

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 2012

Additional Science

Unit Chemistry C2

CHY2F

Chemistry

Unit Chemistry C2

F

Written Paper

Thursday 24 May 2012 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.



J U N 1 2 C H Y 2 F 0 1

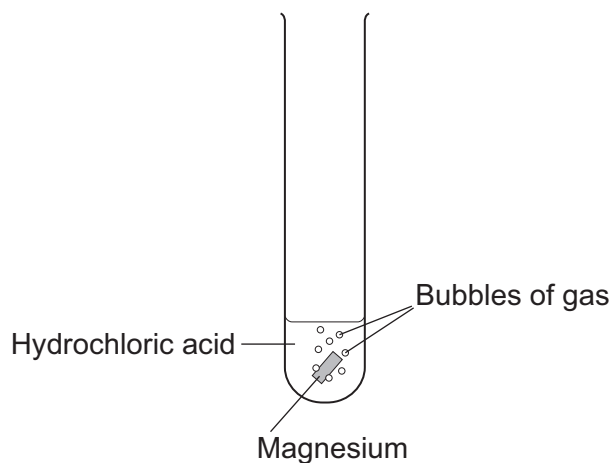
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CHY2F

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

1 A student investigated the reaction of magnesium with hydrochloric acid.

1 (a) A piece of magnesium was dropped into the hydrochloric acid.



Bubbles of gas were produced and the magnesium disappeared.

The reaction is exothermic.

1 (a) (i) What measurements would the student make to show that the reaction is exothermic?

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

(2 marks)

1 (a) (ii) How would these measurements show that the reaction is exothermic?

.....

(1 mark)



The student investigated how changing the concentration of the hydrochloric acid affects this reaction.

Each test tube contained a different concentration of hydrochloric acid. The diagrams show the results of this experiment.



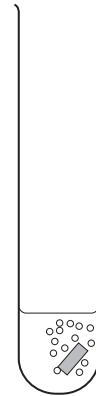
Test tube A



Test tube B



Test tube C



Test tube D

- 1 (b) Suggest **one** control variable in this investigation.

.....

 (1 mark)

- 1 (c) (i) Which test tube, **A**, **B**, **C** or **D**, contained the greatest concentration of hydrochloric acid?

Test tube

(1 mark)

- 1 (c) (ii) Why did you choose this test tube?

.....

 (1 mark)

- 1 (d) The student predicted that if the temperature of the acid was increased the reaction would take place faster.

Tick (✓) **two** statements in the table which explain why.

Statement	Tick (✓)
The particles move faster	
The particles collide with less energy	
The particles collide more often	
The particles are bigger	

(2 marks)

Turn over ►

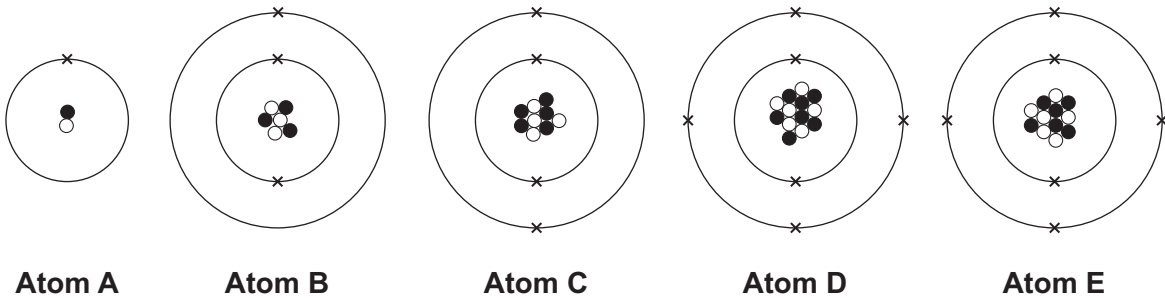


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ANSWER IN THE SPACES PROVIDED**



2 The diagrams show five different atoms, **A**, **B**, **C**, **D** and **E**.



Key

- represents a proton
- represents a neutron
- × represents an electron

2 (a) Which atom, **A**, **B**, **C**, **D** or **E**:

2 (a) (i) has an atomic number (proton number) of 3

Atom
(1 mark)

2 (a) (ii) has a mass number of 2

Atom
(1 mark)

2 (a) (iii) is in Group 2 of the periodic table?

Atom
(1 mark)

2 (b) Which **two** atoms from **A**, **B**, **C**, **D** and **E** are isotopes of the same element?

Atom and **Atom** .

(1 mark)

2 (c) Which particle in an atom has a negative charge?

(1 mark)

5

Turn over for the next question

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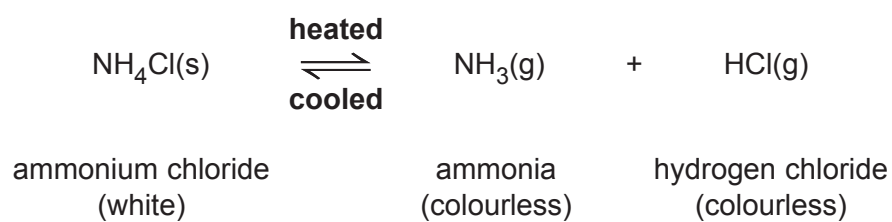


3 Stage smoke is used for special effects at pop concerts.



Ammonium chloride can be used to make stage smoke.
Ammonium chloride is a white solid.
When heated, ammonium chloride produces white smoke which can be blown onto the stage.

The equation shows what happens when ammonium chloride is heated and cooled.



3 (a) The sentences explain how the smoke is made.

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

Use the information and the equation to help you.

When heated, ammonium chloride makes two colourless

solids.

liquids.

gases.

These are blown into the air where they cool and make a

colourless

solid

black

liquid

white

gas

which is

ammonia.

ammonium chloride.

hydrogen chloride.

(4 marks)

3 (b) Complete the sentence.

The symbol \rightleftharpoons means that the reaction is

(1 mark)

5

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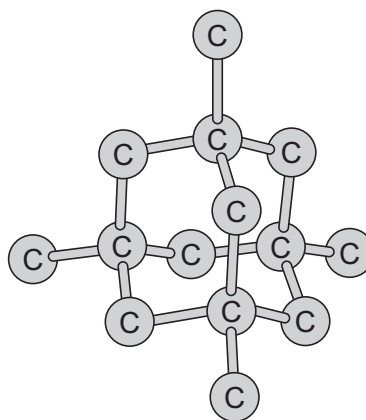
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- 4 Liquids containing nanoparticles of diamond are used as abrasives. Nanoparticles of diamond can be used to grind down surfaces to give them a very smooth polished finish.



Abrasive liquid containing nanoparticles of diamond



Model of part of the diamond structure

- 4 (a) Diamond is made of one element. Draw a ring around the name of this element.

calcium

carbon

chromium

cobalt

(1 mark)

- 4 (b) Tick (✓) **two** statements in the table which explain why diamond is hard.

Statement	Tick (✓)
It is made of layers.	
It has weak covalent bonds.	
Each atom is joined to four other atoms.	
It has a giant structure.	
It has strong ionic bonds.	

(2 marks)

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

Nanoparticles of diamond are

very small.

large.

very large.

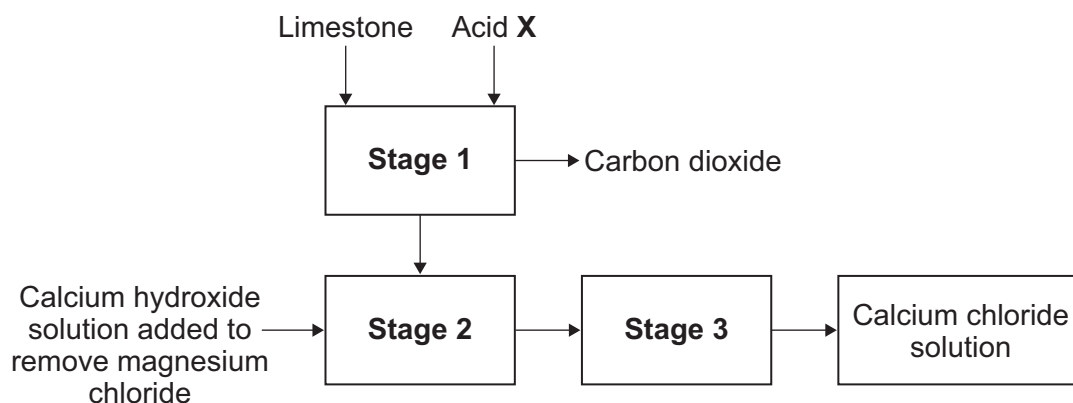
(1 mark)

4

Turn over ►



- 5 (a) Calcium chloride is made from limestone. Limestone contains mainly calcium carbonate and a small amount of magnesium carbonate.



- 5 (a) (i) In **stage 1** calcium carbonate reacts with acid **X** to form calcium chloride.

Draw a ring around the name of acid **X**.

hydrochloric

nitric

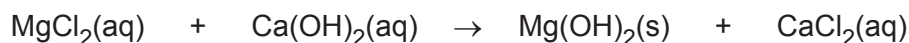
sulfuric

(1 mark)

- 5 (a) (ii) **Stage 1** produces a concentrated solution of calcium chloride. The solution also contains magnesium chloride.

Calcium hydroxide solution is added in **stage 2** to remove the magnesium chloride.

The equation for this reaction is:



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

In **stage 2** a precipitate is made because magnesium hydroxide is dissolved
insoluble
soluble in water.

In **stage 3** the solid magnesium hydroxide can be separated from the calcium chloride

solution using

chromatography.
electrolysis.
filtration.

(2 marks)



5 (a) (iii) What method can be used to change the calcium chloride solution into solid calcium chloride?
Draw a ring around your answer.

crystallisation

electrolysis

reduction

(1 mark)

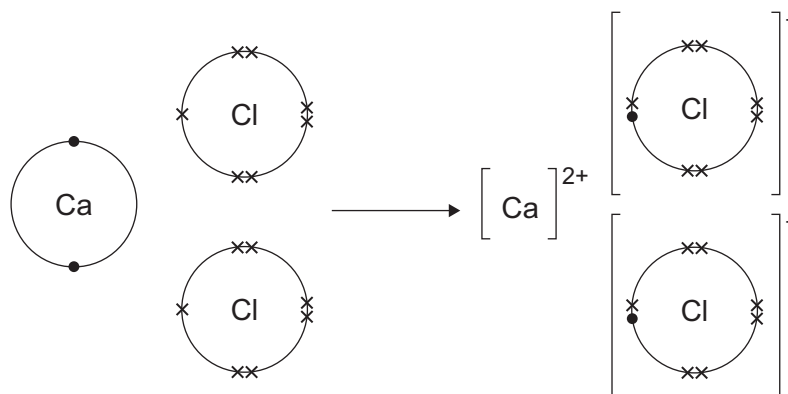
5 (b) Calcium chloride can also be made by reacting calcium with chlorine:



The diagram shows what happens to atoms of calcium and chlorine in this reaction.

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

Only the outer electrons are shown.



Use the diagram to help you to answer this question.

Describe, as fully as you can, what happens when calcium reacts with chlorine to make calcium chloride.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

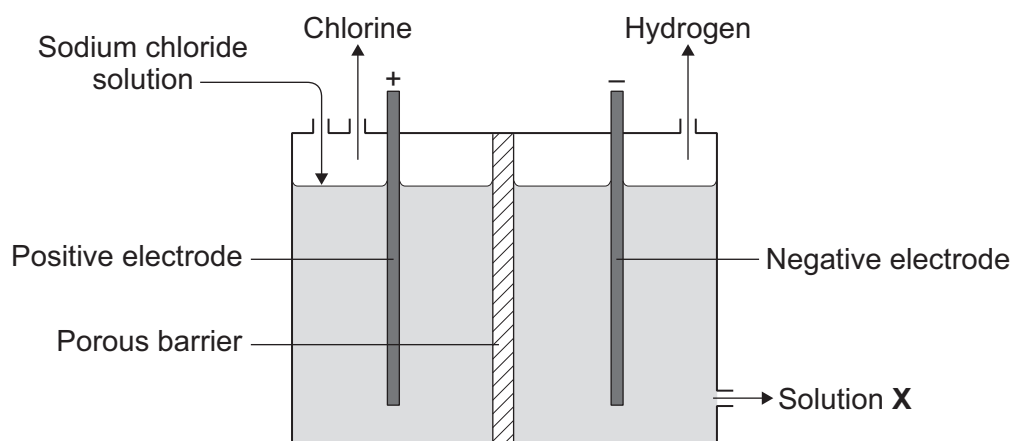
(4 marks)

8

Turn over ►



6 The electrolysis of sodium chloride solution is an industrial process.



6 (a) Why do chloride ions move to the positive electrode?

.....
(1 mark)

6 (b) Sodium chloride solution contains two types of positive ions, sodium ions (Na^+) and hydrogen ions (H^+).

Tick (✓) the reason why hydrogen is produced at the negative electrode and **not** sodium.

Reason	Tick (✓)
Hydrogen is a gas.	
Hydrogen is less reactive than sodium.	
Hydrogen is a non-metal.	
Hydrogen ions travel faster than sodium ions.	

(1 mark)

6 (c) Solution X is alkaline.

Which ion makes solution X alkaline?

.....
(1 mark)

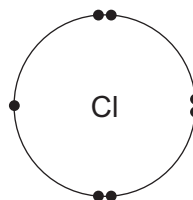


6 (d) Electrolysis of sodium chloride solution produces hydrogen and chlorine.
The hydrogen and chlorine can be used to make hydrogen chloride.

6 (d) (i) The diagrams show how the outer electrons are arranged in atoms of hydrogen and chlorine.

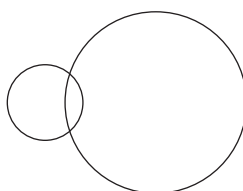


Hydrogen atom



Chlorine atom

Complete the diagram to show how the electrons are arranged in a molecule of hydrogen chloride (HCl).



(1 mark)

6 (d) (ii) Name the type of bond between the hydrogen and the chlorine atoms in a molecule of hydrogen chloride.

.....
(1 mark)

6 (d) (iii) Some hydrogen chloride was bubbled into water. This made a solution with a pH of 1.

Which ion gave the solution a pH of 1?

.....
(1 mark)

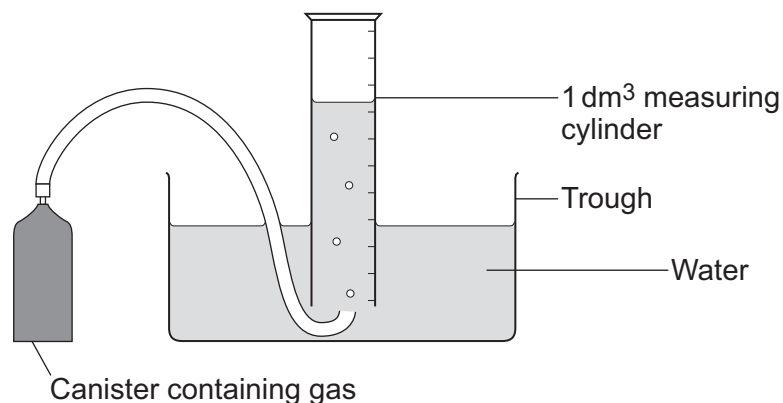
6

Turn over for the next question

Turn over ►



7 Some students did an experiment to find the relative formula mass (M_r) of a gas.



This is the method they used.

- The mass of the canister of gas was measured using a balance, which weighed to two decimal places.
- The measuring cylinder was filled with 1 dm³ of the gas from the canister.
- The mass of the canister of gas was measured again.
- The temperature of the laboratory was measured.
- The air pressure in the laboratory was measured.

The students repeated the experiment three times.

7 (a) The results for one of the experiments are shown in the table below.

Mass of the canister of gas before filling the measuring cylinder	53.07 g
Mass of the canister of gas after filling the measuring cylinder	51.21 g

Calculate the mass of the 1 dm³ of gas in the measuring cylinder.

.....

Mass = g
(1 mark)

7 (b) How could the results be made more precise?

.....

.....

(1 mark)



- 7 (c)** The students used their results to calculate values for the relative formula mass (M_r) of this gas.
The results are shown in the table below.

Experiment	1	2	3	4
Relative formula mass (M_r)	45.4	51.5	46.3	45.8

- 7 (c) (i)** Calculate the mean value for these results.

.....

Mean =

(2 marks)

- 7 (c) (ii)** The four results are different.
The students thought this was because of experimental error.

Suggest **two** causes of experimental error in this experiment.

.....

.....

.....

.....

(2 marks)

- 7 (c) (iii)** It was important for the students to repeat the experiment.
Suggest why.

.....

.....

(1 mark)

- 7 (d)** The teacher told the students that the formula of the gas is C_3H_8
Calculate the relative formula mass (M_r) of this gas. You should show your working.
Relative atomic masses: H = 1; C = 12.

.....

.....

Relative formula mass =

(2 marks)

9

END OF QUESTIONS



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