Surname	Centre Number	Candidate Number
Other Names		0

GCSE

4462/01

SCIENCE A/CHEMISTRY

CHEMISTRY 1
FOUNDATION TIER

A.M. TUESDAY, 14 January 2014

1 hour

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

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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 question **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.

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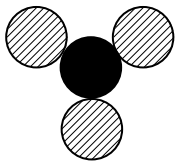
Answer **all** *questions.*

1. *(a)* The key below represents atoms of some elements.

nitrogen, N hydrogen, H oxygen, O

(i) Use the key to draw a diagram representing a molecule of nitrous oxide, N_2O. [1]

(ii) Use the key to give the chemical formula for the following molecule. [1]



Formula .....

(b) The box below shows the symbols and formulae for some gases.

CO_2	**O_2**	**He**	**CH_4**	**Ne**	**SO_2**

Choose from the box

(i) **two** elements, ... and ..... [1]

(ii) **two** compounds. ..... and ..... [1]

(c) The chemical formula of nitric acid is HNO_3.

(i) State how many nitrogen atoms are present in the formula, HNO_3. ..... [1]

(ii) Give the **total** number of atoms shown in the formula. ..... [1]

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(d) You may wish to refer to the table of common ions to help you answer parts (i) and (ii).

(i) Give the **formulae** of the **ions** present in the compound $MgCl_2$. [1]

Positive ion ..... *Negative ion* .....

(ii) Give the chemical formula for sodium hydroxide. [1]

.....

8

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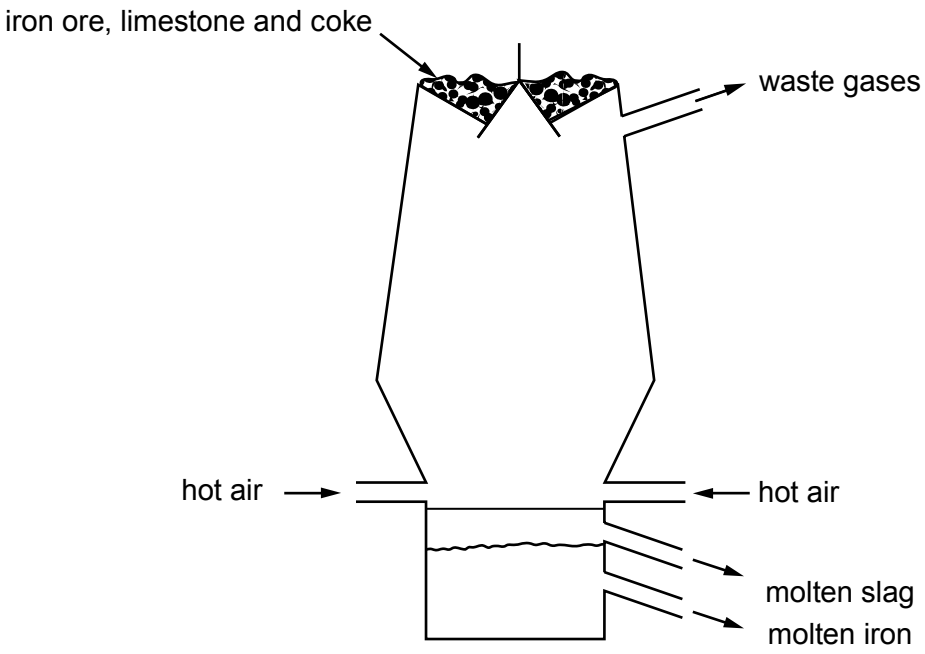
2. Iron is extracted from iron ore in a blast furnace.



(a) Draw a line to link the raw material to its use in the blast furnace. [2]

Raw material	Use
iron ore	source of iron
limestone	acts as a fuel
coke	removes impurities

(b) Coke contains the element carbon. Carbon reacts with oxygen in the air forming carbon dioxide. Write a **word** equation for this reaction. [1]

..... + ... ⟶ .....

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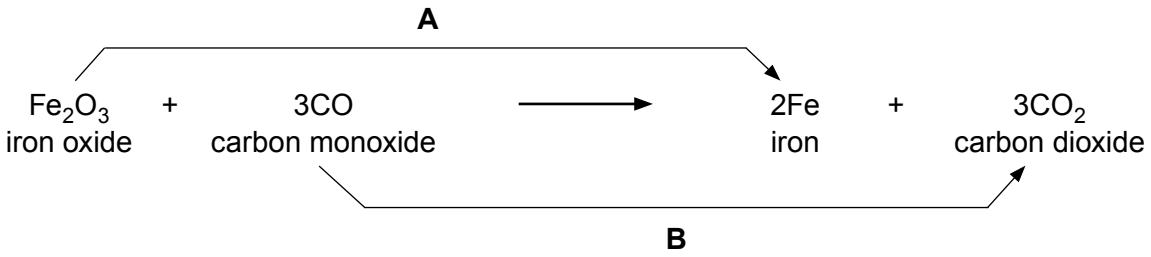
(c) The equation below shows the formation of iron in the blast furnace.



Give the **letter** of the arrow which shows **reduction** taking place. Give a reason for your choice. [2]

.....

.....

(d) Iron is used to make steel. Steel is an example of an alloy.

compound	**element**	**mixture**

Choose from the box above the term used to describe an alloy. [1]

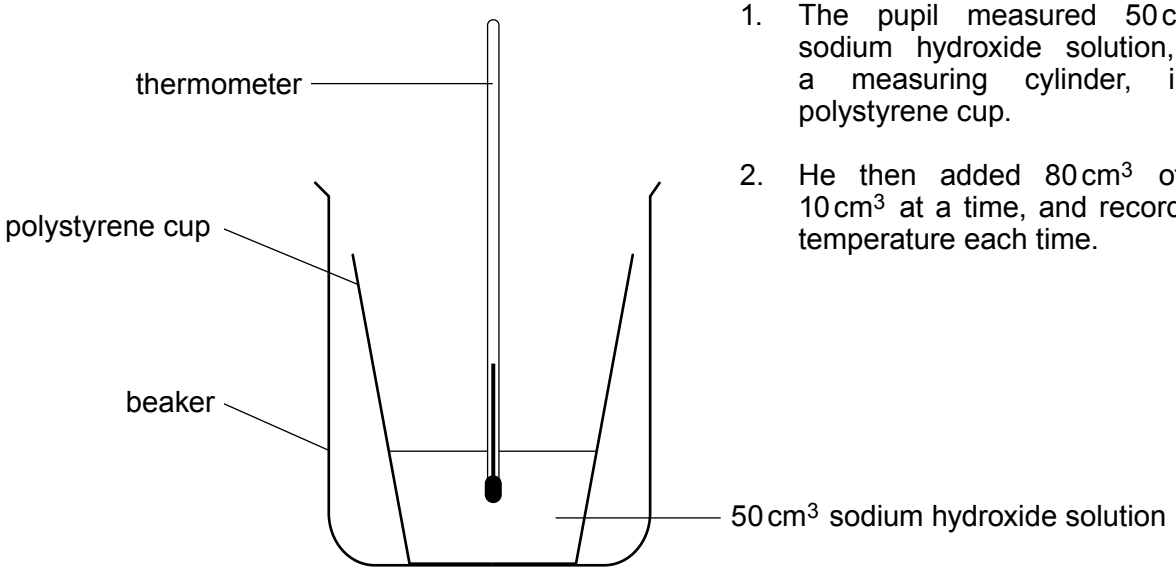
.....

6

Turn over.

Examiner only

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



1. The pupil measured 50 cm^3 of sodium hydroxide solution, using a measuring cylinder, into a polystyrene cup.

2. He then added 80 cm^3 of acid, 10 cm^3 at a time, and recorded the temperature each time.

Volume of acid added (cm^3)	Temperature (°C)
0	21.0
10	22.7
20	24.0
30	25.1
40	26.0
50	26.5
60	26.0
70	25.0
80	24.0

(a) On the grid opposite plot the volume of acid added against the temperature and draw a suitable line. [3]

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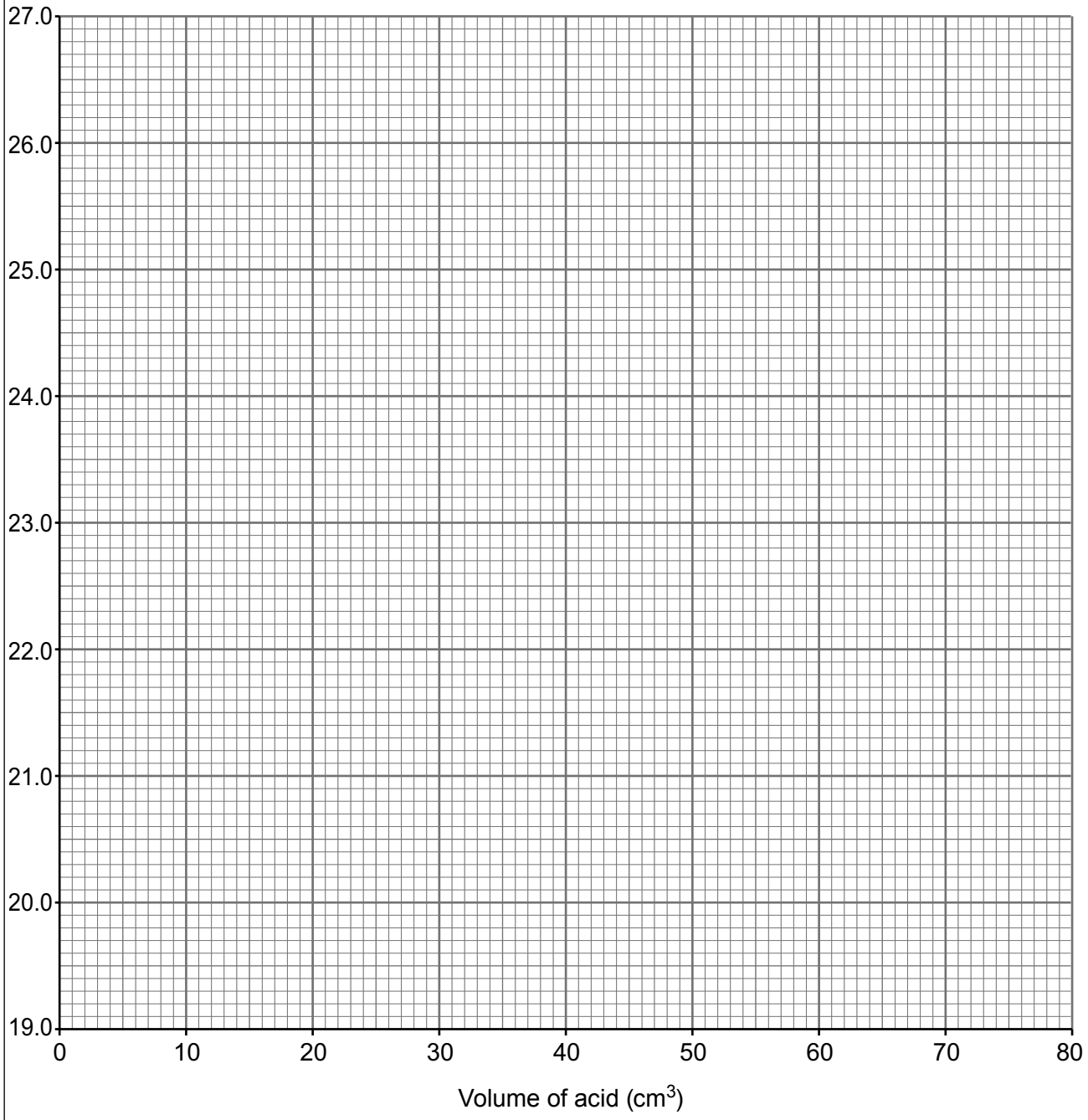

(b) Use the graph to find the

(i) maximum temperature **rise** during the experiment, ... °C [1]

(ii) volume of acid needed to neutralise **all** the alkali. ..... cm^3 [1]

Turn over.

Examiner only

(c) It is important to reduce heat lost during this experiment. State how the amount of heat lost was reduced during the experiment. Suggest what else could be done to reduce heat lost if the experiment was repeated. [2]

.....

.....

(d) Choose from the box below a term that could be used to describe this reaction. [1]

combustion	**exothermic**	**endothermic**	**oxidation**

.....

8

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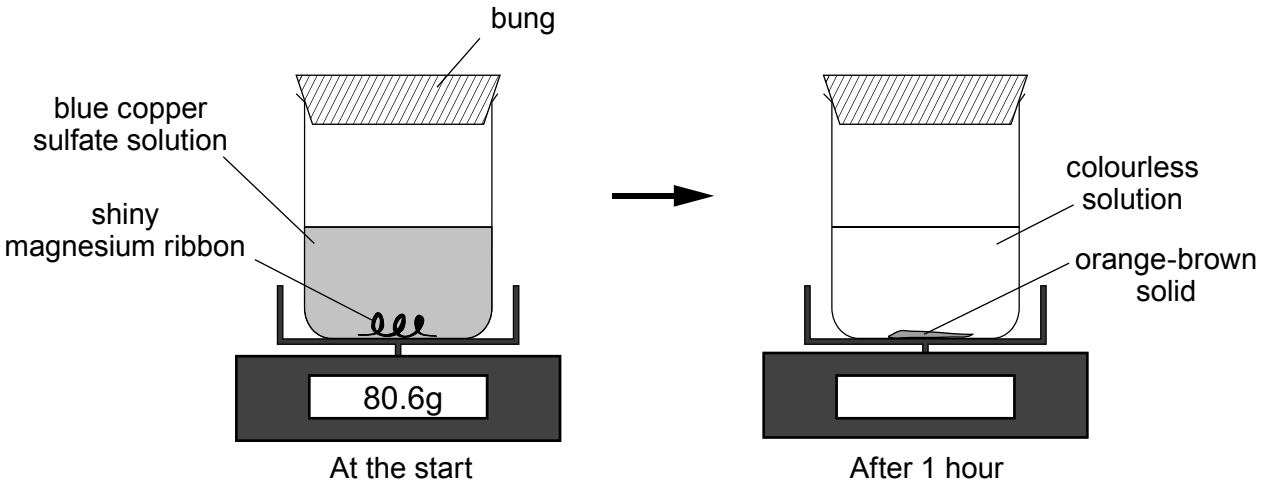
4. A pupil was asked to investigate what happens when a piece of shiny magnesium ribbon is added to copper sulfate solution. The apparatus was set up as shown below. The mass was recorded at the start and again after one hour.



(a) Complete the **word** equation:

magnesium + copper sulfate ⟶ ..... + ...

[1]

(b) Choose from the box below the name given to this type of reaction. [1]

combustion	**corrosion**	**displacement**	**electrolysis**

.....

(c) Put a tick (✓) in the box next to the mass of the beaker and contents after 1 hour.

more than 80.6 g ☐ equal to 80.6 g ☐ less than 80.6 g ☐

Give the reason for your choice. [2]

.....

(d) The experiment was repeated using sodium sulfate solution instead of copper sulfate solution. No reaction took place.

Put the metals copper, magnesium and sodium in order of reactivity. [1]

Most reactive .....

.....

Least reactive .....

5

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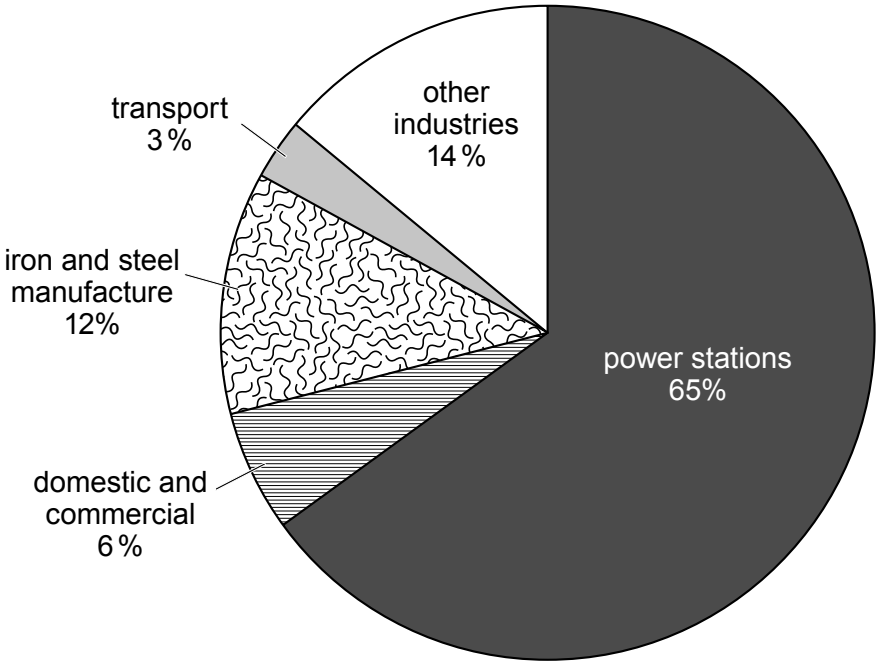
5. *(a)* The pie chart below shows sources of sulfur dioxide in the UK.

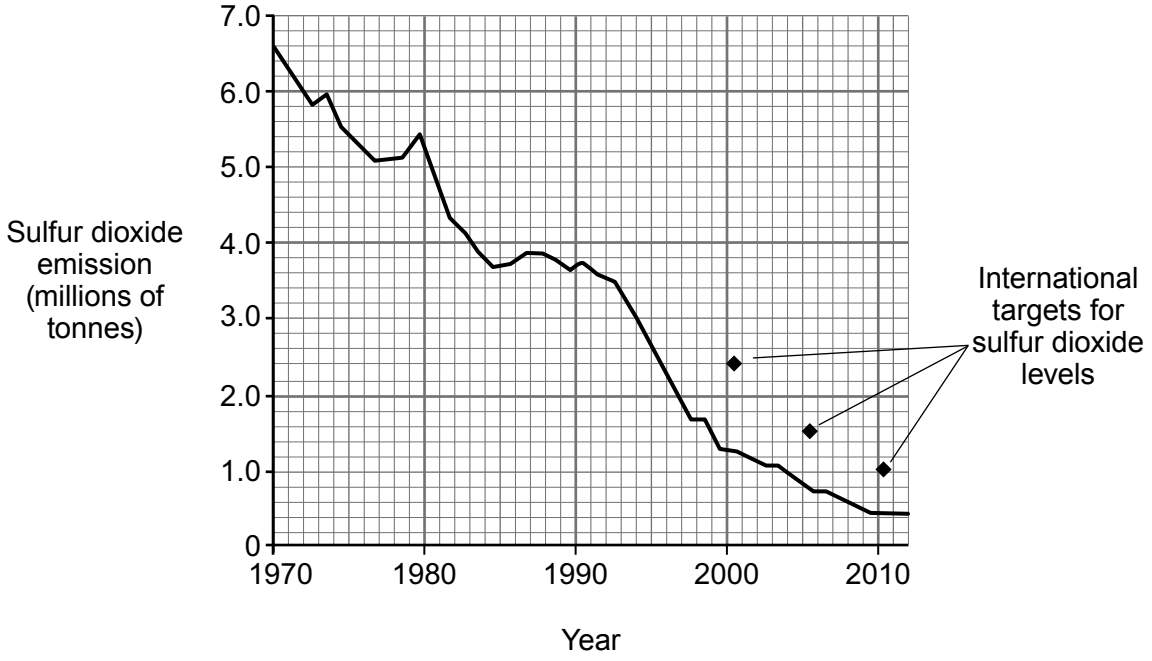


Industrial sources of sulfur dioxide include power stations, iron and steel manufacture and other industries. Calculate the total percentage (%) of sulfur dioxide from industrial sources. [1]

Total percentage from industrial sources = ... %

Examiner only

(b) The graph below shows the total sulfur dioxide emissions in the UK between 1970 and 2012. International targets for sulfur dioxide levels are also shown (◆).



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(i) Use the information to give **two** conclusions that describe sulfur dioxide emissions in the UK between 2000 and 2012. [2]

.....

.....

(ii) The generation of electricity in power stations is the main source of sulfur dioxide. Suggest an explanation for the small peak in sulfur dioxide emission in 1979. [2]

.....

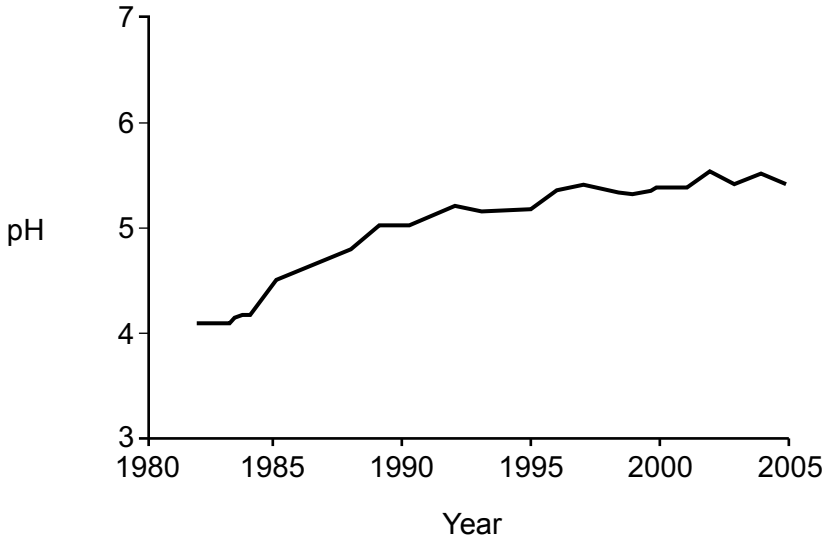
.....

Turn over.

Examiner only

(c) One of the major consequences of sulfur dioxide emission is the formation of acid rain. Acid rain causes the pH in lakes and reservoirs to decrease.

The graph below shows the change in the pH of a reservoir between 1982 and 2005.



(i) Describe how the pH **and** the acidity changes between 1982 and 2005. [2]

pH .....

Acidity .....

(ii) The reservoir is in a remote part of the country and difficult to reach. pH readings were taken daily and used to produce the graph above.

pH meter

A

datalogger and pH sensor

B

pH paper

C

litmus paper

D

Give the **letter** of the equipment above that you would choose to record and store the pH of the reservoir several times a day. Give a reason for you choice. [2]

Letter .....

Reason .....

.....

9

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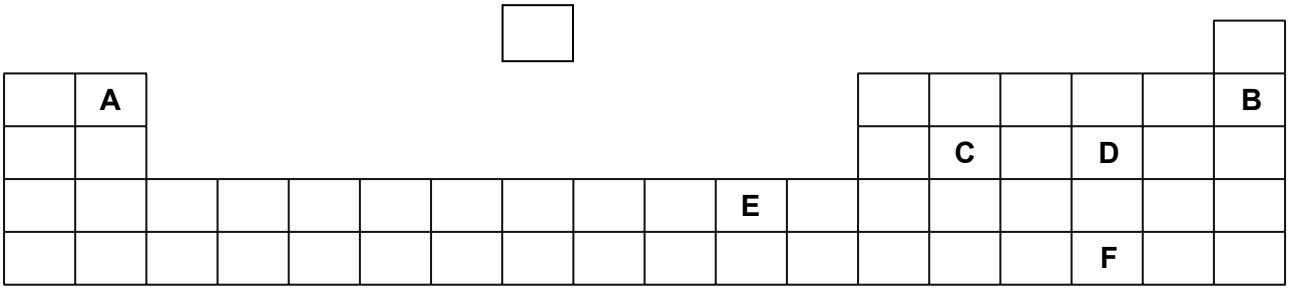
6. The following diagram shows an outline of the Periodic Table.
The letters shown are NOT the chemical symbols of the elements.



(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
1	1084	2927	shiny brown solid	malleable
2	1414	2900	shiny grey solid	brittle
3	115	445	yellow solid	brittle

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

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5

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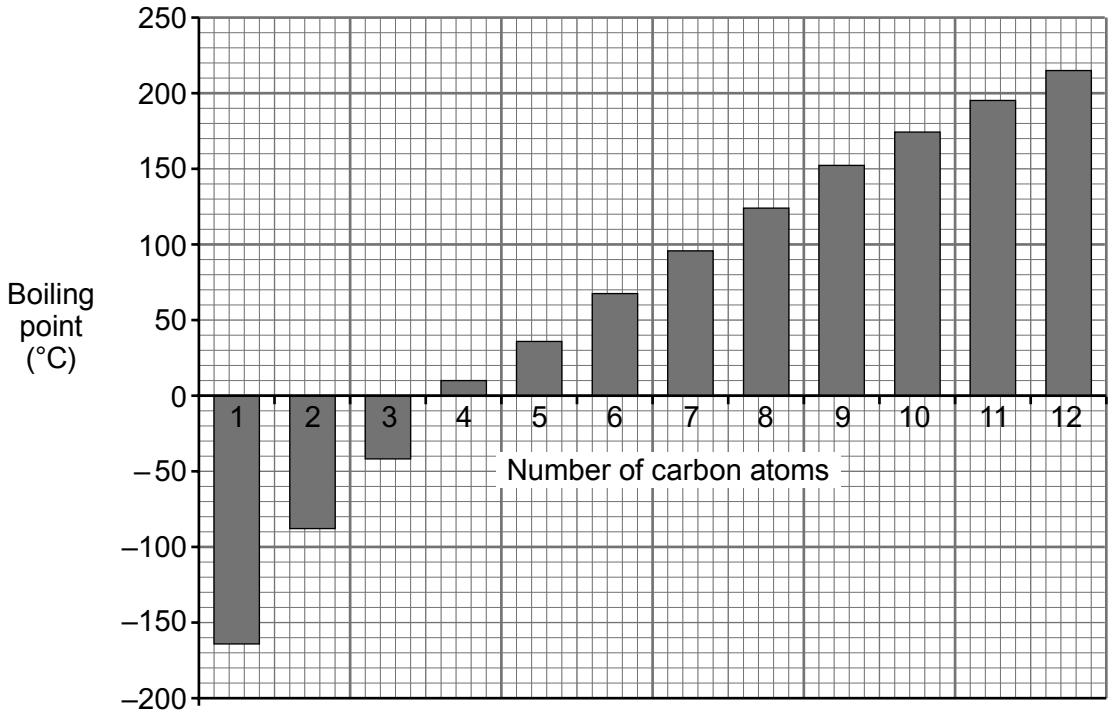
7. *(a)* Crude oil can be separated into simpler mixtures, called fractions, which contain hydrocarbon compounds with boiling points within a similar range.

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]

.....

(b) Plastic has replaced glass for making some drink bottles.
Apart from cost, give **one** property of plastic that makes it a more suitable material for making drink bottles. [1]

.....

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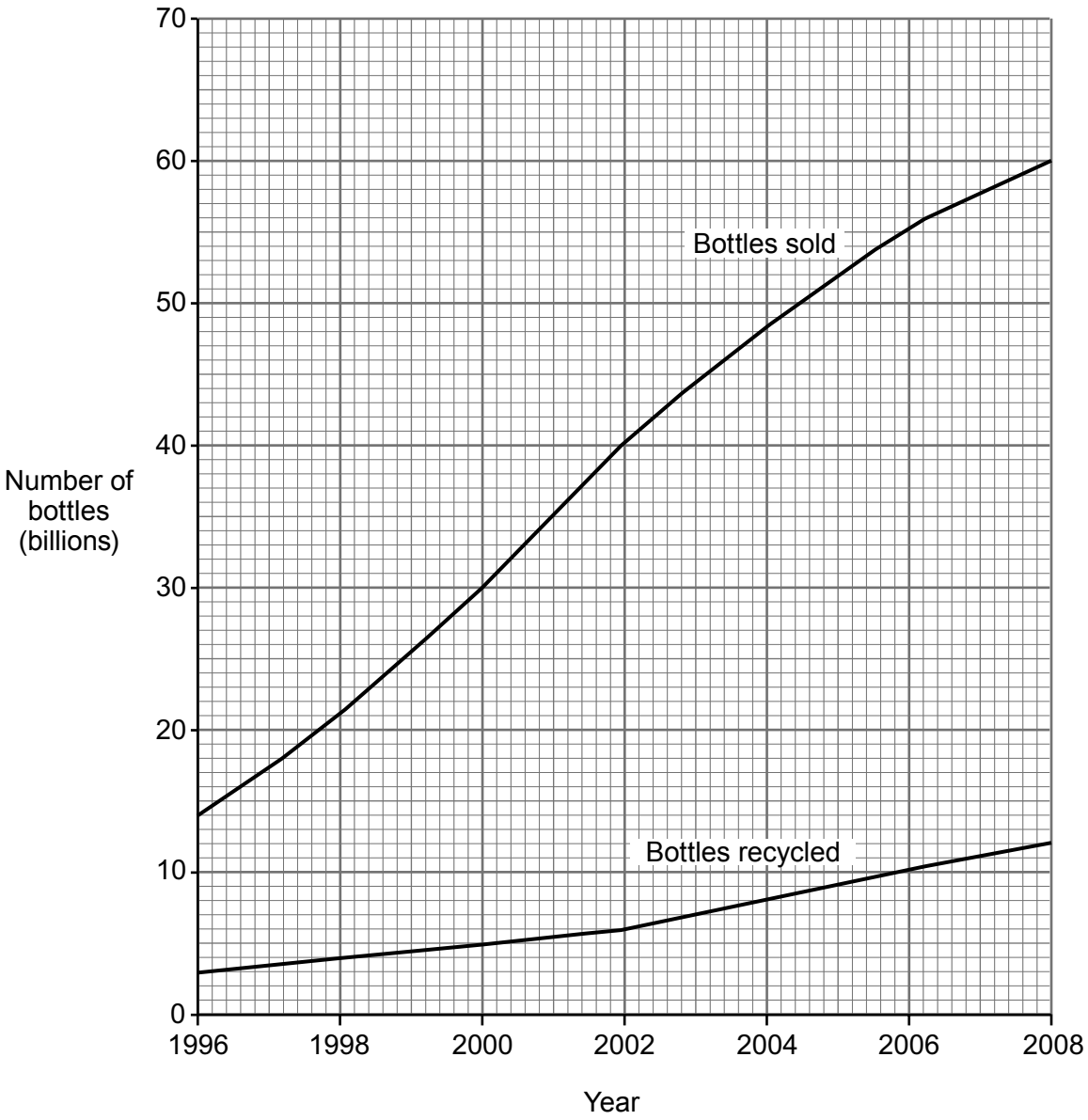
(c) The graph below shows the number of plastic drink bottles sold and recycled in the United States between 1996 and 2008.



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

Percentage recycled = ... %

Turn over.

Examiner only

(d) State and explain the advantages of recycling plastic. [3]

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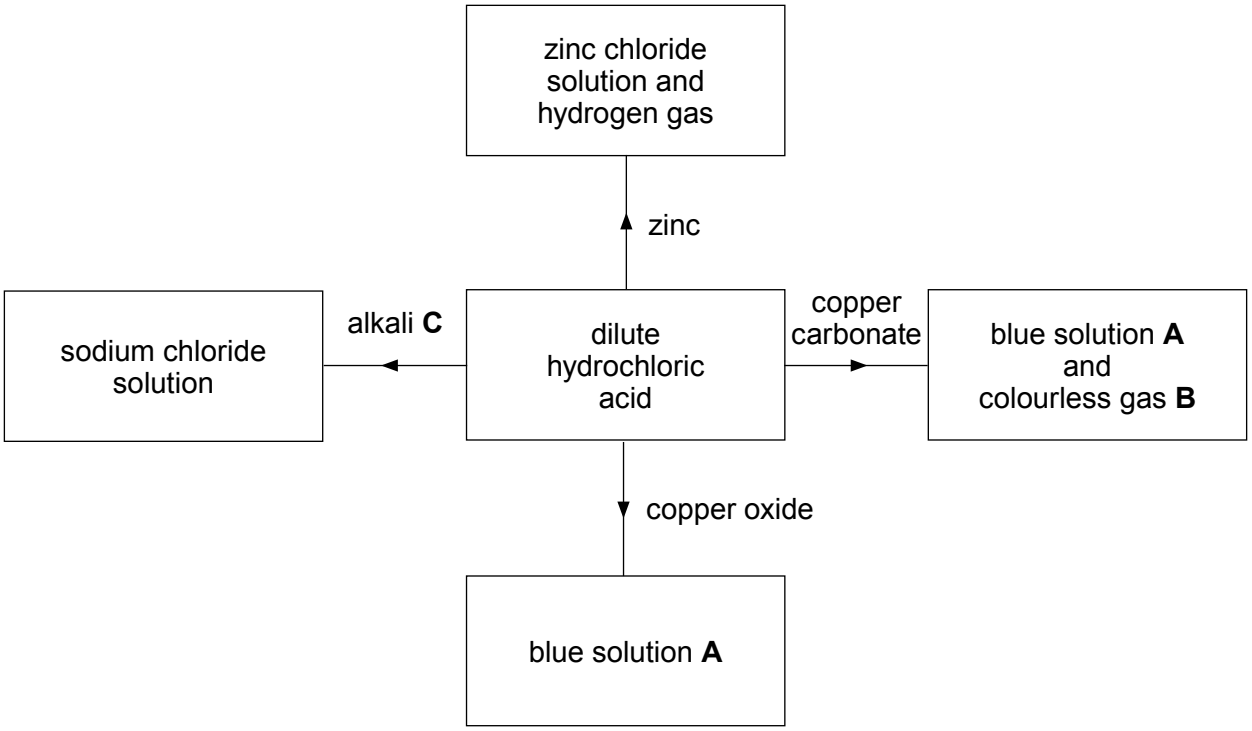
8. The diagram below shows some reactions of dilute hydrochloric acid.



(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]

$$Zn + \square HCl \longrightarrow ZnCl_2 + H_2$$

4

Turn over.

Examiner only

9. All water supplies in the UK are chlorinated but only some are fluoridated.

State why each process is carried out and outline why some people are opposed to the fluoridation of drinking water but no one opposes chlorination. [6 QWC]

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Question number	Additional page, if required. Write the question number(s) in the left-hand margin.

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FORMULAE FOR SOME COMMON IONS

POSITIVE IONS		NEGATIVE IONS	
Name	**Formula**	**Name**	**Formula**
Aluminium	Al^{3+}	Bromide	Br^{-}
Ammonium	NH_4^{+}	Carbonate	CO_3^{2-}
Barium	Ba^{2+}	Chloride	Cl^{-}
Calcium	Ca^{2+}	Fluoride	F^{-}
Copper(II)	Cu^{2+}	Hydroxide	OH^{-}
Hydrogen	H^{+}	Iodide	I^{-}
Iron(II)	Fe^{2+}	Nitrate	NO_3^{-}
Iron(III)	Fe^{3+}	Oxide	O^{2-}
Lithium	Li^{+}	Sulfate	SO_4^{2-}
Magnesium	Mg^{2+}		
Nickel	Ni^{2+}		
Potassium	K^{+}		
Silver	Ag^{+}		
Sodium	Na^{+}		
Zinc	Zn^{2+}		

PERIODIC TABLE OF ELEMENTS

1	2	Group										3	4	5	6	7	0
											$^{1}_{1}$H Hydrogen						$^{4}_{2}$He Helium
$^{7}_{3}$Li Lithium	$^{9}_{4}$Be Beryllium											$^{11}_{5}$B Boron	$^{12}_{6}$C Carbon	$^{14}_{7}$N Nitrogen	$^{16}_{8}$O Oxygen	$^{19}_{9}$F Fluorine	$^{20}_{10}$Ne Neon
$^{23}_{11}$Na Sodium	$^{24}_{12}$Mg Magnesium											$^{27}_{13}$Al Aluminium	$^{28}_{14}$Si Silicon	$^{31}_{15}$P Phosphorus	$^{32}_{16}$S Sulfur	$^{35}_{17}$Cl Chlorine	$^{40}_{18}$Ar Argon
$^{39}_{19}$K Potassium	$^{40}_{20}$Ca Calcium	$^{45}_{21}$Sc Scandium	$^{48}_{22}$Ti Titanium	$^{51}_{23}$V Vanadium	$^{52}_{24}$Cr Chromium	$^{55}_{25}$Mn Manganese	$^{56}_{26}$Fe Iron	$^{59}_{27}$Co Cobalt	$^{59}_{28}$Ni Nickel	$^{64}_{29}$Cu Copper	$^{65}_{30}$Zn Zinc	$^{70}_{31}$Ga Gallium	$^{73}_{32}$Ge Germanium	$^{75}_{33}$As Arsenic	$^{79}_{34}$Se Selenium	$^{80}_{35}$Br Bromine	$^{84}_{36}$Kr Krypton
$^{86}_{37}$Rb Rubidium	$^{88}_{38}$Sr Strontium	$^{89}_{39}$Y Yttrium	$^{91}_{40}$Zr Zirconium	$^{93}_{41}$Nb Niobium	$^{96}_{42}$Mo Molybdenum	$^{99}_{43}$Tc Technetium	$^{101}_{44}$Ru Ruthenium	$^{103}_{45}$Rh Rhodium	$^{106}_{46}$Pd Palladium	$^{108}_{47}$Ag Silver	$^{112}_{48}$Cd Cadmium	$^{115}_{49}$In Indium	$^{119}_{50}$Sn Tin	$^{122}_{51}$Sb Antimony	$^{128}_{52}$Te Tellurium	$^{127}_{53}$I Iodine	$^{131}_{54}$Xe Xenon
$^{133}_{55}$Cs Caesium	$^{137}_{56}$Ba Barium	$^{139}_{57}$La Lanthanum	$^{179}_{72}$Hf Hafnium	$^{181}_{73}$Ta Tantalum	$^{184}_{74}$W Tungsten	$^{186}_{75}$Re Rhenium	$^{190}_{76}$Os Osmium	$^{192}_{77}$Ir Iridium	$^{195}_{78}$Pt Platinum	$^{197}_{79}$Au Gold	$^{201}_{80}$Hg Mercury	$^{204}_{81}$Tl Thallium	$^{207}_{82}$Pb Lead	$^{209}_{83}$Bi Bismuth	$^{210}_{84}$Po Polonium	$^{210}_{85}$At Astatine	$^{222}_{86}$Rn Radon
$^{223}_{87}$Fr Francium	$^{226}_{88}$Ra Radium	$^{227}_{89}$Ac Actinium															

Key: