

Candidate Name	Centre Number	Candidate Number
		0



General Certificate of Secondary Education

236/01

**SCIENCE
FOUNDATION TIER (Grades G-C)
CHEMISTRY 1**

P.M. FRIDAY, 18 January 2008

(45 minutes)

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

ADDITIONAL MATERIALS

In addition to this paper you may require a calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

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.

No certificate will be awarded to a candidate detected in any unfair practice during the examination.

Answer all questions.

1. The following lists three questions that a student wanted to answer.

- A How much chlorine is used by the Welsh Water Authority each year to sterilize the water supply in Wales?
- B Are the general public prepared to pay more for cleaner fuel?
- C Is the reaction between magnesium and dilute hydrochloric acid exothermic or endothermic?

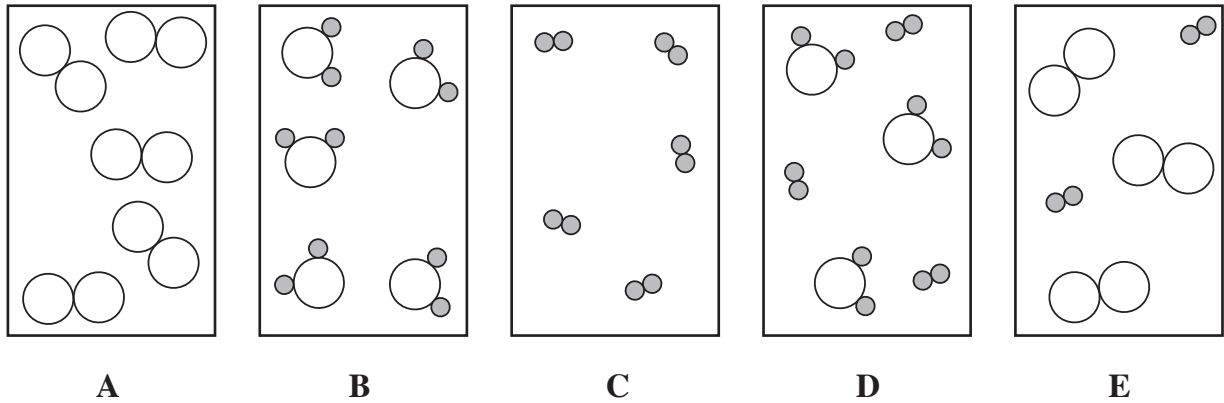
Give the letter of the question, **A**, **B** or **C**, that can be answered by

- (i) doing an experiment,
- (ii) using an internet search,
- (iii) carrying out a survey.

[2]

2. (i) The diagrams below, labelled **A**, **B**, **C**, **D** and **E**, represent particles of some chemicals.

In the five boxes below,  and  represent atoms of different elements.




Give the letter of a box which contains

- I. only an element, [1]
- II. a mixture of an element and a compound, [1]
- III. only water vapour, H_2O [1]
- (ii) The gas, ammonia, has the formula NH_3 .

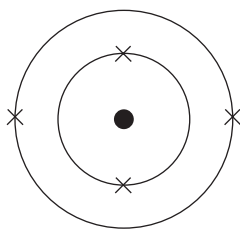
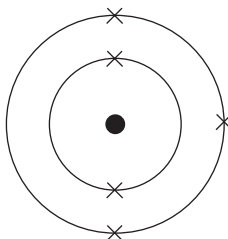
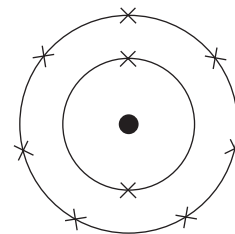
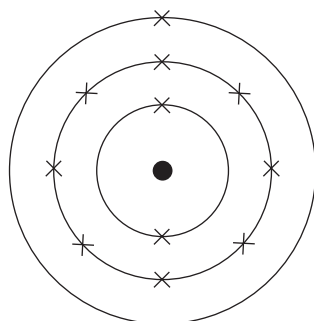
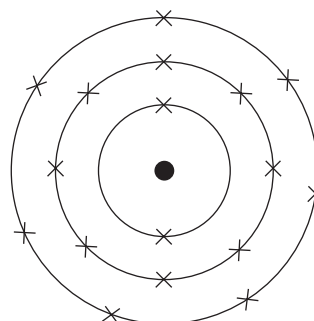
In the space below, draw a diagram to represent a molecule of ammonia. [1]

Represent one atom of nitrogen as 

Represent one atom of hydrogen as 

3. The diagrams below show five different atoms labelled **A**, **B**, **C**, **D** and **E**.

These letters are **not** chemical symbols.

**A****B****C****D****E**

Choose a letter from the diagrams above to answer each of the following questions.

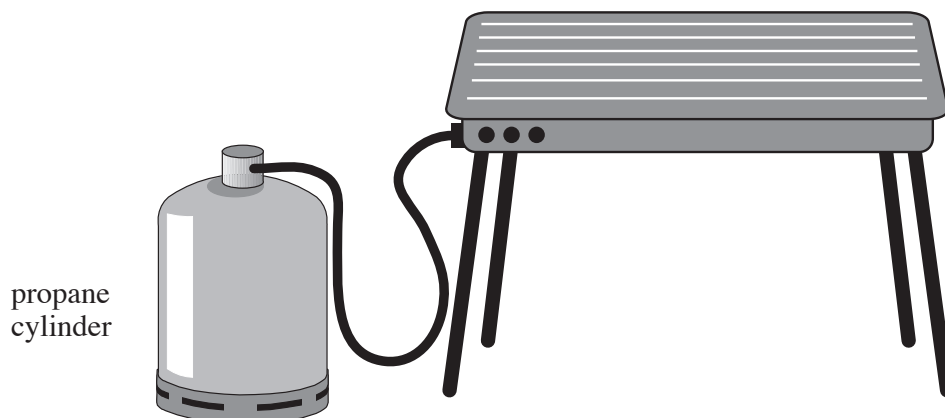
Each letter may be used once, more than once or not at all.

Give the letter of the atom which

- | | | | |
|-------|---|-------|-----|
| (i) | has three electrons in the outer shell (orbit), | | [1] |
| (ii) | has the atomic number of 11, | | [1] |
| (iii) | is in the same Group of the Periodic Table as C , | | [1] |
| (iv) | has the electronic structure 2, 2, | | [1] |
| (v) | is in the same Period (row) of the Periodic Table as E . | | [1] |

4. (i) The diagram below shows a typical gas barbecue.

The gas used in this barbecue is propane, C_3H_8 .



The word equation for the reaction that takes place when the propane burns is:



- I. Use the word equation above to name one **reactant** and one **product**. [2]

Reactant

Product

- II. State where the oxygen gas comes from. [1]

.....

III.

boiling	combustion	evaporation
----------------	-------------------	--------------------

Use a word from the box above to describe the reaction that takes place when the propane gas burns. [1]

.....

- (ii) Some people prefer the taste of food cooked on a charcoal barbecue. Charcoal, which is mainly carbon, reacts with oxygen to give carbon dioxide.

Use the information to give a **word** equation for the reaction that takes place as the carbon burns. [2]

..... + \longrightarrow

5. (a) Read the account in the box and answer the questions that follow.

Some fuels, such as coal, contain small amounts of sulphur as an impurity. When these fuels burn, sulphur dioxide gas is formed from this impurity. Sulphur dioxide is an acidic gas which reacts with rain water to form acid rain.

Acid rain is harmful to the environment, since it kills fish in lakes and damages trees and buildings.

Methods often used to reduce the problem caused by acid rain include:

- building tall chimneys to reduce low level pollution;
- neutralising acidic gases by reacting with limestone;
- adding limestone to lakes to neutralise the acidic solution.

Use only the information in the box above to answer parts (i), (ii) and (iii).

- (i) Name the gas that is responsible for acid rain. [1]

.....

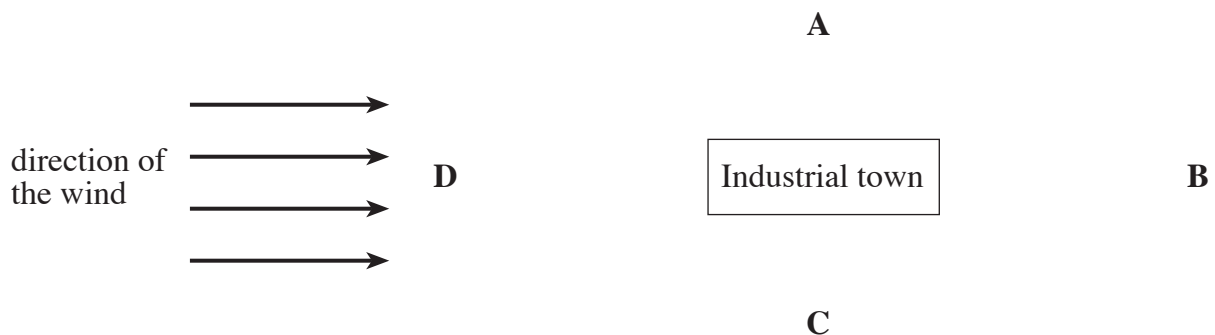
- (ii) State **one** environmental problem caused by acid rain. [1]

.....

- (iii) Give the method used to reduce the amount of sulphur dioxide being released into the atmosphere by industry. [1]

.....

- (b) The following diagram shows a map of a town which has a coal-burning industry and the direction of the wind.



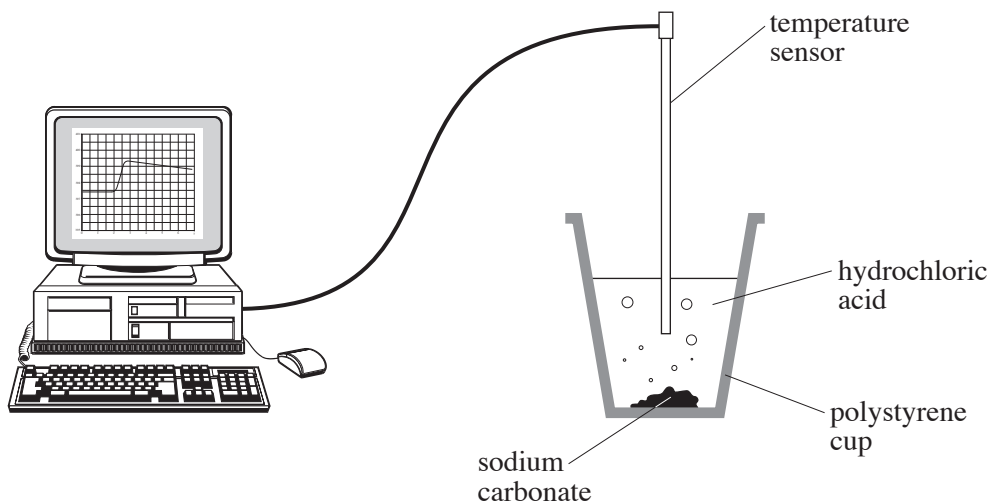
State the area outside the town, **A**, **B**, **C** or **D**, in which you would expect to find most sulphur dioxide from the coal-burning plant and explain your answer. [2]

.....

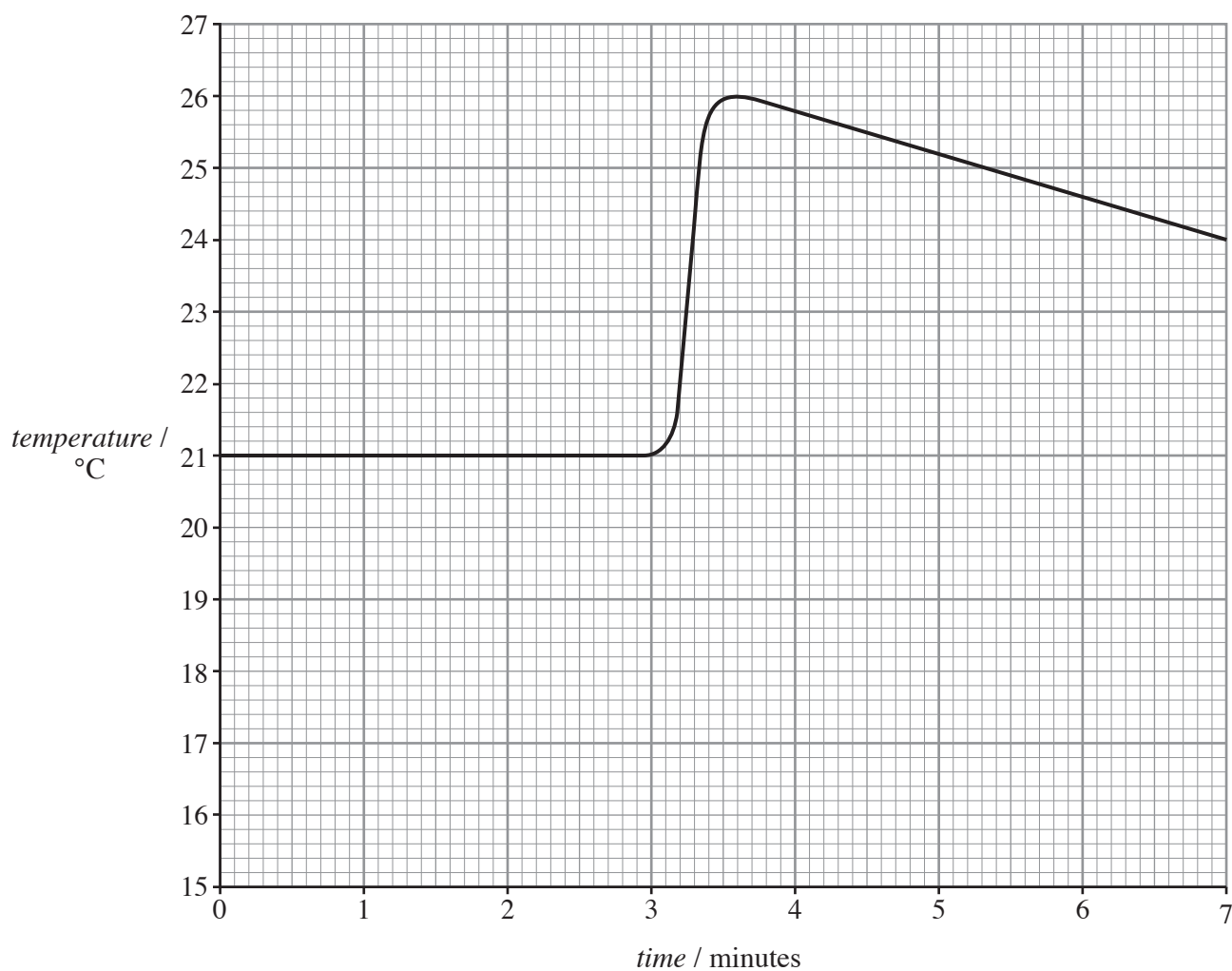
.....

BLANK PAGE

6. An experiment to investigate the changes in temperature for the reaction between sodium carbonate and hydrochloric acid was set up using the equipment shown below. The temperature sensor was placed in the acid for three minutes and then sodium carbonate was added.



The graph produced by the computer is shown below.



- (i) Use the graph to give the
- I. **highest** temperature recorded during the reaction, [1]
 °C
- II. **increase** in temperature during the reaction. [1]
 °C
- (ii) Give a reason for using a polystyrene cup rather than a glass beaker in this experiment. [1]

- (iii) Using the substances in the box below, write a word equation for the reaction that took place inside the polystyrene cup. [2]

carbon dioxide

hydrochloric acid

sodium carbonate

sodium chloride

water

..... + → + +

- (iv) State the word used to describe this type of reaction and give a reason for your answer. [2]

7. (i) Complete the following table. You may find it helpful to use the Periodic Table of Elements on the **back cover of this examination paper**. [2]

<i>Compound</i>	<i>Formula</i>	<i>Elements present</i>
calcium carbonate	CaCO ₃	calcium, carbon and oxygen
potassium hydroxide	KOH
.....	MgO	magnesium and oxygen

- (ii) Fizzy drinks, such as lemonade, contain carbonic acid. Each molecule of carbonic acid contains two atoms of hydrogen, one atom of carbon and three atoms of oxygen.

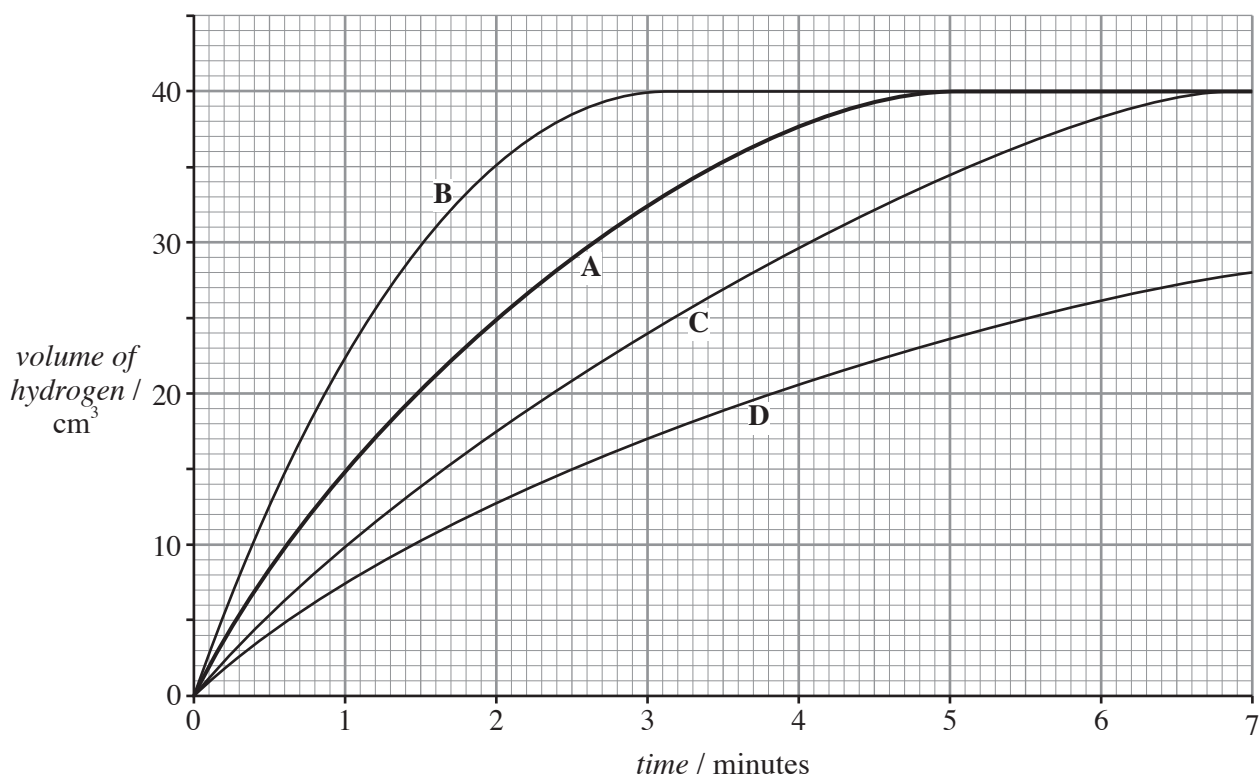
Give the formula of carbonic acid. [2]

- (iii) Use the table of '*Formulae for some common ions*' on the **inside of the back cover of this examination paper**, to give the formula of

I. lithium bromide, [1]

II. sodium oxide. [1]

8. (a) Magnesium reacts with hydrochloric acid to give hydrogen gas. Graph A below shows the volume of hydrogen formed when a certain mass of magnesium ribbon is reacted with excess hydrochloric acid at 20°C.



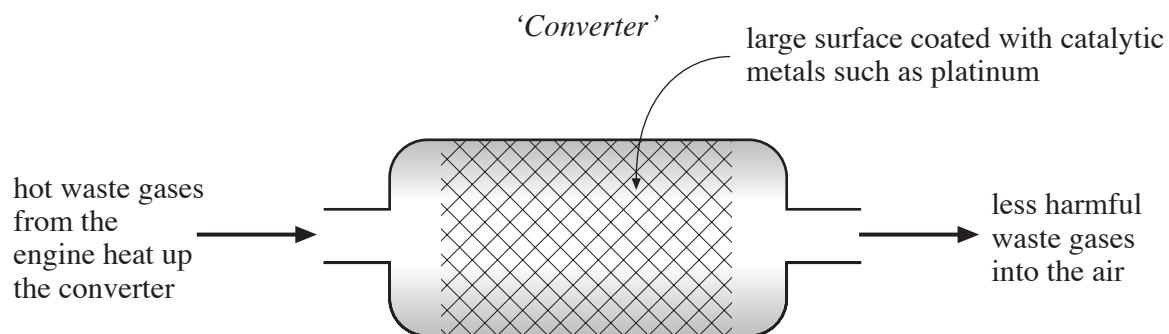
- (i) Use graph A to find the
- I. volume of hydrogen given off after 2 minutes, [1]
 cm³
- II. time when the reaction between magnesium and hydrochloric acid has stopped. [1]
 minutes
- (ii) State which of the graphs, B, C or D, is the correct result if the experiment had been repeated at a higher temperature of 40°C. [2]
 Explain your answer.

Graph

Explanation

- (iii) Apart from changing the temperature, state **one** way in which this reaction could be made to go faster. [1]

- (b) The exhaust systems in modern cars are fitted with catalytic converters. Inside the converter, a reaction takes place which changes harmful gases such as carbon monoxide, hydrocarbons and nitrogen oxides into less harmful ones such as carbon dioxide, nitrogen and water vapour.



State **three** features shown above that ensure a high rate of reaction inside the converter. [3]

1.
2.
3.

9. The Earth’s outer layer is split into a number of large pieces called *plates*.

- (i) The map shows Iceland, which lies on the boundary between two plates. This boundary is called the Mid-Atlantic Ridge. The shaded part of the island shows relatively new or young rock that is less than 25,000 years old.



- I. State how these large plates – the North American plate and the Eurasian plate – are moving and explain how the new (young) rock was formed. [2]

.....

.....

- II. Name the **type** of rock present in this ‘new’ rock. [1]

.....

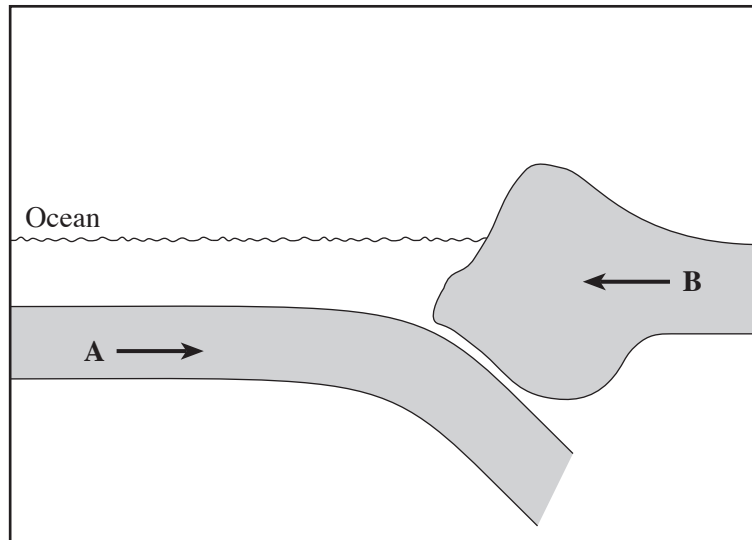
- (ii) The world’s highest mountain, Mount Everest, lies in the Himalayan Mountain range. The region also lies on a boundary between two different plates.

Explain how these mountains were created. [2]

.....

.....

- (iii) The diagram shows what happens when two different plates, **A** and **B**, move towards each other.



- I. Give the reason for plate **A** moving **underneath** plate **B**. [1]

.....

- II. State what happens to plate **A** as it moves downwards. [1]

.....

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^{+}		

PERIODIC TABLE OF ELEMENTS

1 2**Group****3****4****5****6****7****0**

1 H Hydrogen

${}^7_3\text{Li}$ Lithium	${}^9_4\text{Be}$ Beryllium											${}^{19}_9\text{F}$ Fluorine	${}^{20}_{10}\text{Ne}$ Neon				
${}^{23}_{11}\text{Na}$ Sodium	${}^{24}_{12}\text{Mg}$ Magnesium											${}^{35}_{17}\text{Cl}$ Chlorine	${}^{40}_{18}\text{Ar}$ Argon				
${}^{39}_{19}\text{K}$ Potassium	${}^{40}_{20}\text{Ca}$ Calcium	${}^{45}_{21}\text{Sc}$ Scandium	${}^{48}_{22}\text{Ti}$ Titanium	${}^{51}_{23}\text{V}$ Vanadium	${}^{52}_{24}\text{Cr}$ Chromium	${}^{55}_{25}\text{Mn}$ Manganese	${}^{56}_{26}\text{Fe}$ Iron	${}^{59}_{27}\text{Co}$ Cobalt	${}^{59}_{28}\text{Ni}$ Nickel	${}^{64}_{29}\text{Cu}$ Copper	${}^{65}_{30}\text{Zn}$ Zinc	${}^{70}_{31}\text{Ga}$ Gallium	${}^{73}_{32}\text{Ge}$ Germanium	${}^{75}_{33}\text{As}$ Arsenic	${}^{79}_{34}\text{Se}$ Selenium	${}^{80}_{35}\text{Br}$ Bromine	${}^{84}_{36}\text{Kr}$ Krypton
${}^{86}_{37}\text{Rb}$ Rubidium	${}^{88}_{38}\text{Sr}$ Strontium	${}^{89}_{39}\text{Y}$ Yttrium	${}^{91}_{40}\text{Zr}$ Zirconium	${}^{93}_{41}\text{Nb}$ Niobium	${}^{96}_{42}\text{Mo}$ Molybdenum	${}^{99}_{43}\text{Tc}$ Technetium	${}^{101}_{44}\text{Ru}$ Ruthenium	${}^{103}_{45}\text{Rh}$ Rhodium	${}^{106}_{46}\text{Pd}$ Palladium	${}^{108}_{47}\text{Ag}$ Silver	${}^{112}_{48}\text{Cd}$ Cadmium	${}^{115}_{49}\text{In}$ Indium	${}^{119}_{50}\text{Sn}$ Tin	${}^{122}_{51}\text{Sb}$ Antimony	${}^{128}_{52}\text{Te}$ Tellurium	${}^{127}_{53}\text{I}$ Iodine	${}^{131}_{54}\text{Xe}$ Xenon
${}^{133}_{55}\text{Cs}$ Caesium	${}^{137}_{56}\text{Ba}$ Barium	${}^{139}_{57}\text{La}$ Lanthanum	${}^{179}_{72}\text{Hf}$ Hafnium	${}^{181}_{73}\text{Ta}$ Tantalum	${}^{184}_{74}\text{W}$ Tungsten	${}^{186}_{75}\text{Re}$ Rhenium	${}^{190}_{76}\text{Os}$ Osmium	${}^{192}_{77}\text{Ir}$ Iridium	${}^{195}_{78}\text{Pt}$ Platinum	${}^{197}_{79}\text{Au}$ Gold	${}^{201}_{80}\text{Hg}$ Mercury	${}^{204}_{81}\text{Tl}$ Thallium	${}^{207}_{82}\text{Pb}$ Lead	${}^{209}_{83}\text{Bi}$ Bismuth	${}^{210}_{84}\text{Po}$ Polonium	${}^{210}_{85}\text{At}$ Astatine	${}^{222}_{86}\text{Rn}$ Radon
${}^{223}_{87}\text{Fr}$ Francium	${}^{226}_{88}\text{Ra}$ Radium	${}^{227}_{89}\text{Ac}$ Actinium															

Key:

