

Surname	Centre Number	Candidate Number
Other Names		0



**GCSE**

4462/02

**SCIENCE A/CHEMISTRY**

**CHEMISTRY 1**

**HIGHER TIER**

A.M. TUESDAY, 14 January 2014

1 hour

**Suitable for Modified  
Language Candidates**

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	5	
2.	9	
3.	4	
4.	6	
5.	8	
6.	8	
7.	5	
8.	9	
9.	6	
<b>Total</b>	<b>60</b>	

**ADDITIONAL MATERIALS**

In addition to this paper you will need a calculator and a ruler.

**INSTRUCTIONS TO CANDIDATES**

Use black ink or black ball-point pen. Do not use gel pen or correcting fluid.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

If you run out of space, use the additional page(s) at the back of the booklet, taking care to number the question(s) correctly.

**INFORMATION FOR CANDIDATES**

The number of marks is given in brackets at the end of each question or part-question.

You are reminded that assessment will take into account the quality of written communication used in your answer to questions **4** and **9**.

The Periodic Table is printed on the back cover of the examination paper and the formulae for some common ions on the inside of the back cover.



Answer **all** questions.

1. The following diagram shows an outline of the Periodic Table.  
The letters shown are **NOT** the chemical symbols of the elements.

	<b>A</b>																		<b>B</b>
										<b>E</b>									
																		<b>F</b>	

- (a) Give the **letter** of the element which is found in Group 0 and Period 2. [1]

.....

- (b) Give the **letters** of the **two** elements which you would expect to have similar chemical properties. Give a reason for your choice.

*Letters* ..... and .....

*Reason* ..... [2]

- (c) The table below shows the properties of three elements **1**, **2** and **3**.

Element	Properties			
	Melting Point (°C)	Boiling Point (°C)	Appearance	Malleable or brittle
<b>1</b>	1084	2927	shiny brown solid	malleable
<b>2</b>	1414	2900	shiny grey solid	brittle
<b>3</b>	115	445	yellow solid	brittle

State which of elements **1**, **2** or **3** could be element **C** in the Periodic Table above. Give reasons for your choices. [2]

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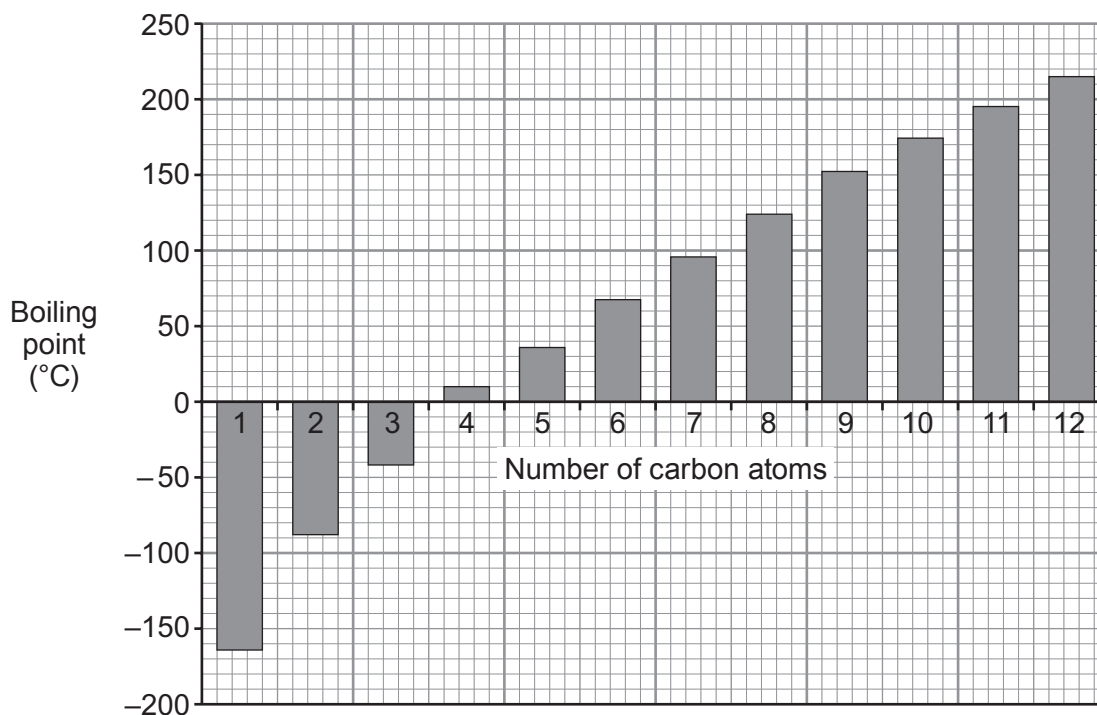
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2. (a) Crude oil can be separated into simpler mixtures, called fractions. Fractions contain hydrocarbon compounds with boiling points within a similar range.

The graph below shows the boiling points of hydrocarbons containing 1 to 12 carbon atoms.



- (i) Give the number of carbon atoms in the hydrocarbon which has the **lowest** boiling point. [1]

.....

- (ii) State how the boiling point changes as the number of carbon atoms increases. [1]

.....

- (iii) A company wants to produce a fraction with a boiling point in the range 120–140 °C.  
Give the number of carbon atoms present in the hydrocarbons found in this fraction. [1]

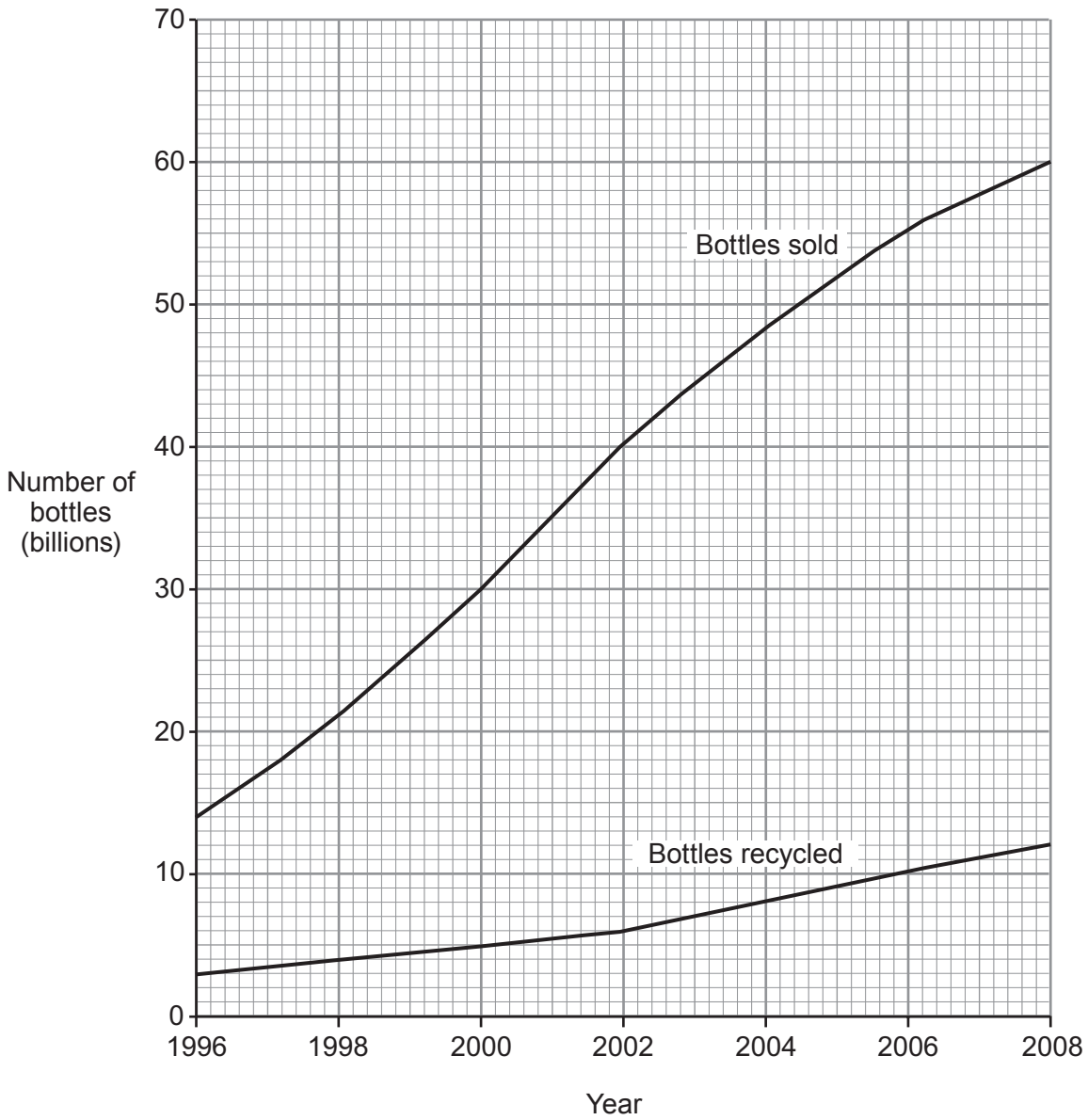
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- (b) Plastic has replaced glass for making some drink bottles.  
Give **one** property of plastic that makes it a more suitable material for making drink bottles.  
Do not use **cost** for your answer. [1]

.....



(c) The graph below shows the number of plastic drink bottles sold and recycled in the United States between 1996 and 2008.



Calculate the percentage (%) of plastic bottles sold in 2008 that were recycled. [2]

Percentage recycled = ..... %

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(d) State and explain the advantages of recycling plastic.

[3]

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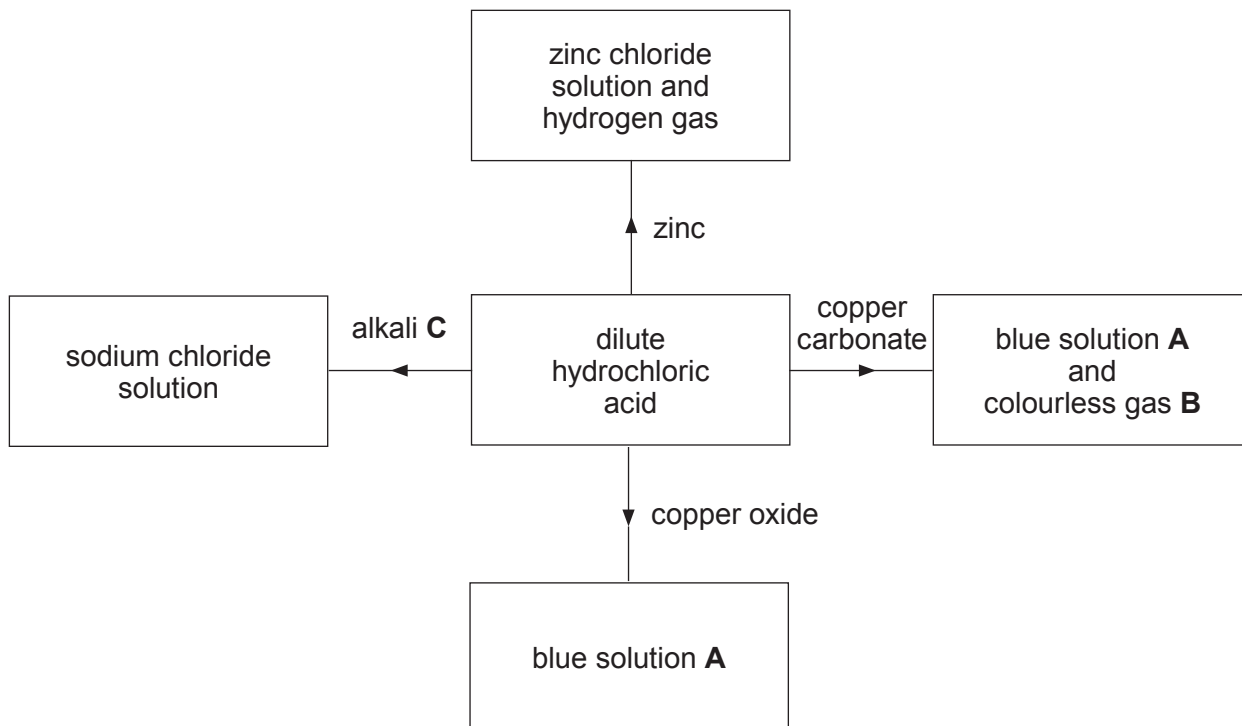
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3. The diagram below shows some reactions of dilute hydrochloric acid.



(a) Name the following substances.

blue solution A .....

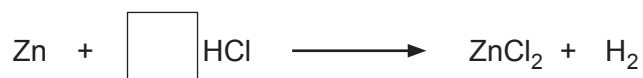
colourless gas B .....

alkali C .....

[3]

(b) Balance the **symbol** equation for the reaction between zinc and dilute hydrochloric acid.

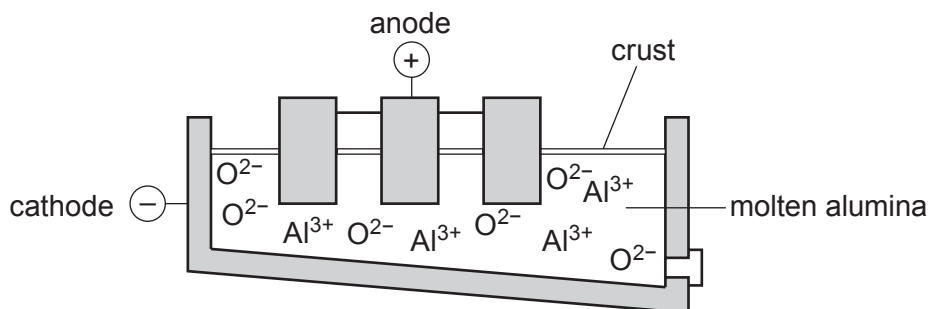
[1]







5. (a) Aluminium is obtained by the electrolysis of molten alumina.



The electrode equations below show how the products are formed.



- (i) Choose from the equations above

an ion, .....

an atom, .....

a molecule. ....

[2]

- (ii) At which electrode is aluminium formed? Give the reason for your answer. [2]

.....  
.....

- (iii) Use the information in the diagram above to give the chemical name and formula of alumina. [2]

*Chemical name* .....

*Formula* .....

- (iv) State **one** environmental problem associated with the **electrolysis** of molten alumina. [1]

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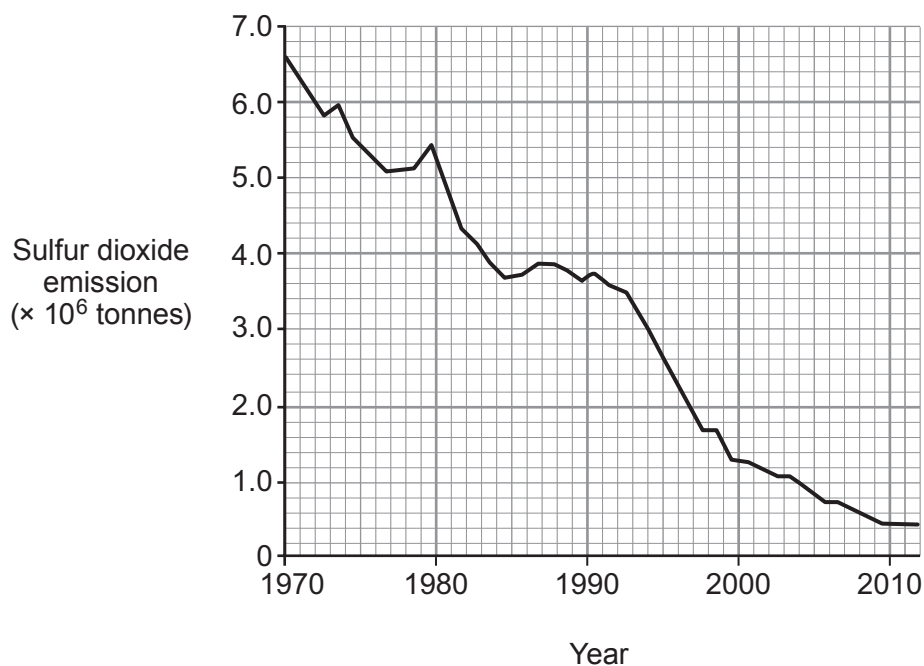
- (b) Aluminium is a good electrical conductor. It is therefore used to make overhead power cables.

Give a **different** property of aluminium and **one** use which relies on this property. [1]

.....  
.....



6. (a) The graph below shows the total sulfur dioxide emissions in the UK between 1970 and 2012.



- (i) Use the graph to calculate the decrease in sulfur dioxide emissions in **tonnes** between 1994 and 2004. [1]

*Decrease in sulfur dioxide emissions* = ..... tonnes

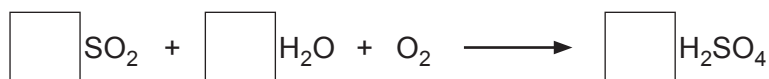
- (ii) Suggest and explain a possible reason for the trend shown in the graph. [2]

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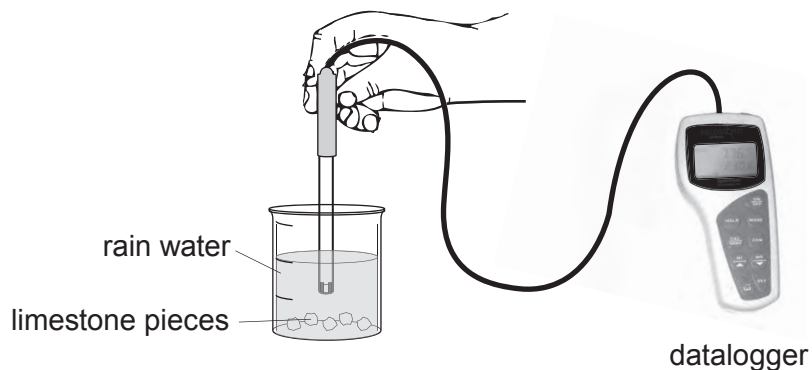
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- (iii) Balance the symbol equation below which shows a reaction that can lead to the formation of sulfuric acid in the atmosphere. [1]



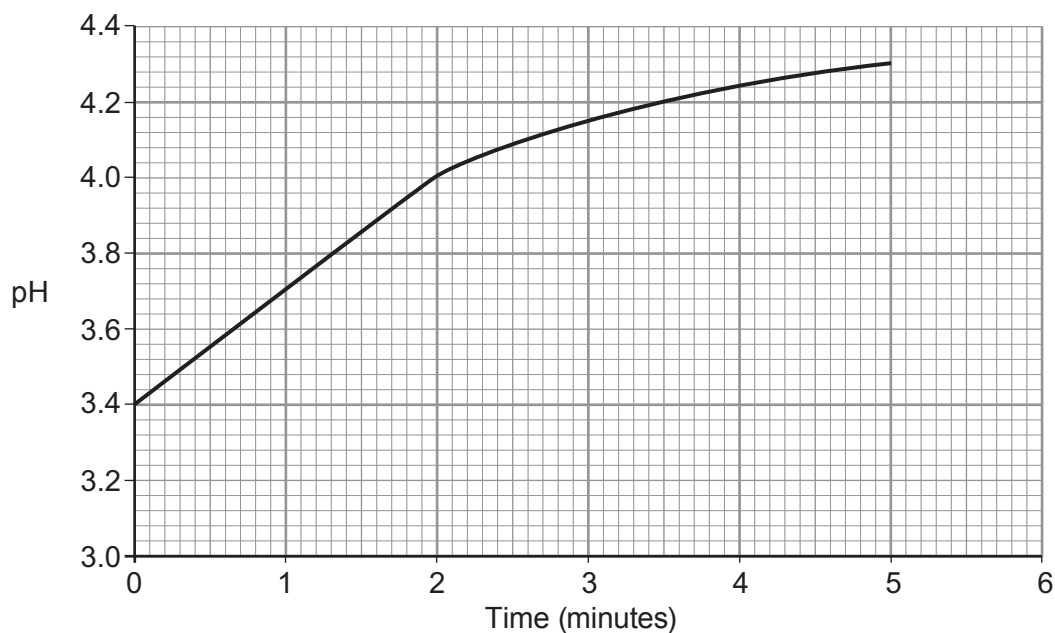
- (b) A group of pupils investigated the pH change which occurs when limestone reacts with acid rain. The group collected rain water during a rain shower.

They used the apparatus shown below.



They added limestone pieces to the rain water and recorded the pH of the mixture for 5 minutes. The data collected was then downloaded to a computer.

The graph below shows the results recorded.



- (i) Name the type of reaction taking place. [1]

.....

- (ii) Limestone affects the acidity of acid rain. Describe how the graph supports this statement. [2]

.....  
.....

- (iii) Give **one other** problem associated with acid rain. Do not use the destruction of limestone buildings and statues in your answer. [1]

.....



7. Satellite images are used to show the area of Arctic sea ice.



Photograph: National Snow and Ice Data Centre, Colorado.

(a) Environmental groups think that the shrinking of the ice caps is the result of global warming. State and explain the **main** cause of global warming. [2]

.....

.....

.....

.....

(b) Give **one** consequence of the reduction of Arctic sea ice. [1]

.....

(c) Scientists are currently developing a process called **carbon capture and storage (CCS)**. This will reduce the problem of global warming. There are three main steps to CCS. Firstly, carbon dioxide is trapped and separated from other gases produced in coal-powered electricity plants. The captured carbon dioxide is transported to a storage location. The carbon dioxide is then stored far away from the atmosphere (underground or deep in the ocean).

Suggest **two** reasons why some scientists do not support the use of CCS. Use the information above to help you answer. [2]

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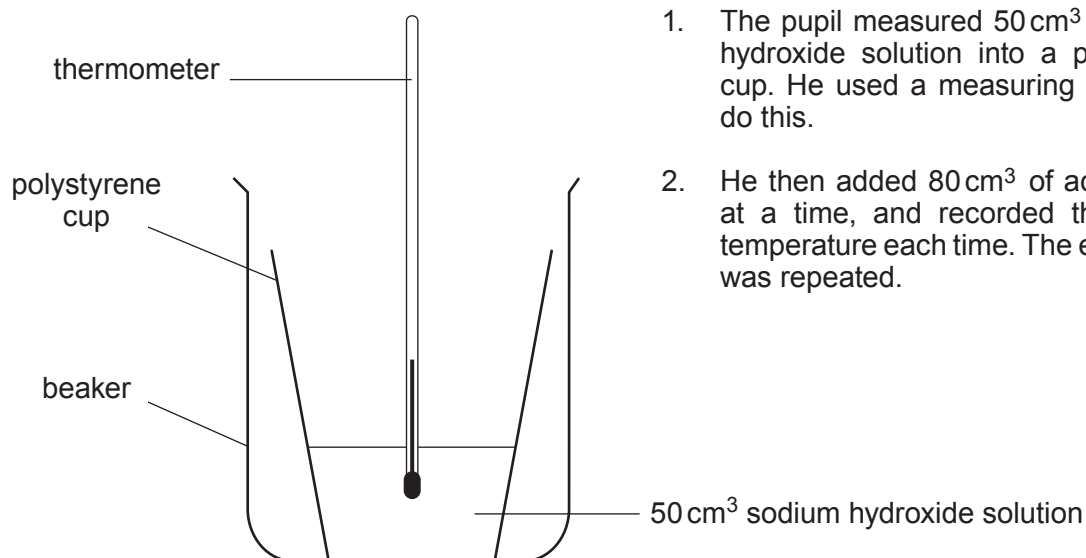


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8. A pupil used the apparatus below to carry out an investigation. He wanted to find the temperature change which occurs when dilute hydrochloric acid reacts with dilute sodium hydroxide solution.



1. The pupil measured  $50\text{ cm}^3$  of sodium hydroxide solution into a polystyrene cup. He used a measuring cylinder to do this.
2. He then added  $80\text{ cm}^3$  of acid,  $10\text{ cm}^3$  at a time, and recorded the highest temperature each time. The experiment was repeated.

Volume of acid added ( $\text{cm}^3$ )	Temperature ( $^{\circ}\text{C}$ )		
	Experiment 1	Experiment 2	Mean
0	21.0	21.0	21.0
10	22.1	23.5	22.8
20	24.9	23.5	24.2
30	28.0	22.8	25.4
40	26.0	26.8	26.4
50	27.4	26.6	27.0
60	26.6	26.8	26.7
70	26.2	26.2	26.2
80	25.5	25.7	25.6

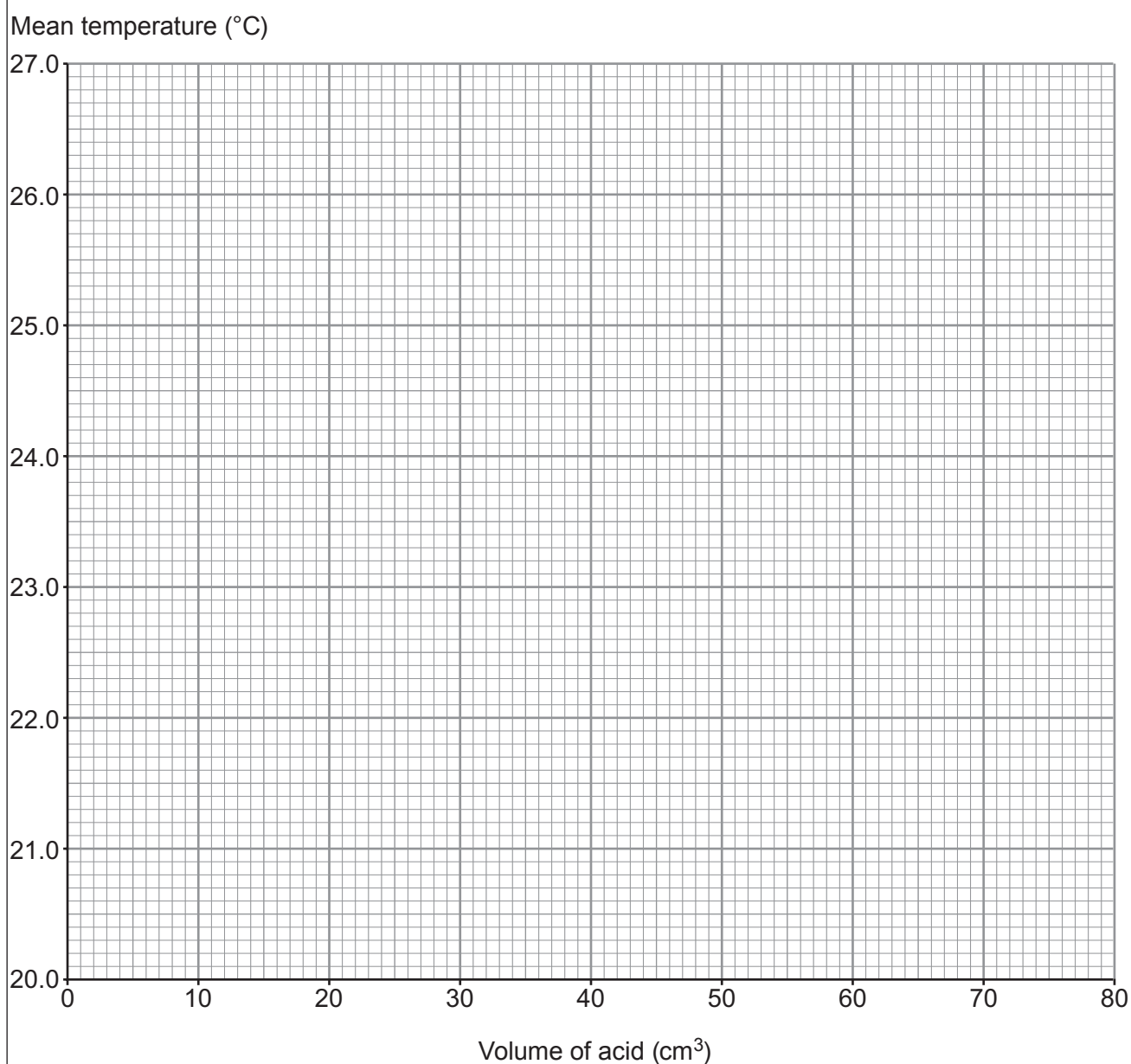
- (a) State the volume of acid where the temperature readings appear to be incorrect. Use the data in the **table**. Give the reason for your choice. [2]

.....

.....

- (b) Plot the volume of acid against the **mean** temperature. Draw a suitable line. Use the grid opposite for your graph. [3]





- (c) State why the incorrect temperature readings given in part (a) might not have been noticed by the pupil. Use your graph to help you answer. [1]

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- (d) Describe and explain the shape of the graph in relation to the chemical reaction taking place. [3]

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9. Many car companies are manufacturing hydrogen-fuelled cars.  
Describe and explain the advantages and disadvantages of hydrogen as a replacement for petrol and diesel to fuel cars. [6 QWC]

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## FORMULAE FOR SOME COMMON IONS

POSITIVE IONS		NEGATIVE IONS	
Name	Formula	Name	Formula
Aluminium	$\text{Al}^{3+}$	Bromide	$\text{Br}^-$
Ammonium	$\text{NH}_4^+$	Carbonate	$\text{CO}_3^{2-}$
Barium	$\text{Ba}^{2+}$	Chloride	$\text{Cl}^-$
Calcium	$\text{Ca}^{2+}$	Fluoride	$\text{F}^-$
Copper(II)	$\text{Cu}^{2+}$	Hydroxide	$\text{OH}^-$
Hydrogen	$\text{H}^+$	Iodide	$\text{I}^-$
Iron(II)	$\text{Fe}^{2+}$	Nitrate	$\text{NO}_3^-$
Iron(III)	$\text{Fe}^{3+}$	Oxide	$\text{O}^{2-}$
Lithium	$\text{Li}^+$	Sulfate	$\text{SO}_4^{2-}$
Magnesium	$\text{Mg}^{2+}$		
Nickel	$\text{Ni}^{2+}$		
Potassium	$\text{K}^+$		
Silver	$\text{Ag}^+$		
Sodium	$\text{Na}^+$		
Zinc	$\text{Zn}^{2+}$		



# PERIODIC TABLE OF ELEMENTS

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