Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
TOTAL	

General Certificate of Secondary Education
Higher Tier
June 2012

Science B
Unit Chemistry C1

CHY1H

H

Chemistry
Unit Chemistry C1

Written Paper

Friday 15 June 2012 1.30 pm to 2.15 pm

For this paper you must have:
- a ruler.

You may use a calculator.

Time allowed
- 45 minutes

Instructions
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 45.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

Advice
- In all calculations, show clearly how you work out your answer.

There are no questions printed on this page

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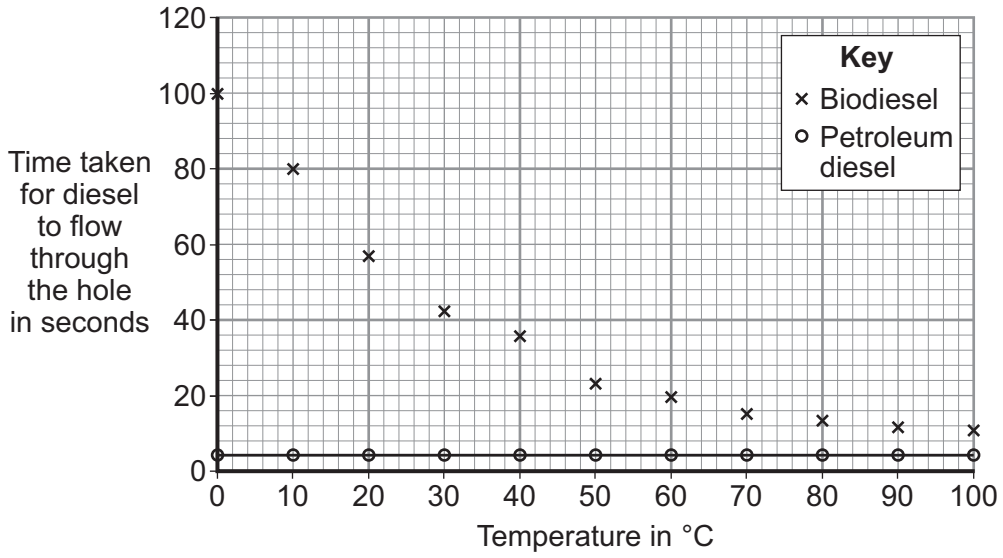
ANSWER IN THE SPACES PROVIDED

1 There are two main types of diesel fuel used for cars:

- biodiesel, made from vegetable oils
- petroleum diesel, made from crude oil.

1 (a) A scientist compared the viscosity of biodiesel with petroleum diesel at different temperatures.
The scientist measured the time for the same volume of diesel to flow through a small hole in a cup.
The scientist's results are plotted on the grid.



1 (a) (i) Draw a line of best fit for the biodiesel results.

(1 mark)

1 (a) (ii) What conclusions can the scientist make about the viscosity of biodiesel compared with the viscosity of petroleum diesel at different temperatures?

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(2 marks)

1 (a) (iii) Biodiesel may be less suitable than petroleum diesel as a fuel for cars.
Use these results to suggest **one** reason why.

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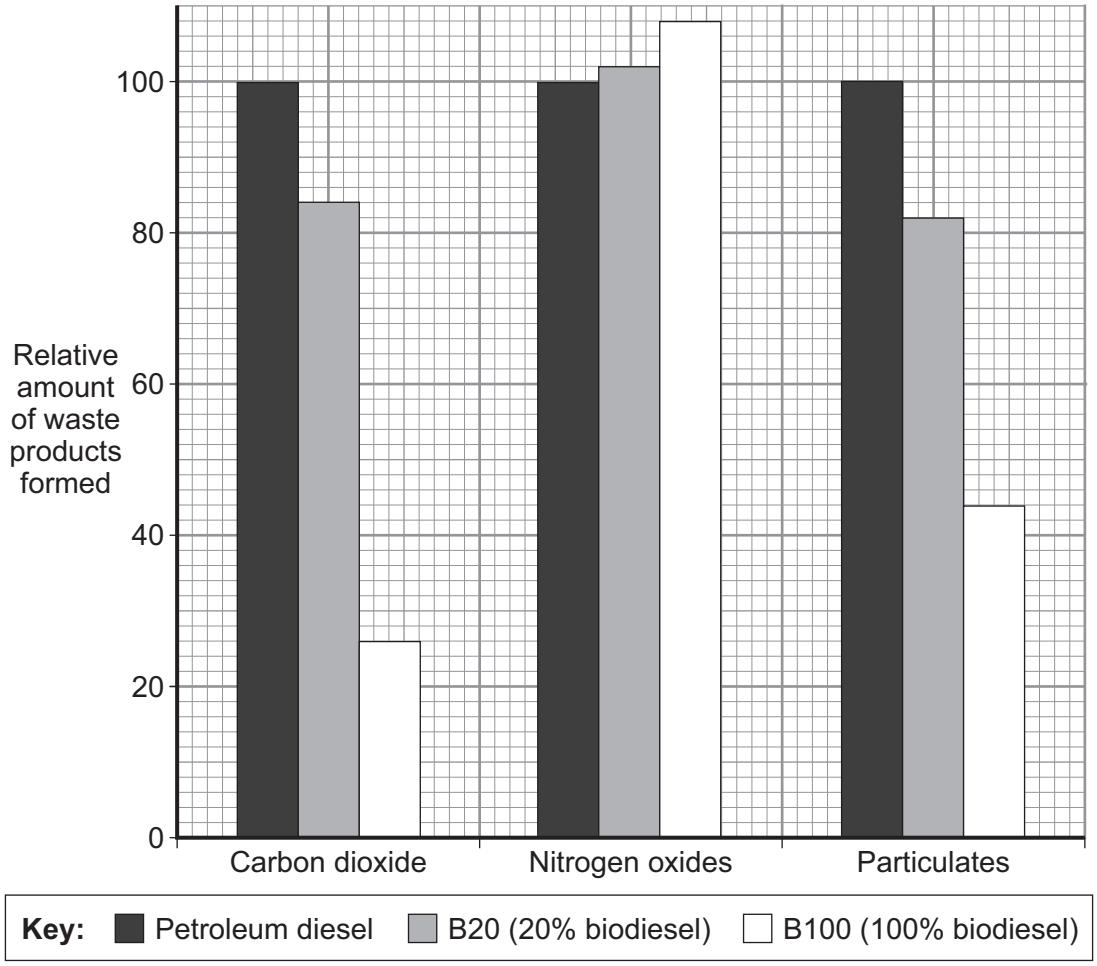
(1 mark)

Turn over ▶

1 (b) Biodiesel can be mixed with petroleum diesel to make a fuel for cars.
In a car engine, the diesel fuel burns in air.
The waste products leave the car engine through the car exhaust system.
The bar chart compares the relative amounts of waste products made when three different types of diesel fuel burn in a car engine.



Nitrogen oxides and sulfur dioxide cause a similar environmental impact.

1 (b) (i) What environmental impact do particulates from car exhaust systems cause?

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(1 mark)

1 (b) (ii) What is the percentage reduction in particulates when using B100 instead of petroleum diesel?

..... *%*

(1 mark)

1 (b) (iii) Replacing petroleum diesel with biodiesel increases one type of environmental pollution.

Use the bar chart and the information given to explain why.

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(2 marks)

1 (b) (iv) A carbon neutral fuel does **not** add extra carbon dioxide to the atmosphere.

Is biodiesel a carbon neutral fuel?

Use the bar chart and your knowledge to explain your answer.

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(2 marks)

10

Turn over for the next question

2 Read the article.

Problem food colourings

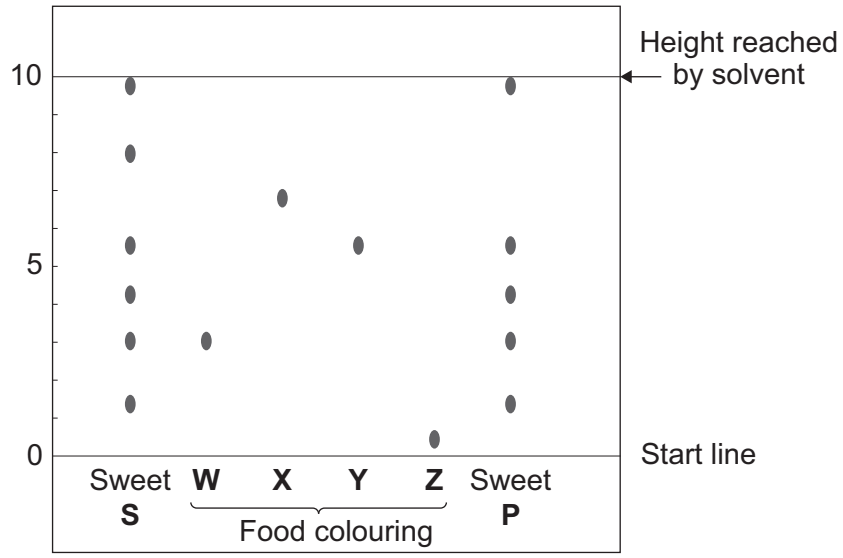
Scientists say they have evidence that some food colourings cause hyperactive behaviour in young children.

These food colourings are added to some sweets.

W, **X**, **Y** and **Z** are food colourings that may cause hyperactive behaviour in young children.

A scientist used chromatography to see if these food colourings were used in two sweets, **S** and **P**.

The results are shown on the chromatogram.



2 (a) Food colourings, such as **W**, **X**, **Y** and **Z**, are added to some sweets.

Suggest **one** reason why.

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(1 mark)

2 (b) In chromatography, the R_f value = $\frac{\text{distance moved by the colouring}}{\text{distance moved by the solvent}}$

Use the scale on the chromatogram to help you to answer this question.

Which food colouring, **W**, **X**, **Y** or **Z**, has an R_f value of 0.7?

(1 mark)

2 (c) From the chromatogram, what conclusions can the scientist make about the colourings in sweets **S** and **P**?

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(3 marks)

5

Turn over for the next question

3 Steels are used to make cars, bridges and knives.
The main element in steel is iron.

3 (a) Iron is extracted from an *ore* that contains about 60% iron oxide, Fe_2O_3

3 (a) (i) What is the meaning of *ore*?

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(1 mark)

3 (a) (ii) In a blast furnace, iron oxide reacts with carbon monoxide to produce iron.
The word equation for this reaction is:

iron oxide + carbon monoxide → iron + carbon dioxide

Complete and balance the chemical equation for this reaction.

Fe_2O_3 + ... CO → ..... + ...

(2 marks)

3 (a) (iii) Name the type of reaction that produces a metal from its metal oxide.

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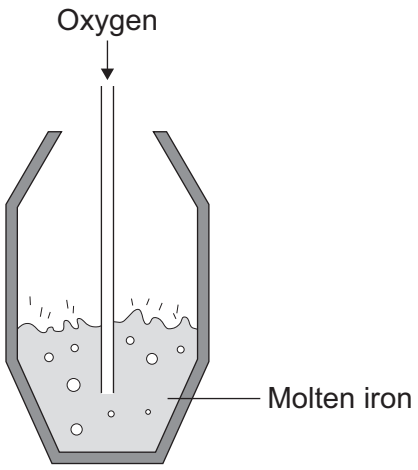
(1 mark)

3 (b) Steels are produced from molten iron in two stages:

Stage 1 blowing oxygen into molten iron from the blast furnace.

Stage 2 adding other metals to make different steels.



3 (b) (i) In **Stage 1**, suggest how the oxygen removes most of the carbon from the molten iron.

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(2 marks)

3 (b) (ii) **Stage 2** produces different steels.

Suggest why different steels are needed.

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(1 mark)

3 (c) Old 5p and 10p coins in the UK were made from cupro-nickel.
Cupro-nickel is 75% copper and 25% nickel.

New 5p and 10p coins in the UK are now made from nickel-plated steel and not from cupro-nickel.

Explain why.

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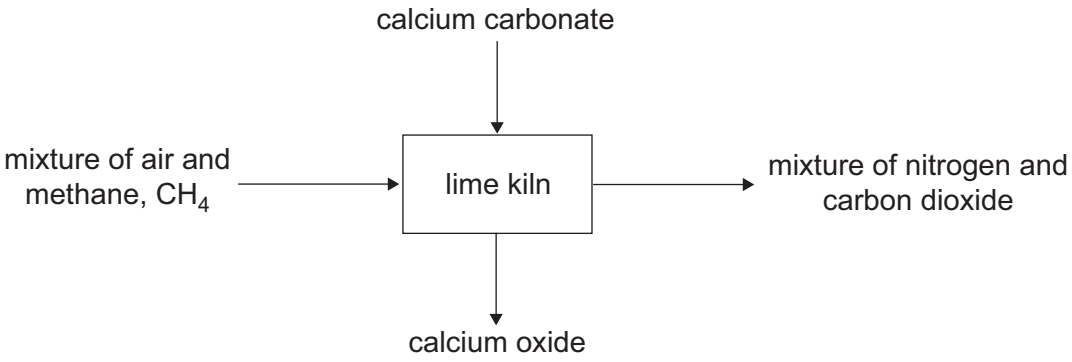
(2 marks)

9

Turn over for the next question

4 Limestone is mainly calcium carbonate, $CaCO_3$
The flow diagram represents how calcium oxide (quicklime) is made when calcium carbonate (limestone) is heated in a lime kiln.



4 (a) (i) How many elements is calcium carbonate, $CaCO_3$, made from?

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(1 mark)

4 (a) (ii) The main gases leaving the lime kiln are nitrogen and carbon dioxide.

Explain why.

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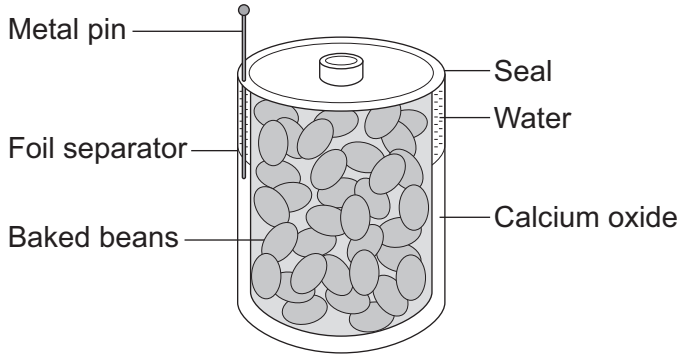
(3 marks)

4 (b) Calcium oxide (quicklime) is used in self-heating cans.

The diagram shows a self-heating can made to warm baked beans.



To warm the baked beans the metal pin is pushed through the seal and foil separator. The foil separator breaks allowing water to mix with the calcium oxide (quicklime).

Describe what happens when water mixes with calcium oxide.

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(2 marks)

6

Turn over for the next question

5 There are different theories about how mountain ranges formed on the surface of the Earth.

5 (a) (i) Suggest **one** reason why there are different theories.

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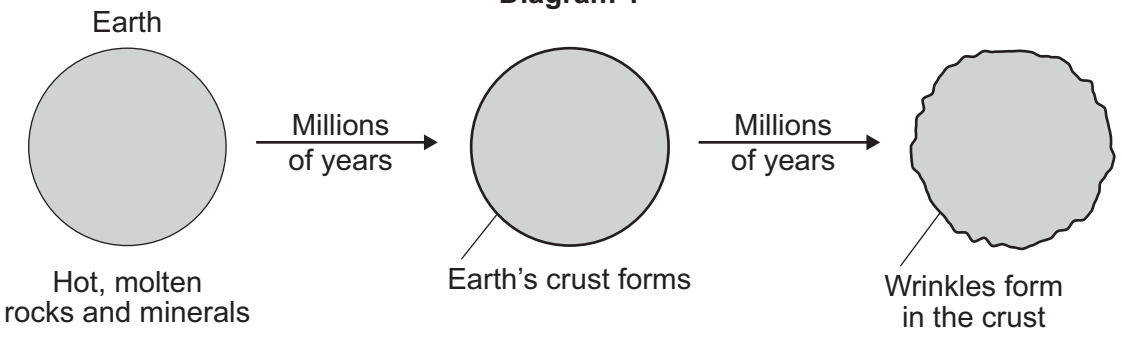
(1 mark)

5 (a) (ii) **Diagram 1** represents an early theory of how mountain ranges may have formed.

Diagram 1



Use **Diagram 1** to suggest how mountain ranges may have formed.

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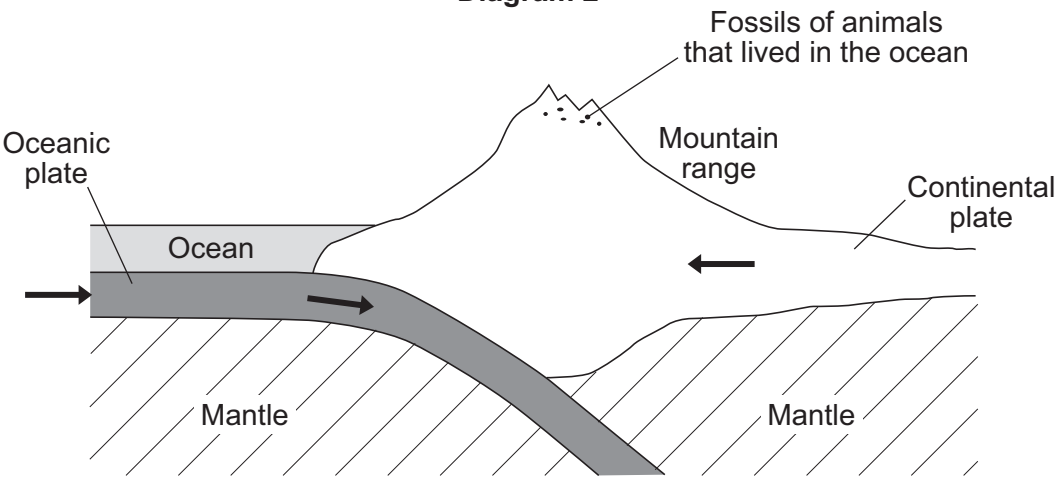
(2 marks)

5 (b) **Diagram 2** represents a more recent theory of how mountain ranges may have formed.

Diagram 2



5 (b) (i) The Earth's crust and the upper part of the mantle are cracked into a number of very large pieces called tectonic plates.

Explain how these tectonic plates are able to move.

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(3 marks)

5 (b) (ii) Use **Diagram 2** to suggest how mountain ranges may have formed.

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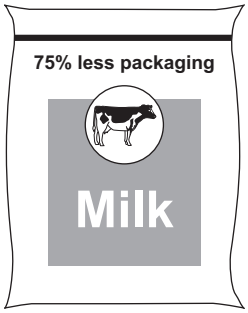
(2 marks)

8

Turn over ▶

6 Read the article and then answer the questions.

Supermarkets launch eco-friendly plastic milk bags. Could this be the end of the milk bottle?



Milk bottles are made from glass or from plastic.

Glass milk bottles contain 0.5 litres of milk. When the milk is used up the empty bottles are returned to be re-used. Glass milk bottles are re-used 24 times on average. The glass to make new milk bottles is produced when a mixture of sand, limestone, soda and recycled glass is heated to about 1600 °C in a furnace. There are almost unlimited amounts of the raw materials needed to produce this glass. About 35% of used glass is recycled.

The most common plastic milk bottles contain 2 litres of milk. When the milk is used up the empty bottles are discarded as waste. The plastic used to make these milk bottles is poly(ethene). Poly(ethene) is produced from crude oil by first using fractional distillation, then cracking the naphtha fraction and finally polymerising the ethene. About 5% of used poly(ethene) is recycled.

The new plastic milk bags contain 2 litres of milk. The milk bags are also made from poly(ethene). A milk bag uses 75% less poly(ethene) than is used to make the poly(ethene) milk bottles. When the milk is used up the empty bags are discarded as waste.

6 (a) Describe what happens in fractional distillation so that fractions, such as naphtha, are separated from crude oil.

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(3 marks)

6 (b) Supermarkets claim that using milk bags instead of milk bottles would have less environmental impact.

Do you agree with this claim?

Use the information on page 14 and your knowledge and understanding to make appropriate comparisons to justify your answer.

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(4 marks)

7

END OF QUESTIONS

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