

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

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



General Certificate of Secondary Education  
Higher Tier  
January 2012

**Science B**  
Unit Chemistry C1

**CHY1H**

**Chemistry**  
Unit Chemistry C1

**H**

**Written Paper**

**Thursday 26 January 2012 9.00 am to 9.45 am**

**You will need no other materials.**  
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**

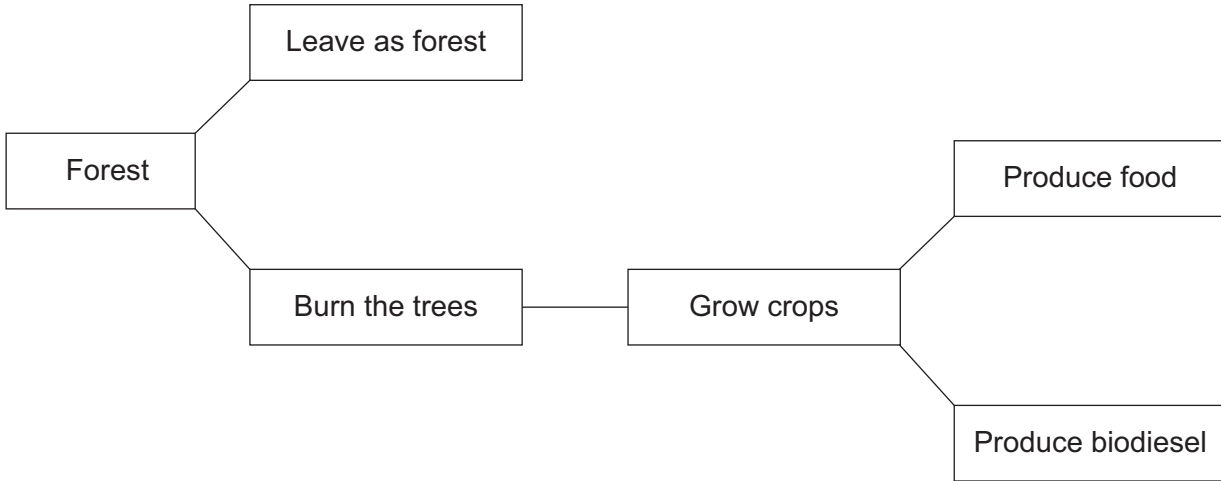
- In all calculations, show clearly how you work out your answer.



J A N 1 2 C H Y 1 H O 1

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

- 1** Petroleum diesel is a fuel made from crude oil.  
Biodiesel is a fuel made from vegetable oils.  
To make biodiesel, large areas of land are needed to grow crops from which the vegetable oils are extracted.  
Large areas of forest are cleared by burning the trees to provide more land for growing these crops.



**1 (a)** Use this information and your knowledge and understanding to answer these questions.

**1 (a) (i)** Carbon neutral means that there is no increase in the amount of carbon dioxide in the atmosphere.

Suggest why adverts claim that using biodiesel is carbon neutral.

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*(2 marks)*



**1 (a) (ii)** Explain why clearing large areas of forest has an environmental impact on the atmosphere.

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(2 marks)

**1 (b)** Why is there an increasing demand for biodiesel?

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(1 mark)

**1 (c)** Suggest why producing biodiesel from crops:

**1 (c) (i)** causes ethical concerns

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(1 mark)

**1 (c) (ii)** causes economic concerns.

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(1 mark)

7

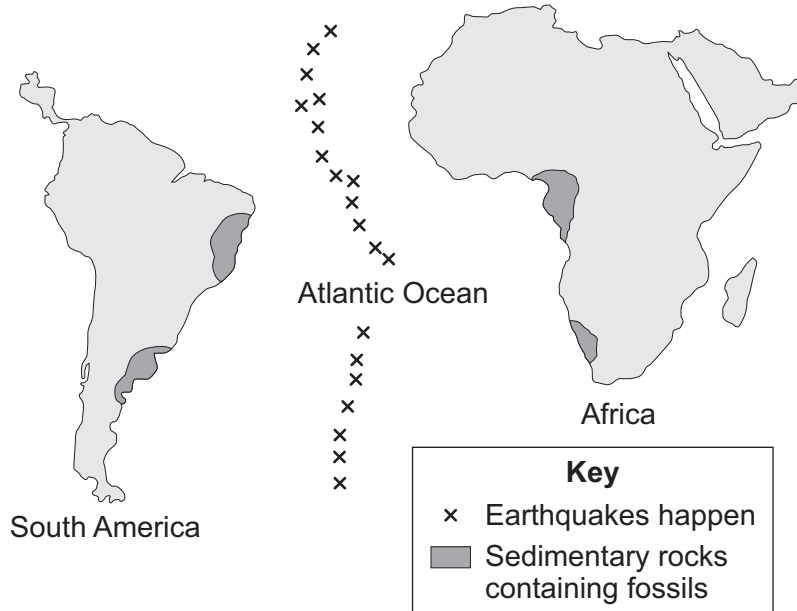
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2 Earthquakes happen in some places on Earth.

The diagram shows some of these places that are between the continents of South America and Africa.



2 (a) (i) Why do earthquakes happen in the places shown on the diagram?

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 (1 mark)

2 (a) (ii) Scientists cannot predict when earthquakes will happen. Suggest why.

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 (1 mark)



**2 (b)** In 1915, Alfred Wegener proposed the idea of continental drift. He suggested that South America and Africa had once been joined. Most scientists in 1915 did not accept his idea.

**2 (b) (i)** In 1915, Wegener's idea was **not** accepted by most scientists. Suggest **one** reason why.

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*(1 mark)*

**2 (b) (ii)** Use the information in the diagram to suggest **two** pieces of evidence that led to Wegener's idea being accepted by most scientists.

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*(2 marks)*

**2 (c)** Explain, in as much detail as you can, what is causing the continents of South America and Africa to move further apart.

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*(3 marks)*

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**3** About 3000 million years ago, carbon dioxide was one of the main gases in the Earth's atmosphere.

About 400 million years ago, plants and trees grew on most of the land. When the plants and trees died they were covered by sand and slowly decayed to form coal.

**3 (a)** Describe and explain how the composition of the Earth's atmosphere was changed by the formation of coal.

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*(3 marks)*

**3 (b)** Today, coal is burned in power stations to release the energy needed by industry. Carbon dioxide, water and sulfur dioxide are produced when this coal is burned.

Name **three** elements that are in this coal.

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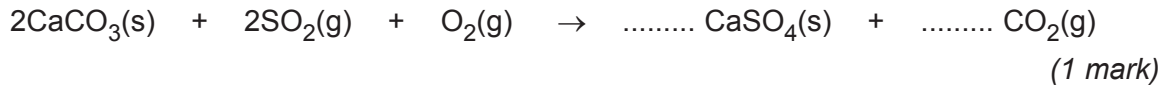
*(2 marks)*



**3 (c)** In some power stations coal is mixed with calcium carbonate (limestone).  
The mixture is crushed before it is burned.

**3 (c) (i)** Many chemical reactions happen when this mixture is burned.  
The chemical equation represents one of these reactions.

Balance the chemical equation.



**3 (c) (ii)** Explain how the use of calcium carbonate in the mixture:

increases atmospheric pollution

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decreases atmospheric pollution.

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(4 marks)

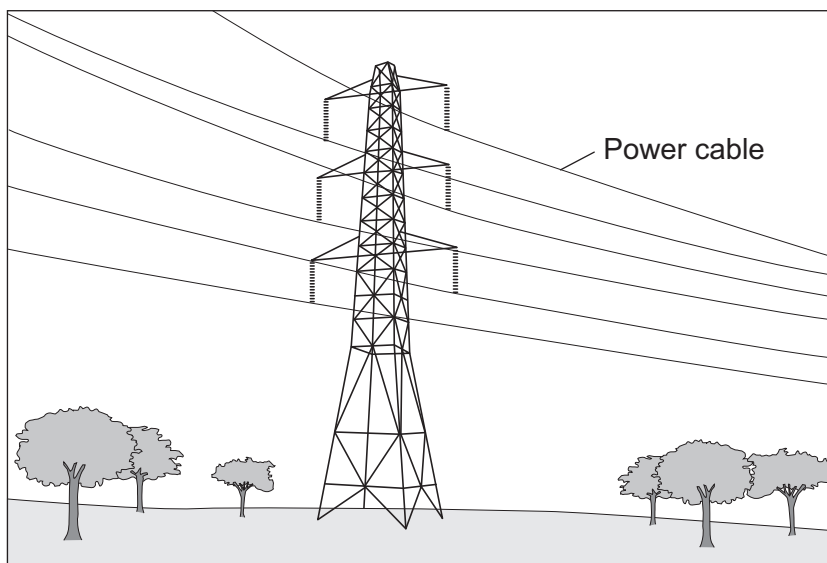
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4 Metals are used in the manufacture of overhead power cables.



The table shows some properties of three metals.

Metal	Density in g per cm <sup>3</sup>	Melting point in °C	Percentage (%) relative electrical conductivity	Percentage (%) abundance in Earth's crust	Percentage (%) of metal in its ore
copper	8.92	1083	100	0.007	3
aluminium	2.70	660	60	8.1	25
iron	7.86	1535	20	5.0	60

4 (a) Use information from the table to explain why aluminium is used to conduct electricity in overhead power cables.

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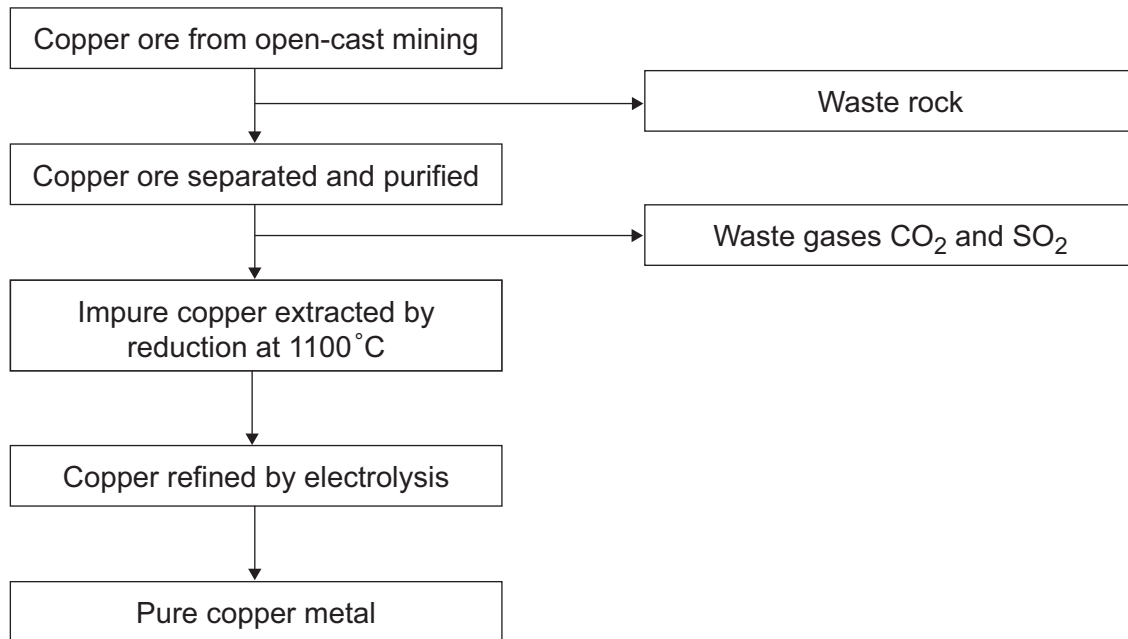
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(2 marks)





- 4 (b) Most electric cables use copper to conduct electricity.  
The main steps in the extraction of copper are shown in the flow diagram.



Use the information in the flow diagram and your knowledge and understanding to suggest the benefits of recycling copper compared with the extraction of copper from its ore.

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(3 marks)

Question 4 continues on the next page

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**4 (c)** PEX is a polymer that can be used to cover and insulate power cables.  
PEX is made from poly(ethene).  
Poly(ethene) is made from ethene.

**4 (c) (i)** Describe how ethene,  $C_2H_4$ , can be produced from pentane,  $C_5H_{12}$

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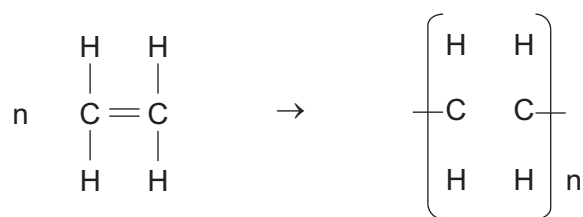
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(2 marks)

**4 (c) (ii)** The equation for the formation of poly(ethene) is shown.

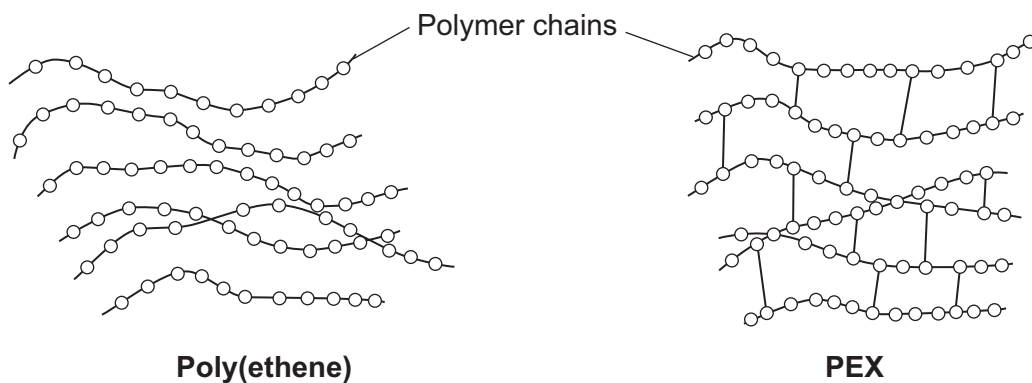
Complete the structure of poly(ethene) by drawing in the missing bonds of the product.



(1 mark)



4 (c) (iii) The simplified structures of poly(ethene) and PEX are shown.



Poly(ethene) softens when heated and can be reshaped. PEX does not soften when heated and cannot be reshaped.

Use the structures to suggest and explain why.

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(3 marks)

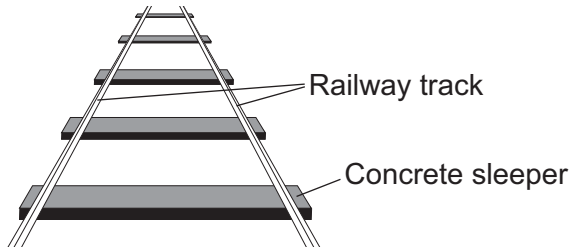
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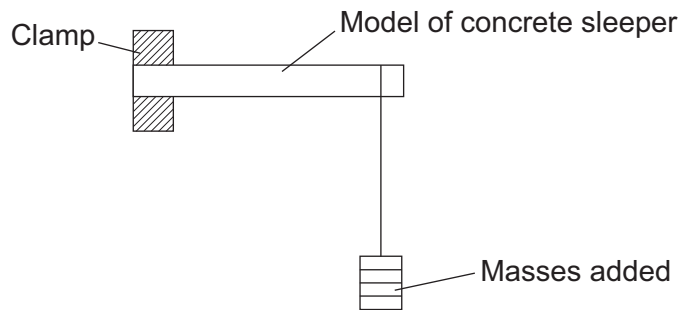


5 In the UK railway sleepers were made from wood. They are now often made from concrete.



A scientist was asked to find the best concrete mixture to use so that railway sleepers would not break easily. The scientist made:

- a mould to make small models of concrete sleepers
- concrete mixtures using crushed rock, sand, cement and water
- the equipment shown to add 0.1 kg masses until the model sleeper broke.



The scientist's results are shown in the table.

Concrete mixture in % by volume			Total mass added to break the model sleeper in kg				
Cement	Sand	Crushed rock	Test 1	Test 2	Test 3	Test 4	Mean
10	70	20	1.2	1.1	1.3	1.2	1.2
20	60	20	3.0	2.6	2.5	2.4	
30	50	20	3.5	3.3	3.3	3.3	3.3
40	40	20	3.9	3.8	4.0	3.3	3.9
50	30	20	4.2	4.5	4.2	4.3	4.3

5 (a) Calculate the mean total mass added to break the model sleeper that has 20% cement by volume.

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Mean = ..... kg  
 (2 marks)



**5 (b)** State **one** conclusion that the scientist could make from these results.

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(1 mark)

**5 (c)** The scientist sent the results in a report to a company that makes full-size concrete railway sleepers.

**5 (c) (i)** Suggest **two** other factors that the company should take into consideration before deciding which mixture to use to make a full-size concrete railway sleeper.

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(2 marks)

**5 (c) (ii)** The scientist's report claimed that using concrete sleepers instead of wooden sleepers would have less environmental impact.  
Do you agree with the scientist's claim?  
Use your knowledge and understanding to justify your answer.  
Remember to compare using concrete with using wood for the sleepers.

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(4 marks)

**END OF QUESTIONS**

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