Surname		Other Names	
Centre Number			Candidate Number				
Candidate Signature									

For Examiner's Use

General Certificate of Secondary Education
January 2008

SCIENCE B
Unit Chemistry C1

CHY1H
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CHEMISTRY
Unit Chemistry C1

Higher Tier

Friday 18 January 2008 1.30 pm to 2.15 pm

For Examiner's Use			
Question	Mark	Question	Mark
1		3	
2		4	
		5	
		6	
Total (Column 1) →			
Total (Column 2) →			
TOTAL			
Examiner's Initials			

For this paper you must have:
- a ruler.

You may use a calculator.

Time allowed: 45 minutes

Instructions
- Use blue or black ink or ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- Answer the questions in the spaces provided.
- Do all rough work in this book. Cross through any work you do not want to be marked.

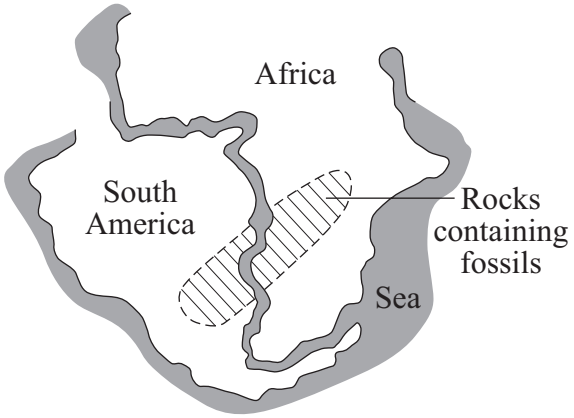
Information
- The maximum mark for this paper is 45.
- The marks for questions are shown in brackets.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

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

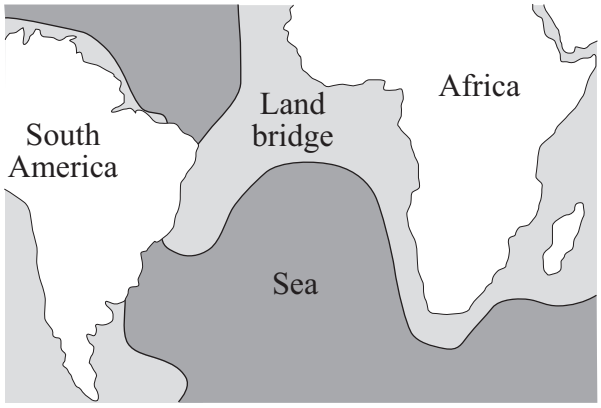
Answer **all** questions in the spaces provided.

1 A map of the world shows that the outline of South America looks as if it would fit into the west coast of Africa.

- Alfred Wegener in 1920 suggested his idea that the continents had been joined together but then slowly drifted apart.



- Other scientists in 1920 said that the continents were fixed on solid Earth and had been joined by a land bridge.



Modern South American animals are different from modern African animals.
Most fossils of animals found in South America and Africa are exactly the same.

(a) Consider the information above.

(i) What evidence gave Wegener the idea that the continents of South America and Africa had been joined?

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(1 mark)

(ii) Suggest **two** reasons why the other scientists in 1920 thought that Wegener was wrong.

1 .....

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2 .....

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(2 marks)

(b) Complete the sentences by writing in the correct words.

Recent evidence has supported Wegener's idea.

The Earth's ..... and the upper part of the mantle are now thought to be composed of tectonic plates.

Heat released by radioactive processes causes convection currents within the Earth's ..... . These convection currents cause the plates to move a few centimetres per ..... .

(3 marks)

6

Turn over for the next question

2 Soda-lime glass is made by heating, to above 1500 °C, a mixture of:

soda (sodium carbonate), Na_2CO_3
limestone (calcium carbonate), $CaCO_3$
sand (silicon dioxide), SiO_2

(a) (i) Which element do all of these compounds contain?

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(1 mark)

(ii) Explain what the formula Na_2CO_3 shows about the compound.

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(2 marks)

(b) Calcium carbonate breaks down when heated to above 1500 °C.

(i) Write a word equation to show what happens.

..... → ..... + ...

(2 marks)

(ii) What is the name of this type of chemical reaction?

.....

(1 mark)

(c) The melting point of soda-lime glass is about 750 °C.
The raw materials for making soda are limestone and common salt (sodium chloride).
There are almost unlimited amounts of the raw materials available to manufacture soda-lime glass.

From the information given, what is the most important reason for recycling soda-lime glass?

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(1 mark)

7

Turn over for the next question

3 The nutrition label is from a pack of smoked salmon.

Typical values	Per 100 g	Per 50 g portion
Energy kJ	695	350
kcal	165	85
Protein g	22.3	11.2
Carbohydrate g	3.2	1.6
of which sugars g	0.1	0.05
Fat g	7.1	3.6
of which saturates g	1.7	0.9
monounsaturates g	2.5	1.3
polyunsaturates g	2.4	1.2
Fibre g	0.5	0.3
Sodium g	1.30	0.70
Equivalent as salt g	3.2	1.6

Guideline Daily Amounts			
Recommended by nutrition professionals for average adults			
	Per 50 g portion	Woman	Man
Calories	85	2000	2500
Fat g	3.6	70	95
Salt g	1.6	6	6

(a) Smoked salmon is said to be a healthy food because it contains Omega 3 and other *unsaturated* fats.

(i) What does *unsaturated* mean?

.....

(1 mark)

(ii) To detect unsaturated fats, a small amount of bromine or iodine solution can be added.

What happens to show that an unsaturated fat is present?

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(1 mark)

(b) The amount of salt in this smoked salmon may be considered unhealthy.

Explain why it is advisable to consume only one portion of the smoked salmon per day.

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(2 marks)

LEAVE MARGIN BLANK

(c) Some farmed salmon have a coloured additive in the food that they are given. This is a permitted additive that improves the colour of the fish meat.

A sample of the colour is extracted from a salmon.

Explain how paper chromatography could be used to confirm that this is the permitted additive.

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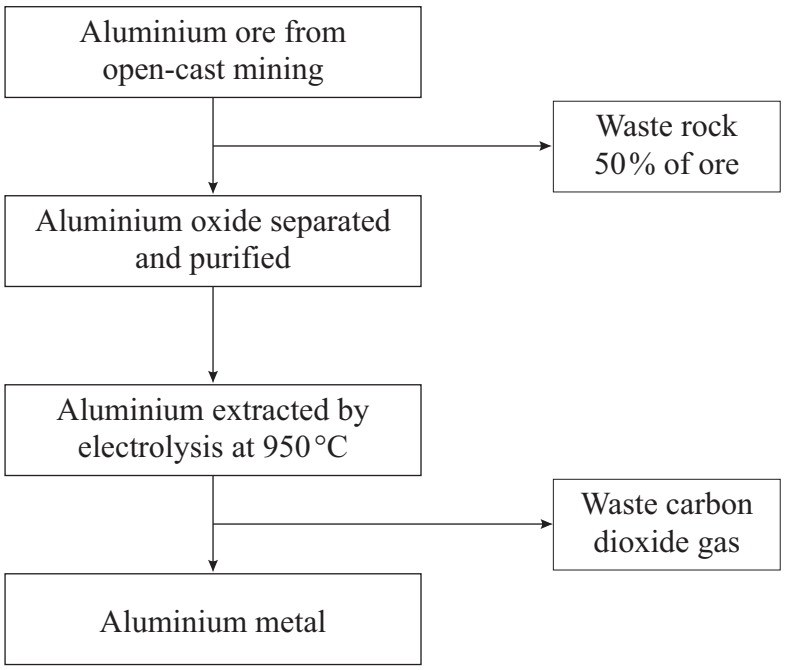
(3 marks)

7

Turn over for the next question

4 Aluminium has many uses because of its low density, good electrical conductivity, flexibility and resistance to corrosion.

The main steps in the extraction of aluminium are shown in the flow chart.



(a) Use the information in the flow chart to suggest the benefits of recycling aluminium.

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(3 marks)

(b) Pure aluminium is rarely used for the construction of large objects. Small amounts of other metals are usually mixed with aluminium.

Explain why.

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(2 marks)

5

Turn over for the next question

5 Since 2000 there has been a lot more research into alternative, environmentally-friendly fuels for road transport.
Several pollutants are found in the exhaust emissions produced when fossil fuels are used for road transport.

Carbon monoxide (CO) interferes with the way that red blood cells carry oxygen.
Carbon dioxide (CO_2) increases the level of carbon dioxide in the atmosphere and causes global warming.

Oxides of nitrogen (NO_x) are produced at high temperatures when nitrogen and oxygen from the atmosphere combine.

Sulfur dioxide (SO_2) is produced when sulfur impurities in the fuel combine with oxygen in the atmosphere.

Tiny particles of solids are produced when the fuel does not burn completely.
This increases the level of particulates (PM10) in the atmosphere.

(a) Name the environmental effect caused by:

(i) oxides of nitrogen (NO_x) and sulfur dioxide (SO_2)

.....

(1 mark)

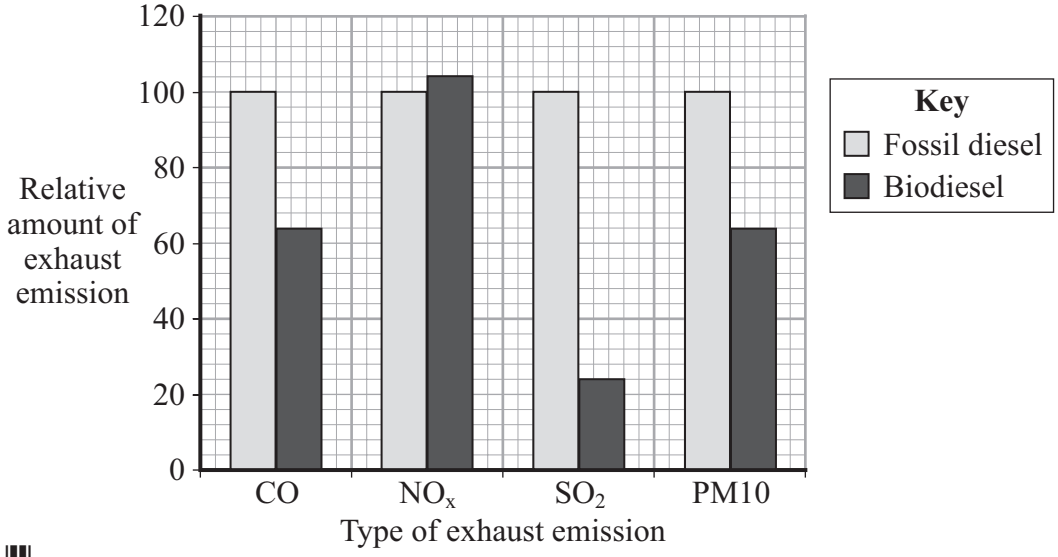
(ii) the increased level of particulates (PM10).

.....

(1 mark)

(b) Diesel obtained from crude oil is often called fossil diesel.
Biodiesel can be made from many vegetable oils.
One research project compared the exhaust emissions when fossil diesel or biodiesel were used as fuels.

Some of the relative amounts of these exhaust emissions are shown in the bar chart.



(i) Use your knowledge and the information opposite to explain the environmental benefits of using biodiesel as a sustainable, low pollution fuel.

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(3 marks)

(ii) Biodiesel is called a green fuel.

This is because the life-cycle emission of carbon dioxide from biodiesel is less than that from fossil diesel.

Use your knowledge and the information opposite to explain why biodiesel's contribution to global warming is considered to be much less than that of fossil diesel.

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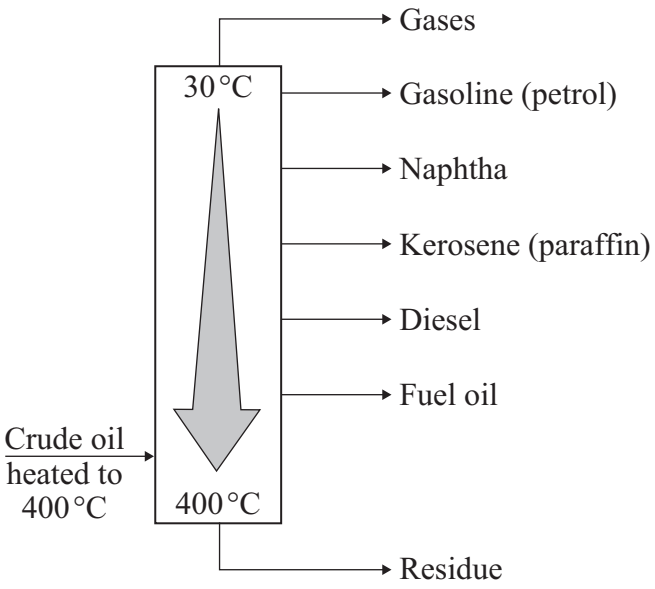
(3 marks)

8

Turn over for the next question

6 Crude oil is the source of many useful materials. Crude oil is separated into fractions by fractional distillation.



(a) Describe how the naphtha fraction separates from the other fractions.

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(2 marks)

(b) The naphtha fraction is often used to make other useful materials.
This involves the cracking of hydrocarbons in the naphtha fraction.

For example:

decane → hexane + ethene

$C_{10}H_{22} \rightarrow C_6H_{14} + C_2H_4$

(i) Balance the symbol equation given above.

(1 mark)

(ii) Describe how cracking is carried out.

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(2 marks)

(iii) Why does ethene have different chemical properties from decane and hexane?

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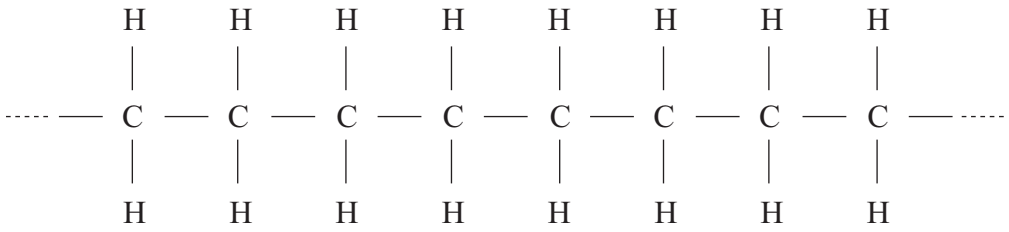
(2 marks)

(c) Ethene is used as the starting material for many polymers. The most common polymer is poly(ethene). One hydrocarbon molecule in poly(ethene) will contain thousands of carbon atoms.



Complete the diagram to show the bonds in ethene.

(1 mark)

Question 6 continues on the next page

(d) Read the following information.

Landfill, Incineration, Recycling and Re-use of Poly(ethene)

People could be encouraged to re-use their poly(ethene) bags and containers.

Recycling poly(ethene) saves raw materials and energy needed to make new plastic. When polymers are recycled the plastics must be collected, transported, sorted into different types by hand and washed. This requires the use of fossil fuels and is expensive.

Poly(ethene) can be burnt in an incinerator with other household waste. The heat released could be used to make steam to drive an electric generator. Surplus heat could be used to heat greenhouses used for growing vegetables. Incineration at too low a temperature can produce harmful substances. The residue (ash) has to go to landfill.

Landfill is probably the easiest way to dispose of polymers and it is cheap. Polymers are often mixed in with other household rubbish. Household waste does not get sorted into different materials because it is disposed of in the same hole in the ground. When the hole is eventually full, the waste is covered by a layer of soil to stop it smelling. The waste gets compressed under its own weight. Most polymers, such as poly(ethene), are not biodegradable so will remain in the ground forever.

You are asked to decide which option for the disposal of poly(ethene) will be put forward in your area. You decide that recycling is the best option.

Suggest **one** economic argument and **one** environmental argument that will be made against recycling.

For each argument made, how will you persuade those making the argument to accept your option?
(You must use only one sentence for each argument made against your decision and only one sentence for your response to it.)

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(4 marks)

12

END OF QUESTIONS

There are no questions printed on this page