

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
TOTAL	



General Certificate of Secondary Education  
Foundation Tier  
January 2012

**Science A**  
Unit Chemistry C1

**CH1FP**

**Chemistry**  
Unit Chemistry C1

**F**

**Wednesday 18 January 2012 9.00 am to 10.00 am**

**For this paper you must have:**

- a ruler
  - the Chemistry Data Sheet (enclosed).
- You may use a calculator.

**Time allowed**

- 1 hour

**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 60.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- Question 5(b) should be answered in continuous prose.  
In this question you will be marked on your ability to:
  - use good English
  - organise information clearly
  - use specialist vocabulary where appropriate.

**Advice**

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



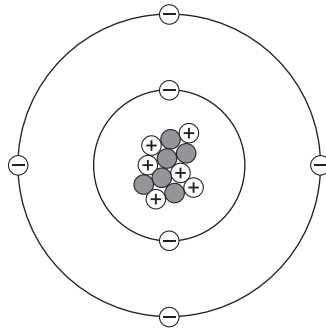
J A N 1 2 C H 1 F P O 1

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

- 1 The picture shows a diamond ring.



- 1 (a) Diamond is a form of carbon. The diagram represents a carbon atom.



Complete the table to show the name and charge of each type of particle in the carbon atom.

Name of particle	Charge
proton	
neutron	0
	-1

(2 marks)



**1 (b)** Use the Chemistry Data Sheet to help you to answer these questions.

**1 (b) (i)** Draw a ring around the correct answer to complete the sentence.

Gold and carbon are

compounds.
elements.
mixtures.

(1 mark)

**1 (b) (ii)** Complete the sentence.

Gold and carbon have different properties because gold is a metal  
and carbon is a .....

(1 mark)

**1 (c)** Draw a ring around the correct answer to complete each sentence.

Pure gold is not used to make the ring because pure gold is too

hard.
reactive.
soft.

The gold ring is made by mixing pure gold with other metals to form

a compound.
an atom.
an alloy.

(2 marks)

**Question 1 continues on the next page**

**Turn over ►**



- 1 (d) The data in the table shows some information about the three metals in the gold ring.

Name of metal	Atomic number	Percentage (%) of metal
gold	79	
silver	47	16
copper	29	9

Draw **one** line from each question to its correct answer.

**Question**

**Answer**

What is the percentage of gold in this ring?

29

How many electrons are there in a copper atom?

61

How many neutrons are in an atom of silver with a mass number of 108?

75

79

(3 marks)

9



**Turn over for the next question**

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ANSWER IN THE SPACES PROVIDED**

**Turn over ►**



0 5

- 2 Cans for food and drinks are made from steel or aluminium.  
The main metal in steel is iron.

- 2 (a) Reacting iron oxide with carbon produces iron.

Draw a ring around the correct answer to complete the sentence.

The reaction to produce iron from iron oxide is

decomposition.

oxidation.

reduction.

(1 mark)

- 2 (b) Aluminium cannot be produced by reacting aluminium oxide with carbon.

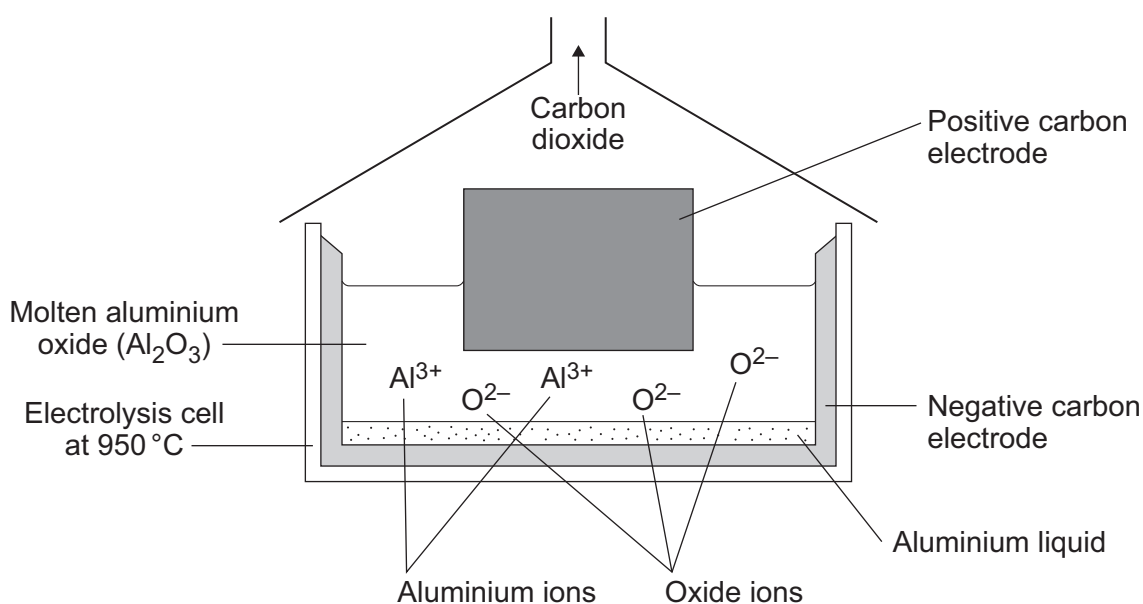
Why does aluminium oxide **not** react with carbon?

Tick (✓) the correct answer.

Answer	Tick (✓)
aluminium is less reactive than carbon	
carbon is less reactive than aluminium	
oxygen is more reactive than carbon	

(1 mark)

- 2 (c) Aluminium can be produced by electrolysis.



Why do the aluminium ions collect at the negative electrode?

.....

.....

.....

.....

(2 marks)

**2 (d)** Some statements about aluminium are given below.

Tick (✓) **two** statements that are correct reasons why aluminium is used to make cans.

Statement	Tick (✓)
aluminium conducts electricity	
aluminium is not a transition metal	
aluminium has a low density	
aluminium is resistant to corrosion	

(2 marks)

**2 (e)** Recycling aluminium cans uses less fossil fuels than producing aluminium from its ore.

Tick (✓) **one** advantage and tick (✓) **one** disadvantage of recycling aluminium to make aluminium cans.

Statement	Advantage Tick (✓)	Disadvantage Tick (✓)
aluminium is the most common metal in the Earth's crust		
less carbon dioxide is produced		
more aluminium ore needs to be mined		
used aluminium cans have to be collected and transported		

(2 marks)



- 3 (a)** Crude oil is a mixture of compounds.  
These compounds are made up of hydrogen and carbon atoms only.

- 3 (a) (i)** Draw a ring around the correct answer to complete the sentence.

Compounds made up of carbon and hydrogen atoms only are called

alcohols.
hydrocarbons.
vegetable oils.

(1 mark)

- 3 (a) (ii)** The table shows five of these compounds.

Compound	State at room temperature (20 °C)	Boiling point in °C
ethane, C <sub>2</sub> H <sub>6</sub>	gas	-89
butane, C <sub>4</sub> H <sub>10</sub>	gas	0
hexane, C <sub>6</sub> H <sub>14</sub>	liquid	+69
pentadecane, C <sub>15</sub> H <sub>32</sub>	liquid	+270
heptadecane, C <sub>17</sub> H <sub>36</sub>	solid	+302

Tick (✓) **two** correct statements about the five compounds.

Statement	Tick (✓)
ethane has the smallest molecules	
hexane and pentadecane are liquid at 100 °C	
heptadecane has the highest boiling point	
butane boils at 100 °C	

(2 marks)

- 3 (a) (iii)** Draw a ring around the correct answer to complete each sentence.

Fractional distillation is used to separate the compounds in crude oil.

The first step in fractional distillation is

cracking
displacing
evaporating

the crude oil.





During fractional distillation the compounds

- |           |
|-----------|
| burn      |
| condense  |
| decompose |

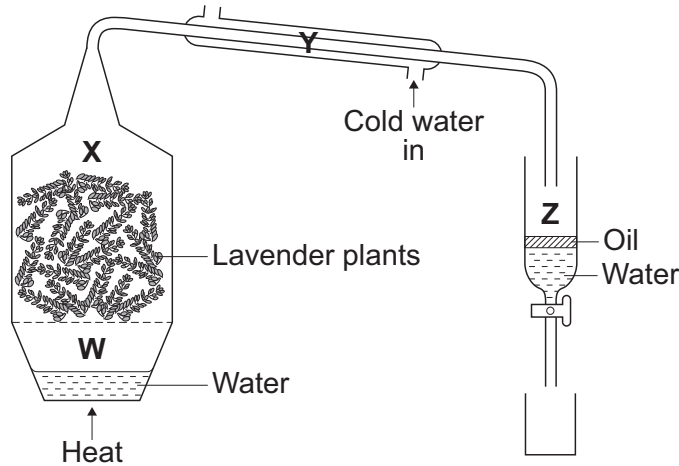
at different temperatures.

(2 marks)

3 (b)

Steam distillation is used to separate oils from plants.

The diagram shows some apparatus that can be used to separate oil from lavender plants. Four parts of the apparatus are labelled W, X, Y and Z.



3 (b)(i) In which part, W, X, Y or Z, of the apparatus:

is steam produced

are steam and oil condensed?

(2 marks)

3 (b)(ii) Use the correct word from the box to complete the sentence.

- |           |        |       |
|-----------|--------|-------|
| dissolves | floats | sinks |
|-----------|--------|-------|

When the oil separates from the water, the oil .....

(1 mark)

3 (b)(iii) Describe how part Z of the apparatus can be used to remove the water from the oil.

.....

.....

.....

.....

(2 marks)

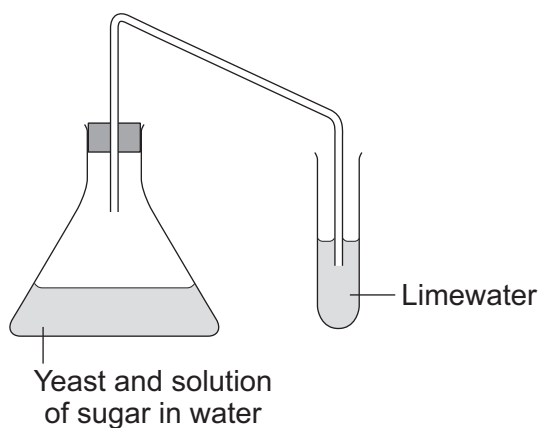
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4 Two fuels that can be used for cars are:

- petrol from crude oil
- ethanol made from sugar in plants.

4 (a) A student used the apparatus shown to investigate the reaction to make ethanol from sugar.



4 (a) (i) Draw a ring around the correct answer to complete the sentence.

This reaction to make ethanol from sugar is

combustion.

decomposition.

fermentation.

(1 mark)

4 (a) (ii) Complete the sentences.

The limewater turns .....

This happens because .....

(2 marks)

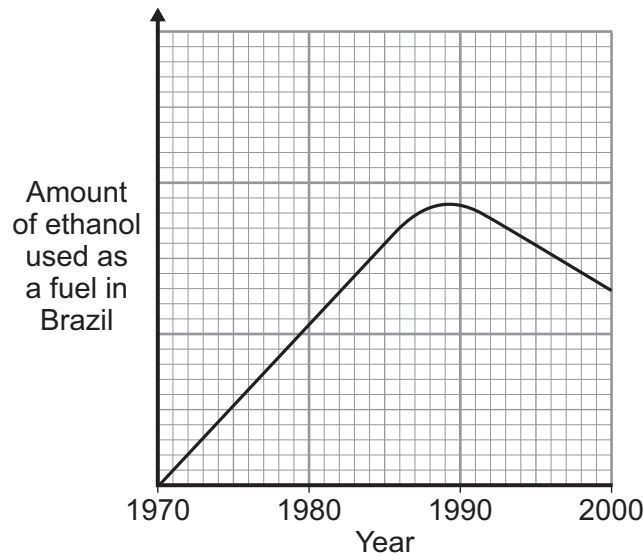


**4 (b)** In 1970, the Brazilian Government stated that all petrol must contain more than 25% ethanol.

The reasons for this statement in 1970 were:

- Brazil did not have many oilfields
- Brazil has a climate suitable for growing sugar cane.

The graph shows the amount of ethanol used as a fuel in Brazil from 1970 to 2000.



**4 (b) (i)** Use the graph to describe the changes in the amount of ethanol used as a fuel in Brazil from 1970 to 2000.

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(2 marks)

**4 (b) (ii)** In 2011, the Brazilian Government decided to reduce the amount of ethanol in petrol to 18%.

Suggest **one** reason for their decision.

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(1 mark)

6
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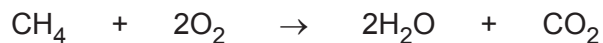
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**5** Cement is made by heating a mixture of clay and limestone in a kiln.

**5 (a)** Many kilns are heated by burning natural gas (methane) in air.

A chemical equation for the burning of methane is:



Describe this reaction in words.

Give the names of the molecules **and** the numbers of each molecule in this chemical equation.

.....

.....

.....

.....

(2 marks)

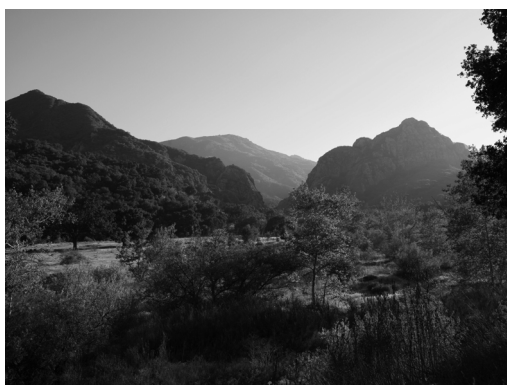
**5 (b)** *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

Limestone contains calcium carbonate.

There is a large deposit of limestone under an area of natural beauty.

A company wants to quarry this limestone and build a kiln near to the quarry to make cement.

**Area of natural beauty**



**A quarry**



Explosives will be used to extract the limestone out of the ground.

Heavy machinery will be used to lift and crush the limestone.

Lorries will be used to transport the limestone to the kiln to make cement.

The lorries and the heavy machinery will use diesel fuel.



Quarrying limestone and making cement will have an impact on everything near the area.

Describe the positive and the negative impacts of quarrying limestone and making cement.

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(6 marks)

8

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- 6** A mixture of petrol and air is burned in a car engine.  
Petrol is a mixture of alkanes. Air is a mixture of gases.

The tables give information about the composition of petrol and the composition of air.

Petrol	
Alkane	Formula
hexane	C <sub>6</sub> H <sub>14</sub>
heptane	
octane	C <sub>8</sub> H <sub>18</sub>
nonane	C <sub>9</sub> H <sub>20</sub>
decane	C <sub>10</sub> H <sub>22</sub>

Air	
Gas	Percentage (%)
nitrogen	78
oxygen	21
carbon dioxide	0.035
Small amounts of other gases and water vapour	

- 6 (a)** Use the information above to answer these questions.

- 6 (a) (i)** Give the formula for heptane.

.....  
(1 mark)

- 6 (a) (ii)** Complete the general formula of alkanes.  
n = number of carbon atoms



(1 mark)

- 6 (b)** Alkanes in petrol burn in air.  
The equations represent two reactions of hexane burning in air.



**Reaction 2** produces a different carbon compound to **Reaction 1**.

- 6 (b) (i)** Name the carbon compound produced in **Reaction 2**.

.....  
(1 mark)

- 6 (b) (ii)** Give a reason why the carbon compounds produced are different.

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

Question 6 continues on the next page

Turn over ►



**6 (c)** The table shows the percentages of some gases in the exhaust from a petrol engine.

Name of gas	Percentage (%)
nitrogen	68
carbon dioxide	15
carbon monoxide	1.0
oxygen	0.75
nitrogen oxides	0.24
hydrocarbons	0.005
sulfur dioxide	0.005
other gases	

**6 (c) (i)** What is the percentage of the other gases in the table?

.....  
(1 mark)

**6 (c) (ii)** What is the name of the compound that makes up most of the other gases?

.....  
(1 mark)

**6 (c) (iii)** Give a reason why sulfur dioxide is produced in a petrol engine.

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

**6 (c) (iv)** State how nitrogen oxides are produced in a petrol engine.

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





**6 (d)** Many scientists are concerned about the carbon dioxide released from burning fossil fuels such as petrol.

Explain why.

.....

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(2 marks)

11

**Turn over for the next question**

**Turn over ►**



7 There are about 500 000 earthquakes every year. On 12 January 2010 there was an earthquake near Port-au-Prince in Haiti. Many buildings were destroyed causing the deaths of thousands of people. The earthquake did not come as a surprise to scientists who predicted the earthquake a week earlier. The Government and people ignored the prediction.



The Richter scale is used to compare the size of earthquakes.

Richter scale value	Effect of earthquake
Less than 2	People do not feel the earthquake.
2–4	People feel the earthquake but the earthquake rarely causes damage to buildings.
4–5	People feel the earthquake and the earthquake causes minor damage to a few buildings.
5–6	Shaking of the ground and major damage to some buildings.
6–8	Violent shaking of the ground and many buildings destroyed.
8–10	Very violent shaking of the ground and most buildings destroyed.

7 (a) Use the information above to answer these questions.

7 (a) (i) Suggest the Richter scale value for the earthquake that happened near Port-au-Prince in Haiti.

.....  
(1 mark)

7 (a) (ii) Governments and people often ignore scientists' predictions of an earthquake.

Suggest **three** reasons why.

1 .....

.....

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2 .....

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3 .....

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(3 marks)

**7 (b)** During the twentieth century many scientists proposed ideas about the cause of earthquakes and about the Earth's crust.  
 In 1912 Alfred Wegener proposed his idea of '*continental drift*'.  
 In 1930 Arthur Holmes suggested his idea of '*mantle dynamics*'.

**7 (b) (i)** What did Wegener mean by '*continental drift*'?

.....

.....

.....

.....

(2 marks)

**7 (b) (ii)** Holmes' idea of '*mantle dynamics*' provided an explanation for Wegener's idea of '*continental drift*'.

Suggest what '*mantle dynamics*' is and state what causes '*mantle dynamics*'.

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(2 marks)

8

**END OF QUESTIONS**



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