



Elements, Compounds and Mixtures

Science – Junior Cert

Quick Notes

Elements, Compounds and Mixtures

CHEMISTRY

The world is made up of a variety of substances.

Some of these occur naturally in our environment, others are made through the combination of naturally occurring substances to form new materials.

The study of chemistry can lead us to a better understanding of our material world and the processes by which materials can change and be changed.

Matter is anything that **occupies space** and **has mass**

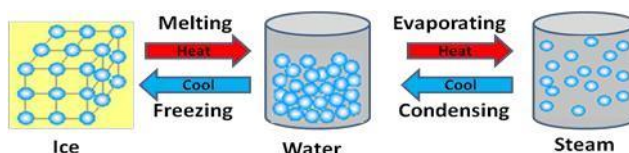
There are three states of matter

- Solids, Liquids and Gases

Characteristics of the States of Matter

Solid	Liquid	Gas
Fixed Shape	Shape of Container	Shape of Container
Fixed Volume	Fixed Volume	Shape of Container
Cannot flow	Can flow	Can flow
e.g. iron, copper, sulphur	e.g. water, mercury	e.g. hydrogen, oxygen, methane

Changes of State



Elements, Compounds and Mixtures

Elements: Cannot be broken down into anything simpler using chemical means or Substance made up of one type of atom

- All the known elements are listed in the Periodic Table Invented by **Dmitri Mendeleev**
- **Vertical columns** are called **Groups**
- **Horizontal rows** are called **Periods**
- **Metals** are to the left of the red line and **Non-metals** are to the right of the red line

Periodic Table

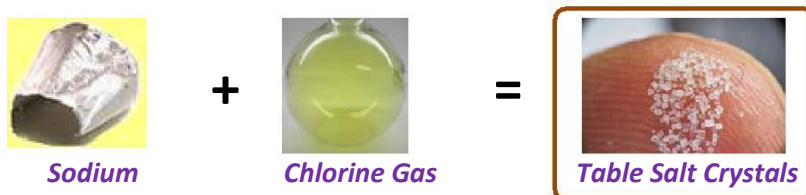
										Solid													Liquid													Gas		
										Metals										Non-metals																		
H 1																	He 2																					
Li 3	Be 4																	B 5	C 6	N 7	O 8	F 9	Ne 10															
Na 11	Mg 12																	Al 13	Si 14	P 15	S 16	Cl 17	Ar 18															
K 19	Ca 20	Sc 21	Ti 22	V 23	Cr 24	Mn 25	Fe 26	Cu 27	Ni 28	Cu 29	Zn 30	Ga 31	Ge 32	Se 33	Sc 34	Br 35	Kr 36																					
Rb 37	Sr 38	Y 39	Zr 40	Nb 41	Mn 42	Tc 43	Ru 44	Rh 45	Pd 46	Ag 47	Cd 48	In 49	Sn 50	Sb 51	Te 52	I 53	Xe 54																					
Cs 55	Ba 56	La 57-71	Hf 72	Ta 73	W 74	Re 75	Os 76	Ir 77	Pt 78	Au 79	Hg 80	Tl 81	Pb 82	Bi 83	Po 84	At 85	Rn 87																					
Fr 87	Ra 88	Ac 89-103	Rf 104	Db 105	Sg 106	Bh 107	Hs 108	Mt 109	Ds 110	Rg 111	Uub 112	Uut 113	Uuq 114	Uup 115	Uuh 116	Uus 117	Uuo 118																					

Physical Properties of two metals and two Non-metals

Element	Metal or Non-metal	State	Colour
Hydrogen (H)	Non-metal	Gas	Colourless
Carbon (C)	Non-metal	Solid	Black
Copper (Cu)	Metal	Solid	Salmon pink
Mercury (Hg)	Metal	Liquid	Silvery

Compounds: Substance made up of more than one type of atom chemically joined

- Elements combine chemically to form compounds
- When elements combine they **lose their individual properties**
 - Sodium is a very reactive **silvery metal**
 - Chlorine is a **poisonous green-yellow gas**
 - Sodium chloride (table salt) formed when they react is a **white crystalline solid**



Properties of Simple Compounds and their Constituent Elements

Compound	Properties	Elements	Properties
H ₂ O Water	Colourless liquid Does not burn	Hydrogen	Colourless gas burns
		Oxygen	Colourless gas, supports combustion
CO ₂ Carbon dioxide	Colourless gas Does not burn	Carbon	Black solid
		Oxygen	Colourless gas, supports combustion
MgO Magnesium oxide	White powder Does not burn	Magnesium	Silvery metal, burns
		Oxygen	Colourless gas, supports combustion
FeS Iron sulphide	Grey solid Does not burn	Iron	Grey shiny metal, burns if powdered
		Sulphur	Yellow solid , burns

Mixtures: Substance made up of more than one type of atom NOT chemically joined

e.g. salt and sand, salt and water

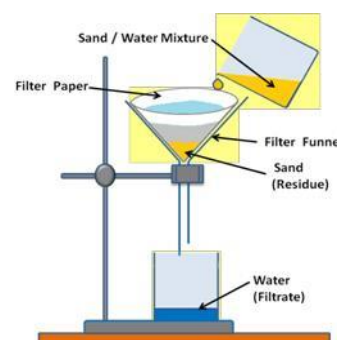
Separating Sand and Water by Filtration

Filtration is used to separate an insoluble solid from a liquid
e.g. salt and sand

- Set up the apparatus as in the diagram
- Fold the filter paper twice and place it opened in the filter funnel
- Pour the mixture of sand and water into the filter paper

Result: The sand particles are trapped in the filter paper and are called the **residue**. Water passes through and is called the **filtrate**

Conclusion: Filtration can be used to separate an insoluble solid from a liquid

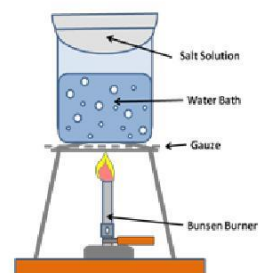


Separating Salt and Water by Evaporation

Evaporation is used to separate a soluble solid from a liquid e.g. salt and water

- Set up the apparatus as in the diagram
- Pour the salt water solution into the evaporating basin
- Place the evaporating basin on top of the boiling water bath

Result: The water evaporates leaving the salt behind **Conclusion:** Evaporation can be used to separate a soluble solid from a liquid



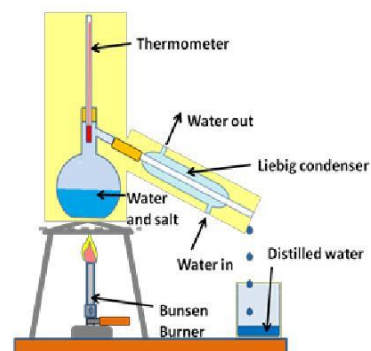
Separating Salt and Water by Distillation

Distillation separates a liquid from a soluble solid or another liquid, and collects the liquid separated

- Set up the apparatus as shown
- Connect the bottom lug to the tap so that water enters the bottom of the condenser
- The pipe from the top lug should go to the sink
- Heat the flask
- **Collect the distillate** in a beaker

Result: Water evaporates from the flask and is condensed (turned back to water) in the Liebig condenser.

Conclusion: distillation can be used to separate and collect a liquid from a soluble solid

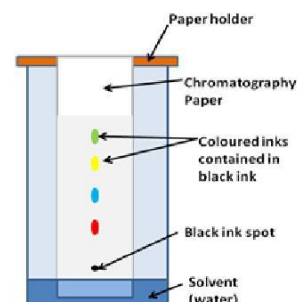


Separating a Mixture of Inks using Paper Chromatography

- Place a spot of black ink near the bottom of a strip of chromatography paper
- Place the paper in water so that the black ink spot is above the water as shown in diagram
- Leave for a time and observe the solvent moving up the paper

Result: the different inks are carried up the paper by the solvent at different rates and so are separated.

Conclusion: Paper chromatography can be used to separate a mixture of inks



Metals

- are **shiny** (have a **lustre**) e.g. silver and fresh copper in new coins
- can be **stretched into wires** (ductile) e.g. copper
- can be **hammered into sheets** (**malleable**) e.g. gold leaf
- **conduct heat**
- **conduct electricity**
- are used to make tins, cars, ships, bridges, knives, gold rings and bracelets etc.
- Good examples of metallic elements are **copper (Cu), zinc (Zn), aluminium (Al), iron (Fe), silver (Ag) and gold (Au)** [Learn these symbols]

Alloys are mixtures of metals (carbon is considered as a metal in this case)

Alloy	Constituents	Uses
Bronze	Copper (Cu) and Zinc (Zn)	Ornaments, coins and statues
Brass	Copper (Cu) and Tin (Sn)	Door knobs, hinges and musical instruments
Steel	Iron (Fe) and Carbon (C)	Ships, bridges and car bodies
Solder	Lead (Pb) and Tin (Sn)	Joining metals in electrical circuits

Non-metals

- Are **not shiny**
- Are **brittle**
- Do **not conduct heat**
- Don **not conduct electricity** (*carbon is a notable exception*)
- **Many are gases**

You need to know the following non-metals and their symbols:

Carbon (C), Oxygen (O), Sulfur (S), Hydrogen (H) and Nitrogen (N)

For more comprehensive Revision Notes Visit.... mocks.ie **Junior Cert
Science Notes**