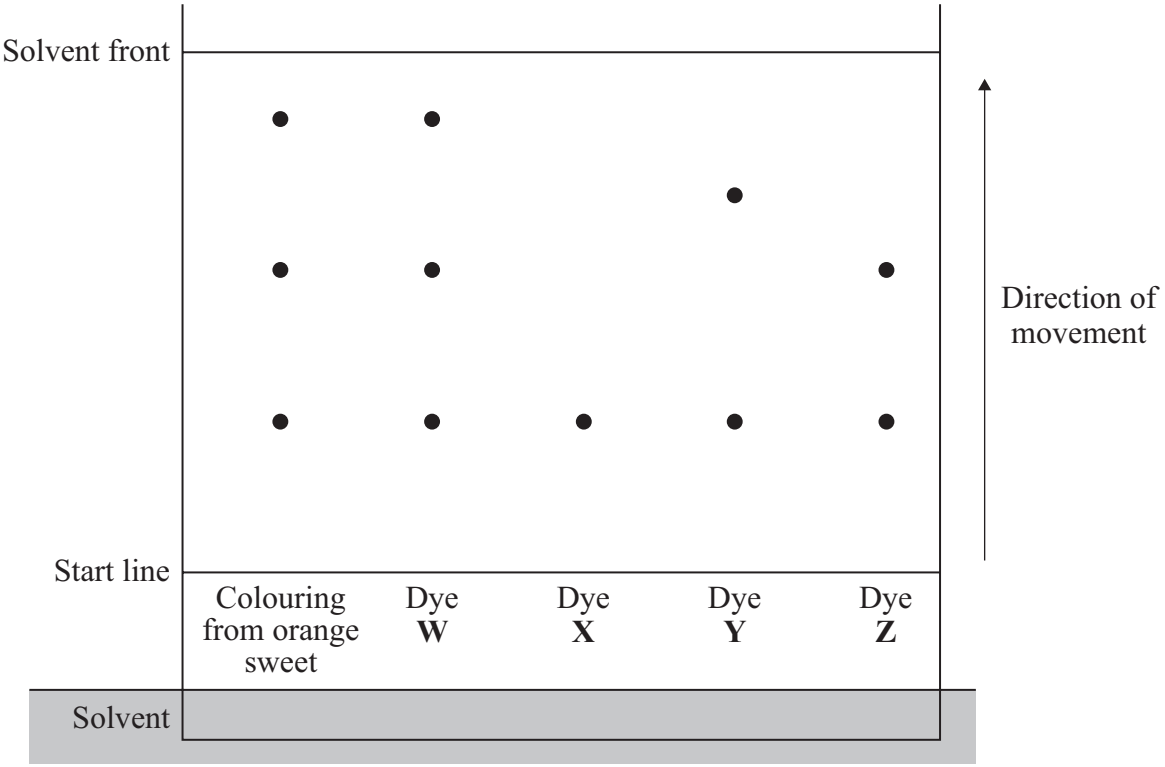
4 The longer the plastic, the less it bends.

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QUESTION SEVEN

A chromatogram of an orange colouring from a sweet was made and this was compared with various orange dyes, **W**, **X**, **Y** and **Z**.

The results are shown below.



7A Which dye contains the most colours?

1 dye **W**

2 dye **X**

3 dye **Y**

4 dye **Z**

7B Which statement about the orange colouring in the sweet could be true?

1 It contains dyes **W** and **Z** only.

2 It contains dyes **X** and **Z** only.

3 It contains dyes **Y** and **Z** only.

4 It contains dye **Z** only.

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7C Dye **Z** was found to cause an allergic reaction in some people.

What should the orange sweet manufacturer do?

1 replace dye **Z** with dye **Y**

2 reduce the amount of dye **Z** in the sweets

3 stop the sale of these orange sweets

4 use only dye **W**

7D Which of these statements are reasons for putting additives into food?

Statement **K** – Increase the shelf-life of the food
Statement **L** – Improve the taste of the food
Statement **M** – Raise the cost of the food

1 **L** only

2 **K** and **L**

3 **K** and **M**

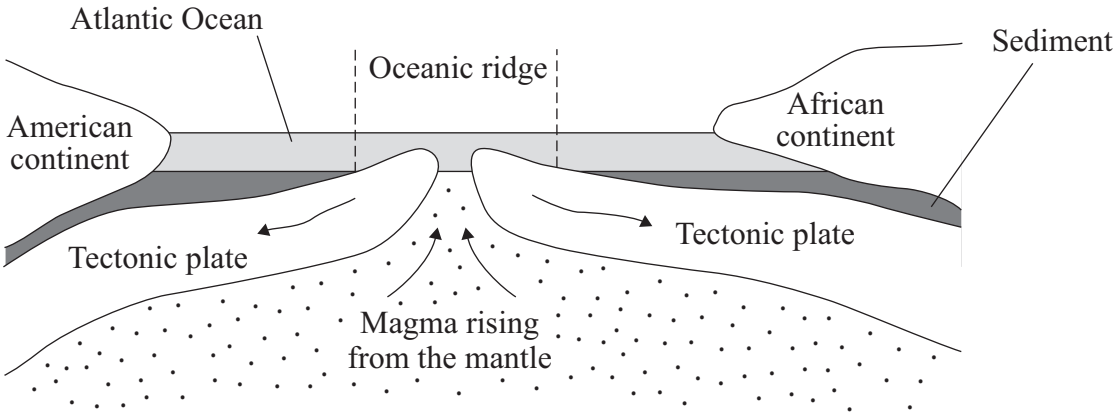
4 **K**, **L** and **M**

Turn over for the next question

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QUESTION EIGHT

The diagram shows a section across the Atlantic Ocean.



The oceanic ridge has formed at the boundary between two tectonic plates which are moving apart.

8A What causes the tectonic plates to move apart?

1 strong ocean currents

2 convection currents

3 tidal waves

4 the weight of the sediments

8B There are volcanic islands in several places in the mid-Atlantic Ocean.

They have probably formed there because . . .

1 magma has erupted until it is above sea level.

2 sediments have piled up along the oceanic ridge.

3 the tides have washed up a shell bank.

4 there is debris from oil drilling.

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8C Sudden movements of tectonic plates can cause . . .

1 earthquakes.

2 continents to collide.

3 the Earth to shrink.

4 the Earth to cool down.

8D The discovery of tectonic plates brought greater acceptance of the theory that . . .

1 the Earth is cooling down.

2 the temperature of the atmosphere is rising.

3 continents can move.

4 the Earth is shrinking.

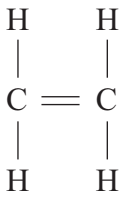
Turn over for the next question

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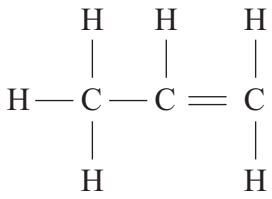
QUESTION NINE

The diagram shows three compounds.

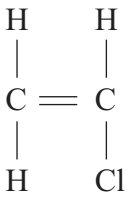
Compound W



Compound X



Compound Y



9A Which of the compounds are hydrocarbons?

1 **W** and **X**

2 **W** and **Y**

3 **X** and **Y**

4 **W**, **X** and **Y**

9B Which row in the table correctly describes the bonding in Compound **X**?

	Number of bonds to each carbon atom	**Number of bonds to each hydrogen atom**
1	1	1
2	1	4
3	4	1
4	4	4

9C All three compounds can form polymers because . . .

1 they have saturated molecules.

2 their molecules contain two or more carbon atoms.

3 their molecules have a double carbon carbon bond.

4 they have small molecules.

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9D Disposal of polymer waste can be a problem.

The main reason that it causes problems in a landfill site is that . . .

1 it is very light.

2 it is not easily broken down by microorganisms.

3 it is difficult to bury.

4 it burns easily, releasing toxic gases.

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.

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 extracting lavender oil from lavender plants.

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

A condenses

B boils

C evaporates

D floats

The crushed lavender plants are mixed with water in a distillation flask and heated until the mixture . . . **1** . . . .

The lavender oil and some water . . . **2** . . . .

The vapour is allowed to cool and it . . . **3** . . . .

The lavender oil rises to the surface of the water where it . . . **4** . . . .
The lavender oil is separated from the water and collected.

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QUESTION TWO

The equation shows a chemical reaction.

$$\underset{\text{Substance } \mathbf{K}}{C_{10}H_{22}} \longrightarrow \underset{\text{Substance } \mathbf{L}}{C_8H_{18}} + \underset{\text{Substance } \mathbf{M}}{C_2H_4}$$

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

A polymerisation

B thermal decomposition

C unsaturation

D hydration

Substances **L** and **M** are obtained from substance **K** by . . . **1** . . . .

Iodine or bromine can be used to test the products for . . . **2** . . . .

Ethanol can be made from substance **M** by . . . **3** . . . .

Molecules of substance **M** can be joined together into long chains by . . . **4** . . . .

Turn over for the next question

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SECTION TWO

Questions **THREE** to **NINE**.

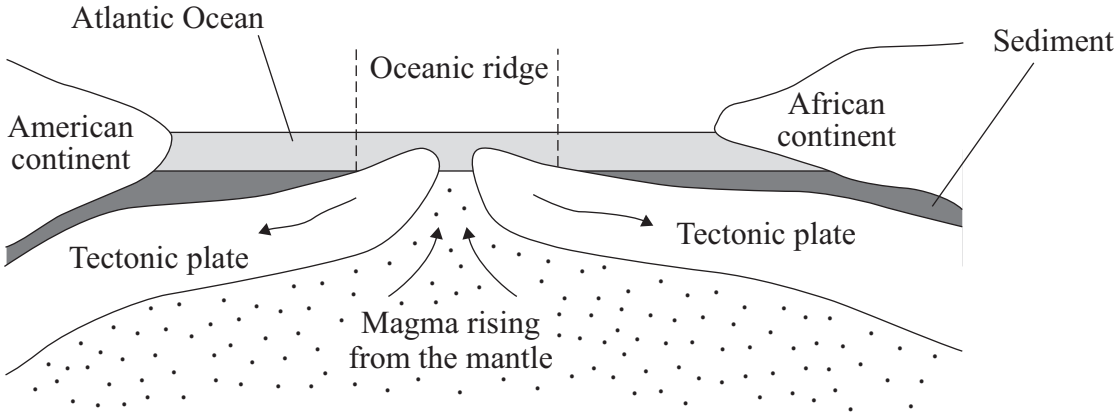
Each of these questions has four parts.

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

Mark your choices on the answer sheet.

QUESTION THREE

The diagram shows a section across the Atlantic Ocean.



The oceanic ridge has formed at the boundary between two tectonic plates which are moving apart.

3A What causes the tectonic plates to move apart?

1 strong ocean currents

2 convection currents

3 tidal waves

4 the weight of the sediments

3B There are volcanic islands in several places in the mid-Atlantic Ocean.

They have probably formed there because . . .

1 magma has erupted until it is above sea level.

2 sediments have piled up along the oceanic ridge.

3 the tides have washed up a shell bank.

4 there is debris from oil drilling.

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3C Sudden movements of tectonic plates can cause . . .

1 earthquakes.

2 continents to collide.

3 the Earth to shrink.

4 the Earth to cool down.

3D The discovery of tectonic plates brought greater acceptance of the theory that . . .

1 the Earth is cooling down.

2 the temperature of the atmosphere is rising.

3 continents can move.

4 the Earth is shrinking.

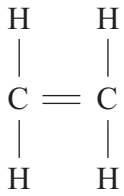
Turn over for the next question

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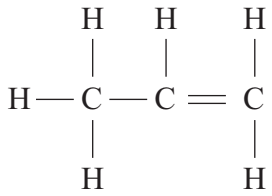
QUESTION FOUR

The diagram shows three compounds.

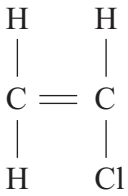
Compound W



Compound X



Compound Y



4A Which of the compounds are hydrocarbons?

1 **W** and **X**

2 **W** and **Y**

3 **X** and **Y**

4 **W**, **X** and **Y**

4B Which row in the table correctly describes the bonding in Compound **X**?

	Number of bonds to each carbon atom	**Number of bonds to each hydrogen atom**
1	1	1
2	1	4
3	4	1
4	4	4

4C All three compounds can form polymers because . . .

1 they have saturated molecules.

2 their molecules contain two or more carbon atoms.

3 their molecules have a double carbon carbon bond.

4 they have small molecules.

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4D Disposal of polymer waste can be a problem.

The main reason that it causes problems in a landfill site is that . . .

1 it is very light.

2 it is not easily broken down by microorganisms.

3 it is difficult to bury.

4 it burns easily, releasing toxic gases.

Turn over for the next question

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QUESTION FIVE

AQA-Dri is a material with a polymer coating. The polymer called poly(tetrafluoroethene) is produced from the monomer tetrafluoroethene, C_2F_4. AQA-Dri is useful for making outdoor clothing because it prevents rain droplets from passing through the pores of the material, but allows water vapour formed during sweating to escape.

5A Which of the following statements explains the useful properties of AQA-Dri?

1 The pores in AQA-Dri are smaller than the molecules in sweat.

2 Water molecules are small enough to pass through AQA-Dri.

3 The pores in AQA-Dri are smaller than water molecules.

4 Water droplets are smaller than the pores in AQA-Dri.

5B Old documents become dry and brittle. AQA-Dri is used to help to flatten old documents, rather than wetting them with a fine water sprayer.

This is because . . .

1 AQA-Dri will let the documents absorb water more quickly.

2 water droplets will not moisten the documents enough to let them flatten.

3 water sprayers make the documents too wet, so they become even more fragile.

4 water sprayers are a low technology, out-of-date solution to the problem.

5C In the 1950s, the inventors of AQA-Dri intended to use poly(tetrafluoroethene) as an electrical insulator. Today, it has many uses.

This is because . . .

1 scientists are constantly discovering new electrical insulators.

2 chemical companies are always trying to find new applications for their products.

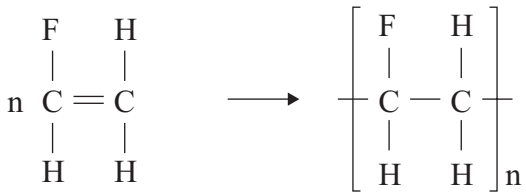
3 chemical companies are trying to find alternative ways of waterproofing fabrics.

4 scientists stop testing the properties of materials once they are discovered.

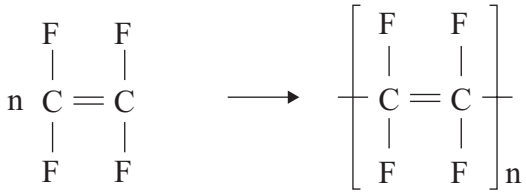
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5D Which of the following is the correct equation for the formation of poly(tetrafluoroethene) from tetrafluoroethene?

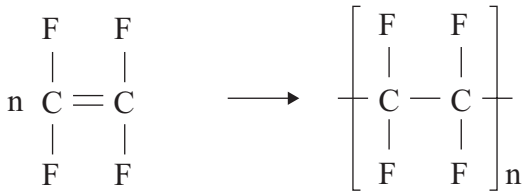
1



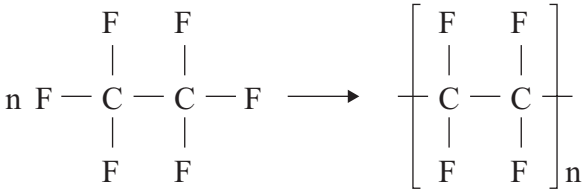
2



3



4



Turn over for the next question

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QUESTION SIX

This question is about heating oil fractions.

$C_{20}H_{42}$ is found in one of the oil fractions. On heating, it can break down as shown in the equation:

$$C_{20}H_{42} \rightarrow C_8H_{16} + 2\mathbf{X} + \mathbf{Y}$$

6A Which row in the table correctly identifies **X** and **Y** in the equation?

	X	**Y**
1	C_2H_4	C_8H_{14}
2	C_3H_6	C_6H_{14}
3	C_4H_8	C_3H_8
4	C_5H_{10}	CH_4

6B From the information in the table, substance **X** is . . .

1 a saturated hydrocarbon.

2 an alkane.

3 an alkene.

4 a polymer.

6C In the reaction shown in the equation, which of the following is occurring?

1 Polymer chains are being cracked.

2 Only alkenes are produced.

3 Long-chain hydrocarbons are being emulsified.

4 Long-chain hydrocarbons are being changed into alkane fuels and alkenes.

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6D The process of heating certain oil fractions is carried out continuously night and day because . . .

1 this will provide more work for local people.

2 there is more demand for products at night.

3 extra fuel would be used if the process was restarted every day.

4 this will help to dispose of unwanted oil fractions.

Turn over for the next question

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QUESTION SEVEN

Usually, the lower the melting point of a fat, the more unsaturated it is.

A student measured the melting points of four fats so that he could later compare the amount of unsaturation.

He used four boiling tubes, each half-filled with a different fat. A thermometer was used to measure the melting point of each fat.

The student repeated the measurement of the melting point for each fat either once or twice.

Fat	Melting point in °C		
	Attempt 1	Attempt 2	Attempt 3
Coconut	25	26	
Lard	33	33	
Frying fat	41	49	42
Pastry fat	46	44	

7A Which statement is correct about the way he carried out the test?

1 It was **not** a fair test because he did not repeat each measurement the same number of times.

2 It was a fair test because everything used except the fat, was the same.

3 It was **not** a fair test because he used different fats.

4 It was a fair test because they were all fats.

7B What is the mean value that the student should use for the melting point of frying fat?

1 41.5 °C

2 43.0 °C

3 44.5 °C

4 45.0 °C

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7C If it is true that the lower the melting point of a fat, the more unsaturated it is, then . . .

1 coconut fat should react with the most bromine in a fair test.

2 pastry fat should react with the most bromine in a fair test.

3 coconut fat should contain the highest number of carbon carbon single bonds.

4 pastry fat should contain the highest number of carbon carbon double bonds.

7D Which row in the table shows the conditions that would be required to harden the coconut oil?

	React with	**Temperature in °C**	**Catalyst**
1	oxygen	60	nickel
2	hydrogen	60	nickel
3	hydrogen	100	iron
4	oxygen	100	iron

Turn over for the next question

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QUESTION EIGHT

This question is about ethanol. Some ethanol is used as a fuel to replace petrol.

The table compares two different industrial processes for making ethanol.

Process	Raw material	Type of process	Purity of product	Rate of ethanol production
Fermentation using yeast	Sugar	Batch – one tank of sugar solution is fermented at a time	Dilute solution of ethanol	Slow
Hydration using steam	Ethene	Continuous – ethene and steam flow steadily into the reaction vessel and ethanol flows steadily out	Almost pure ethanol	Fast

8A Ethene is obtained from the hydrocarbons in crude oil by . . .

1 thermal decomposition.

2 hydration.

3 fractional distillation.

4 polymerisation.

8B In some countries, very little ethanol for fuel is produced by fermentation because . . .

1 ethene is obtained from a non-renewable resource.

2 they have a hot climate suitable for growing sugar cane.

3 they are wealthy enough to import oil from abroad.

4 the ethanol from fermentation produces more carbon dioxide when burnt.

8C Which of the following is **not** a reason why an ethanol factory using sugar takes longer to produce ethanol than a factory using ethene?

1 A fermentation tank has to be emptied and cleaned after each batch.

2 After fermentation, the ethanol needs to be separated from water.

3 Sugar cane plants take a long time to grow.

4 Yeast takes several days to convert sugar into ethanol.

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8D Who would benefit economically if ethanol was made by hydration of ethene rather than by fermentation?

1 investors in the fermentation industry

2 oil companies

3 environmental pressure groups

4 sugar cane farmers

Turn over for the next question

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QUESTION NINE

Some scientists think that the Earth's early atmosphere was mainly carbon dioxide, water vapour and nitrogen, with no oxygen.

Some scientists think that the early atmosphere also contained carbon monoxide, hydrogen, methane and ammonia.

Other scientists think that the atmosphere has always contained some oxygen.

Evidence comes from geological records starting over 4 billion years ago, the composition of gases from volcanoes, observations of conditions on other planets, and the composition of the atmosphere today.

The table shows some information about the atmospheres of the planets, Venus, Earth and Mars today.

	Venus	**Earth**	**Mars**
Carbon dioxide, % by mass	98.0	0.036	95.0
Oxygen, % by mass	0.0	21.0	0.25
Nitrogen, % by mass	2.0	78.0	2.4
Water vapour, % by mass	0.05	0.20	0.10
Mass of atmosphere in tonnes	5.2×10^{17}	5.2×10^{15}	2.4×10^{10}

9A Scientists do **not** agree about the Earth's early atmosphere because . . .

1 there is too much evidence available.

2 the information can be interpreted in different ways.

3 the data is inaccurate.

4 geological records do not go back far enough.

9B Which of the following supports the idea that there was oxygen in the Earth's early atmosphere?

1 Calcium sulfate ($CaSO_4$) is found in rocks formed 3.5 billion years ago.

2 Many of the oldest rocks contain iron sulfide, FeS.

3 The atmosphere now contains more than 20% oxygen.

4 Some of the gases in the early atmosphere came from volcanoes.

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9C Which one of these is an **incorrect** reason for the small percentage of carbon dioxide in the Earth's atmosphere today?

1 Some carbon dioxide has dissolved in the oceans.

2 Carbon dioxide has been used in chemical reactions to form sedimentary rocks.

3 Some carbon dioxide has been locked up in fossil fuels.

4 There has always been only a small amount of carbon dioxide in the atmosphere.

9D Which one of the following statements is true?

1 Venus has the smallest mass of water vapour in its atmosphere.

2 Earth has a greater mass of water vapour in its atmosphere than Venus or Mars.

3 Venus has a greater mass of nitrogen in its atmosphere than Earth or Mars.

4 Mars has a greater mass of carbon dioxide in its atmosphere than the Earth.

END OF TEST

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Version 1:0: 21/11/09

ASSESSMENT and QUALIFICATIONS ALLIANCE

GCSE

Science A (4461)

Specification A

CHY1BP, CH1BSF & CH1BSH

Mark Scheme

2009 Examination – November Series

The blank answer sheet for this component can be found at the end of this document.

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This component is an objective test for which the following list indicates the correct answers used in marking the candidates' responses.

Further copies of this Mark Scheme are available to download from the AQA Website: www.aqa.org.uk

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GCSE
SCIENCE A (4461)/CHEMISTRY (4421)
Objective Test Answer Key
CHY1BP (Oils, Earth and Atmosphere)
November 2009
Foundation Tier

Question	Key		
One	**A**	Vegetable oil **A**	**1**
	B	Vegetable oil **B**	**3**
	C	Vegetable oil **C**	**4**
	D	Vegetable oil **D**	**2**
Two	**A**	oxygen	**3**
	B	nitrogen	**1**
	C	carbon dioxide	**4**
	D	helium	**2**
Three	**A**	Crust	**4**
	B	Mantle	**1**
	C	Outer core	**3**
	D	Inner core	**2**
Four	**A**	a preservative	**3**
	B	a colouring	**4**
	C	an emulsifier	**2**
	D	a vegetable oil	**1**
Five	**A**	condenses	**3**
	B	boils	**1**
	C	evaporates	**2**
	D	floats	**4**

	A	B	C	D
Six	**3**	**1**	**3**	**1**
Seven	**1**	**1**	**3**	**2**
Eight	**2**	**1**	**1**	**3**
Nine	**1**	**3**	**3**	**2**

GCSE
SCIENCE A (4461)/CHEMISTRY (4421)
Objective Test Answer Key
CHY1BP (Oils, Earth and Atmosphere)
November 2009
Higher Tier

Question	Key		
One	**A**	condenses	**3**
	B	boils	**1**
	C	evaporates	**2**
	D	floats	**4**
Two	**A**	polymerisation	**4**
	B	thermal decomposition	**1**
	C	unsaturation	**2**
	D	hydration	**3**

	A	B	C	D
Three	**2**	**1**	**1**	**3**
Four	**1**	**3**	**3**	**2**
Five	**2**	**3**	**2**	**3**
Six	**2**	**3**	**4**	**3**
Seven	**2**	**1**	**1**	**2**
Eight	**1**	**3**	**3**	**2**
Nine	**2**	**1**	**4**	**3**

OTQ3

GCSE SCIENCE

AQA

Unit : CHY1BP **CHEMISTRY UNIT 1B**

Centre :

Candidate Number : **UCI :**

Candidate Name :

Series : BG09

19-NOV-09

For completion by the Examination Invigilator. **Please fill this circle if the candidate is absent:** ○

HIGHER TIER

Instructions on how to complete this answer sheet are given on the question paper. Please make sure you follow them carefully.

Questions **ONE** to **NINE** Choose one response **1 - 4** for each of the parts **A - D**

QUESTION ONE		1	2	3	4
1A	condenses	○	○	○	○
1B	boils	○	○	○	○
1C	evaporates	○	○	○	○
1D	floats	○	○	○	○

QUESTION TWO		1	2	3	4
2A	polymerisation	○	○	○	○
2B	thermal decomposition	○	○	○	○
2C	unsaturation	○	○	○	○
2D	hydration	○	○	○	○

QUESTION THREE	1	2	3	4
3A	○	○	○	○
3B	○	○	○	○
3C	○	○	○	○
3D	○	○	○	○

QUESTION FOUR	1	2	3	4
4A	○	○	○	○
4B	○	○	○	○
4C	○	○	○	○
4D	○	○	○	○

QUESTION FIVE	1	2	3	4
5A	○	○	○	○
5B	○	○	○	○
5C	○	○	○	○
5D	○	○	○	○

QUESTION SIX	1	2	3	4
6A	○	○	○	○
6B	○	○	○	○
6C	○	○	○	○
6D	○	○	○	○

QUESTION SEVEN	1	2	3	4
7A	○	○	○	○
7B	○	○	○	○
7C	○	○	○	○
7D	○	○	○	○

QUESTION EIGHT	1	2	3	4
8A	○	○	○	○
8B	○	○	○	○
8C	○	○	○	○
8D	○	○	○	○

QUESTION NINE	1	2	3	4
9A	○	○	○	○
9B	○	○	○	○
9C	○	○	○	○
9D	○	○	○	○

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FOUNDATION TIER

Instructions on how to complete this answer sheet are given on the question paper. Please make sure you follow them carefully.

Questions **ONE** to **NINE** Choose one response **1 - 4** for each of the parts **A - D**

QUESTION ONE

		1	2	3	4
1A	Vegetable oil A	○	○	○	○
1B	Vegetable oil B	○	○	○	○
1C	Vegetable oil C	○	○	○	○
1D	Vegetable oil D	○	○	○	○

QUESTION TWO

		1	2	3	4
2A	oxygen	○	○	○	○
2B	nitrogen	○	○	○	○
2C	carbon dioxide	○	○	○	○
2D	helium	○	○	○	○

QUESTION THREE

		1	2	3	4
3A	Crust	○	○	○	○
3B	Mantle	○	○	○	○
3C	Outer core	○	○	○	○
3D	Inner core	○	○	○	○

QUESTION FOUR

		1	2	3	4
4A	a preservative	○	○	○	○
4B	a colouring	○	○	○	○
4C	an emulsifier	○	○	○	○
4D	a vegetable oil	○	○	○	○

QUESTION FIVE

		1	2	3	4
5A	condenses	○	○	○	○
5B	boils	○	○	○	○
5C	evaporates	○	○	○	○
5D	floats	○	○	○	○

QUESTION SIX

	1	2	3	4
6A	○	○	○	○
6B	○	○	○	○
6C	○	○	○	○
6D	○	○	○	○

QUESTION SEVEN

	1	2	3	4
7A	○	○	○	○
7B	○	○	○	○
7C	○	○	○	○
7D	○	○	○	○

QUESTION EIGHT

	1	2	3	4
8A	○	○	○	○
8B	○	○	○	○
8C	○	○	○	○
8D	○	○	○	○

QUESTION NINE

	1	2	3	4
9A	○	○	○	○
9B	○	○	○	○
9C	○	○	○	○
9D	○	○	○	○

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Surname		Other Names	
Centre Number			Candidate Number				
Candidate Signature								

General Certificate of Secondary Education
June 2009

SCIENCE A **CHY1BP**
Unit Chemistry C1b (Oils, Earth and Atmosphere)

CHEMISTRY
Unit Chemistry C1b (Oils, Earth and Atmosphere)

Monday 22 June 2009 Morning Session

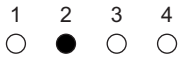
For this paper you must have:
- a black ball-point pen
- an objective test answer sheet.

You may use a calculator.

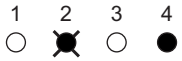
Time allowed: 30 minutes

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 '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.

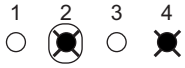
Instructions for recording answers
- Use a **black ball-point pen**.
- For each answer **completely fill in the circle** as shown:



- 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 **FIVE**.

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

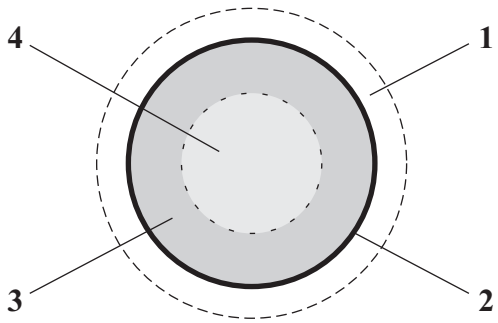
Use **each** answer only **once**.

Mark your choices on the answer sheet.

QUESTION ONE

The diagram shows the layered structure of the Earth.

The outer dotted line marks a layer that is above the Earth's surface.



Match words, **A**, **B**, **C** and **D**, with the labels **1–4** on the diagram.

A Atmosphere

B Core

C Crust

D Mantle

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QUESTION TWO

The table shows the properties of four polymers **A**, **B**, **C** and **D**.

	Polymer	Properties
A	PTFE	can withstand high temperatures and is non-stick
B	Nylon	strong, does not rot and can be pulled into fibres
C	Polystyrene	makes a very light, solid foam which is a good heat insulator
D	PET	strong, light, waterproof and can be recycled

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

	How the polymer could be used
1	to make disposable cups for hot drinks
2	to make the coating on frying pans
3	to make string and ropes
4	to make bottles for soft drinks

Turn over for the next question

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QUESTION THREE

The most abundant gases in the Earth's atmosphere are nitrogen and oxygen.

The table shows the next four most abundant gases, three of which are noble gases.

	Gas	Percentage (%) in atmosphere by volume	Boiling point in °C
1	Argon	0.930	–185
2	Carbon dioxide	0.030	–78
3	Neon	0.018	–246
4	Helium	0.005	–269

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

A It is the gas that is a compound.

B It is the most abundant of the noble gases.

C It is the noble gas with the lowest boiling point.

D There are 18 cm^3 of this gas in 100 litres of air.

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QUESTION FOUR

Castor oil is obtained by crushing and pressing the seeds from the castor oil plant. It has been used for thousands of years for a wide variety of purposes. Around 98.5 % of castor oil consists of unsaturated fats which are easily decomposed by natural organisms.

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

A can release a large quantity of energy

B is biodegradable

C is obtained from a vegetable source

D is unsaturated

Castor oil can be used effectively in oil lamps because it . . . **1** . . . .

Castor oil does **not** create long-term pollution problems because it . . . **2** . . . .

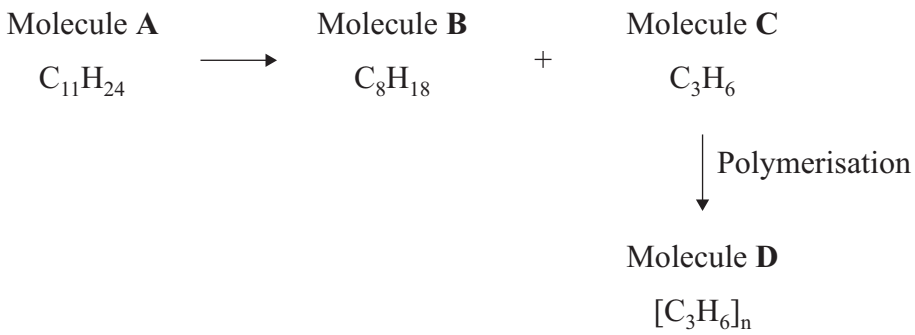
Castor oil supplies will **not** run out because it . . . **3** . . . .

Castor oil will remove some of the colour from an iodine solution because it . . . **4** . . . .

QUESTION FIVE

This question is about reactions of some hydrocarbon molecules.

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



The molecule that has been cracked is . . . **1** . . . .

The molecule that is an alkene is . . . **2** . . . .

The molecule that is a plastic is . . . **3** . . . .

The molecule that is the smallest alkane in these reactions is . . . **4** . . . .

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SECTION TWO

Questions **SIX** to **NINE**.

Each of these questions has four parts.

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

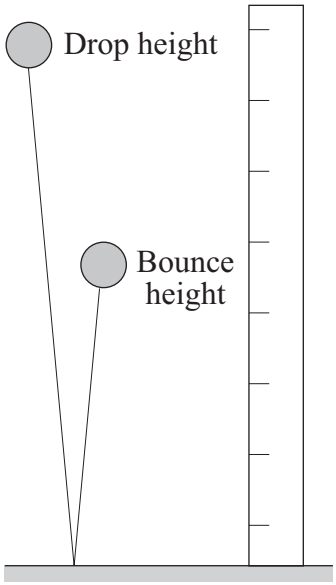
Mark your choices on the answer sheet.

QUESTION SIX

A student tested two balls; one ball was made from natural rubber and the other from a new polymer.

The student dropped the rubber ball from a measured height and recorded the height to which it bounced. The student did the experiment using different drop heights.

The student repeated the whole experiment using the polymer ball.



The results are shown in the table.

Drop height in cm	Rubber ball bounce height in cm	Polymer ball bounce height in cm
20	14	18
40	28	36
60	42	54
80	67	71
100	70	90

6A To improve the reliability of the results, the student could have . . .

1 repeated the test with balls made of different polymers.

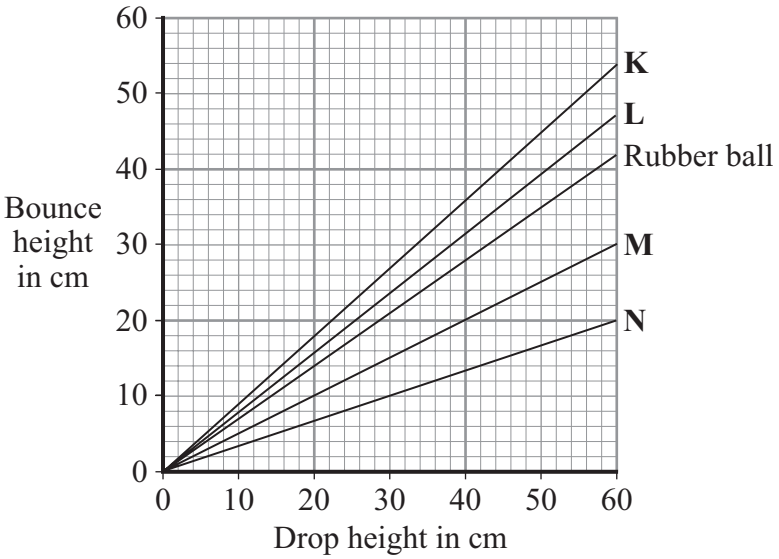
2 repeated the experiment for each drop height several times.

3 used a longer measuring instrument.

4 dropped the ball onto a harder surface.

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6B Which of the lines, **K**, **L**, **M** or **N**, on the graph, represents the polymer ball?



1 **K**

2 **L**

3 **M**

4 **N**

6C Which one of the following values **in the table** for the bounce height is clearly anomalous?

1 28 cm for the rubber ball

2 67 cm for the rubber ball

3 36 cm for the polymer ball

4 71 cm for the polymer ball

6D The results show that for each drop height . . .

1 the rubber ball will bounce higher than the polymer ball.

2 the polymer ball will bounce higher than the rubber ball.

3 the rubber ball will bounce higher as it warms up.

4 the rubber ball becomes less bouncy the more it is used.

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QUESTION SEVEN

A manufacturer of sugar-coated sweets stopped using the colour blue. This was because of concerns about the effect of artificial colours on children's health.

They replaced the blue colour with another dye extracted from plants.

7A The sweets are now labelled as 'free of all artificial colours and flavours'.

What information does this give the consumer?

1 Scientists have shown that the sweets are free of health risks.

2 It has been found that the sweets can be stored for a long time.

3 Naturally occurring chemicals have been used to make the sweets.

4 There has been no cruelty to animals in experiments to make the sweets.

7B Some of the ingredients in the sweets have an *E-number*.

What does this mean?

1 They are permitted additives.

2 They are natural ingredients.

3 They have been made from an emulsion.

4 They are eco-friendly.

7C Chromatography can be used to identify coloured ingredients.

Which statement about chromatography is true?

1 Chromatography works on any soluble colouring.

2 Chromatography works only on natural colouring.

3 Chromatography works only on artificial colouring.

4 Chromatography works on any insoluble colouring.

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7D What should scientists do to help to reduce the risks from food additives?

1 remove food containing additives from supermarkets

2 investigate the links between additives and health problems

3 advise food manufacturers about clear labelling

4 explain to people the risks of eating sugar-coated sweets

Turn over for the next question

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QUESTION EIGHT

This question is about vegetable oils.

8A When food is cooked, it is heated up and chemical changes take place in the food. Food that is cooked in vegetable oil (fried) is completely different from food cooked in water (boiled). Food cooked in oil reaches a much higher temperature than food cooked in water.

This is because . . .

1 water has a higher melting point than vegetable oil.

2 vegetable oil has a higher melting point than water.

3 water has a higher boiling point than vegetable oil.

4 vegetable oil has a higher boiling point than water.

8B Many vegetable oils contain unsaturated compounds.

This means that . . .

1 they do **not** dissolve in water.

2 they contain double carbon carbon bonds.

3 they react with an emulsifier.

4 they are hydrocarbons.

8C The amount of unsaturation in a vegetable oil is found by measuring . . .

1 how much steam it reacts with.

2 how much hydrogen it reacts with.

3 how much iodine it reacts with.

4 how much nickel it reacts with.

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8D Biodiesel is a fuel made from vegetable oils.

Biodiesel is almost ‘carbon neutral’.

This is because . . .

1 it is a renewable energy source.

2 it will never run out.

3 carbon dioxide is absorbed by the plants from which vegetable oils are obtained.

4 the carbon dioxide produced when it burns is not acidic.

Turn over for the next question

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QUESTION NINE

Scientists used to believe that the Earth's core is cooling. They thought that this made the Earth shrink.
In 1915, Alfred Wegener suggested that the continents had once been joined together. Later, the continents split up and moved apart.
At first, scientists did not believe Wegener's theory. They only began to accept his theory with the discovery of new evidence.

9A How did the scientists who believed that the Earth's core is cooling explain the formation of mountains?

1 Mountains were formed by volcanic eruptions.

2 Large wrinkles in the Earth's crust formed the mountains.

3 Mountains were formed by huge tidal waves.

4 The least dense parts of the Earth's crust rose up above parts that were more dense.

9B Scientists now believe that . . .

1 the core is heated by global warming.

2 the core is heated by volcanic eruptions.

3 radioactive processes keep the core heated.

4 burning fossil fuels keeps the core heated.

9C What was the new evidence that persuaded many scientists to accept Wegener's theory?

1 The Earth's crust is cracked into a number of plates.

2 The Earth is almost spherical not square.

3 The Earth is made up of three layers.

4 The Earth's crust is much less dense than the mantle.

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9D Scientists now believe that mountain ranges are formed . . .

1 by earthquakes.

2 by rising liquid material from the core.

3 by magma pushing up the Earth's crust where it is very thin.

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

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.

HIGHER TIER

SECTION ONE

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

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

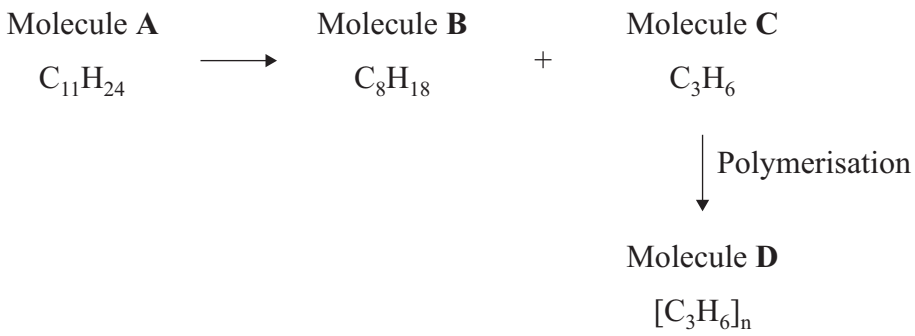
Use **each** answer only **once**.

Mark your choices on the answer sheet.

QUESTION ONE

This question is about reactions of some hydrocarbon molecules.

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



The molecule that has been cracked is . . . **1** . . . .

The molecule that is an alkene is . . . **2** . . . .

The molecule that is a plastic is . . . **3** . . . .

The molecule that is the smallest alkane in these reactions is . . . **4** . . . .

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QUESTION TWO

This question is about obtaining useful substances from crude oil fractions.

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

A polymerisation

B thermal decomposition

C unsaturation

D hydration (addition of water)

Alkenes can be made from oil fractions by . . . **1** . . . .

Bromine can be used to test for . . . **2** . . . in any alkenes formed.

Ethene formed from oil fractions can be made into ethanol by . . . **3** . . . .

Alkene molecules can be joined together into long-chain molecules in the process called . . . **4** . . . .

Turn over for the next question

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SECTION TWO

Questions **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

This question is about vegetable oils.

3A When food is cooked, it is heated up and chemical changes take place in the food. Food that is cooked in vegetable oil (fried) is completely different from food cooked in water (boiled). Food cooked in oil reaches a much higher temperature than food cooked in water.

This is because . . .

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3B Many vegetable oils contain unsaturated compounds.

This means that . . .

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3 they react with an emulsifier.

4 they are hydrocarbons.

3C The amount of unsaturation in a vegetable oil is found by measuring . . .

1 how much steam it reacts with.

2 how much hydrogen it reacts with.

3 how much iodine it reacts with.

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3D Biodiesel is a fuel made from vegetable oils.

Biodiesel is almost ‘carbon neutral’.

This is because . . .

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3 carbon dioxide is absorbed by the plants from which vegetable oils are obtained.

4 the carbon dioxide produced when it burns is not acidic.

Turn over for the next question

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QUESTION FOUR

Scientists used to believe that the Earth's core is cooling. They thought that this made the Earth shrink.
In 1915, Alfred Wegener suggested that the continents had once been joined together. Later, the continents split up and moved apart.
At first, scientists did not believe Wegener's theory. They only began to accept his theory with the discovery of new evidence.

4A How did the scientists who believed that the Earth's core is cooling explain the formation of mountains?

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4B Scientists now believe that . . .

1 the core is heated by global warming.

2 the core is heated by volcanic eruptions.

3 radioactive processes keep the core heated.

4 burning fossil fuels keeps the core heated.

4C What was the new evidence that persuaded many scientists to accept Wegener's theory?

1 The Earth's crust is cracked into a number of plates.

2 The Earth is almost spherical not square.

3 The Earth is made up of three layers.

4 The Earth's crust is much less dense than the mantle.

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4D Scientists now believe that mountain ranges are formed . . .

1 by earthquakes.

2 by rising liquid material from the core.

3 by magma pushing up the Earth's crust where it is very thin.

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

Turn over for the next question

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QUESTION FIVE

Alkenes that have one or more hydrogen atoms replaced by fluorine can be polymerised to make thermosoftening polymers. Replacing hydrogen atoms with fluorine is a very expensive process.

Increasing the number of fluorine atoms in the polymers makes them very unreactive. Polymers with more fluorine atoms in their molecules are more resistant to heat damage. However, if they are subjected to intense heat, they can burn and release some very toxic fumes.

5A Which one of the following monomers would result in the least reactive polymer?

1 $CHF=CH_2$

2 CHF=CHF

3 $CH_2=CF_2$

4 $CF_2=CF_2$

5B The monomer CHF=CHF . . .

1 is saturated.

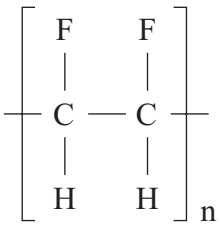
2 does **not** react with bromine.

3 reacts with hydrogen in the presence of a catalyst.

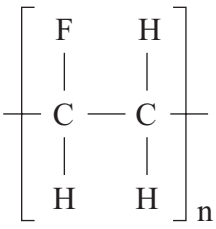
4 can be produced by cracking alkanes.

5C Which polymer would result from polymerisation of CHF=CHF?

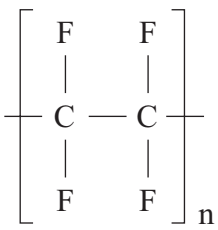
1



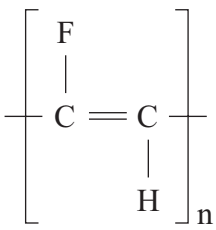
2



3



4



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5D Which statement would **not** apply to objects made from polymers containing a lot of fluorine?

1 They can be disposed of safely in an incinerator.

2 They are resistant to breakdown by microorganisms.

3 They are expensive to manufacture.

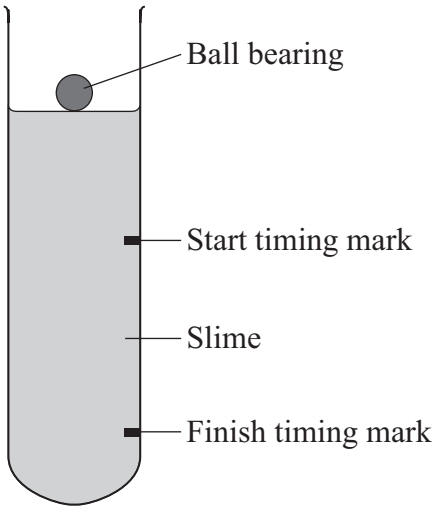
4 They can be used to make kitchen utensils.

Turn over for the next question

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QUESTION SIX

Some students made a slime by mixing a solution of PVA with a solution of borax.



They decided to investigate how the viscosity (thickness) of the slime depended on the amount of borax solution added to the PVA solution. They used various mixtures and timed how long a ball bearing took to fall between two timing marks, as shown in the diagram.
The same person took the time readings throughout the experiment. The temperature of the room did not change.

The students' results are shown in the table.

Volume of PVA solution in cm^3	Volume of borax solution in cm^3	Volume of water in cm^3	Time 1 in seconds	Time 2 in seconds	Time 3 in seconds	Average time in seconds
40	1	9	1.6	1.6	1.6	1.6
40	2	8	3.6	4.0	–	3.8
40	3	7	4.8	5.2	5.6	5.2
40	4	6	7.2	7.4	7.4	7.3
40	5	5	10.0	10.2	9.8	10.0
40	6	4	10.2	10.4	10.0	10.2
40	7	3	11.0	9.0	10.6	10.2
40	8	2	10.0	9.8	9.6	9.8
40	9	1	9.0	9.2	8.8	9.0
40	10	0	8.8	8.8	–	8.8

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6A Which row in the table shows the correct independent and dependent variables in this experiment?

	Independent variable	Dependent variable
1	Volume of PVA solution	Time for ball to drop between the marks
2	Time for ball to drop between the marks	Volume of borax solution
3	Volume of borax solution	Volume of PVA solution
4	Volume of borax solution	Time for ball to drop between the marks

6B In the experiment, one variable that is **not** controlled is . . .

1 the total volume of PVA, borax and water.

2 the person taking the time readings.

3 the temperature of the room.

4 the total volume of water.

6C Which of the following actions will **not** improve the reliability of the results?

1 Measuring the time taken three times instead of two for the tests with 2 cm^3 and 10 cm^3 of borax solution.

2 Using a timer able to read to 0.1 seconds instead of 0.2 seconds.

3 Repeating the set of readings for 7 cm^3 of borax solution.

4 Repeating the whole experiment on another day.

6D What is the **best** conclusion that can be made from the results?

1 There is a consistent error in the method of timing.

2 The viscosity of slime depends directly on the volume of borax solution.

3 There is **not** enough evidence to relate the volume of borax solution to the viscosity of slime.

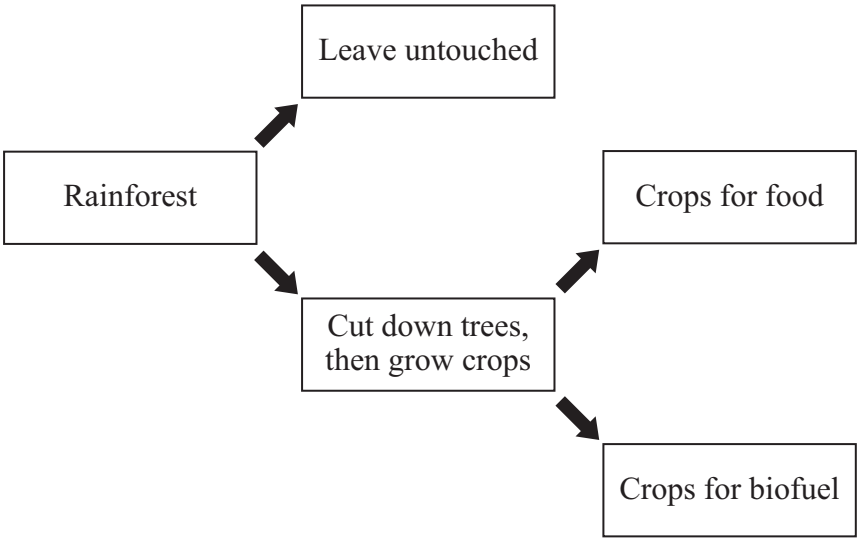
4 There is a clear relationship between the volume of borax solution and the viscosity of slime.

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QUESTION SEVEN

Rainforests have an important global role in absorbing carbon dioxide. They are also a habitat for many endangered species.

Many countries have to make difficult decisions about the use of land. This is summarised in the flow chart. Biofuels that are produced include biodiesel and bioethanol. The trees that are cut down are not always replaced.



7A Why is there a large worldwide demand for biofuels?

1 The carbon dioxide produced by the use of the fuel is completely matched by the carbon dioxide taken in when the fuel is grown.

2 They are a renewable source of energy.

3 Their use is always sustained.

4 No greenhouse gases are produced.

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7B Which row in the table correctly shows two likely consequences of a long-term increase in the demand for biofuel?

1	fewer crops will be grown for food	more species will be endangered
2	fewer trees in rainforests will be cut down	more land will be used for crops
3	less carbon dioxide will be absorbed by the rainforests	more crops will be grown for food
4	land will not be used and will be returned to rainforest	fossil fuel reserves will run out sooner

7C Scientists have been asked to carry out research to produce evidence about the consequences of developing the use of biofuels.

Which row in the table gives the correct description of an issue and its impact?

	Issue	**Impact**
1	ethical	effect on endangered species
2	social	effect on price of fossil fuels
3	environmental	effect on price of wood
4	economic	effect on levels of oxygen in the atmosphere

7D Some of the vegetable oils grown as a food crop are reacted with hydrogen at 60 °C using a nickel catalyst.

The purpose of this process is to . . .

1 remove single carbon carbon bonds in the oil.

2 add double carbon carbon bonds to the oil.

3 change the oil so that its melting point is higher than room temperature.

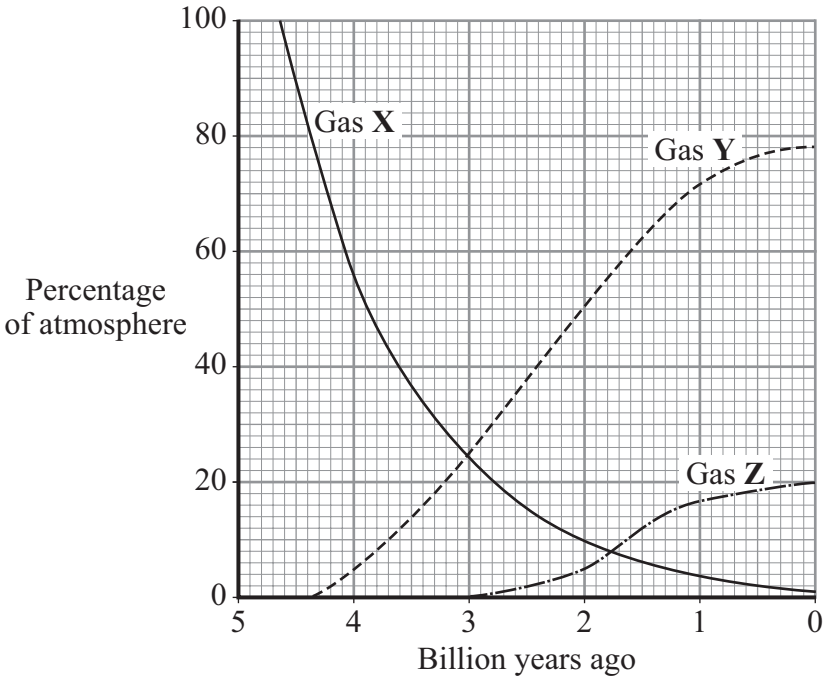
4 make the chemicals in the oil detectable with bromine.

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QUESTION EIGHT

Gases **X**, **Y** and **Z** are found in the Earth's atmosphere today.

The graph shows how the percentages of these gases in the atmosphere have changed over the last five billion years.



8A Which row in the table correctly describes the gases **X**, **Y** and **Z**?

	Gas X	**Gas Y**	**Gas Z**
1	Carbon dioxide	Nitrogen	Oxygen
2	Oxygen	Nitrogen	Carbon dioxide
3	Nitrogen	Carbon dioxide	Oxygen
4	Carbon dioxide	Oxygen	Nitrogen

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8B The Earth's atmosphere today contains the noble gas argon, which is by far the most abundant noble gas.

Argon is used in filament light bulbs because . . .

1 it has a low density.

2 it glows red when hot.

3 it can be obtained from the air by filtration.

4 it is chemically unreactive.

The table below shows the amounts of carbon dioxide in the Earth's atmosphere since 1750.

Year	**1750**	**1800**	**1850**	**1900**	**1950**	**2000**
Percentage (%) of carbon dioxide by volume	0.0270	0.0282	0.0288	0.0297	0.0310	0.0368

8C A graph of percentage (%) of carbon dioxide on the *y*-axis against time on the *x*-axis from 1750 to 2000 would show . . .

1 direct proportionality after 1800.

2 many anomalous values.

3 random scatter.

4 stronger positive correlation after 1850 than before.

8D The values given in the table show . . .

1 sensitivity because the values are close together.

2 reliability because the values are calculated by modern techniques.

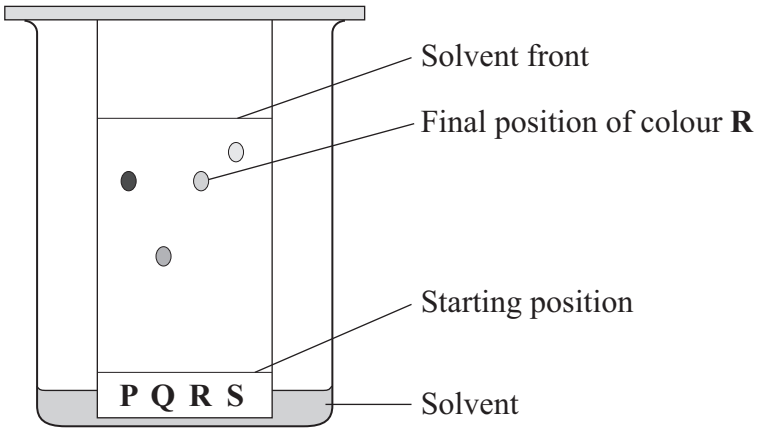
3 precision because the values are given to 4 decimal places.

4 accuracy because famous scientists have calculated the values.

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QUESTION NINE

The diagram shows an investigation of four colours, **P**, **Q**, **R** and **S**, using paper chromatography.



As the solvent rises up the paper it moves the colours depending on their attraction for the solvent and the paper.
The greater the attraction of a colour for the solvent and the less the attraction for the paper, the further the colour moves.

The R_f value is defined as:

$$R_f = \frac{\text{distance travelled by the colour}}{\text{distance travelled by the solvent}}$$

9A In the investigation shown in the diagram, what was the R_f value of colour **Q**?

1 0.0

2 0.5

3 0.7

4 0.9

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The R_f values for the colours, **P**, **Q**, **R** and **S**, in four different solvents are shown in the table.

	Solvent			
	Water	**Ethanol**	**Propanone**	**Tetrachloromethane**
Colour P	0.5	0.9	0.7	0.5
Colour Q	0.0	0.8	0.6	0.2
Colour R	0.5	0.7	0.6	0.1
Colour S	0.2	0.6	0.4	0.2

9B Which colour is **not** soluble in water?

1 **P**

2 **Q**

3 **R**

4 **S**

9C Using the data in the table above, which solvent could be used to separate a mixture of all four colours, **P**, **Q**, **R** and **S**?

1 water

2 ethanol

3 propanone

4 tetrachloromethane

Question 9 continues on the next page

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9D R_f values are not very reliable because other factors can affect how the colours move. These factors include the temperature and the amount of solvent vapour in the atmosphere around the chromatography paper. For this reason, R_f values are not normally quoted in textbooks.

Which of the following statements is true?

1 Chromatography is useless for identifying unknown substances.

2 Chromatography can only be used if the temperature is carefully controlled to a constant value.

3 Chromatography can only be used if there is always the same amount of solvent in the beaker.

4 Chromatography can be used if known colours are used, with the unknown colour as a comparison.

END OF TEST

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Version 1:0: 21/07/09

ASSESSMENT and QUALIFICATIONS ALLIANCE

GCSE

Science A (4461)

Specification A

CHY1BP, CH1BSF & CH1BSH

Mark Scheme

2009 Examination – June Series

The blank answer sheet for this component can be found at the end of this document.

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This component is an objective test for which the following list indicates the correct answers used in marking the candidates' responses.

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GCSE
SCIENCE A (4461)/CHEMISTRY (4421)
Objective Test Answer Key
CHY1BP (Oils, Earth and Atmosphere)
June 2009
Foundation Tier

Question	Key		
One	**A**	Atmosphere	**1**
	B	Core	**4**
	C	Crust	**2**
	D	Mantle	**3**
Two	**A**	PTFE	**2**
	B	Nylon	**3**
	C	Polystyrene	**1**
	D	PET	**4**
Three	**A**	It is the gas that is a compound	**2**
	B	It is the most abundant of the noble gases.	**1**
	C	It is the noble gas with the lowest boiling point	**4**
	D	There are 18 cm^3 of this gas in 100 litres of air	**3**
Four	**A**	can release a large quantity of energy	**1**
	B	is biodegradable	**2**
	C	is obtained from a vegetable source	**3**
	D	is unsaturated	**4**
Five	**A**	Molecule **A**	**1**
	B	Molecule **B**	**4**
	C	Molecule **C**	**2**
	D	Molecule **D**	**3**

	A	B	C	D
Six	**2**	**1**	**2**	**2**
Seven	**3**	**1**	**1**	**2**
Eight	**4**	**2**	**3**	**3**
Nine	**2**	**3**	**1**	**4**

GCSE

SCIENCE A (4461)/CHEMISTRY (4421)

Objective Test Answer Key

CHY1BP (Oils, Earth and Atmosphere)

June 2009

Higher Tier

Question	*Key*		
One	**A**	Molecule **A**	**1**
	B	Molecule **B**	**4**
	C	Molecule **C**	**2**
	D	Molecule **D**	**3**
Two	**A**	polymerisation	**4**
	B	thermal decomposition	**1**
	C	unsaturation	**2**
	D	hydration (addition of water)	**3**

	A	**B**	**C**	**D**
Three	**4**	**2**	**3**	**3**
Four	**2**	**3**	**1**	**4**
Five	**4**	**3**	**1**	**1**
Six	**4**	*	**2**	**4**
Seven	**2**	**1**	**1**	**3**
Eight	**1**	**4**	**4**	**3**
Nine	**2**	**2**	**2**	**4**

* This question has been removed

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AQA

Unit : CHY1BP CHEMISTRY UNIT 1B

Centre :

Candidate Number : **UCI :**

Candidate Name :

Series : 6M09

22-JUN-09

For completion by the Examination Invigilator. **Please fill this circle if the candidate is absent:** ○

HIGHER TIER

Instructions on how to complete this answer sheet are given on the question paper. Please make sure you follow them carefully.

Questions **ONE** to **NINE** Choose one response **1 - 4** for each of the parts **A - D**

QUESTION ONE

		1	2	3	4
1A	Molecule A	○	○	○	○
1B	Molecule B	○	○	○	○
1C	Molecule C	○	○	○	○
1D	Molecule D	○	○	○	○

QUESTION TWO

		1	2	3	4
2A	polymerisation	○	○	○	○
2B	thermal decomposition	○	○	○	○
2C	unsaturation	○	○	○	○
2D	hydration (addition of water)	○	○	○	○

QUESTION THREE

	1	2	3	4
3A	○	○	○	○
3B	○	○	○	○
3C	○	○	○	○
3D	○	○	○	○

QUESTION FOUR

	1	2	3	4
4A	○	○	○	○
4B	○	○	○	○
4C	○	○	○	○
4D	○	○	○	○

QUESTION FIVE

	1	2	3	4
5A	○	○	○	○
5B	○	○	○	○
5C	○	○	○	○
5D	○	○	○	○

QUESTION SIX

	1	2	3	4
6A	○	○	○	○
6B	○	○	○	○
6C	○	○	○	○
6D	○	○	○	○

QUESTION SEVEN

	1	2	3	4
7A	○	○	○	○
7B	○	○	○	○
7C	○	○	○	○
7D	○	○	○	○

QUESTION EIGHT

	1	2	3	4
8A	○	○	○	○
8B	○	○	○	○
8C	○	○	○	○
8D	○	○	○	○

QUESTION NINE

	1	2	3	4
9A	○	○	○	○
9B	○	○	○	○
9C	○	○	○	○
9D	○	○	○	○

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FOUNDATION TIER

Instructions on how to complete this answer sheet are given on the question paper. Please make sure you follow them carefully.

Questions **ONE** to **NINE** Choose one response **1 - 4** for each of the parts **A - D**

QUESTION ONE

		1	2	3	4
1A	Atmosphere				
1B	Core				
1C	Crust				
1D	Mantle				

QUESTION TWO

		1	2	3	4
2A	PTFE				
2B	Nylon				
2C	Polystyrene				
2D	PET				

QUESTION THREE

		1	2	3	4
3A	It is the gas that is a compound.				
3B	It is the most abundant of the noble gases.				
3C	It is the noble gas with the lowest boiling point.				
3D	There are 18 cubic cm of this gas in 100 litres of air.				

QUESTION FOUR

		1	2	3	4
4A	can release a large quantity of energy				
4B	is biodegradable				
4C	is obtained from a vegetable source				
4D	is unsaturated				

QUESTION FIVE

		1	2	3	4
5A	Molecule A				
5B	Molecule B				
5C	Molecule C				
5D	Molecule D				

QUESTION SIX

	1	2	3	4
6A				
6B				
6C				
6D				

QUESTION SEVEN

	1	2	3	4
7A				
7B				
7C				
7D				

QUESTION EIGHT

	1	2	3	4
8A				
8B				
8C				
8D				

QUESTION NINE

	1	2	3	4
9A				
9B				
9C				
9D				

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Surname		Other Names	
Centre Number			Candidate Number				
Candidate Signature									

General Certificate of Secondary Education
March 2009

SCIENCE A **CHY1BP**
Unit Chemistry C1b (Oils, Earth and Atmosphere)

CHEMISTRY
Unit Chemistry C1b (Oils, Earth and Atmosphere)

Wednesday 4 March 2009 Morning Session

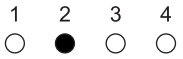
For this paper you must have:
- a black ball-point pen
- an objective test answer sheet.

You may use a calculator.

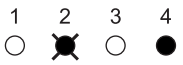
Time allowed: 30 minutes

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 '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.

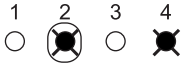
Instructions for recording answers
- Use a **black ball-point pen**.
- For each answer **completely fill in the circle** as shown:



- 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 16 of this booklet.

FOUNDATION TIER

SECTION ONE

Questions **ONE** to **FIVE**.

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 gases.

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

A oxygen

B noble gas

C air

D water vapour

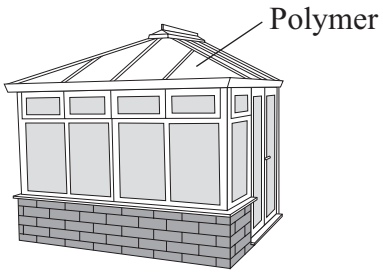
1	It condensed to form the Earth's oceans.
2	It is a mixture.
3	It makes up about 20% of the Earth's atmosphere.
4	It is used in discharge tubes.

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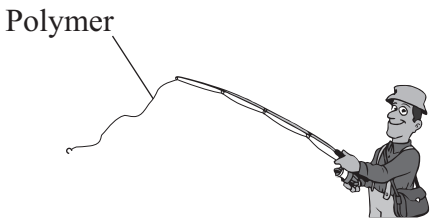
QUESTION TWO

The drawings show four different uses for polymers.

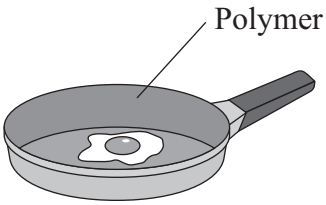
Use A



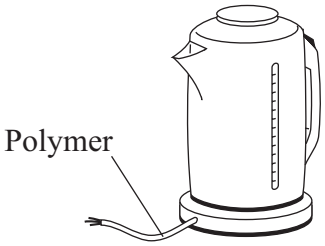
Use B



Use C



Use D



The table shows some of the properties of four different polymers.

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

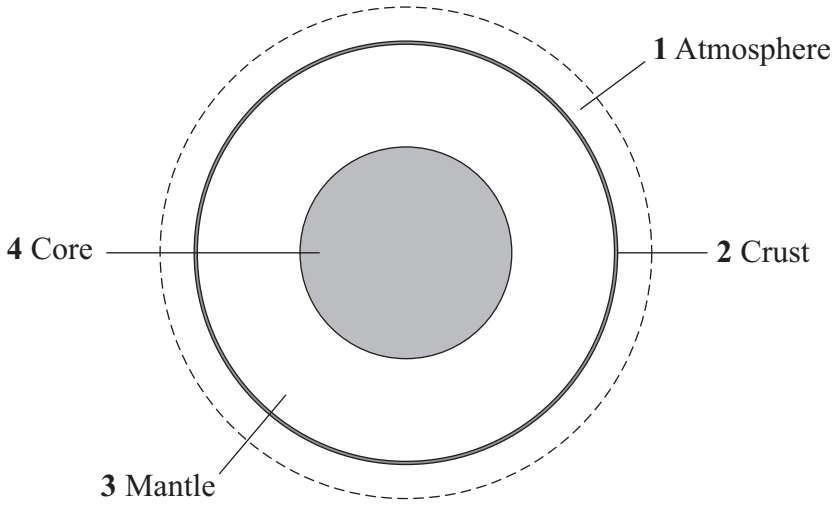
	Properties of the polymer
1	strong, does not rot and can be pulled into fine threads
2	tough, slippery and can be heated strongly
3	flexible, can be coloured and is a good electrical insulator
4	rigid, transparent and can easily be cut into any shape

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QUESTION THREE

This question is about the structure of the Earth.

The diagram below shows the layers in and around the Earth.



The Earth's magnetism is thought to be due to the presence of metallic iron and nickel in the centre of the Earth.

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

A where the plates drift apart

B where convection currents occur, creating plate movements

C where global warming occurs

D where iron and nickel are found as metals

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QUESTION FOUR

This question is about vegetable oils.

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

A spreads

B additives

C fuels

D emulsions

Vegetable oils do not mix with water, but when shaken with water they form . . . **1** . . . .

Vegetable oils can be burned as . . . **2** . . . or hardened to form . . . **3** . . . .

The shelf-life of the vegetable oils after hardening can be improved by using . . . **4** . . . .

Turn over for the next question

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QUESTION FIVE

This question is about four vegetable oils.

	Type of oil	Melting point in °C	Iodine number	Cetane number
A	Palm	35	63	65
B	Rapeseed	5	100	45
C	Sunflower	–18	120	60
D	Corn	–15	125	53

The higher the iodine number, the more unsaturated the oil is.

The higher the cetane number, the easier it is to set the oil alight with a flame.

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

1	the oil that is most difficult to ignite
2	the oil with the lowest melting point
3	the oil that will be first to solidify if cooled from 100 °C
4	the oil with the highest number of double bonds in each molecule

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Turn over for the next question

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SECTION TWO

Questions **SIX** to **NINE**.

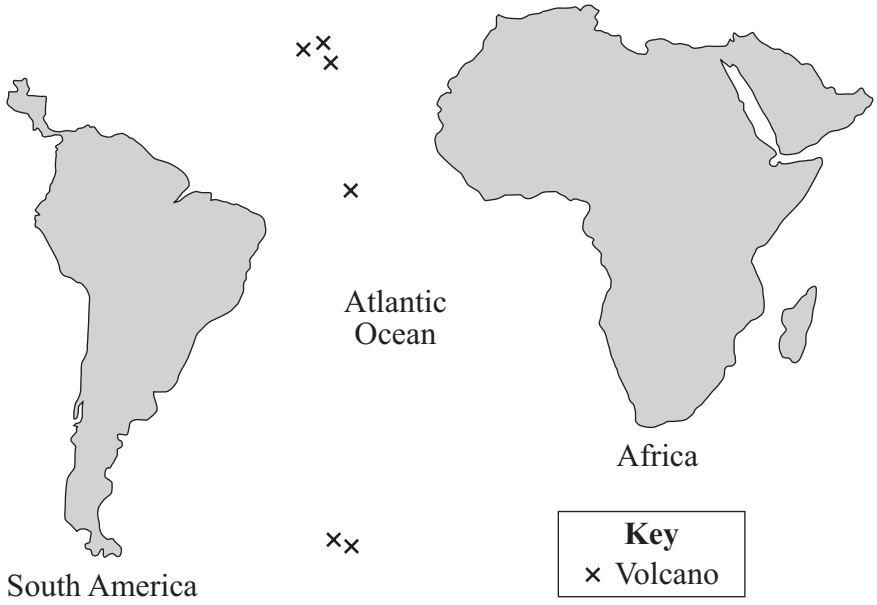
Each of these questions has four parts.

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

Mark your choices on the answer sheet.

QUESTION SIX

The diagram shows the positions of South America and Africa.



Early in the 20th century, a scientist called Alfred Wegener put forward a theory that South America and Africa had once been joined together, but since then had separated.

6A What name is given to this separation of the continents?

1 crustal shrinking

2 continental expansion

3 continental drift

4 crustal cracking

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6B Many scientists did **not** accept Wegener's theory because . . .

1 they thought that continents only moved towards each other.

2 they thought that continents moved too slowly.

3 they had no way of explaining how the continents could move.

4 they believed that the Earth was expanding.

6C Later in the 20th century, more scientists accepted Wegener's theory.

What new evidence made them change their ideas?

1 the existence of tectonic plates

2 the positions of volcanoes

3 the shapes of the continents

4 the sizes of the continents

6D Volcanic eruptions occur in the places shown on the diagram.

This is most likely to be because at these places . . .

1 the Earth's crust is very thick.

2 the Earth's crust is shrinking.

3 there is a boundary between tectonic plates.

4 earthquakes happen only rarely.

Turn over for the next question

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QUESTION SEVEN

Ice-cream is a foam because it has small air bubbles trapped inside it.

Ice-cream is sold by volume. Ice-cream manufacturers increase the volume of air in a product so that they make more money.

A student investigated the volume of air in four different ice-creams, **K**, **L**, **M** and **N**. The four ice-creams were kept in the same freezer.

For each ice-cream, the following procedure was carried out:

- the student measured the volume of some ice-cream straight from the freezer
- the ice-cream was then melted down, allowing the air to escape
- the volume of the ice-cream was re-measured to give the final volume.

The results are shown in the table.

Ice-cream	K	L	M	N
Initial volume in cm^3	100	100	100	100
Final volume in cm^3	96	91	87	95

7A Which ice-cream originally contained the most air?

1 **K**

2 **L**

3 **M**

4 **N**

7B The investigation was fair because . . .

1 the same volume of ice-cream was used each time.

2 four samples of ice-cream were used.

3 the investigation was repeated.

4 the temperature of the ice-creams was kept constant during the investigation.

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7C The student could have improved the reliability of the investigation by . . .

1 allowing the ice-cream to melt over a longer period of time.

2 checking that the temperature was constant throughout the investigation.

3 using more than four ice-cream samples.

4 repeating the investigation.

7D Ice-creams often contain additives such as colourings.

These can be identified by using . . .

1 filtration.

2 hydrogenation.

3 chromatography.

4 emulsification.

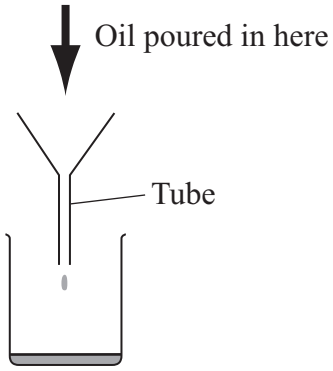
Turn over for the next question

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QUESTION EIGHT

Viscosity indicates the ability of a liquid to flow. Viscosities can be compared by measuring the time taken for a known volume of oil to flow through a tube of a given diameter.

The longer the time taken to flow through the tube, the more viscous the oil is.



The table below shows how the viscosity of an oil varies with the temperature of the oil.

Temperature of oil in °C	Time taken for all of the oil to pass through the tube, in seconds
20	70
30	52
40	37
50	35
60	18
70	10

8A Which one of the following describes the relationship between the temperature of the oil and its viscosity?

1 The oil becomes more viscous as the temperature increases.

2 The oil becomes less viscous as the temperature increases.

3 Viscosity remains constant when the temperature changes.

4 There is no relationship between temperature and viscosity.

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8B The independent variable is . . .

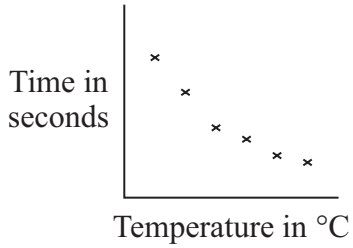
1 temperature.

2 viscosity.

3 time.

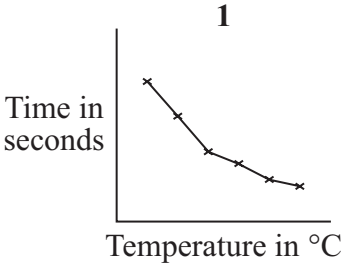
4 type of oil.

8C The results plotted on a temperature–time graph looked like this.

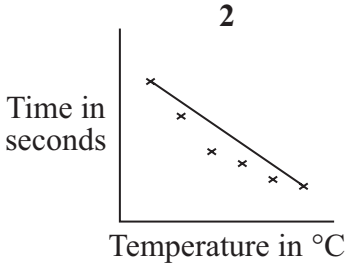


Which one of the following shows the most appropriate line for the plotted results?

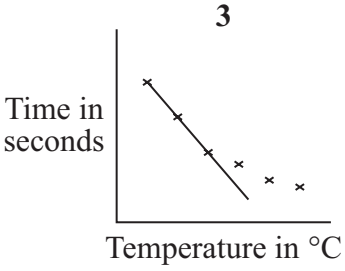
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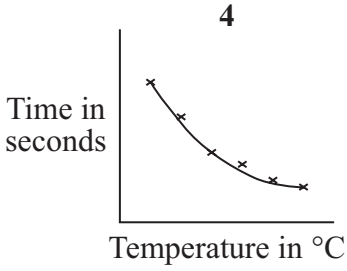
2



3



4



8D The precision of this experiment could be improved by . . .

1 taking readings at smaller temperature intervals.

2 using two different oils.

3 repeating the experiment at 50 °C.

4 using a larger diameter tube for the oil to pass through.

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QUESTION NINE

Scientists have developed a process to convert plastics such as nylon back to their original monomers.

9A What is the monomer used to make the polymer called poly(chloroethene)?

1 ethene

2 ethane

3 chloroethene

4 chloroethane

9B Which of the following is **not** an advantage of returning a polymer back to its monomer?

1 reduces the amount of plastic going into landfill sites

2 oil reserves will last longer

3 uses up excess supplies of monomers

4 avoids recycling of plastics

9C Plastics that can be broken down by microorganisms are described as . . .

1 unsaturated.

2 thermosetting.

3 thermoplastic.

4 biodegradable.

9D At a supermarket, customers can get vouchers for school equipment when they use their own bags for shopping.

The advantage of this scheme is that . . .

1 the supermarket can order more bags.

2 less plastic has to be manufactured.

3 queues will be shorter.

4 the plastic will be easier to recycle.

END OF TEST

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There are no questions printed on this page

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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.

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 four vegetable oils.

	Type of oil	Melting point in °C	Iodine number	Cetane number
A	Palm	35	63	65
B	Rapeseed	5	100	45
C	Sunflower	–18	120	60
D	Corn	–15	125	53

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

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3	the oil that will be first to solidify if cooled from 100 °C
4	the oil with the highest number of double bonds in each molecule

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QUESTION TWO

This question is about vegetable oils.

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

A catalysed

B emulsified

C unsaturated

D hardened

The amount of double carbon carbon bonds in an oil can be estimated by reacting the oil with bromine. If the bromine reacts, this shows the oil to be . . . **1** . . . .

The double carbon carbon bonds in the oil can be removed by heating with hydrogen in the presence of nickel. This is an example of a reaction that has been . . . **2** . . . .

As a result of this reaction with hydrogen, the oil is . . . **3** . . . .

A vegetable oil can be . . . **4** . . . by shaking the oil with water.

Turn over for the next question

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SECTION TWO

Questions **THREE** to **NINE**.

Each of these questions has four parts.

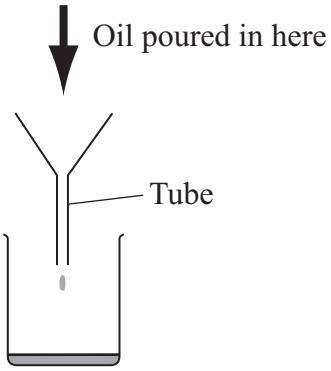
In each part choose only **one** answer.

Mark your choices on the answer sheet.

QUESTION THREE

Viscosity indicates the ability of a liquid to flow. Viscosities can be compared by measuring the time taken for a known volume of oil to flow through a tube of a given diameter.

The longer the time taken to flow through the tube, the more viscous the oil is.



The table below shows how the viscosity of an oil varies with the temperature of the oil.

Temperature of oil in °C	Time taken for all of the oil to pass through the tube, in seconds
20	70
30	52
40	37
50	35
60	18
70	10

3A Which one of the following describes the relationship between the temperature of the oil and its viscosity?

1 The oil becomes more viscous as the temperature increases.

2 The oil becomes less viscous as the temperature increases.

3 Viscosity remains constant when the temperature changes.

4 There is no relationship between temperature and viscosity.

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3B The independent variable is . . .

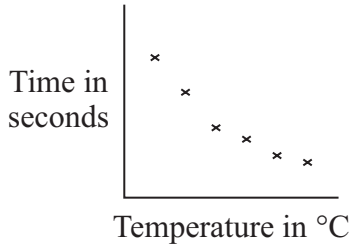
1 temperature.

2 viscosity.

3 time.

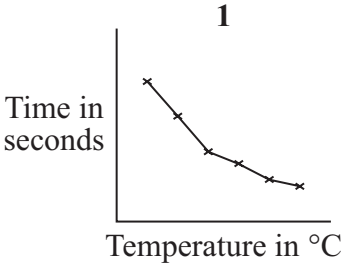
4 type of oil.

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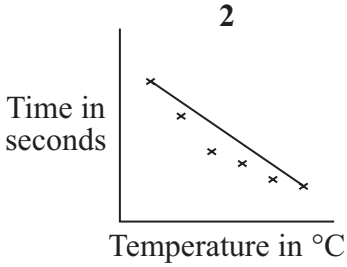


Which one of the following shows the most appropriate line for the plotted results?

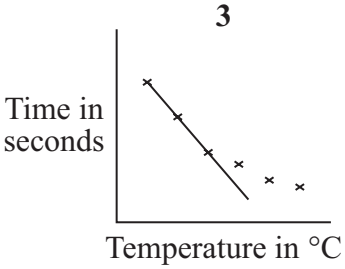
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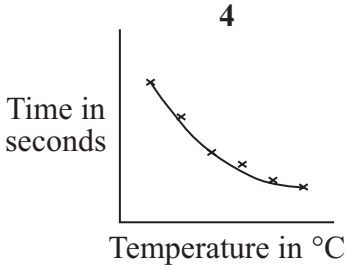
2



3



4



3D The precision of this experiment could be improved by . . .

1 taking readings at smaller temperature intervals.

2 using two different oils.

3 repeating the experiment at 50 °C.

4 using a larger diameter tube for the oil to pass through.

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QUESTION FOUR

Scientists have developed a process to convert plastics such as nylon back to their original monomers.

4A What is the monomer used to make the polymer called poly(chloroethene)?

1 ethene

2 ethane

3 chloroethene

4 chloroethane

4B Which of the following is **not** an advantage of returning a polymer back to its monomer?

1 reduces the amount of plastic going into landfill sites

2 oil reserves will last longer

3 uses up excess supplies of monomers

4 avoids recycling of plastics

4C Plastics that can be broken down by microorganisms are described as . . .

1 unsaturated.

2 thermosetting.

3 thermoplastic.

4 biodegradable.

4D At a supermarket, customers can get vouchers for school equipment when they use their own bags for shopping.

The advantage of this scheme is that . . .

1 the supermarket can order more bags.

2 less plastic has to be manufactured.

3 queues will be shorter.

4 the plastic will be easier to recycle.

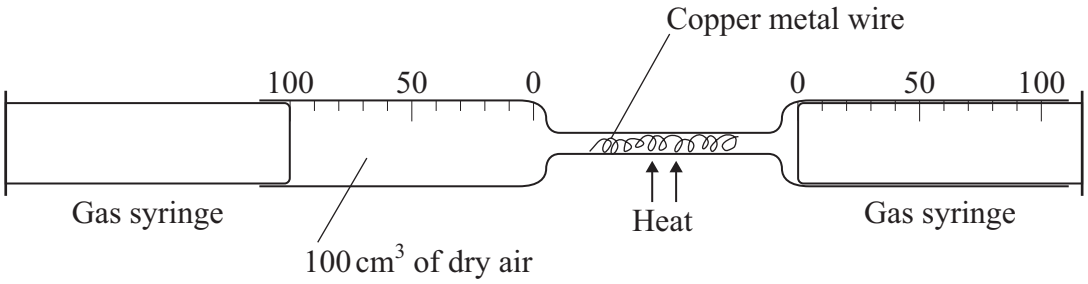
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Turn over for the next question

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QUESTION FIVE

The diagram shows some apparatus that is used to investigate the composition of air.



100 cm^3 of dry air was passed backwards and forwards over heated copper metal wire, using the gas syringes.
The copper reacts with oxygen in the dry air to produce copper oxide.
The process was continued until there was no further reduction in the volume of the gases in the syringes. The apparatus was then allowed to cool.

5A Why is it important to continue heating to a constant volume?

1 The volume of air is greater at higher temperatures.

2 Copper oxide will decompose as the apparatus cools.

3 To be sure that all the oxygen in the air has reacted.

4 So that all of the copper has been converted to copper oxide.

5B What was the final volume of gas left in the syringes at the end of the experiment?

1 40 cm^3

2 60 cm^3

3 80 cm^3

4 100 cm^3

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5C Which substance will be the main gas left in the syringes at the end of the experiment?

1 nitrogen

2 oxygen

3 carbon dioxide

4 a noble gas

5D Which of the following is the balanced symbol equation for the reaction between copper and oxygen?

1 $Cu + O_2 \rightarrow CuO$

2 $Cu + 2O_2 \rightarrow CuO$

3 $2Cu + O_2 \rightarrow 2CuO$

4 $2Cu + 2O_2 \rightarrow 2CuO$

Turn over for the next question

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QUESTION SIX

This question is about cracking large hydrocarbon molecules.

Cracking is achieved by using either a high temperature and pressure without a catalyst, or a low temperature and pressure with a catalyst.

Whichever method is chosen:

- the energy for cracking is provided by burning fossil fuels;
- the zeolite catalysts used are not very expensive;
- the catalyst is not used up in the process;
- the cracking plant is often built near the oil refinery.

6A Which of the following occurs during cracking?

1 Small hydrocarbon molecules join together.

2 The hydrocarbon molecules become saturated.

3 The hydrocarbon molecules react together.

4 The hydrocarbon molecules are decomposed.

6B In which equation do the products include two different alkenes?

1 $C_{15}H_{32} \rightarrow 2C_2H_4 + C_3H_6 + C_8H_{18}$

2 $C_{15}H_{32} \rightarrow C_2H_2 + C_5H_{10} + C_8H_{18} + H_2$

3 $C_{15}H_{32} \rightarrow C_8H_{18} + C_7H_{14}$

4 $C_{15}H_{32} \rightarrow C_7H_{16} + C_8H_{16}$

6C Which of the following shows only products that could be directly obtained by cracking $C_{10}H_{22}$?

1 alkanes up to $C_{20}H_{44}$, hydrogen and ethene

2 alkanes up to C_8H_{18}, carbon dioxide and ethene

3 propene, poly(ethene) and hydrogen

4 alkanes up to C_8H_{18}, ethene and propene

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6D These are the formulae for three hydrocarbons:

C_2H_4 C_2H_6 C_3H_6

Which row in the table shows the hydrocarbons that could form polymers, and gives the correct reason why they can polymerise?

	Hydrocarbons	**Reason**
1	C_2H_4 and C_2H_6	their molecules are saturated
2	C_2H_4 and C_3H_6	their molecules have a double carbon carbon bond
3	C_2H_4 and C_3H_6	their molecules are saturated
4	C_2H_4 and C_2H_6	their molecules have a double carbon carbon bond

Turn over for the next question

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QUESTION SEVEN

This question is about materials used for carrier bags.

7A Plastic bags are made from poly(ethene).

What is the best description of the manufacture of poly(ethene)?

1 Ethene molecules join together, keeping their double bonds.

2 Unsaturated ethene molecules join together to make long saturated molecules.

3 Ethane molecules line up and join 'end to end'.

4 Ethane molecules are made into poly(ethene) using high pressure and a catalyst.

7B Which row in the table correctly identifies an advantage and a disadvantage of using poly(ethene) to make bags?

	Advantage	**Disadvantage**
1	easily coloured and printed	very expensive to make
2	airtight	high melting point
3	lightweight	not biodegradable
4	easy to produce	made from renewable sources

Supermarkets sell bags made of jute to customers. These bags can be re-used many times.

Jute is made from plant material, but jute bags are more expensive to make than plastic bags.

7C What is the best description of the benefits of using jute as a replacement for poly(ethene) in bags?

1 It is made from renewable sources and it will not rot.

2 It is made from non-renewable sources that remove carbon dioxide from the atmosphere.

3 It saves on the use of oil and helps to reduce the waste that goes to landfill.

4 It saves the customer money and it is biodegradable.

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7D Which of the following questions is unsuitable for scientific investigation?

1 Can plastics be made that are easily biodegradable?

2 Should there be laws to make supermarkets give up using plastic bags?

3 Can plastics be made that biodegrade as easily as jute?

4 Are there better materials than plastic and jute to use for making carrier bags?

Turn over for the next question

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QUESTION EIGHT

Movements in the Earth's crust can cause dramatic events such as volcanic eruptions.

8A Which of the following does **not** happen at plate boundaries?

1 Volcanoes form and lava is released.

2 Heat is produced by radioactive processes.

3 Subduction occurs and rocks melt.

4 Sea-floor spreading occurs and ridges form.

8B Scientists can predict with reasonable accuracy . . .

1 the areas in which volcanoes are likely to occur from data about previous eruptions.

2 the position of a volcanic eruption from movements of convection currents in the mantle.

3 the size of a volcanic eruption from the frequency of previous eruptions in the area.

4 the number of volcanic eruptions from slight movements of the Earth's crust.

Scientists measure the temperature of the gases coming out of a volcano. Raised temperatures are an indication of increased volcanic activity.

8C Which row in the table shows:

- the most appropriate method to present the data
- the expected trend which might predict an eruption?

	Method of presenting the data	**Expected trend**
1	line graph	direct proportionality
2	scattergram	positive correlation
3	bar chart	increasing volume of bars
4	pie chart	increase in the area of the sectors representing higher temperatures

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8D The temperatures recorded by the scientists were found to be reproducible but consistently lower than the accurate value.

This was probably due to . . .

1 their readings being invalid.

2 their readings being taken with thermometers that were **not** sensitive enough.

3 their readings being averages that included anomalous results.

4 their thermometers being incorrectly calibrated.

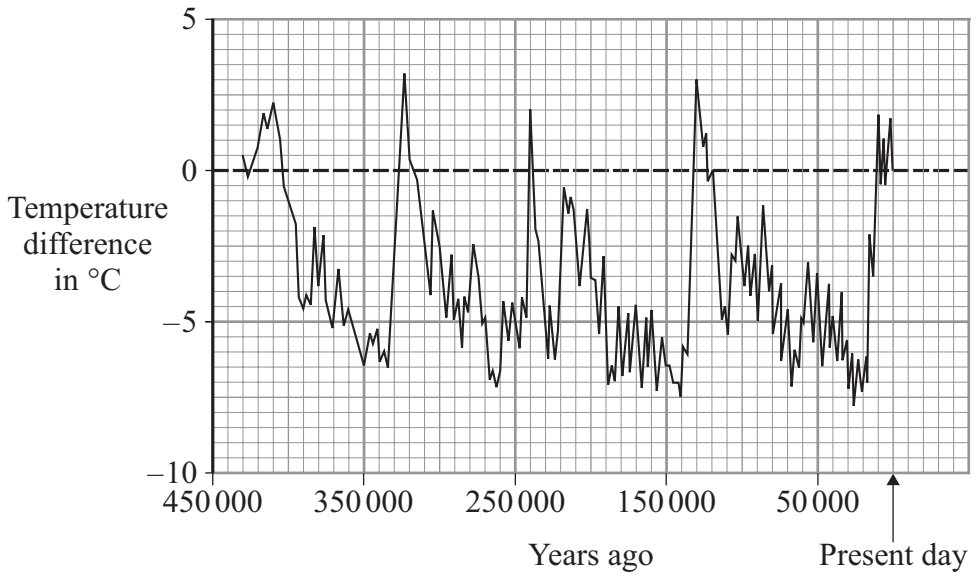
Turn over for the next question

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QUESTION NINE

Humans have only been on Earth for about the past 25 000 years. Before that, the Earth's climate had been changing between ice ages and much warmer periods when all the ice melted.

The graph below shows estimated global temperatures over the past 450 000 years compared with the global temperature today.



9A Which of the following can be deduced from the graph?

1 The graph shows that the onset of an ice age is more rapid than its retreat.

2 The gradual rise in temperature that occurs periodically is due to the increased burning of fossil fuels.

3 The Earth's climate appears to be entering another ice age.

4 It takes about 25 000 years on average for all the ice to melt from each ice age.

9B The estimated global temperature over the past 450 000 years has . . .

1 changed within a range of about 10 °C.

2 on average been 5 °C lower than the Earth's present temperature.

3 never been more than 3 °C above the Earth's present temperature.

4 generally been higher than the present temperature.

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9C The graph has . . .

1 a continuous variable plotted against a categoric variable.

2 a discrete variable plotted against a control variable.

3 a discrete variable plotted against a discrete variable.

4 a continuous variable plotted against a continuous variable.

9D Which of the following suggests that the Earth has cooled since its formation?

1 the gradual rise in the amount of carbon dioxide in the atmosphere

2 the condensation of water vapour to form oceans

3 the gradual formation of mountains due to the crust cooling

4 the reduction in the frequency of earthquakes

END OF TEST

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Version 1:0: 03/04/09

ASSESSMENT and QUALIFICATIONS ALLIANCE

GCSE

Science A (4461)

Specification A

CHY1BP, CH1BSF & CH1BSH

Mark Scheme

2009 Examination – March Series

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This component is an objective test for which the following list indicates the correct answers used in marking the candidates' responses.

Further copies of this Mark Scheme are available to download from the AQA Website: www.aqa.org.uk

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GCSE

SCIENCE A (4461)/CHEMISTRY (4421)

Objective Test Answer Key

CHY1BP (Oils, Earth and Atmosphere)

March 2009

Foundation Tier

Question	Key		
One	**A**	oxygen	**3**
	B	noble gas	**4**
	C	air	**2**
	D	water vapour	**1**
Two	**A**	Use **A**	**4**
	B	Use **B**	**1**
	C	Use **C**	**2**
	D	Use **D**	**3**
Three	**A**	where the plates drift apart	**2**
	B	where convection currents occur, creating plate movements	**3**
	C	where global warming occurs	**1**
	D	where iron and nickel are found as metals	**4**
Four	**A**	spreads	**3**
	B	additives	**4**
	C	fuels	**2**
	D	emulsions	**1**
Five	**A**	Palm	**3**
	B	Rapeseed	**1**
	C	Sunflower	**2**
	D	Corn	**4**

	A	B	C	D
Six	**3**	**3**	**1**	**3**
Seven	**3**	**1**	**4**	**3**
Eight	**2**	**1**	**4**	**1**
Nine	**3**	**3**	**4**	**2**

GCSE

SCIENCE A (4461)/CHEMISTRY (4421)

Objective Test Answer Key

CHY1BP (Oils, Earth and Atmosphere)

March 2009

Higher Tier

Question	Key		
One	**A**	Palm	**3**
	B	Rapeseed	**1**
	C	Sunflower	**2**
	D	Corn	**4**
Two	**A**	catalysed	**2**
	B	emulsified	**4**
	C	unsaturated	**1**
	D	hardened	**3**

	A	B	C	D
Three	**2**	**1**	**4**	**1**
Four	**3**	**3**	**4**	**2**
Five	**3**	**3**	**1**	**3**
Six	**4**	**1**	**4**	**2**
Seven	**2**	**3**	**3**	**2**
Eight	**2**	**1**	**2**	**4**
Nine	**3**	**1**	**4**	**2**