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 2010

Additional Science
Unit Chemistry C2

CHY2F

F

Chemistry
Unit Chemistry C2

Wednesday 26 May 2010 9.00 am to 9.45 am

For this paper you must have:
- a ruler
- the Data Sheet (enclosed).

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.

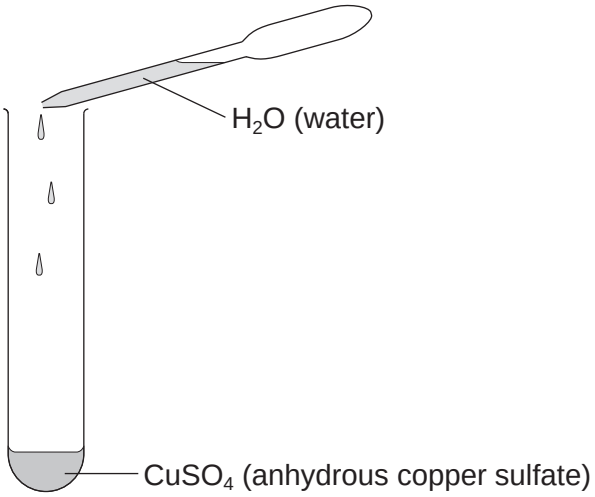
Advice
- In all calculations, show clearly how you work out your answer.

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

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

1 The diagram shows how anhydrous copper sulfate can be used to test for water.



$$\underset{\text{white}}{CuSO_4} + \underset{\text{colourless}}{5H_2O} \rightleftharpoons \underset{\text{blue}}{CuSO_4.\,5H_2O}$$

1 (a) What colour change will you see when water is added to the $CuSO_4$?

Colour changes from .....to .....

(1 mark)

1 (b) Draw a ring around the meaning of the symbol $\rightleftharpoons$

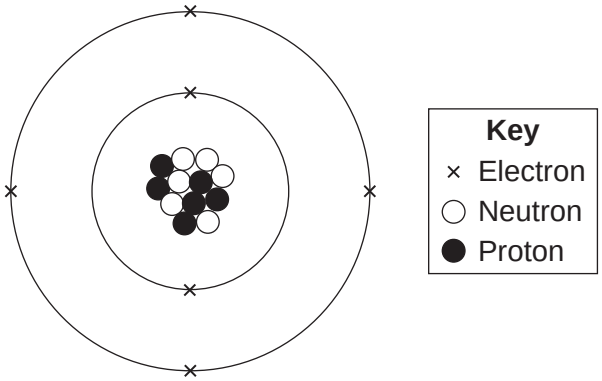
endothermic **exothermic** **reversible**

(1 mark)

2

Turn over for the next question

2 The diagram represents a carbon atom.



2 (a) Use words from the box to answer the questions.

electron	**neutron**	**nucleus**	**proton**

2 (a) (i) What is the name of the central part of the atom?

.....

(1 mark)

2 (a) (ii) What is the name of the particle with no charge?

.....

(1 mark)

2 (a) (iii) What is the name of the particle with a negative charge?

.....

(1 mark)

2 (b) Use the diagram above to help you to answer these questions.

2 (b) (i) Draw a ring around the atomic (proton) number of this carbon atom.

6 **12** **18**

(1 mark)

2 (b) (ii) Draw a ring around the mass number of this carbon atom.

6 **12** **18**

(1 mark)

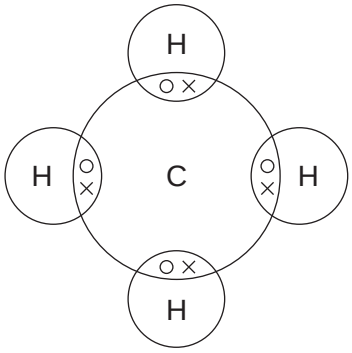
2 (c) A different carbon atom has 6 protons and 8 neutrons.

Draw a ring around the symbol that represents this atom.

$^{8}_{6}C$ $^{14}_{6}C$ $^{14}_{8}C$

(1 mark)

2 (d) The diagram shows the bonding in a methane molecule.



2 (d) (i) Draw a ring around the chemical formula of a methane molecule.

CH_4 **CH^4** **C_4H**

(1 mark)

2 (d) (ii) Draw a ring around the word that describes methane.

compound **element** **mixture**

(1 mark)

2 (d) (iii) Draw a ring around the type of bonding in a methane molecule.

covalent **ionic** **metallic**

(1 mark)

9

Turn over for the next question

3 The picture shows a student with two glow sticks.

Glow sticks contain several chemicals. When a glow stick is bent the chemicals mix. A chemical reaction takes place which causes light to be given out.

A student investigated three glow sticks. One was placed in water at 5 ºC, one in water at 40 ºC and one in water at 70 ºC.

The results are shown in the table.

Temperature in ºC	**Effect on glow stick**	
	Brightness of light	**Time it gave out light, in hours**
5	dim	7
40	bright	3
70	very bright	1

3 (a) How did increasing the temperature affect the brightness of the glow stick?

.....

.....

(1 mark)

3 (b) How did increasing the temperature affect the time it gave out light?

.....

.....

(1 mark)

3 (c) The student was asked why an **increase** in temperature changes the rate of the chemical reaction. The student listed five ideas. Only **three** of them are correct.

Put ticks (✓) next to the **three** correct ideas.

Ideas	Tick (✓)
The particles will collide more often.	
The particles will be more concentrated.	
The particles will move faster.	
The particles will have more energy.	
The particles will get bigger.	

(3 marks)

3 (d) Suggest **one** way the student could improve this investigation.

.....

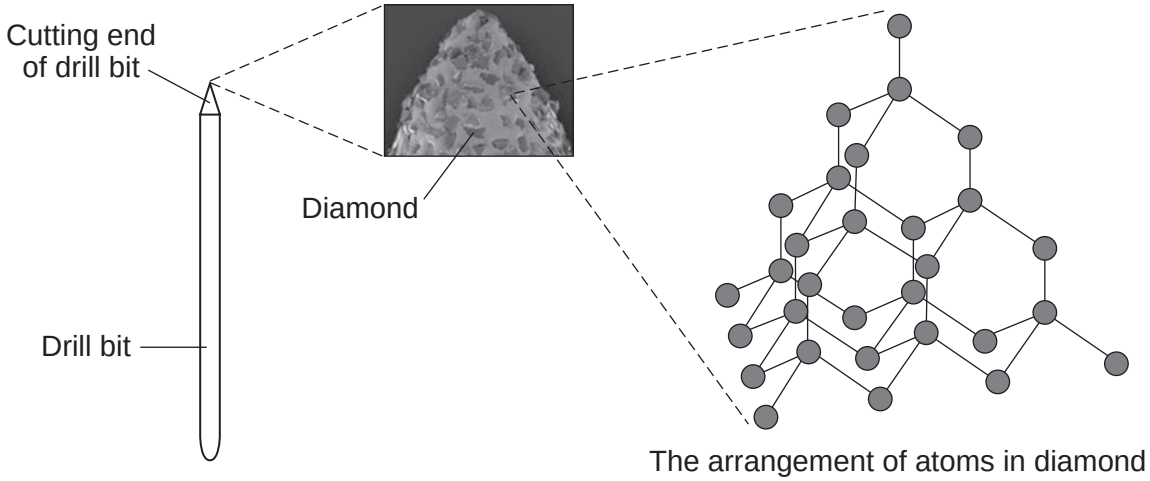
.....

(1 mark)

6

Turn over for the next question

4 A drill bit is used to cut holes through materials. The cutting end of this drill bit is covered with very small diamonds.



The arrangement of atoms in diamond

Draw a ring around the correct word in each box.

4 (a) Diamond is made from [carbon / nitrogen / oxygen] atoms.

(1 mark)

4 (b) Diamond has a giant structure in which [none / some / all] of the atoms are joined together.

(1 mark)

4 (c) The atoms in diamond are joined together by [covalent / ionic / metallic] bonds.

(1 mark)

4 (d) In diamond each atom is joined to

two
three
four

other atoms.

(1 mark)

4 (e) Diamond is suitable for the cutting end of a drill bit because it is

hard.
shiny.
soft.

(1 mark)

5

Turn over for the next question

5 This question is about lead iodide and magnesium iodide.

5 (a) Lead iodide can be made by mixing a solution containing lead ions with a solution containing iodide ions.

Lead iodide is formed as a solid.

lead ions in solution + iodide ions in solution → lead iodide solid

5 (a) (i) Draw a ring around the name given to this type of reaction.

electrolysis **neutralisation** **precipitation**

(1 mark)

5 (a) (ii) Tick (✓) the method used to separate solid lead iodide from the solution.

Method	Tick (✓)
distillation	
evaporation	
filtration	

(1 mark)

5 (a) (iii) The table below gives information about the solubility of some compounds.

Soluble compounds	Insoluble compounds
all sodium and potassium salts	
all nitrates	
most chlorides, bromides and iodides	silver and lead chlorides, bromides and iodides

Use the table to help you to:

draw a ring around a soluble compound which contains lead ions

lead bromide **lead chloride** **lead nitrate**

draw a ring around a soluble compound which contains iodide ions.

lead iodide **silver iodide** **sodium iodide**

(2 marks)

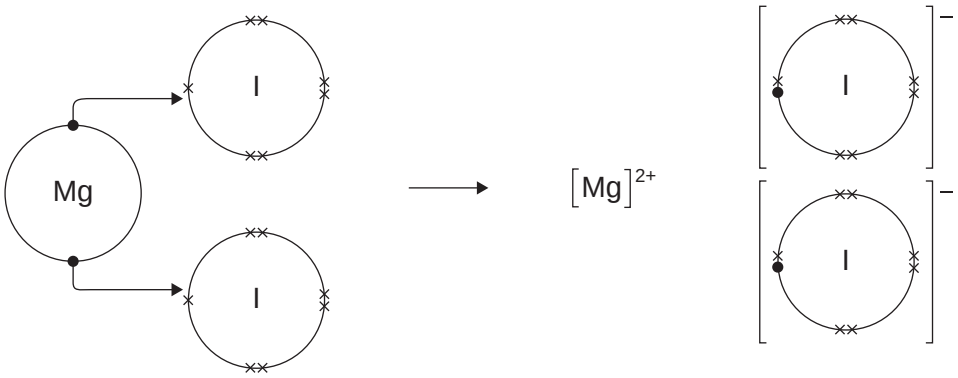
5 (b) Magnesium iodide can be made by reacting magnesium with iodine.

magnesium + iodine → magnesium iodide

The diagram shows how this takes place.

Only the outer electrons are shown.

The dots (•) and crosses (×) are used to represent electrons.



Use the diagram to help you to answer this question.

Describe, as fully as you can, what happens when magnesium reacts with iodine to make magnesium iodide.

To gain full marks you should use the words atom, electron and ion in your answer.

.....

.....

.....

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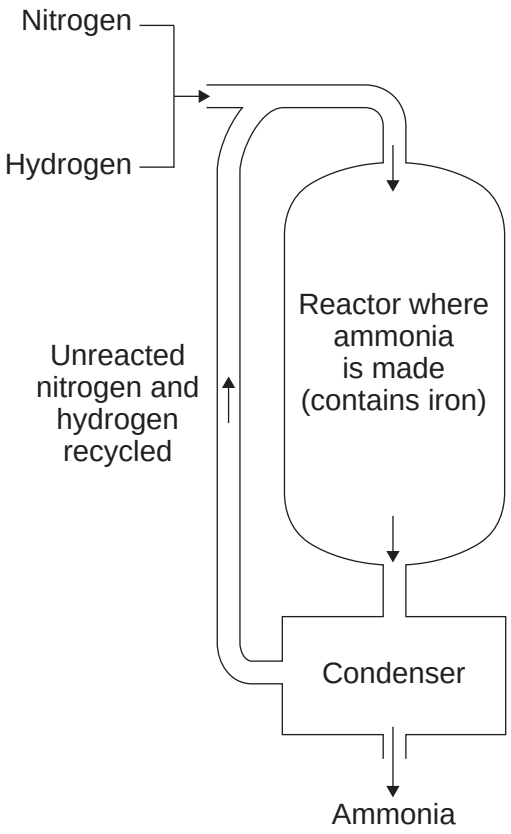
(4 marks)

8

Turn over ▶

6 (a) The diagram shows how ammonia is made.



6 (a) (i) Complete the word equation for the reaction that takes place in the reactor.

nitrogen + ... → .....

(1 mark)

6 (a) (ii) Ammonia is made by passing nitrogen and hydrogen over hot iron.
Why is iron used in the reactor?

.....

.....

(1 mark)

6 (a) (iii) Explain how ammonia is separated from the unreacted nitrogen and hydrogen.

.....

.....

.....

.....

(2 marks)

6 (b) Ammonia is used to make the fertiliser ammonium nitrate.

Calculate the relative formula mass (M_r) of ammonium nitrate, NH_4NO_3

Relative atomic masses (A_r): H = 1; N = 14; O = 16

.....

.....

.....

.....

Relative formula mass = ...

(2 marks)

6 (c) Another fertiliser is potassium nitrate, KNO_3

The relative formula mass (M_r) of potassium nitrate is 101.

Relative atomic masses (A_r): N = 14; O = 16; K = 39

The table shows the percentage by mass of potassium and nitrogen in four fertilisers, **A**, **B**, **C** and **D**.

Fertiliser	Percentage by mass of potassium (%)	Percentage by mass of nitrogen (%)
A	12.45	25.21
B	19.91	24.12
C	38.61	13.86
D	24.89	9.25

Which fertiliser, **A**, **B**, **C** or **D**, is potassium nitrate?

You **must** show your working to gain full marks.

.....

.....

.....

.....

Potassium nitrate is fertiliser ☐

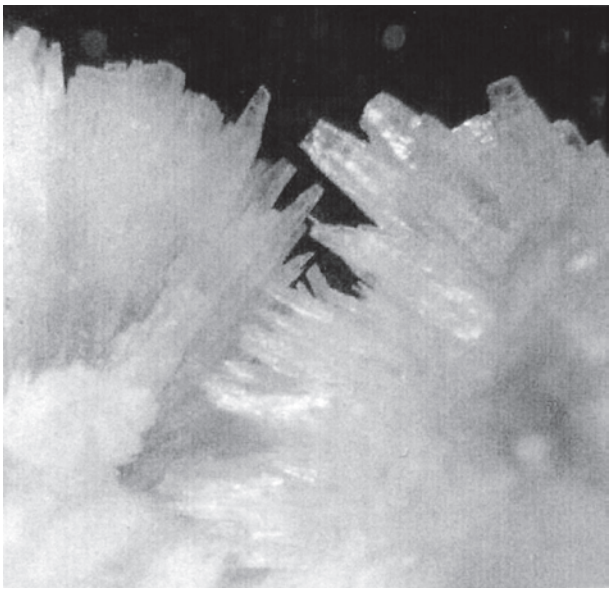
(2 marks)

8

7 (a) Read the article about the mineral strontianite.

Strontianite is a mineral that was discovered near the village of Strontian in Scotland. At first some scientists thought that strontianite was barium carbonate.

Strontianite



In 1790, Professor Adair Crawford and William Cruikshank were both lecturers in chemistry and doctors of medicine. They investigated the properties of strontianite. They found that strontianite had different properties from barium carbonate. They concluded that strontianite contained a new element.

After this, other scientists also showed that strontianite and barium carbonate had different properties. Strontianite is now known to be strontium carbonate.

7 (a) (i) What evidence did Crawford and Cruikshank use to prove that strontianite was **not** barium carbonate?

.....

.....

(1 mark)

7 (a) (ii) Crawford and Cruikshank's conclusion was immediately accepted by other scientists. Suggest why.

.....

.....

(1 mark)

7 (a) (iii) How was the reliability of the work of Crawford and Cruikshank confirmed?

.....

.....

(1 mark)

7 (b) One of Crawford and Cruikshank's experiments was repeated in a school laboratory. Samples of strontianite and barium carbonate were reacted with hydrochloric acid to produce strontium chloride and barium chloride.

Solid strontium chloride and solid barium chloride were separately added to water. The change in temperature of the water was measured.

The results of the experiments are shown below.

	Experiment 1 Strontium chloride dissolved in water	**Experiment 2** Barium chloride dissolved in water
Temperature of water before adding the chloride in ºC	19.5	19.6
Temperature of water after adding the chloride in ºC	21.2	17.5

7 (b) (i) State **one** variable that should be controlled to make it a fair test.

.....

.....

(1 mark)

7 (b) (ii) Which experiment, **1** or **2**, is endothermic?

Explain how you know.

Experiment ☐ because .....

.....

(1 mark)

7 (b) (iii) The results prove that strontium chloride and barium chloride must be different even if all of the variables had not been controlled when they were dissolved. Explain why.

.....

.....

(1 mark)

7 (c) In 1808, Humphry Davy was the first person to extract strontium. He did this by the electrolysis of molten strontium chloride. Strontium formed at the negative electrode.

Suggest why strontium ions are attracted to the negative electrode.

.....

.....

(1 mark)

7

END OF QUESTIONS

There are no questions printed on this page

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