Candidate Name	Centre Number					Candidate Number				
						0				

GCSE

SCIENCE (Double Award)

UNIT 5: (Double Award) CHEMISTRY 2
FOUNDATION TIER

SAMPLE ASSESSMENT MATERIALS

(1 hour 15 minutes)

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

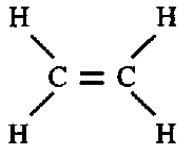
ADDITIONAL MATERIALS
In addition to this paper you will require a calculator.

INSTRUCTIONS TO CANDIDATES
Use black ink or black ball-point pen. Do not use gel pen. Do not use correction 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.

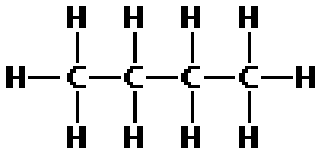
INFORMATION FOR CANDIDATES
The number of marks is given in brackets at the end of each question or part-question.
Question **7** is a quality of extended response (QER) question where your writing skills will be assessed.

Answer **all** *questions.*

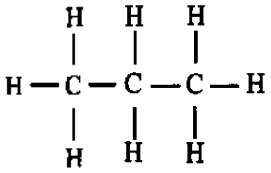
1. (a) The diagrams below show the structural formulae of some hydrocarbons.



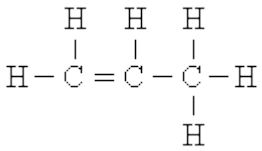
A



B



C



D

(i) Give the **letters** of the two hydrocarbons which are alkenes. Give the reason for your choice. [2]

..... and .....

Reason ……...

……

(ii) Give the **letter** of the hydrocarbon which is represented by the molecular formula C_3H_6. [1]

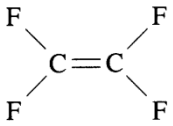
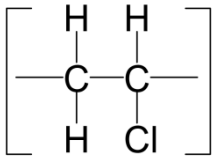
……...

(iii) Give the name of hydrocarbon **B**. [1]

……

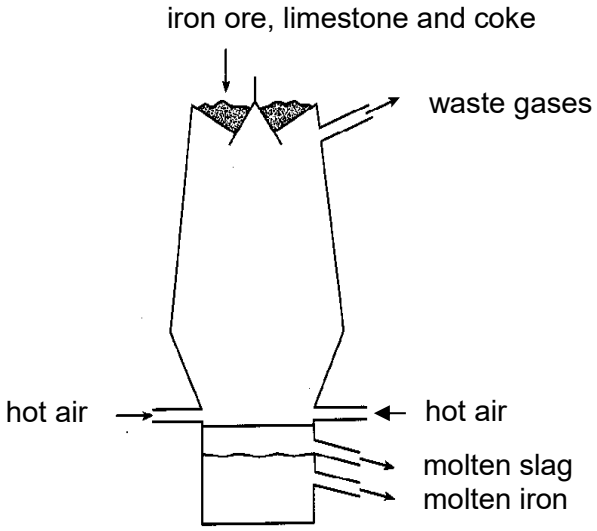
(b) An alkane contains two carbon atoms and six hydrogen atoms. Draw its structural formula. [1]

(c) The table below shows some information about monomers and the polymers that can be made from them.
Complete the table. [2]

Name of monomer	Structural formula of monomer	Name of polymer	Repeating unit for the polymer
tetrafluoroethene		polytetrafluoroethene PTFE	.....
vinylchloride (chloroethene)	.....	polyvinylchloride PVC	

7

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



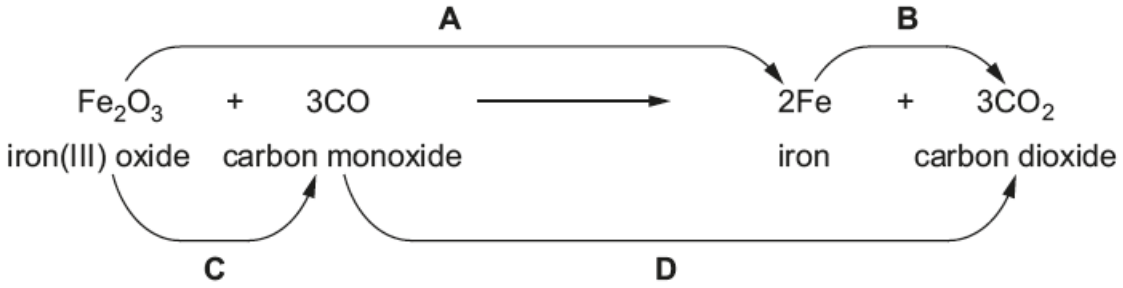
(a) Draw a line to link the raw material to its use in the blast furnace. [2]

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 **symbol** equation for this reaction. [1]

…… + …… ⟶ ……

(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]

……..

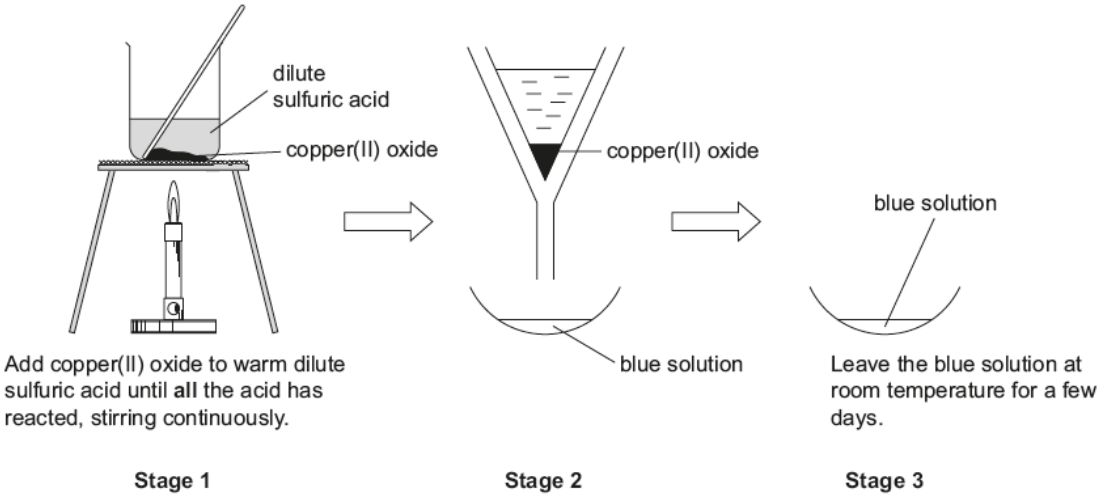
……..

(d) The maximum mass of iron that can be obtained from 1 tonne of iron oxide is 0.7 tonnes. In the actual reaction, only 0.65 tonnes of iron is made. Calculate the percentage yield of iron in the reaction. [2]

Percentage yield = …… %

7

3. The diagrams below show the three stages a pupil follows to make copper(II) sulfate crystals.



(a) State what the pupil will **see** when **all** the acid has reacted in stage 1. [1]

.....

(b) Name the process in stage 2. Give the reason why it is necessary. [2]

.....

.....

(c) Complete the symbol equation for this reaction. [2]

$$CuO + H_2SO_4 \longrightarrow \text{.....} + \text{.....}$$

(d) If hydrochloric acid were used instead of sulfuric acid, give the name and chemical formula for the salt formed. [2]

Name ……

Chemical formula ……

7

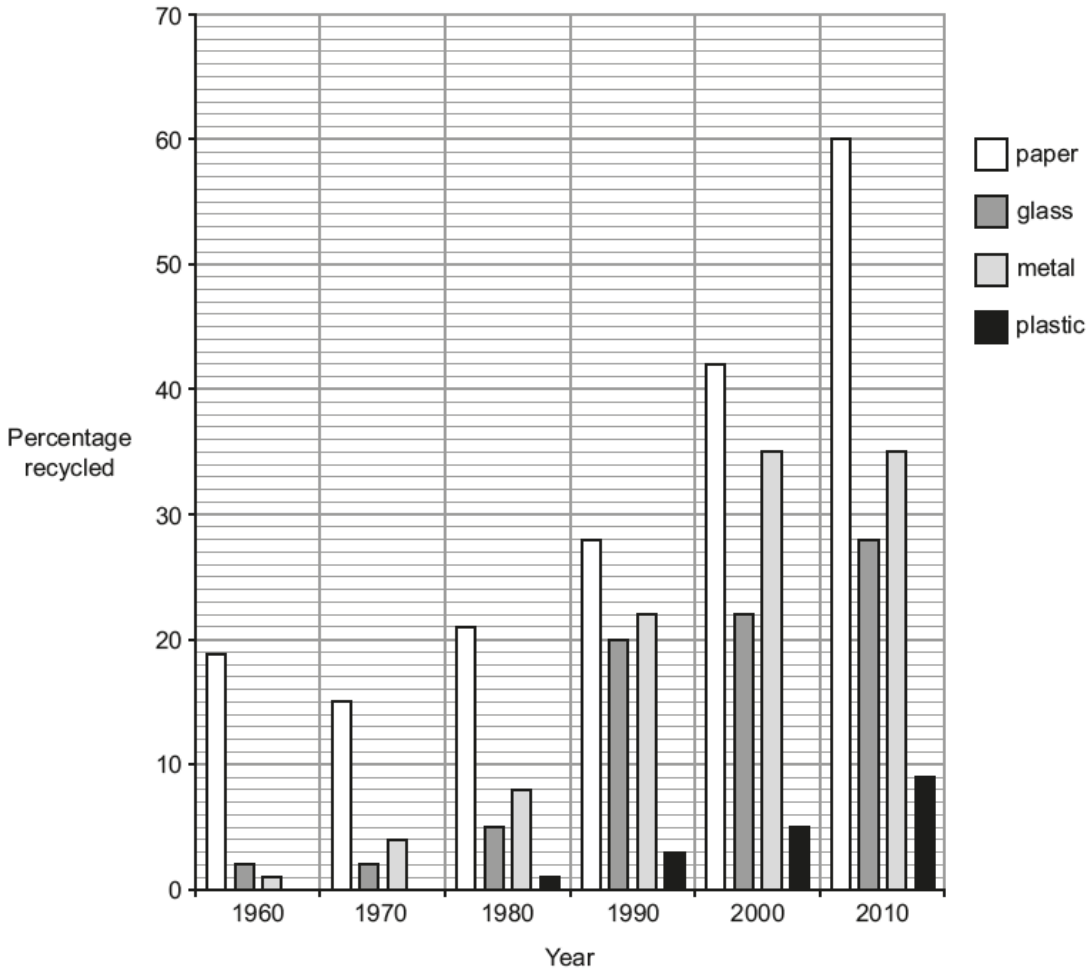
4. Plastic bottles can be found as litter almost anywhere on Earth.

(a) State **one** advantage of recycling plastic bottles. [1]

.....

.....

(b) **Graph 1** shows how the percentage of common materials recycled changed between 1960 and 2010.



Graph 1

(i) Use the graph to find the **increase** in percentage of each material recycled between 1980 and 2010. List the materials in order from the one with the greatest increase to the one with the smallest increase.

Greatest increase ..... [2]

.....

.....

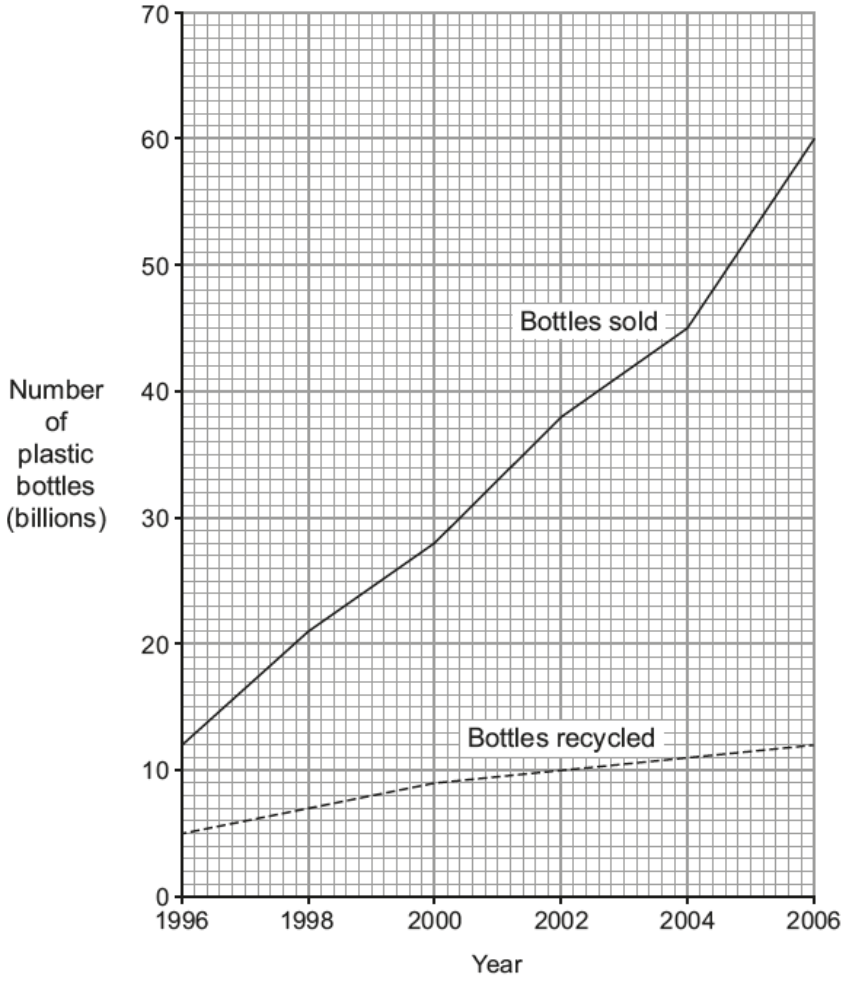
Smallest increase .....

(ii) Describe how the percentage of plastic recycled **changed** between 1960 and 2010. [2]

.....

.....

(c) **Graph 2** shows the number of plastic bottles produced and recycled in the USA between 1996 and 2006.



Graph 2

(i) Between 1996 and 2006 the number of plastic bottles recycled increased. Using the graph, explain why this increase has had little effect on the amount of plastic bottle litter. [1]

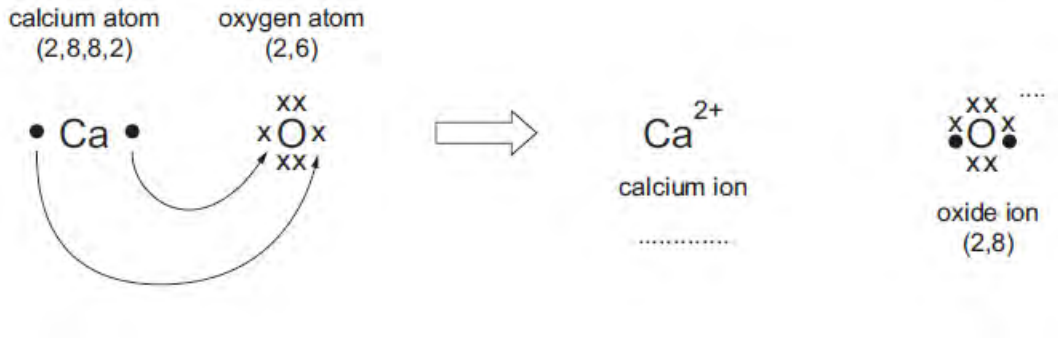
.....

.....

(ii) Calculate the number of plastic bottles **not** recycled in 2006. [2]

Number not recycled = ...

5. (a) The diagram shows the electronic changes that occur when calcium reacts with oxygen to form calcium oxide. The • and x symbols represent outer shell electrons.



(i) Complete the diagram by adding the charge on the oxide ion **and** the electronic structure of the calcium ion. [1]

(ii) Write the chemical formula of calcium oxide. [1]

.....

(b) Calcium oxide has a giant ionic structure. It has a high melting point, is soluble in water and conducts electricity when molten.

Select the substance from the following table that is most likely to have a giant covalent structure. Explain your choice. [2]

Substance	Melting point (°C)	Solubility in water	Conductivity when molten
W	–70	soluble	poor
X	650	insoluble	good
Y	1050	soluble	good
Z	1600	insoluble	poor

……..

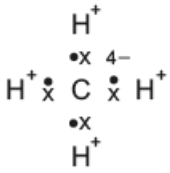
……..

……..

(c) Methane contains carbon and hydrogen atoms.

Element	Electronic structure
carbon	2,4
hydrogen	1

Put a tick (✓) in the box which represents the bonding in a methane molecule.
[1]



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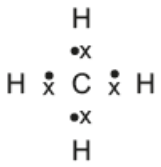

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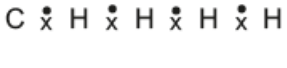

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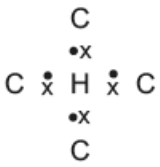

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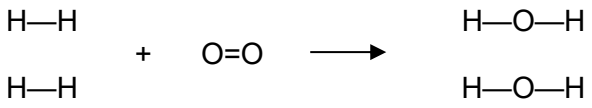
5

6. When hydrogen, H_2, burns in air, water is formed.



The bond energies relevant to the reaction are shown in the table.

Bond	Bond energy (kJ)
H—H	436
O=O	498
O—H	464

(a) (i) Calculate the energy needed to break **all** the bonds in the **reactants**. [2]

Energy needed = ……kJ

(ii) Calculate the energy released when **all** the bonds in the **product** are formed. [2]

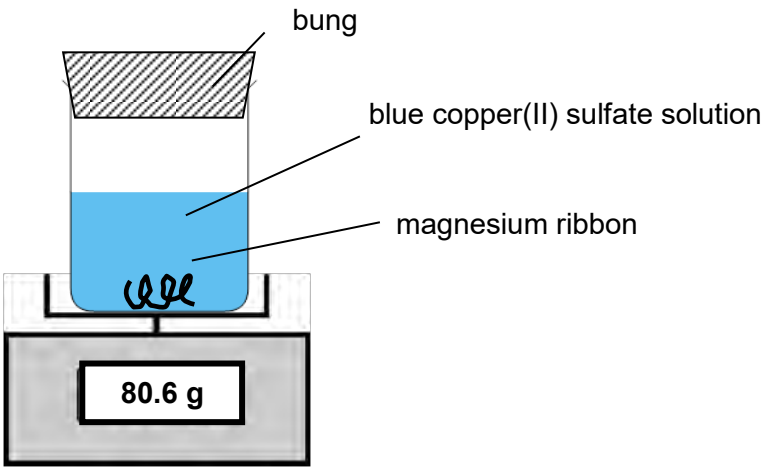
Energy released = ……kJ

(b) Use your answers from part (a) to calculate the overall energy change. [1]

Energy change = ……kJ

5

7. A student investigated what happened when a piece of magnesium ribbon was added to copper(II) sulfate solution. The diagram below shows the apparatus she set up. She left the apparatus for 1 hour.



At the start

Describe **all** the observations the student would make when she returned after 1 hour. Explain these observations. [6 QER]

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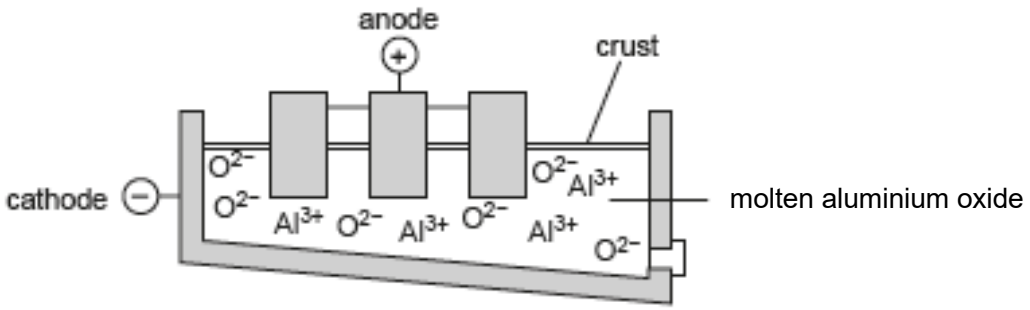
6

8. (a) Aluminium is obtained by the electrolysis of molten aluminium oxide.



(i) The electrode equation for the formation of aluminium is as shown below.

$$Al^{3+} + 3e^- \longrightarrow Al$$

State at which electrode aluminium is formed. Give a reason for your answer. [2]

……

……

(ii) Write a balanced symbol equation for the overall reaction taking place. [3]

…….. ⟶ …….. + ……..

(iii) Explain how the extraction of aluminium may contribute to global warming. [2]

……

……

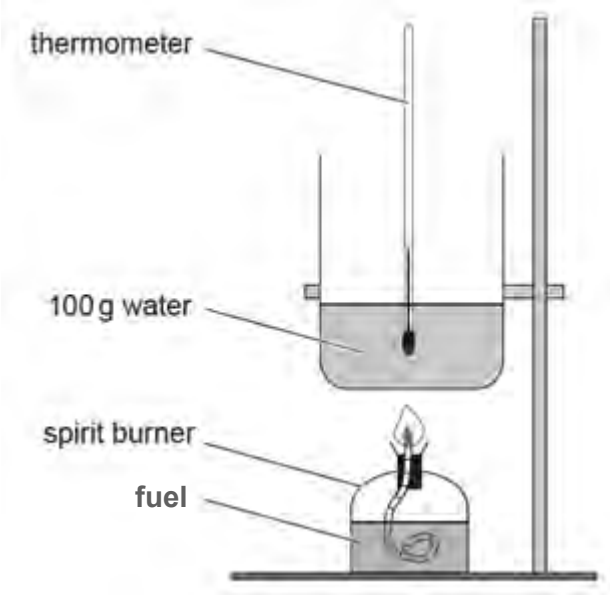
(b) Aluminium is a good electrical conductor and is therefore used to make overhead power cables.

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

……

8

9. Methanol, ethanol, propanol and butanol can be used as fuels. An experiment was carried out to find out which alcohol gives out the most energy when burned. The diagram below shows the apparatus used.



1 g of each fuel was used to heat 100 g of water. The results are shown below.

Fuel	Initial temperature of water (°C)	Final temperature of water (°C)	Temperature change (°C)	Energy given out (J/g)
methanol	18	31	13	5460
ethanol	20	45	25	10 500
propanol	19	48	29	12 180
butanol	20	50	30	

(a) The energy given out by each fuel can be calculated using the formula:

energy given out = mass of water × 4.2 × temperature change

Use this formula to calculate the energy given out per gram of butanol burned. [2]

Energy given out = ……..J/g

(b) Apart from using 1 g of each fuel and 100 g of water, give **two** *other* ways the experiment could be made a fair test. [2]

1. ……

……

2. ……

……

(c) The theoretical values for the energy given out by each alcohol are given in the table below.

Fuel	Theoretical energy given out values (J/g)
methanol	22 700
ethanol	29 700
propanol	33 600
butanol	36 100

(i) Give **one** similarity and **one** difference between the experimental and theoretical values. [2]

Similarity ……

……

Difference ……

……

(ii) Give the **main** reason for the difference between the experimental and theoretical values. [1]

……

……

7

END OF PAPER

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+}		

Avogadro's number, $L = 6 \times 10^{23}$

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: