

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  
June 2013

## Additional Science

Unit Chemistry C2

CH2FP

## Chemistry

Unit Chemistry C2

F

Monday 20 May 2013 1.30 pm to 2.30 pm

**For this paper you must have:**

- 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 6(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 U N 1 3 C H 2 F P 0 1

G/J92916 6/6/6/6/6

CH2FP

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ANSWER IN THE SPACES PROVIDED**



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

**1** This question is about lithium and sodium.

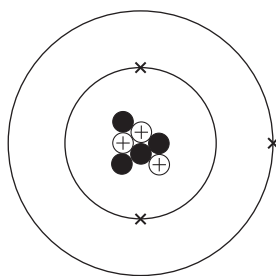
**1 (a)** Use the Chemistry Data Sheet to help you to answer this question.

In which group of the periodic table are lithium and sodium? Group

(1 mark)

**1 (b)** A lithium atom can be represented as  ${}^7_3\text{Li}$

The diagram represents the lithium atom.



**1 (b) (i)** Some particles in the nucleus have a positive charge.

What is the name of these particles? .....

(1 mark)

**1 (b) (ii)** Some particles in the nucleus have no charge.

What is the name of these particles? .....

(1 mark)

**1 (b) (iii)** Use the correct answer from the box to complete the sentence.

<b>3</b>	<b>4</b>	<b>7</b>
----------	----------	----------

The mass number of this atom of lithium is

(1 mark)

**Question 1 continues on the next page**

**Turn over ►**

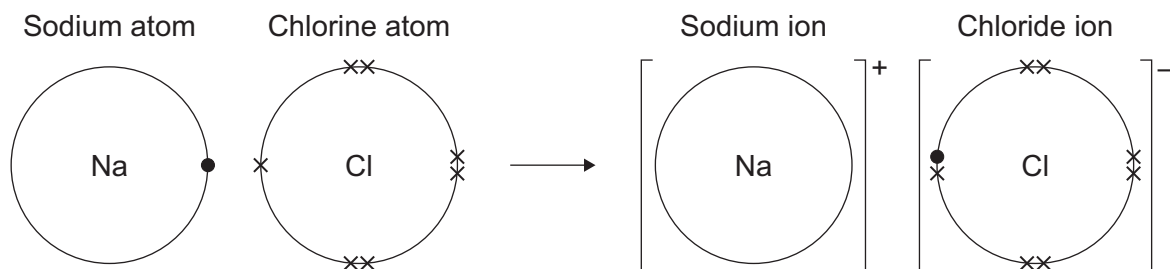


**1 (c)** Sodium reacts with chlorine to produce sodium chloride.



The diagram shows how the reaction happens.

Only the outer electrons are shown.



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

**1 (c) (i)** A sodium atom changes into a sodium ion by

gaining

losing

sharing

an electron.

(1 mark)

**1 (c) (ii)** A sodium ion has

a negative

no

a positive

charge.

(1 mark)

**1 (c) (iii)** The ions in sodium chloride are held together by strong

covalent

electrostatic

magnetic

forces.

(1 mark)



1 (d) Sodium chloride is an ionic compound.

Tick (✓) **two** properties of ionic compounds.

Property	Tick (✓)
Do <b>not</b> dissolve in water	
High melting points	
Low boiling points	
Strong bonds	

(2 marks)

1 (e) (i) The formula of sodium chloride is NaCl

Calculate the relative formula mass of sodium chloride.

Relative atomic masses: Na = 23; Cl = 35.5

.....  
.....

Relative formula mass = .....

(1 mark)

1 (e) (ii) Draw a ring around the correct answer to complete the sentence.

The relative formula mass of a substance, in grams, is one

ion
isotope
mole

of the substance.

(1 mark)

1 (f) Nanoparticles of sodium chloride (salt) are used to flavour crisps.

What are nanoparticles?

.....  
.....

(1 mark)



**2** This question is about salts of ammonia and salts of lead.

**2 (a)** Ammonia dissolves in water to make an alkaline solution.

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

The pH of a solution of ammonia is

2.

7.

11.

(1 mark)

**2 (b)** Ammonia can be reacted with an acid to produce the salt ammonium nitrate.

**2 (b) (i)** Name the acid used to produce ammonium nitrate.

.....

(1 mark)

**2 (b) (ii)** Draw a ring around the correct answer to complete the sentence.

The reaction of ammonia with an acid is a

neutralisation

polymerisation

reduction

reaction.

(1 mark)

**2 (c)** Why do farmers use ammonium nitrate on their fields?

.....

.....

(1 mark)



**2 (d)** Lead iodide is a salt that can be produced without using an acid.

**2 (d) (i)** Lead iodide is produced by mixing two solutions.

Complete the word equation.

lead ..... + potassium .....  $\longrightarrow$  lead iodide + potassium nitrate  
(2 marks)

**2 (d) (ii)** The lead iodide is produced as a solid.

Complete the sentence.

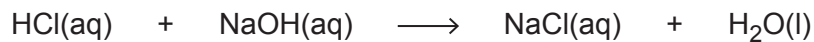
A solid that is produced when two solutions are mixed is called a .....  
(1 mark)

**2 (d) (iii)** How could the solid lead iodide be separated from the solution?

.....  
(1 mark)

**2 (d) (iv)** A student mixed two solutions to make sodium chloride.

The equation for the reaction the student used is:



How could the student obtain solid sodium chloride from the solution?

.....  
(1 mark)

9
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**Turn over for the next question**

**Turn over ►**

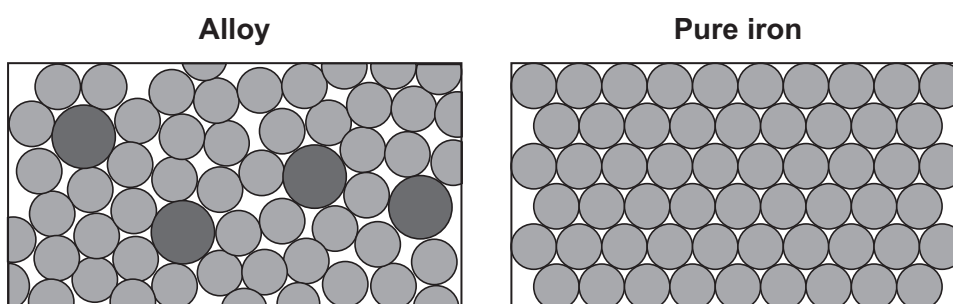


3 Oil rigs are used to drill for crude oil.



3 (a) Drills are made from an alloy of iron.

The diagrams show the particles in the alloy and in pure iron.



Use the diagrams to explain why the alloy is harder than pure iron.

.....

.....

.....

.....

(2 marks)

3 (b) Drill heads contain diamonds.

Tick (✓) **two** reasons why diamonds are hard.

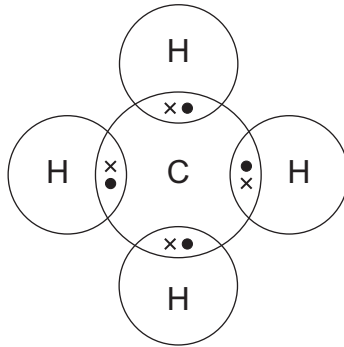
Reason	Tick (✓)
Diamonds have a giant covalent structure.	<input type="checkbox"/>
Diamonds have high melting points.	<input type="checkbox"/>
Diamonds are unreactive.	<input type="checkbox"/>
Diamonds have strong bonds between carbon atoms.	<input type="checkbox"/>

(2 marks)





- 3 (c)** Methane gas is often found where crude oil is found.  
The diagram shows how atoms bond in methane.  
Only the outer electrons are shown.



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

Methane is

a compound.
an element.
a mixture.

(1 mark)

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

The formula of methane is

$C_4H_4$
$C_4H$
$CH_4$

(1 mark)

- 3 (c) (iii)** Name the type of bond between the carbon and hydrogen atoms in methane.

.....  
(1 mark)

- 3 (d)** Explain why methane is a gas at 20°C.

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



**4** Humphrey Davy was a professor of chemistry.

In 1807 Humphrey Davy did an electrolysis experiment to produce potassium.

**4 (a) (i)** Humphrey Davy was the first person to produce potassium.

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

Humphrey Davy's experiment to produce this new element was quickly accepted by

other scientists because he

had a lot of money.
had a lot of staff to help.
was well qualified.

(1 mark)

**4 (a) (ii)** Other scientists were able to repeat Davy's experiment.

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

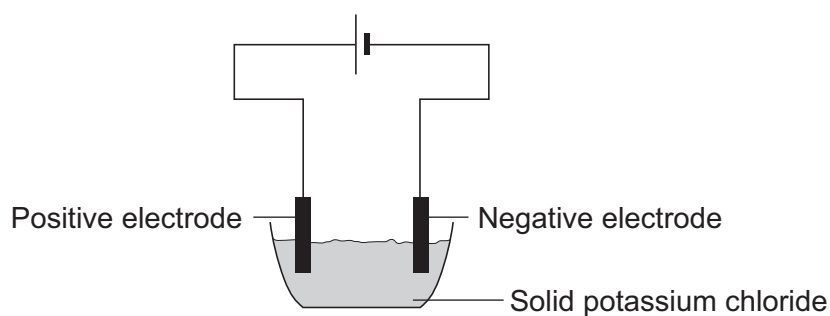
Being able to repeat Davy's experiment is important because

other scientists can

check the results of the experiment.
see if the experiment is safe.
take the credit for the discovery.

(1 mark)

**4 (b)** A student tried to electrolyse potassium chloride.



Potassium chloride contains potassium ions ( $K^+$ ) and chloride ions ( $Cl^-$ ).



**4 (b) (i)** The student found that solid potassium chloride does not conduct electricity.

Use the correct answer from the box to complete the sentence.

**are too big**

**cannot move**

**have no charge**

Solid potassium chloride does not conduct electricity because

the ions .....

(1 mark)

**4 (b) (ii)** What could the student do to the potassium chloride to make it conduct electricity?

.....  
(1 mark)

**4 (b) (iii)** During electrolysis why do potassium ions move to the negative electrode?

.....  
(1 mark)

**4 (b) (iv)** Draw a ring around the correct answer to complete the sentence.

When the potassium ions reach the negative electrode

they turn into potassium

atoms.

electrodes.

molecules.

(1 mark)

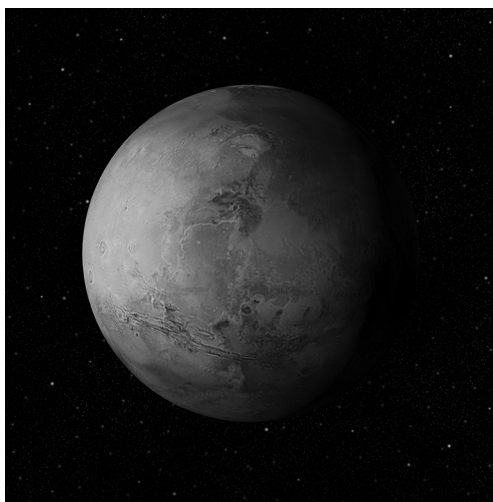
6

**Turn over for the next question**

**Turn over ►**



**5** This question is about the planet Mars.



**5 (a)** Mars is a red colour in the sky at night.

The red colour of Mars is because of iron oxide.

Iron oxide is an ionic compound.

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

Ionic compounds are made of

giant lattices.

polymer chains.

simple molecules.

(1 mark)

**5 (b)** Many spacecraft have been sent to Mars. Parts of these spacecraft are made from polymers.

**5 (b) (i)** Polymers that behave like shape memory alloys are used in spacecraft.

The shape memory polymers are cooled and compressed. These polymers are stored on the spacecraft until needed.

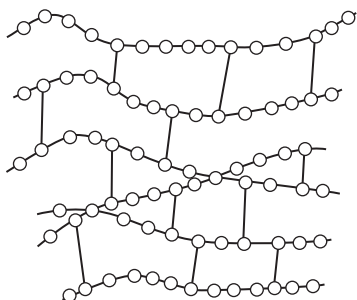
Suggest how the polymers could be made to return to their original shape.

.....  
(1 mark)



**5 (b) (ii)** Thermosetting polymers are used for the tiles on the outside of spacecraft.

The diagram shows the structure of a thermosetting polymer.



Explain, in terms of structure, why some polymers are thermosetting.

.....

.....

.....

.....

(2 marks)

**5 (c)** Instrumental methods such as GC–MS are used to analyse substances found on Mars.

In GC–MS, gas chromatography columns are linked to mass spectrometers.

**5 (c) (i)** What does gas chromatography do to the substances?

.....

.....

(1 mark)

**5 (c) (ii)** Give **two** reasons for using instrumental methods for analysis.

1 .....

.....

2 .....

.....

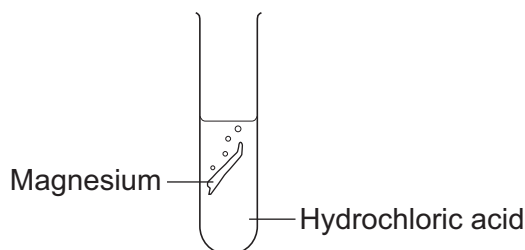
(2 marks)

7
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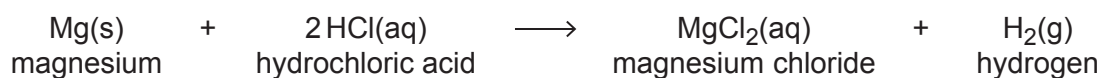
Turn over ►



- 6 A student investigated the reaction between magnesium and hydrochloric acid.



The equation for the reaction is:



- 6 (a) Give **two** observations the student could make during the reaction.

1 .....

.....

2 .....

.....

(2 marks)

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

The student investigated how the rate of this reaction changed when the concentration of hydrochloric acid was changed.

Write a plan the student could use.

In your plan you should:

- describe how you would carry out the investigation and make it a fair test
- describe the measurements you would make.

.....

.....

.....

.....

.....

.....



Dotted writing lines for student response.

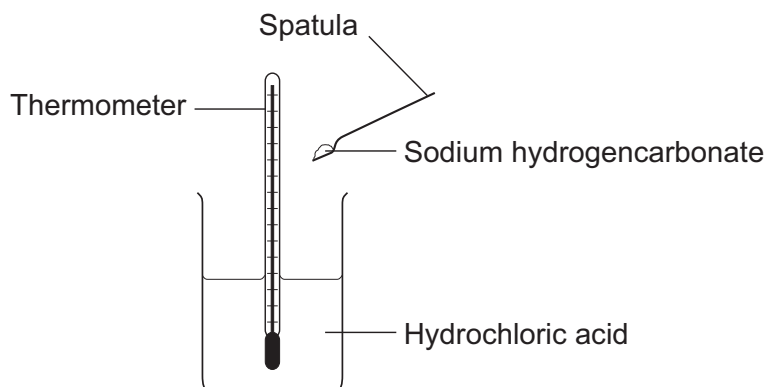
(6 marks)

8
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Turn over ►



- 7 (a)** Some students did an experiment to find the temperature change when hydrochloric acid reacts with sodium hydrogencarbonate.



The results are in the table.

Number of spatula measures of sodium hydrogencarbonate	Start temperature in °C	Final temperature in °C	Change in temperature in °C
2	20	16	4
4	20	14	6
6	19	11	8
8	20	10	10
10	19	9	10
12	20	10	10





**7 (a) (i)** Describe, as fully as you can, the trends shown in the students' results.

.....

.....

.....

.....

.....

.....

.....

.....

.....

*(3 marks)*

**7 (a) (ii)** State the type of energy transfer for this reaction.

.....

.....

*(1 mark)*

**Question 7 continues on the next page**

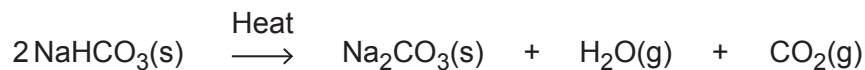
**Turn over ►**



**7 (b)** Sodium hydrogencarbonate is used as baking powder for making cakes.

When the cake mixture is baked the sodium hydrogencarbonate decomposes.

The equation for the reaction is:



**7 (b) (i)** The cake mixture rises when baked.



Use the equation to suggest why.

.....  
 .....

(1 mark)

**7 (b) (ii)** The same reaction can be reversed to produce sodium hydrogencarbonate from sodium carbonate.



Do the reactants need to be heated?

Give a reason for your answer.

.....  
 .....

(1 mark)



**7 (c) (i)** Calculate the relative formula mass of sodium hydrogencarbonate ( $\text{NaHCO}_3$ ).

Relative atomic masses ( $A_r$ ): H=1; C=12; O=16; Na=23

.....  
.....  
.....

Relative formula mass ( $M_r$ ) = .....  
(2 marks)

**7 (c) (ii)** Calculate the percentage by mass of carbon in sodium hydrogencarbonate.

.....  
.....

Percentage of carbon = ..... %  
(1 mark)

9

**END OF QUESTIONS**



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