

Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

For Examiner's Use
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General Certificate of Secondary Education  
January 2007

**SCIENCE B**  
**Unit Chemistry C1**

**CHEMISTRY**  
**Unit Chemistry C1**

**Higher Tier**

Friday 19 January 2007 1.30 pm to 2.15 pm



**CHY1H**

**H**

<p><b>You will need no other materials.</b> You may use a calculator.</p>
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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.

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

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

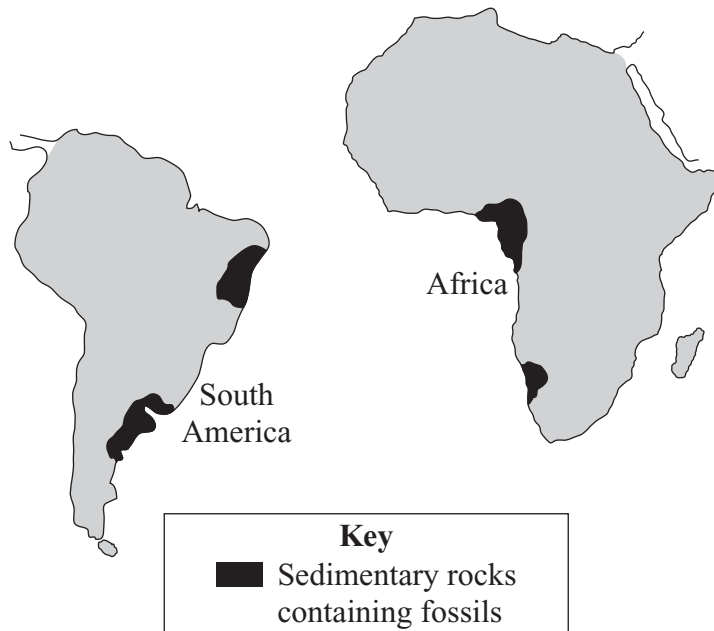
- 1 (a) Two hundred years ago, scientists thought that the Earth was about 400 million years old. This estimate came from the idea that the centre of the Earth was still molten. More recently, measurement of radioactivity in rocks has shown that the Earth is much older than 400 million years.

Suggest **one** reason why scientists now know that the Earth is much older than 400 million years.

.....  
 .....

(1 mark)

- (b) About one hundred years ago there was a scientist called Alfred Wegener. He found evidence that the continents, such as South America and Africa, had once been joined and then drifted apart.



Use the diagram to suggest **two** pieces of evidence that could be used to show that the continents had once been joined.

1 .....

.....

2 .....

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(2 marks)

- (c) About fifty years ago, new evidence convinced scientists that the Earth's crust is made up of tectonic plates that are moving very slowly.

Give **two** pieces of evidence that have helped to convince these scientists that the tectonic plates are moving.

1 .....

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2 .....

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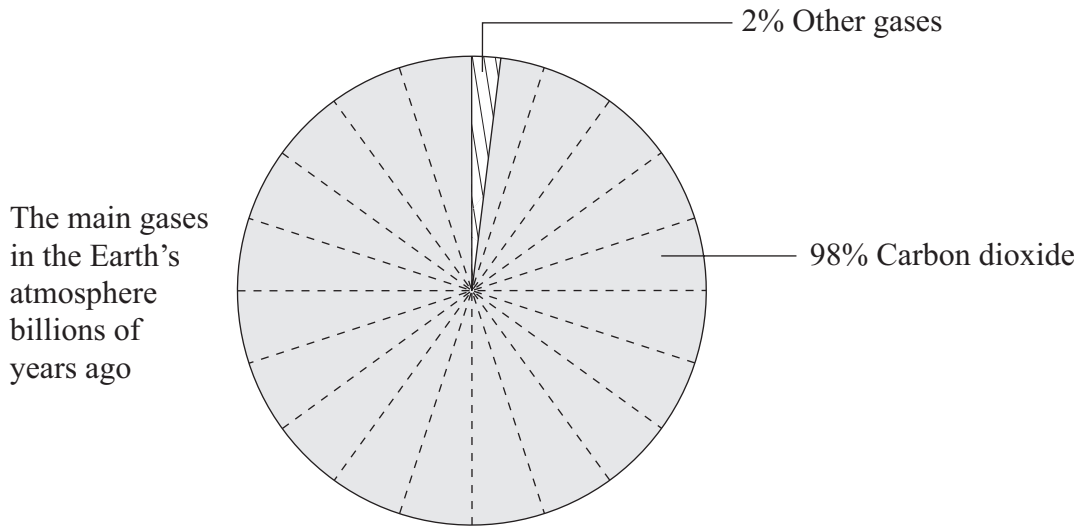
*(2 marks)*

<b>5</b>

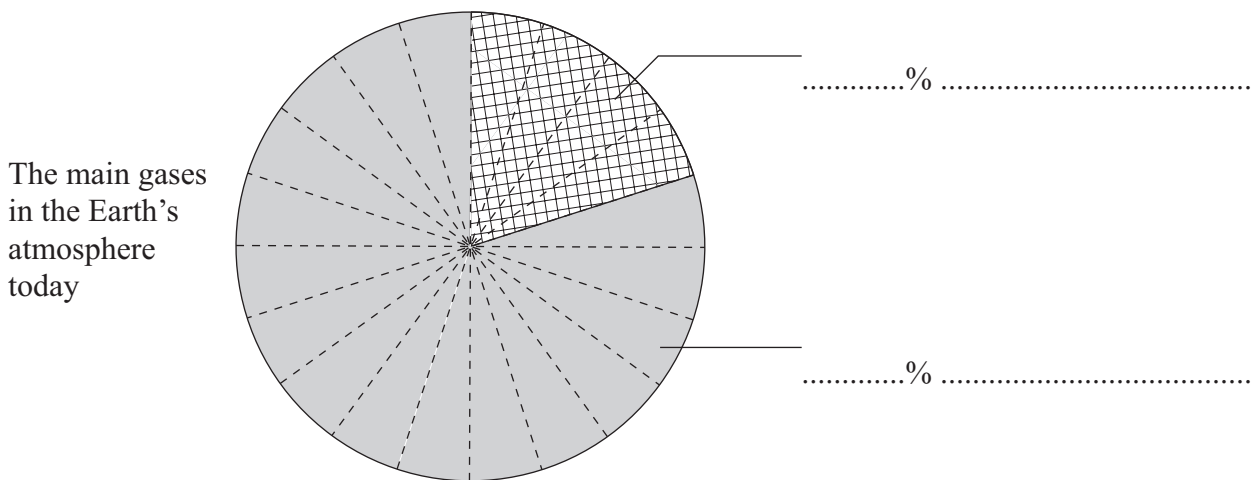
**Turn over for the next question**

**Turn over ►**

- 2 Life on Earth would not exist without the atmosphere.  
Billions of years ago the composition of the Earth's atmosphere was very different from the composition today.



- (a) Label the pie chart below to show the percentages and names of the two main gases in the Earth's atmosphere today.



(2 marks)

- (b) There is evidence that the composition of the Earth's atmosphere is still changing. One possible reason is that many power stations generate electricity by burning fossil fuels such as coal, oil or natural gas. Sulfur dioxide,  $\text{SO}_2$ , is produced when coal burns in air.

(i) What environmental problem does sulfur dioxide cause?

.....  
.....  
(1 mark)

(ii) How could this environmental problem be reduced in coal-fired power stations?

.....  
.....  
(1 mark)

(iii) Gas-fired power stations burn methane,  $\text{CH}_4$ , in air.

Complete the word equation for this reaction.

methane + ..... → carbon dioxide + .....  
(2 marks)

- (c) Excess carbon dioxide should be prevented from entering the atmosphere.

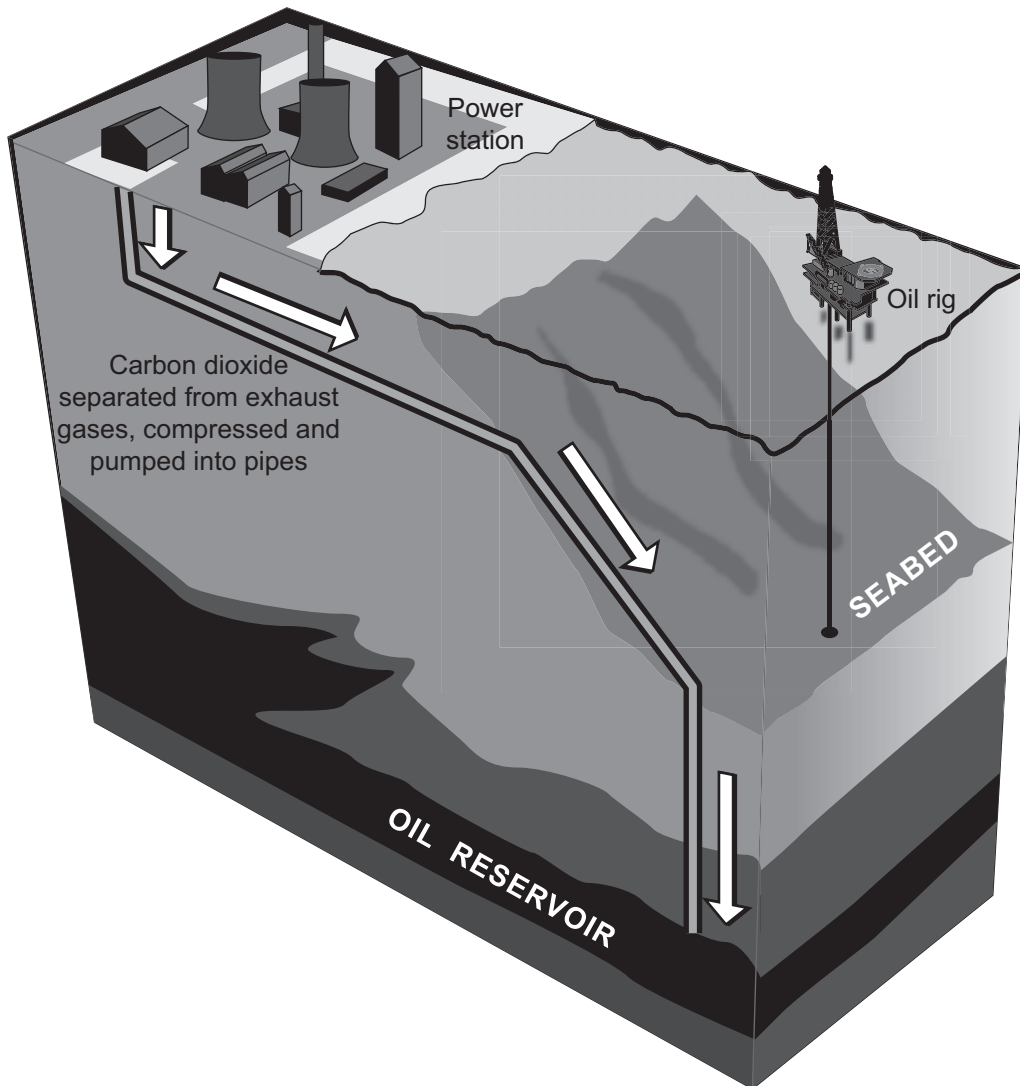
Explain why.

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(2 marks)

**Question 2 continues on the next page**

**Turn over ►**

- (d) Carbon dioxide is produced when fossil fuels burn in power stations. The diagram represents one idea to prevent excess carbon dioxide from entering the atmosphere.



Use the diagram to explain how carbon dioxide can be prevented from entering the atmosphere.

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(2 marks)

3 Many everyday items are made from iron.

(a) Haematite is an *ore* of iron. Haematite contains iron oxide,  $\text{Fe}_2\text{O}_3$ .

(i) What is the meaning of the term *ore*?

.....  
.....  
(1 mark)

(ii) Iron can be produced by reacting iron oxide with carbon in a blast furnace.

What type of reaction produces the iron?

.....  
.....  
(1 mark)

(iii) The word equation for this reaction is:

iron oxide + carbon  $\rightarrow$  iron + carbon dioxide

Complete and balance the symbol equation for this reaction.

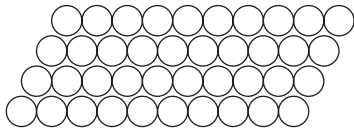
..... $\text{Fe}_2\text{O}_3$  + .....C  $\rightarrow$  ..... + .....  
(2 marks)

**Question 3 continues on the next page**

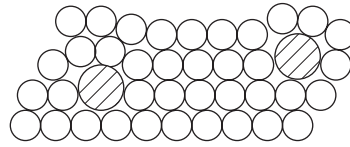
**Turn over ►**

(b) Pure iron is relatively soft and not very strong.

The iron from the blast furnace is very hard and brittle. It contains about 4% carbon and is used as cast iron.



Pure iron



Cast iron

Explain the differences in the properties of pure iron and cast iron by referring to the diagrams.

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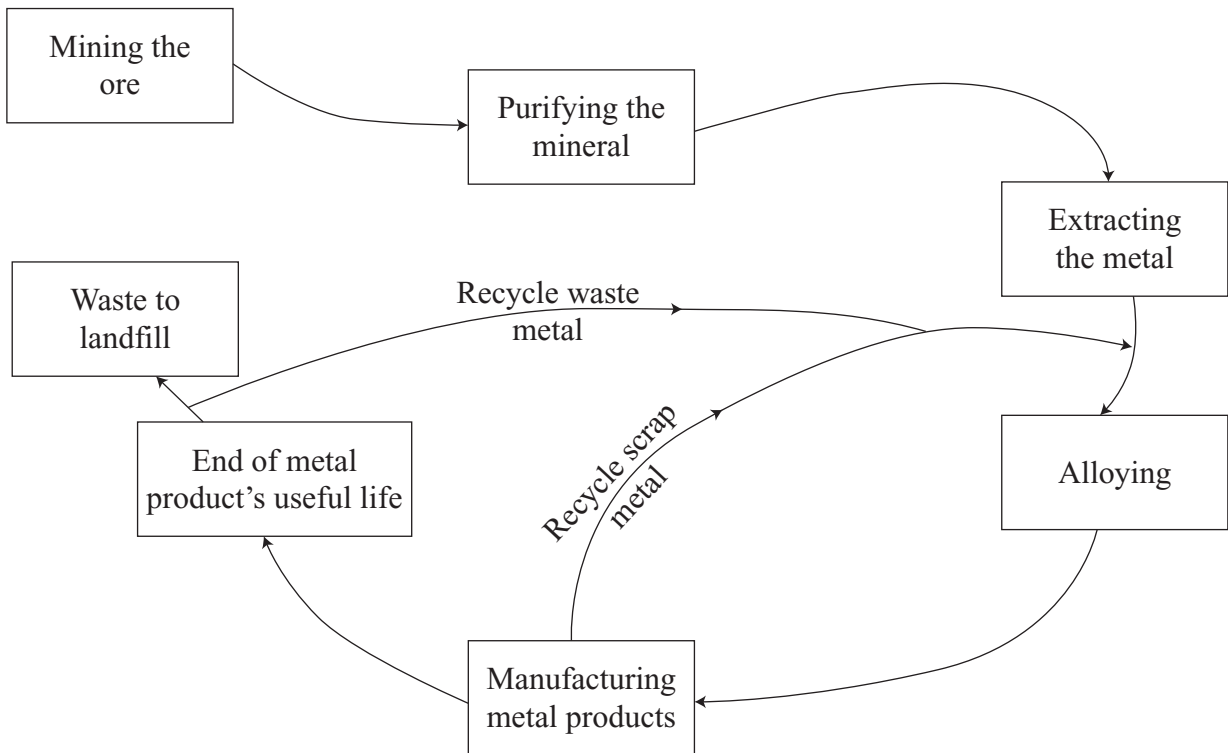
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(3 marks)



(c) The diagram shows the way in which iron is extracted, used and recycled.



Explain why the recycling of iron is necessary for sustainable development.

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(3 marks)

10
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Turn over ►

4 This information was taken from a label on a packet of crisps.

<b>Main ingredients:</b>	
Potatoes, vegetable oil, Worcester sauce flavour, colourings, flavourings, salt.	
<b>Nutritional information (per 100 g):</b>	
Energy	2040 kJ
Protein	6.5 g
Carbohydrate	55 g
of which sugars	3 g
Fat	27 g
of which saturates	9 g
unsaturates	18 g
Fibre	4.5 g
Sodium	1.2 g

(a) Saturated fats are linked to heart problems. In order to claim that their crisps are healthy, the manufacturer keeps the proportion of saturated fats low.

(i) What type of fat contains double carbon carbon bonds?

.....  
(1 mark)

(ii) The colour of bromine water is orange.

What is seen when bromine water is shaken with:

an unsaturated fat .....

a saturated fat? .....

(2 marks)

(iii) Unsaturated vegetable oils can be hardened to make them useful as spreads.

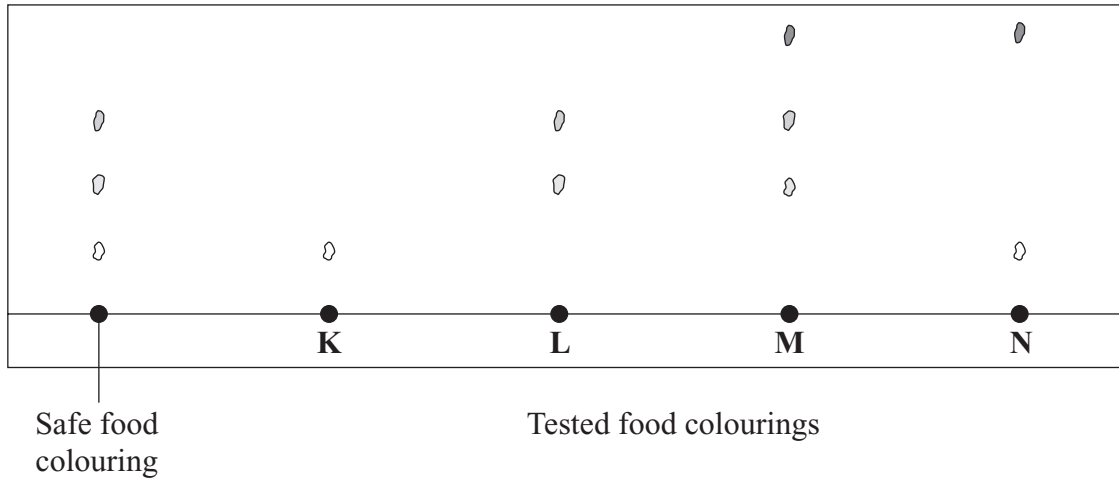
Describe how unsaturated vegetable oils are hardened.

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(2 marks)

- (b) The crisp manufacturer had to remove these crisps from sale because they contained Worcester sauce flavour. The Worcester sauce flavour was found to contain the artificial colouring called Sudan 1, which is known to cause cancer.

The diagram shows how the dyes in the colourings were detected and identified.



- (i) What is the name of the process that is used to detect and identify the dyes in colourings?

.....  
(1 mark)

- (ii) Which food colouring, **K**, **L**, **M** or **N**, is made up of a single dye?

.....  
(1 mark)

- (iii) Which of the food colourings **K**, **L**, **M** and **N** are safe to use?

.....  
(1 mark)

- (iv) Explain how you can tell that each of the five food colourings is different.

.....  
.....  
.....  
.....  
.....  
(2 marks)

5 Crude oil is a mixture of mostly alkanes.

(a) Crude oil is separated into useful fractions by fractional distillation.

(i) Describe and explain how the mixture of alkanes is separated by fractional distillation.

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(3 marks)

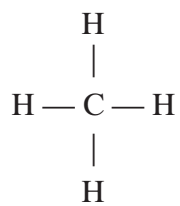
(ii) The table gives the name and formula for each of the first three alkanes.

Complete the table to show the formula of butane.

Name of alkane	Formula
Methane	CH <sub>4</sub>
Ethane	C <sub>2</sub> H <sub>6</sub>
Propane	C <sub>3</sub> H <sub>8</sub>
Butane	

(1 mark)

(b) The structural formula of methane,  $\text{CH}_4$ , is:



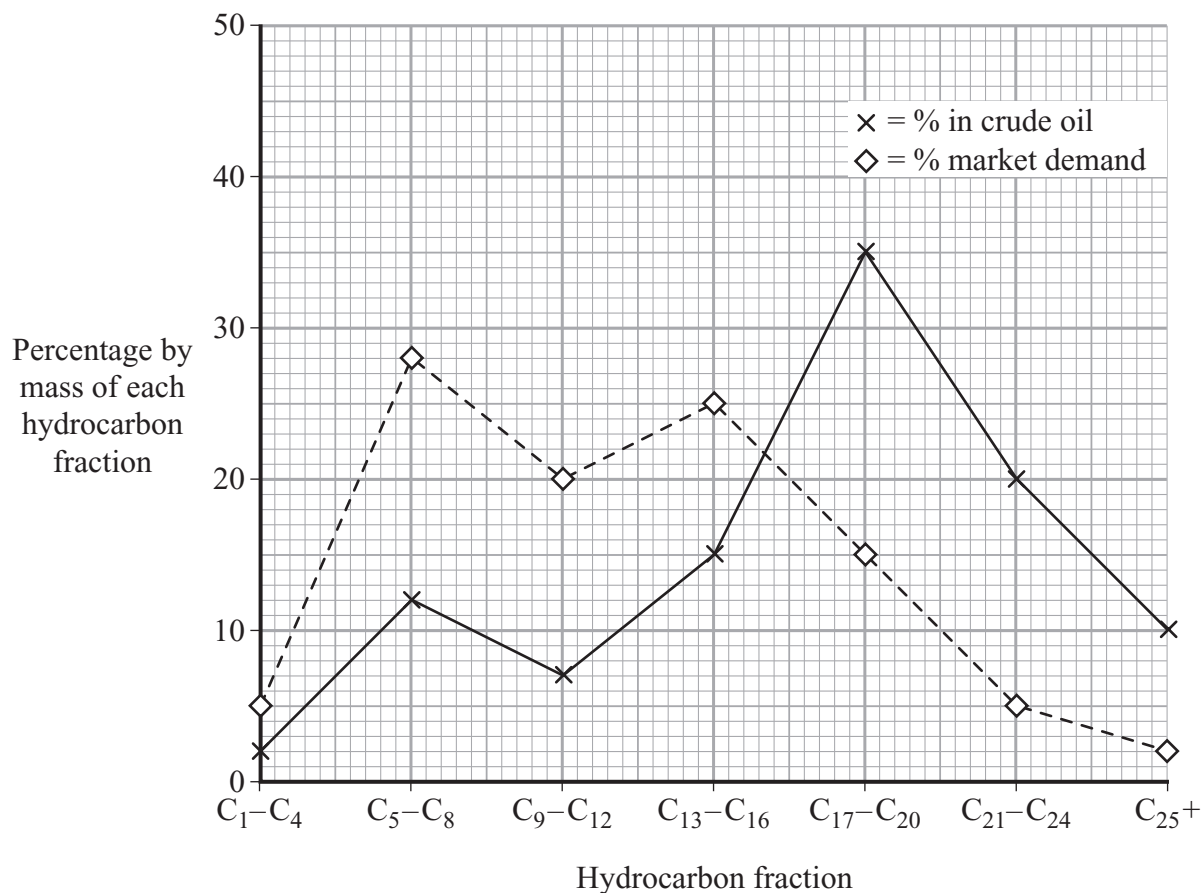
Draw the structural formula of propane,  $\text{C}_3\text{H}_8$

*(1 mark)*

**Question 5 continues on the next page**

**Turn over ►**

- (c) The relative amounts of and the market demand for some hydrocarbons from the fractional distillation of crude oil are shown in the graph.

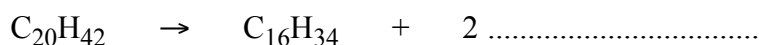


- (i) Why is the market demand for the C<sub>5</sub>-C<sub>8</sub> fraction higher than the market demand for the C<sub>21</sub>-C<sub>24</sub> fraction?

.....  
 .....  
 (1 mark)

- (ii) Cracking is used to break down large hydrocarbon molecules into smaller hydrocarbon molecules.

Complete the symbol equation by writing in the formula of the other hydrocarbon.



(1 mark)

(iii) The C<sub>5</sub>–C<sub>8</sub> fraction has low supply and high market demand.

Suggest **three** ways in which the oil industry could overcome this problem.

1 .....

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2 .....

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3 .....

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*(3 marks)*

<b>10</b>

**END OF QUESTIONS**

**There are no questions printed on this page**