

Surname _____

Other Names _____

Centre Number _____

For Examiner's Use

Candidate Number _____

Candidate Signature _____

ASSESSMENT AND QUALIFICATIONS ALLIANCE

General Certificate of Secondary Education

Foundation Tier

June 2010

Additional Science

Unit Chemistry C2

Chemistry

Unit Chemistry C2

CHY2F

Wednesday 26 May 2010 9.00 am

For this paper you must have:

- a ruler
- the Data Sheet (enclosed).

You may use a calculator.

TIME ALLOWED

- 45 minutes plus your additional time allowance.

At the top of the page, write your surname and other names, your centre number, your candidate number and add your signature.

[Turn over]

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INSTRUCTIONS

- **Use black ink or black ball-point pen.**
- **Answer ALL questions.**
- **You must 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 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.**

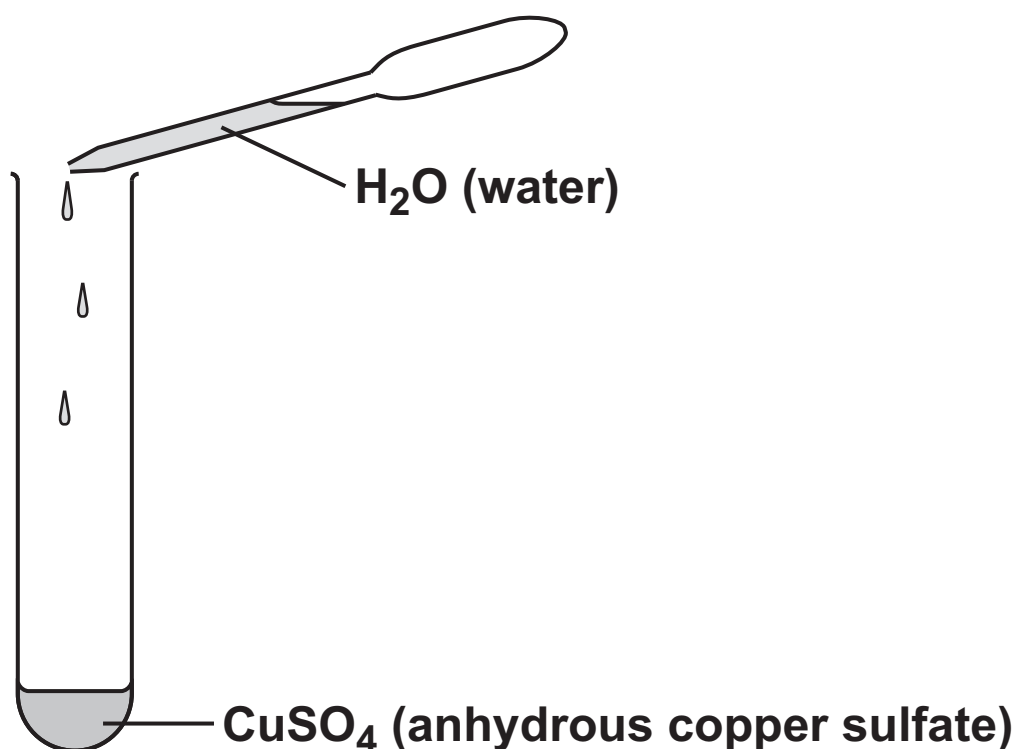
ADVICE

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

DO NOT TURN OVER UNTIL TOLD TO DO SO

Answer ALL questions in the spaces provided.

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



- 1 (a) What colour change will you see when water is added to the CuSO₄? [1 mark]

Colour changes from _____

to _____

1 (b) Draw a ring around the meaning of
the symbol \rightleftharpoons
[1 mark]

endothermic

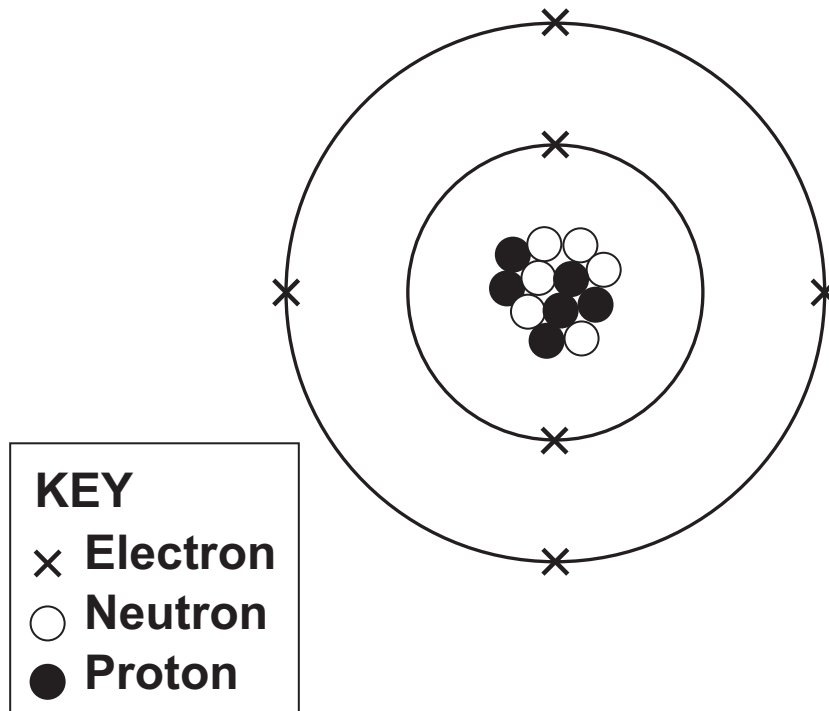
exothermic

reversible

2

[Turn over for the next question]

2 The diagram represents a carbon atom.



2 (a) Use words from the list 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 opposite to help you to answer these questions.

2 (b) (i) Draw a ring around the atomic (proton) number of this carbon atom. [1 mark]

6 12 18

2 (b) (ii) Draw a ring around the mass number of this carbon atom. [1 mark]

6 12 18

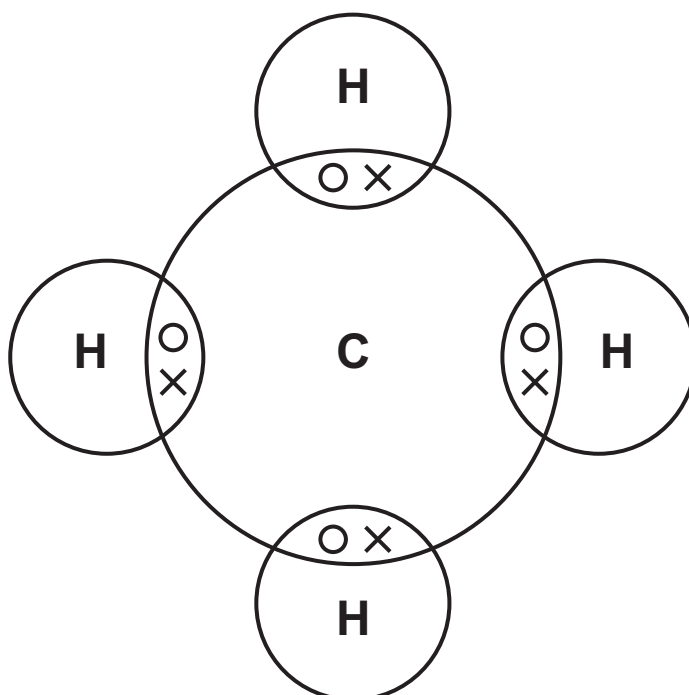
2 (c) A different carbon atom has 6 protons and 8 neutrons.

Draw a ring around the symbol that represents this atom. [1 mark]



[Question 2 continues on the next page]

- 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. [1 mark]



- 2 (d) (ii) Draw a ring around the word that describes methane. [1 mark]

compound

element

mixture

- 2 (d) (iii) Draw a ring around the type of bonding in a methane molecule. [1 mark]

covalent

ionic

metallic

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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°C , one in water at 40°C and one in water at 70°C .

The results are shown in the table.

TEMPERATURE IN $^{\circ}\text{C}$	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]

[Question 3 continues on the next page]

- 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.
[3 marks]

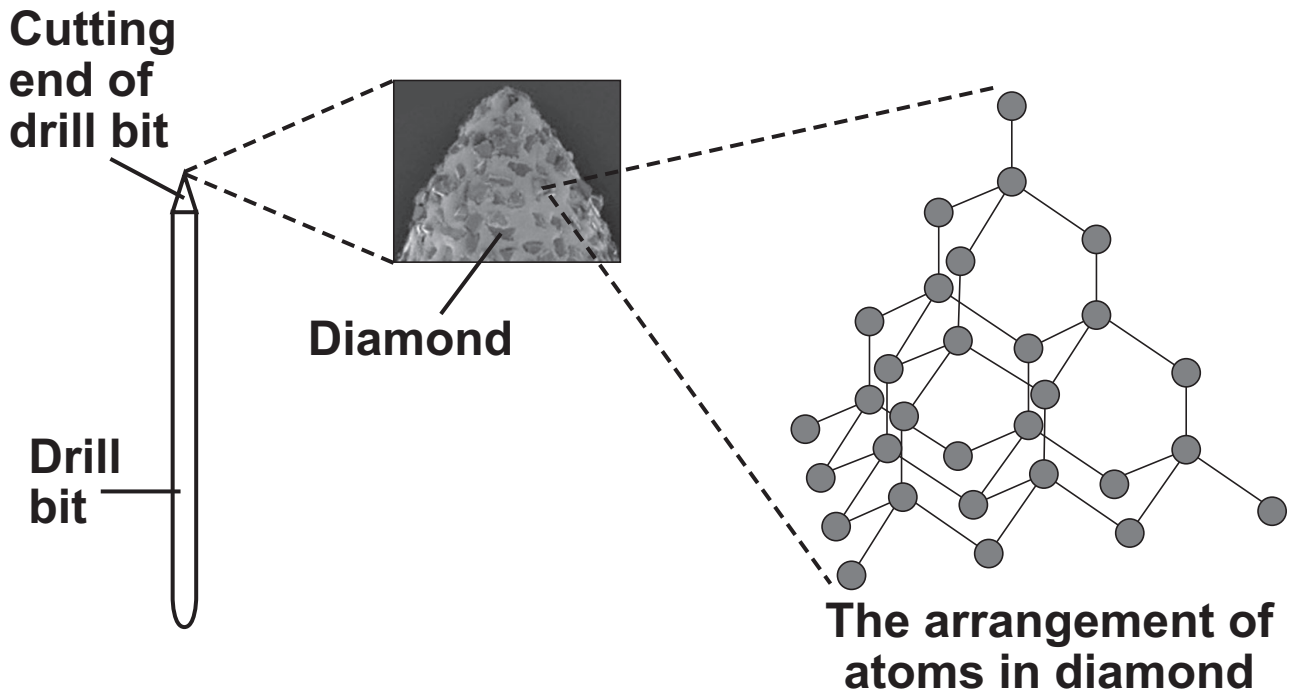
TICK (✓)	IDEAS
	The particles will collide more often.
	The particles will be more concentrated.
	The particles will move faster.
	The particles will have more energy.
	The particles will get bigger.

- 3 (d) Suggest **ONE** way the student could improve this investigation. [1 mark]

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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.



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
other atoms. [1 mark]

two
three
four

4 (e) Diamond is suitable for the cutting end of a

drill bit because it is
[1 mark]

hard.
shiny.
soft.

[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.



5 (a) (i) Draw a ring around the name given to this type of reaction. [1 mark]

electrolysis

neutralisation

precipitation

5 (a) (ii) Tick (✓) the method used to separate solid lead iodide from the solution. [1 mark]

TICK (✓)	METHOD
	distillation
	evaporation
	filtration

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]

[Question 5 continues on the next page]

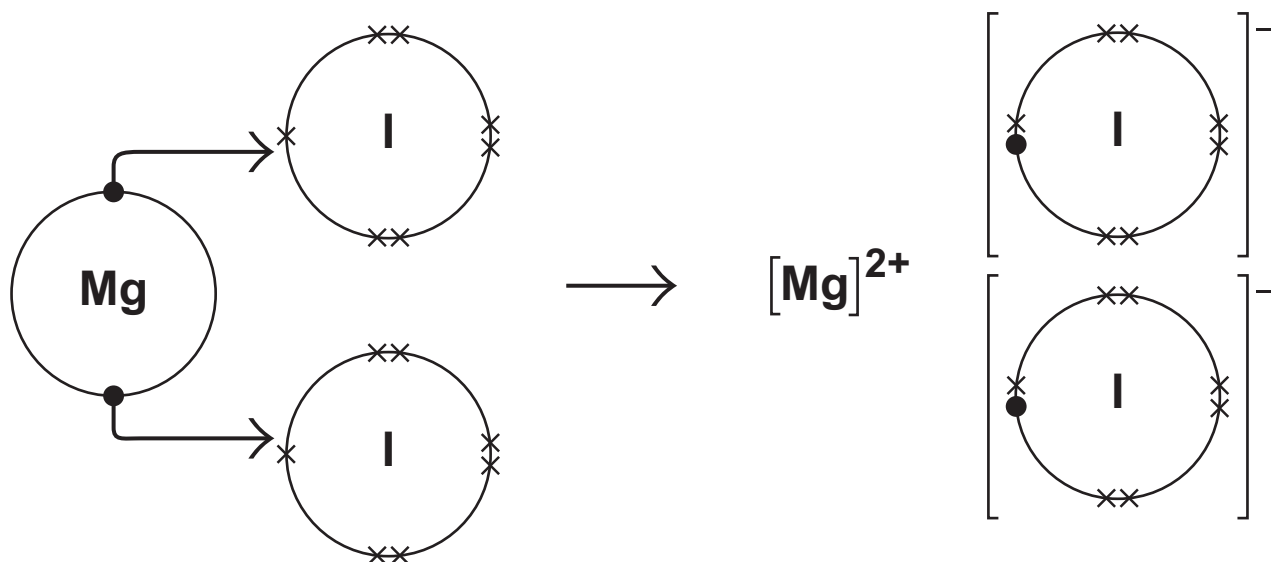
5 (b) Magnesium iodide can be made by reacting magnesium with iodine.



The diagram shows how this takes place.

Only the outer electrons are shown.

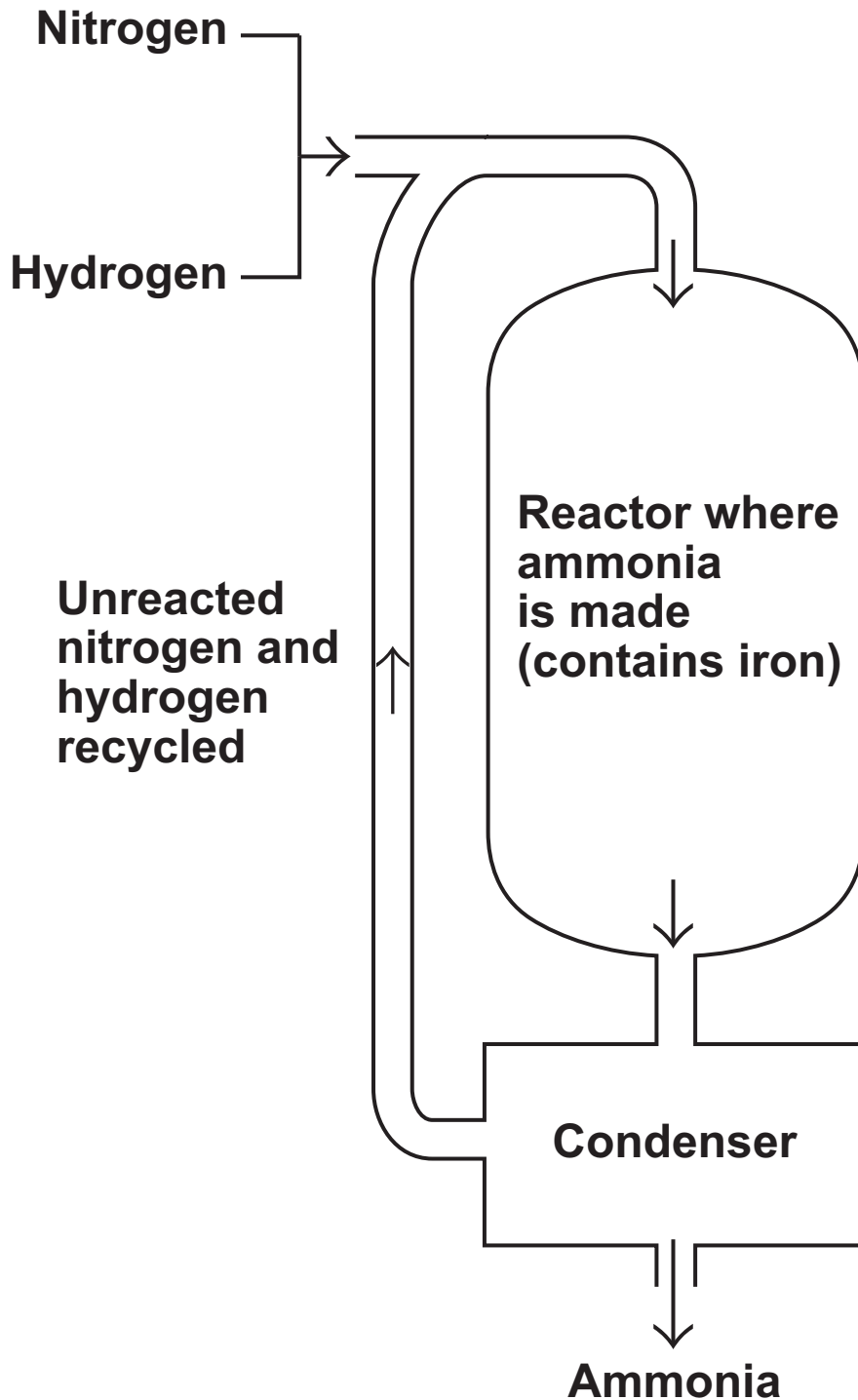
The dots (●) and crosses (×) are used to represent electrons.



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. [4 marks]

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. [1 mark]

nitrogen + _____ →

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]

[Question 6 continues on the next page]

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

Calculate the relative formula mass (M_r) of ammonium nitrate, NH_4NO_3 [2 marks]

Relative atomic masses (A_r):

H = 1; N = 14; O = 16

Relative formula mass = _____

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? [2 marks]

You MUST show your working to gain full marks.

Potassium nitrate is fertiliser

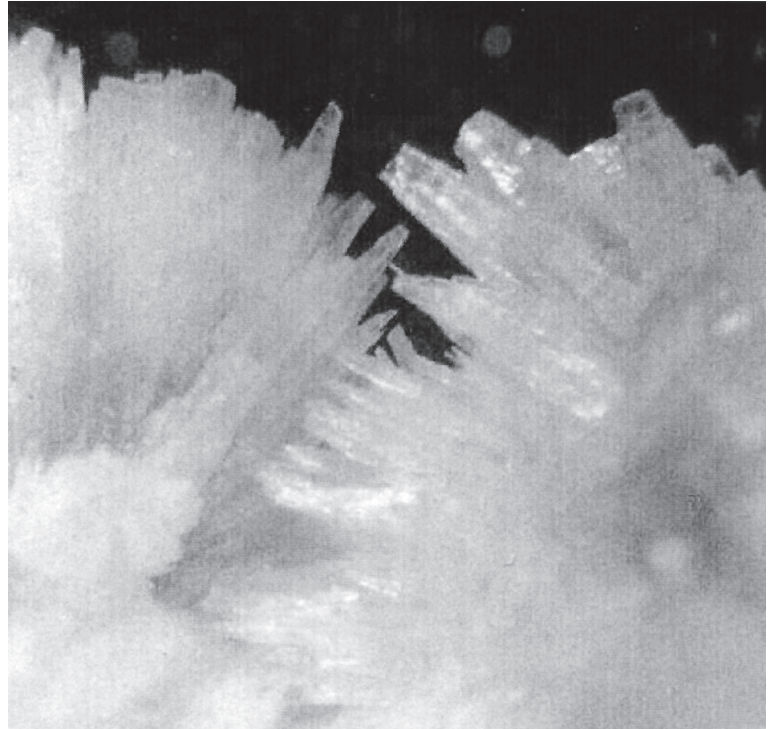
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[Turn over]

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]

[Question 7 continues on the next page]

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 °C	19·5	19·6
Temperature of water after adding the chloride in °C	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. [1 mark]

Experiment because _____

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]

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Examiner's Initials	
Question	Mark
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6	
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TOTAL	

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