Surname	Centre Number	Candidate Number
Other Names		0

GCSE

0240/01

ADDITIONAL SCIENCE
FOUNDATION TIER
CHEMISTRY 2

A.M. MONDAY, 21 May 2012

45 minutes

Suitable for Modified Language Candidates

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**7**	
2.	**7**	
3.	**5**	
4.	**4**	
5.	**4**	
6.	**8**	
7.	**5**	
8.	**4**	
9.	**6**	
Total	**50**	

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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.

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.

INFORMATION FOR CANDIDATES

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

You are reminded of the necessity for good English and orderly presentation in your answers.

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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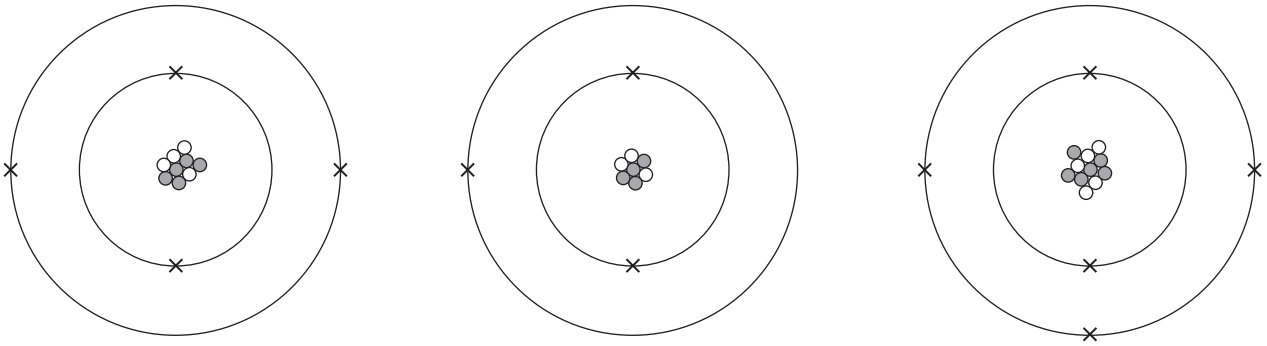
Answer **all** *questions.*

1. *(a)* Atoms are made up of protons, neutrons and electrons.

A, **B** and **C** represent atoms of three different elements.



A **B** **C**

Give the **letter** of the atom which contains

(i) four protons, ... [1]

(ii) five electrons. ..... [1]

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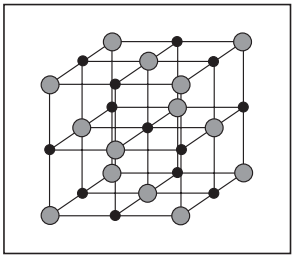
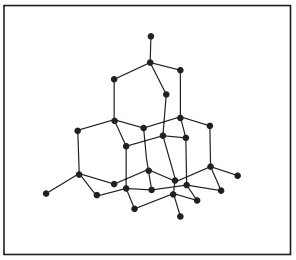
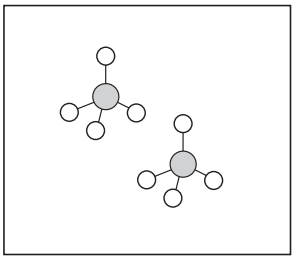
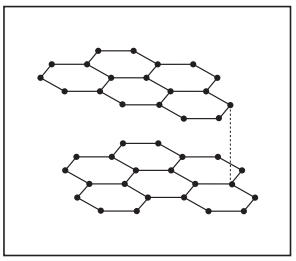
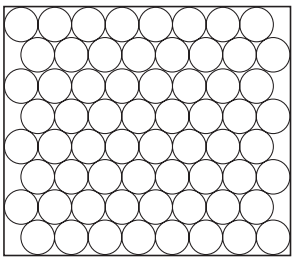
(b) The following diagrams show the structures of some substances.

(i) Draw a line to connect **each** substance to its correct structure. [4]

Substance	Structure
aluminium	
methane	
diamond	
sodium chloride	
	

(ii) Give the name of the substance which contains positive and negative ions. [1]

.....

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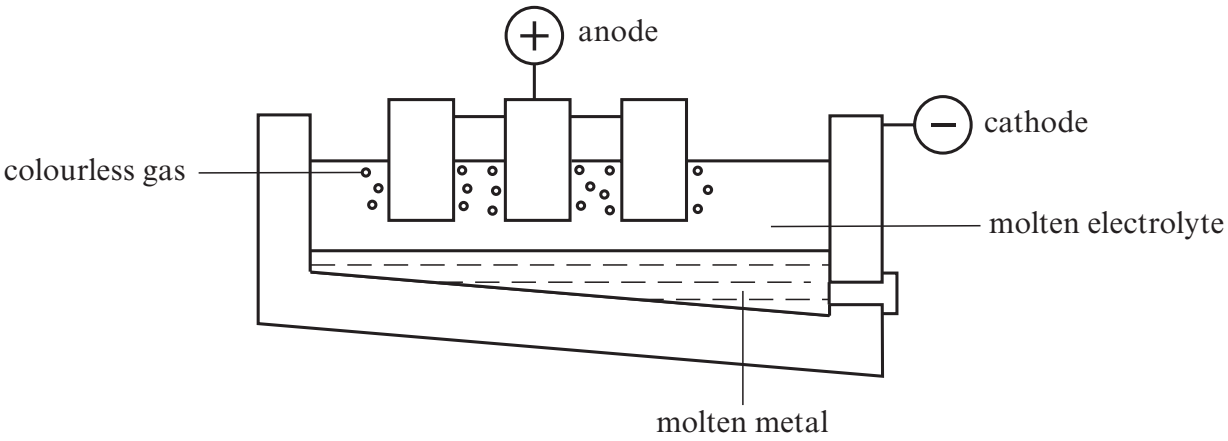
2. *(a)* The diagram below shows the cell used in the industrial extraction of aluminium.



The molten electrolyte used in the process contains the ions Al^{3+} and O^{2-}.

(i) Give the chemical name for the molten electrolyte. ..... [1]

(ii) Name the electrode at which aluminium is formed. ..... [1]

(iii) Name the colourless gas formed during the process. ..... [1]

(b) The electrolyte is obtained from an ore called bauxite. Bauxite needs to be imported into the UK. The industrial extraction also needs a lot of electricity.

Which **two** factors are **most** important when locating a new aluminium extraction plant in the UK? Choose from the box below. [2]

coastal position	**good transport system**	**nearby housing**
nearby limestone quarries	**nearby power station**	**nearby river for water**

Factor 1 .....

Factor 2 .....

Examiner only

(c) Some properties and uses of aluminium are given below.
Draw a line from each pair of properties to the use which relies on **both** of these properties. [2]

Pair of properties	**Use**
heat conductor and malleable	drinks cans
electrical conductor and ductile	overhead power cables
malleable and non-toxic	cooking foil

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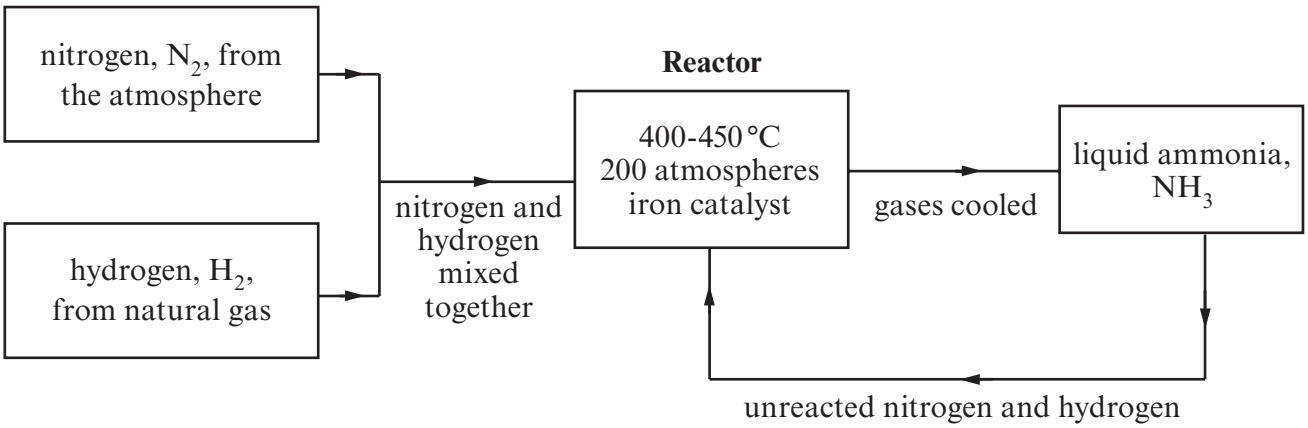
3. The flow chart below shows the stages in the manufacture of ammonia.



Use only the information in the flow chart to answer parts *(a)*-*(c)*.

(a) Name the raw materials from which nitrogen and hydrogen are obtained. [1]

Nitrogen .....

Hydrogen .....

(b) The manufacture of ammonia is a reversible reaction.

Write a **word** equation for this reaction. [2]

..... + ... $\rightleftharpoons$ .....

(c) The reaction mixture contains ammonia and unreacted nitrogen and hydrogen.

(i) Describe what happens to ammonia gas on cooling. [1]

.....

(ii) Only about 20% of the nitrogen and hydrogen react to form ammonia. State what happens to the unreacted gases. [1]

.....

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4. The box below shows some smart materials.

thermochromic pigment	**photochromic pigment**	**shape memory alloy**
hydrogel	**shape memory polymer**	

Which type of smart material is used in each of the following items? Choose from the box.

(a) Battery test strips [1]

Pressing both ends of the battery completes a circuit. This causes the strip to heat up and change colour. It shows if the battery is in good condition.

Smart material .....

(b) Water-absorbing granules [1]

Some garden centres sell water-absorbing granules. They can be mixed with soil in plant pots. The granules absorb up to 100 times their weight in water. They then release it slowly back to the soil.

Smart material .....

(c) Nitinol stents for veins [1]

A collapsed nitinol stent can be inserted into a vein. When it is warmed up the stent returns to its original expanded shape. This helps to improve blood flow.

Smart material .....

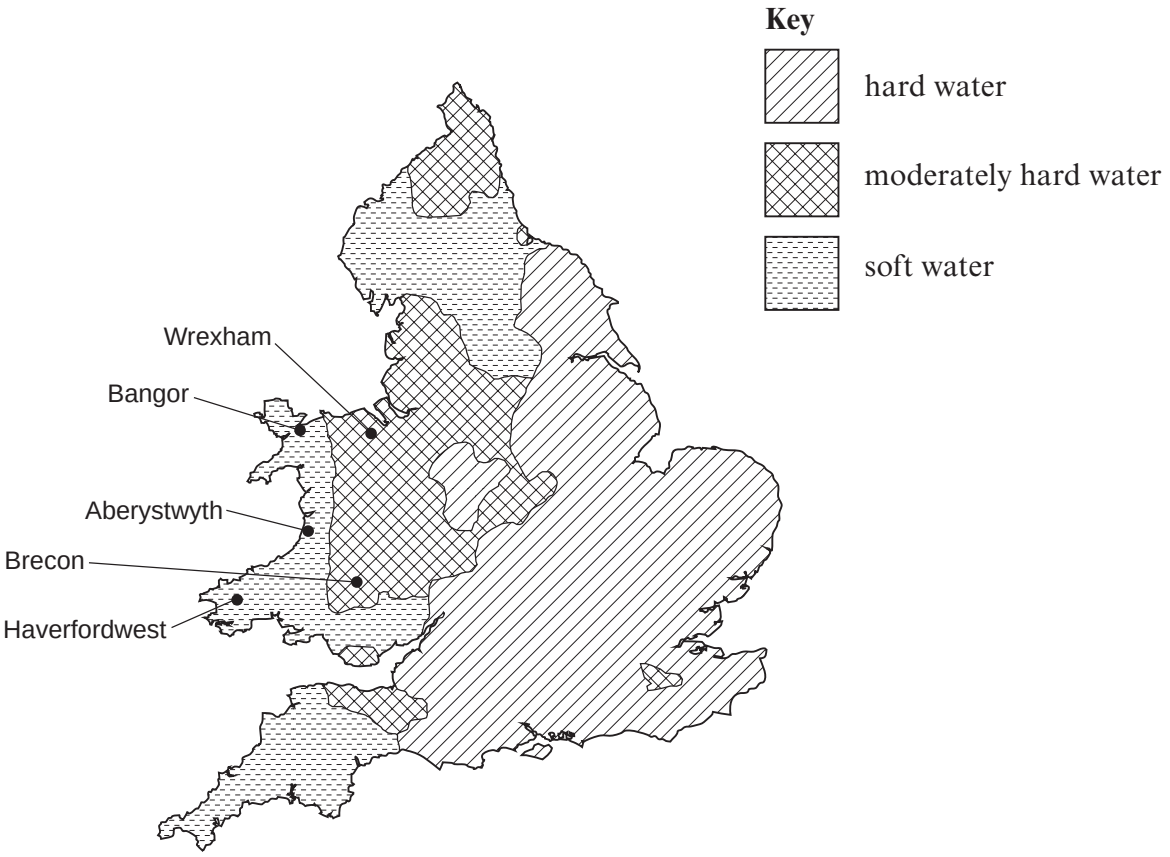
(d) Lenses for sunglasses [1]

Some lenses automatically darken when exposed to sunlight. They return to a lighter shade when the light intensity decreases.

Smart material .....

Examiner only

5. The map below shows the hardness of water across the different regions of Wales and England.



(a) Water samples were collected at Bangor, Brecon and Wrexham.
$1\,cm^3$ of soap solution was added to $10\,cm^3$ of each sample in separate test tubes.
Each tube was shaken for 10 seconds.

What difference would you expect in the appearance of the shaken solutions in each tube? Explain your answer. [3]

.....

.....

.....

.....

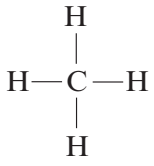
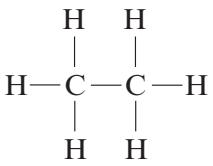
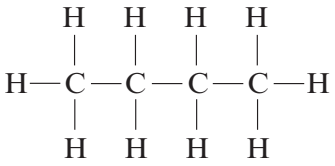
(b) Give **one** way the procedure was made a fair test. [1]

.....

4

Examiner only

6. *(a)* (i) Complete the following table to show the **structural** formula for propane. [1]

Structural formula				
Molecular formula	CH_4	C_2H_6	C_3H_8	C_4H_{10}
Name	methane	ethane	propane	butane

(ii) A molecule of pentane contains 5 carbon atoms. Give the number of hydrogen atoms found in a molecule of pentane. [1]

.....

(b) Use the relative atomic masses given below. Calculate the relative molecular mass (M_r) of butane, C_4H_{10}. [2]

$A_r(H) = 1$ $A_r(C) = 12$

$M_r(C_4H_{10})$ = ...

(c) Plastics have replaced many traditional materials.

Give **two** general properties of a plastic which makes it a better material than the following. Do NOT use cost.

(i) paper for making carrier bags, [2]

Property 1 .....

Property 2 .....

(ii) iron for making guttering. [2]

Property 1 .....

Property 2 .....

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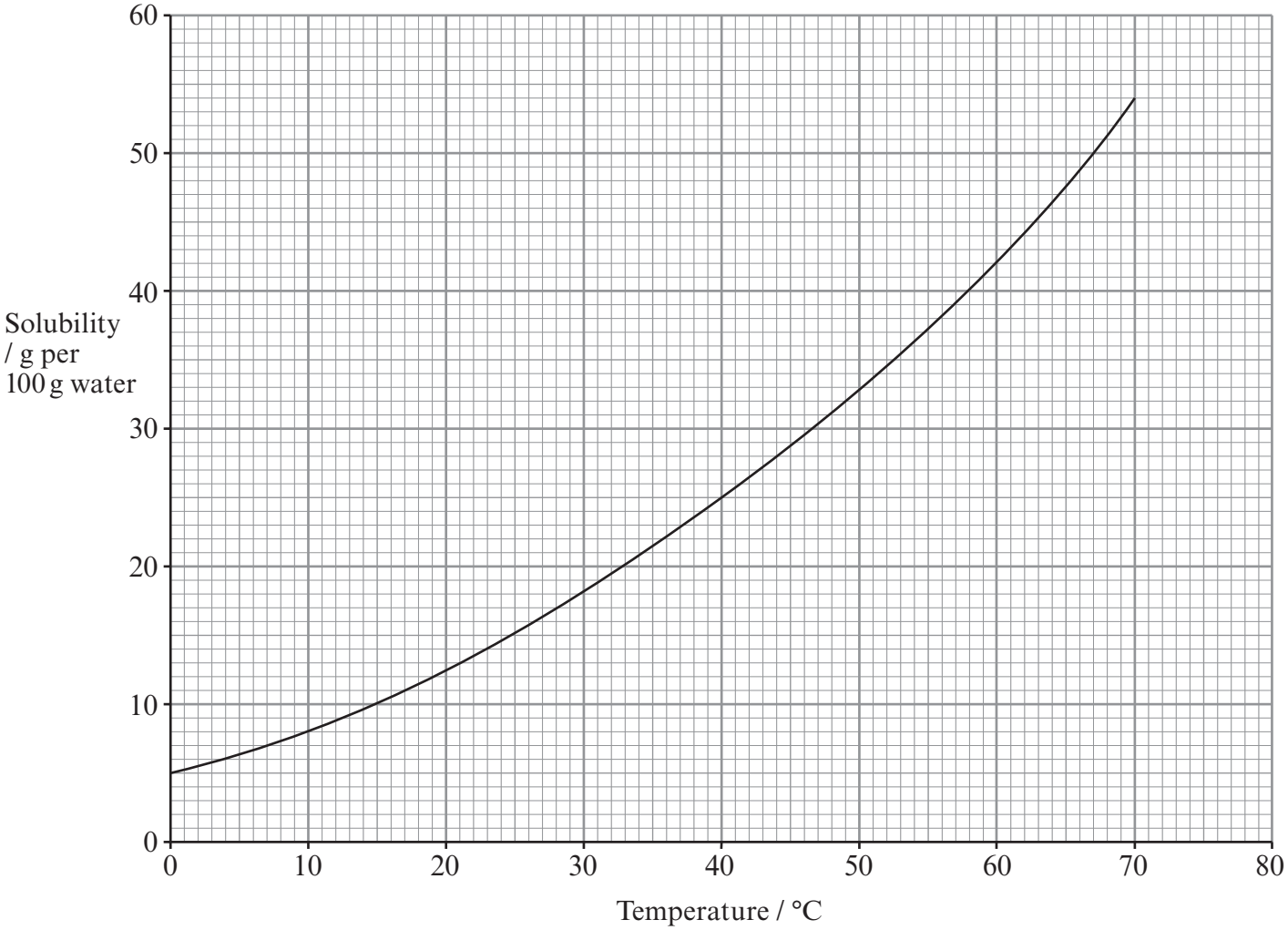
7. The graph below shows the solubility of potassium dichromate in water at different temperatures.



The table below shows the solubility of potassium chloride in water at different temperatures.

Temperature / °C	0	20	40	60	80
Solubility / g per 100 g water	28	34	40	46	52

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(a) Plot the graph of the solubility of potassium chloride on the grid on the opposite page. [3]

(b) Using the graphs give

(i) the temperature at which the solubility is the **same** for both potassium chloride and potassium dichromate, [1]

Temperature = ... °C

(ii) the **difference** between the solubilities of potassium chloride and potassium dichromate at 30 °C. [1]

Difference = ... g per 100 g of water

5

8. The table below shows information about the atoms of three elements.

Complete the table.

Use the data and key on the Periodic Table of Elements shown on the **back page of this examination paper**. [4]

Element	Symbol	Number of protons	Number of neutrons	Number of electrons
beryllium	$^{9}_{4}Be$	4		4
phosphorus		15	16	15
argon	$^{40}_{18}Ar$		22	

4

Turn over.

Examiner only

9. *(a)* Copper, magnesium, silver and zinc were added separately to solutions containing copper nitrate, magnesium nitrate, silver nitrate and zinc nitrate.

The table shows the results obtained from the series of experiments.

Metal	Metal nitrate solution			
	copper nitrate	magnesium nitrate	silver nitrate	zinc nitrate
copper	no reaction	no reaction	silvery-grey crystals form on copper foil	no reaction
magnesium	brown solid forms and blue solution turns colourless	no reaction	silvery-grey solid forms	silvery-grey solid forms
silver	no reaction	no reaction	no reaction	no reaction
zinc	brown solid forms and blue solution turns colourless	no reaction	silvery-grey solid forms	no reaction

(i) Use the information in the table above. Place the metals copper, magnesium, silver and zinc in order of reactivity. [2]

Most reactive .....

.....

.....

Least reactive .....

(ii) Write a **word** equation for the reaction between copper and silver nitrate. [2]

..... + ... ⟶ ..... + ...

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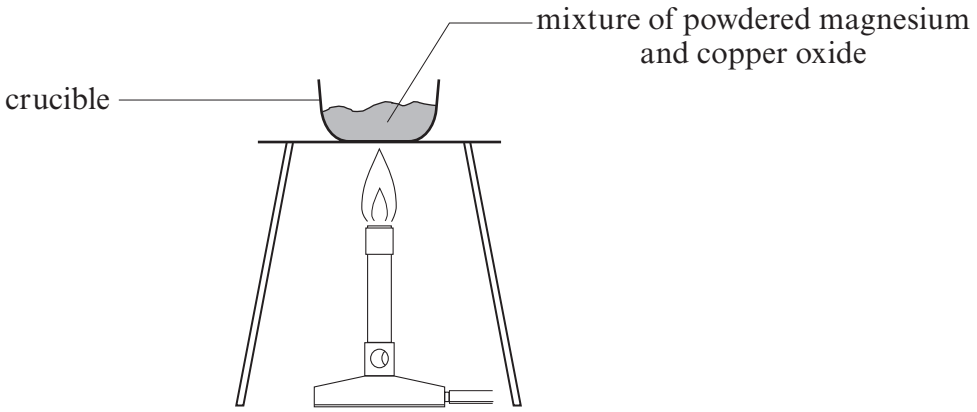
(b) The apparatus in the diagram below can be used to show the violent reaction between magnesium and copper oxide. Both solids are in **powdered** form and well mixed together.



After a few minutes of heating a violent reaction occurs. Tiny brown specks and a white powdery substance remain.

Use **this reaction** to explain the terms oxidation and reduction. [2]

.....

.....

.....

Turn over.

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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^{+}	Sulphate	SO_4^{2-}
Magnesium	Mg^{2+}		
Nickel	Ni^{2+}		
Potassium	K^{+}		
Silver	Ag^{+}		
Sodium	Na^{+}		

Turn over.

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 Sulphur	$^{35}_{17}$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: