

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 2010

**Science B**  
Unit Chemistry C1

**CHY1H**

**Chemistry**  
Unit Chemistry C1

**H**

**Written Paper**

**Wednesday 16 June 2010 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.

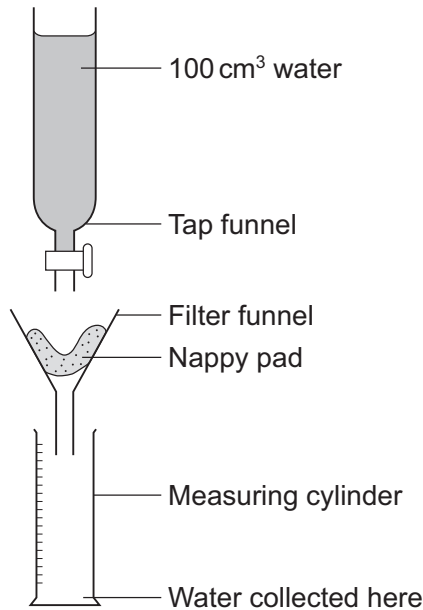


J U N 1 0 C H Y 1 H 0 1

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

- 1** Disposable nappies for babies need to absorb as much water as possible. Disposable nappies have a pad containing a special polymer called a hydrogel. Hydrogels absorb water.

A company called Aqanaps compared the water absorption of its nappy pads with nappy pads made by other companies.



- A scientist from Aqanaps poured  $100\text{ cm}^3$  of water onto the pad of one of its nappies.
- He measured the volume of water that passed through.
- He did the test three times using a new nappy pad for each test.
- The scientist then repeated the procedure using the nappy pads from three other companies, **A**, **B** and **C**.

The results are shown in the table.

Company	Volume of water collected in $\text{cm}^3$		
	Pad 1	Pad 2	Pad 3
<b>Aqanaps</b>	55	57	55
<b>A</b>	47	46	39
<b>B</b>	65	63	64
<b>C</b>	38	39	38



1 (a) (i) Choose **one** result in the table that should be tested again.

Result: Company ..... Pad .....

Explain why you chose this result.

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(2 marks)

1 (a) (ii) Suggest **one** variable that should be controlled in this investigation.

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(1 mark)

1 (a) (iii) Suggest **one** possible cause of error in this investigation.

.....  
.....

(1 mark)

1 (b) (i) The Aqanaps company studied the results. The company concluded that it should increase the amount of hydrogel used in its nappy pads.

Give **two** reasons why the company decided to increase the amount of hydrogel used in its nappy pads.

1 .....  
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2 .....  
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(2 marks)

1 (b) (ii) Suggest **one** disadvantage for the company if it increases the amount of hydrogel used in its nappy pads.

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(1 mark)

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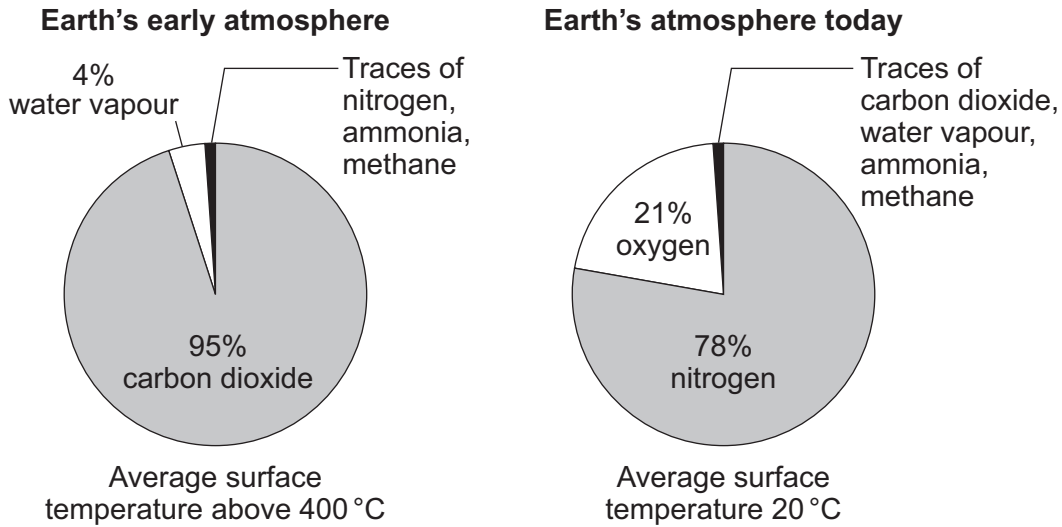
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2 (a) Scientists have suggested that:

- the Earth formed as a molten ball of rock and minerals
- the rock and minerals cooled slowly
- the surface of the Earth was covered by volcanoes
- the volcanoes released gases that formed the Earth's early atmosphere.

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



2 (a) (i) Explain what has happened to most of the water vapour in the Earth's early atmosphere.

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(2 marks)

2 (a) (ii) Give **two** reasons why the percentage of carbon dioxide in the Earth's early atmosphere decreased.

1 .....

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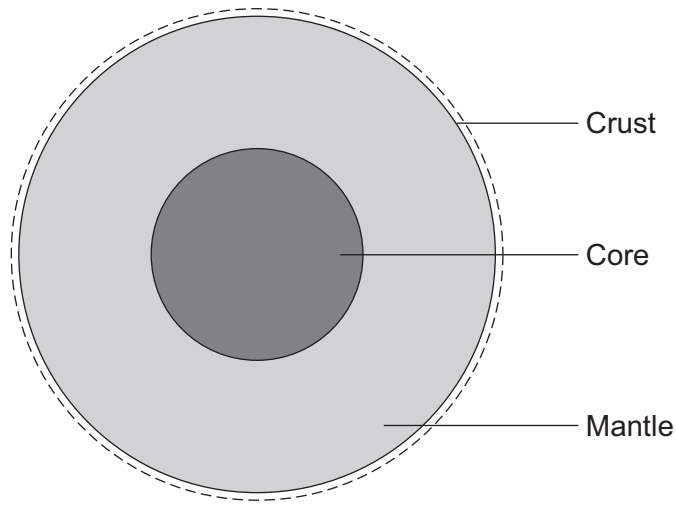
2 .....

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(2 marks)



2 (b) Scientists have suggested that the Earth consists of a core, mantle and crust.



A 'traditional' theory is that the core is made of iron and nickel.

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

2 (b) (i) Why can scientists **not** prove which theory about the core is correct?

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(1 mark)

2 (b) (ii) How can the 'controversial' theory be used to explain why the Earth's tectonic plates move?

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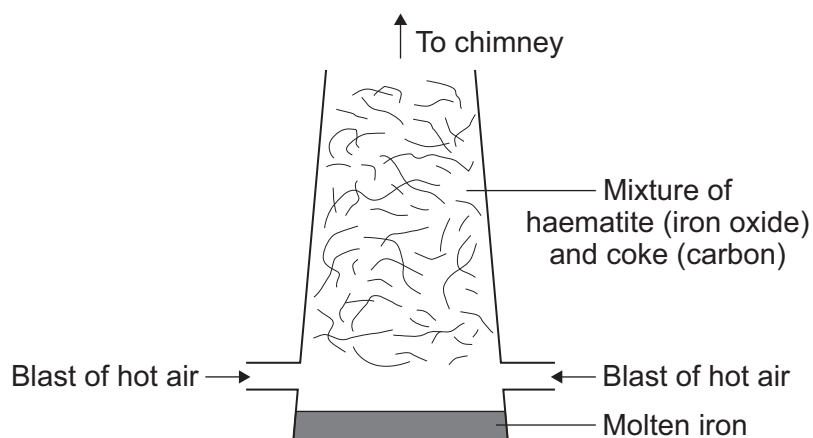
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- 3** Iron is produced by reacting a mixture of haematite and coke in a blast furnace. Haematite is an ore of iron containing iron oxide ( $\text{Fe}_2\text{O}_3$ ). Coke is made from coal and is almost pure carbon.



- 3 (a) (i)** The coke burns in air. This reaction heats the furnace to above  $1300^\circ\text{C}$ .

Complete the chemical equation for carbon reacting with oxygen to form carbon dioxide.



(1 mark)

- 3 (a) (ii)** Carbon monoxide is also formed in the furnace. Carbon monoxide reacts with iron oxide to produce iron and carbon dioxide.



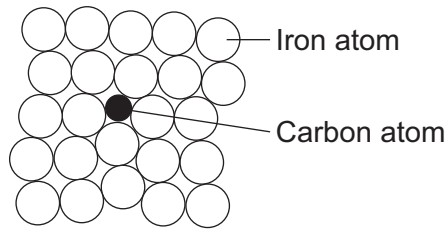
Complete and balance the chemical equation for the production of iron.



(2 marks)



3 (a) (iii) Iron from a blast furnace is called cast iron and contains about 4% carbon.



Why is pure iron softer than cast iron?

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(1 mark)

3 (b) Steel is made by reducing the percentage of carbon in cast iron and then adding different metals to form the type of steel required.

In the UK we use about 1.8 billion steel cans every year but only 30% of these are recycled. Recycling reduces waste. Producing steel from recycled cans requires only 25% of the energy needed to make steel from iron ore.

Give **three** environmental benefits of recycling a higher percentage of used steel cans.

1 .....

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2 .....

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3 .....

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(3 marks)

7

Turn over for the next question

Turn over ►



- 4 Medical evidence suggests that eating saturated fats, compared with unsaturated fats, is associated with a higher risk of circulatory and heart problems.

Each of the oils listed in the table contains a mixture of saturated and unsaturated fats.

Oil	Melting point in °C	Iodine number
palm	24	54
olive	-6	85
rapeseed	-10	98
sunflower	-17	127

The iodine number is the mass of iodine in grams that reacts with 100 cm<sup>3</sup> of the oil. The iodine number shows the amount of unsaturated fat in each oil.

- 4 (a) (i) What would be seen if a solution containing 1 g of iodine was added to 100 cm<sup>3</sup> of any of these oils?

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 .....  
 (1 mark)

- 4 (a) (ii) What does the word *unsaturated* mean?

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

- 4 (a) (iii) Which oil in the table would **probably** cause the highest risk of circulatory and heart problems?

Use the information in the table to give a reason for your answer.

Oil .....

Reason .....

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 (2 marks)





**4 (b)** Sunflower oil can be hardened so that it can be used to make margarine.

Explain how sunflower oil can be hardened.

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(3 marks)

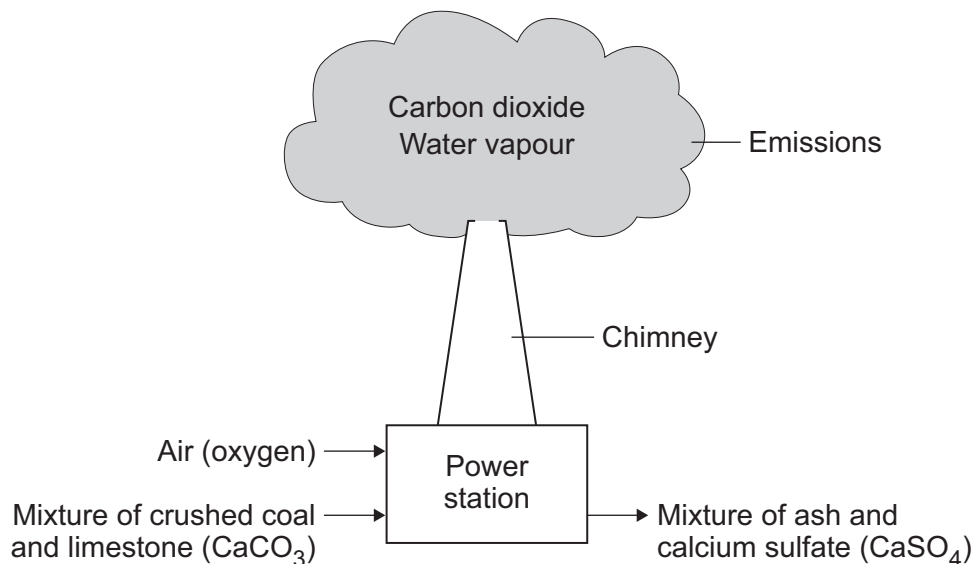
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- 5** Most power stations burn coal to generate electricity. Burning coal gives off sulfur dioxide gas which can be removed from the waste gases by using limestone. This prevents sulfur dioxide from entering the atmosphere and causing acid rain. One disadvantage of using limestone in a power station is that it releases 'locked up carbon dioxide' into the atmosphere.



- 5 (a)** How does the limestone used in a power station:

- 5 (a) (i)** release carbon dioxide

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 .....  
 (1 mark)

- 5 (a) (ii)** remove sulfur dioxide?

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 .....  
 (1 mark)



**5 (b)** The waste gases from the chimney are monitored. One toxic gas that should not be released is carbon monoxide.

Explain how carbon monoxide would be formed.

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(2 marks)

**5 (c)** The use of limestone in a power station releases 'locked up carbon dioxide' into the atmosphere.

**5 (c) (i)** Explain the meaning of 'locked up carbon dioxide'.

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(2 marks)

**5 (c) (ii)** Why does the release of this carbon dioxide cause an environmental problem?

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(1 mark)

<b>7</b>

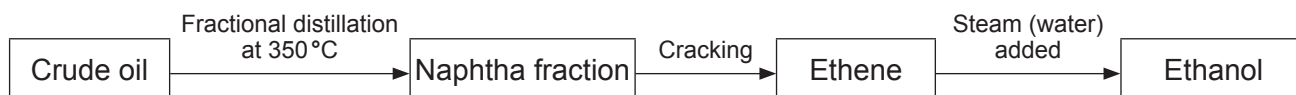
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- 6** Petrol sold in most countries now contains at least 5% ethanol. The production of ethanol, for use as a fuel, is being increased.

The flow diagram shows how ethanol can be produced from crude oil.



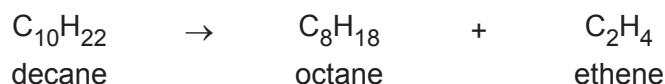
- 6 (a)** Why does crude oil need to be fractionally distilled?

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(1 mark)

- 6 (b)** Hydrocarbons, such as decane, in the naphtha fraction are cracked to produce ethene. The balanced chemical equation shows the cracking of decane.



- 6 (b) (i)** Describe how cracking is done.

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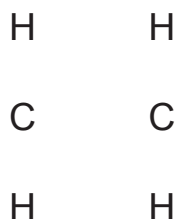
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(2 marks)

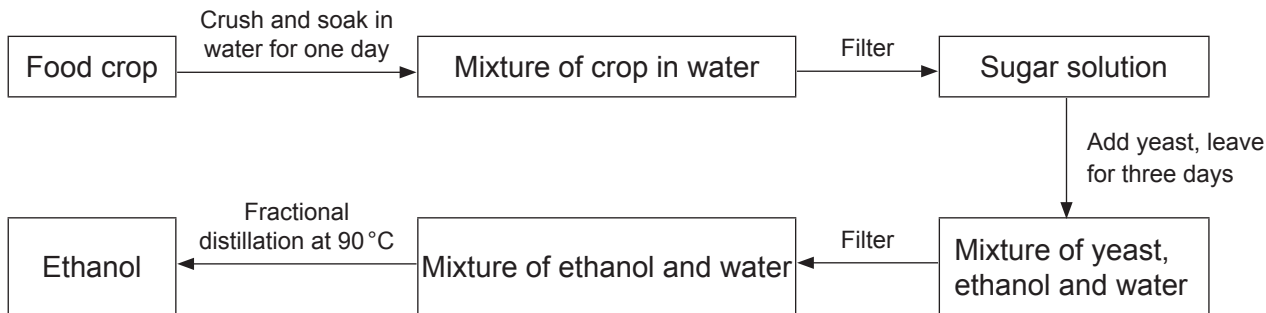
- 6 (b) (ii)** Complete the structural formula of ethene by drawing lines to represent each covalent bond.



(1 mark)



**6 (c)** The flow diagram below shows how ethanol, for use as a fuel, can also be produced from food crops.



Use the information in the two flow diagrams and your own knowledge and understanding to evaluate whether more of this ethanol should be produced from food crops or from crude oil.

Remember to give a conclusion to your evaluation.

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(5 marks)

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**END OF QUESTIONS**



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