

# ① MATTER

Everything is made of atoms.

90 natural atoms

An atom is the smallest partical which <sup>(keeps)</sup> retains the property of matter.

There are 90 naturally occuring atoms in the universe.

Atoms contain 3 sub-a-tonic particles -

protons neutrons electrons

are in the nucleus



Lithium

3 protons ⊕

4 neutrons

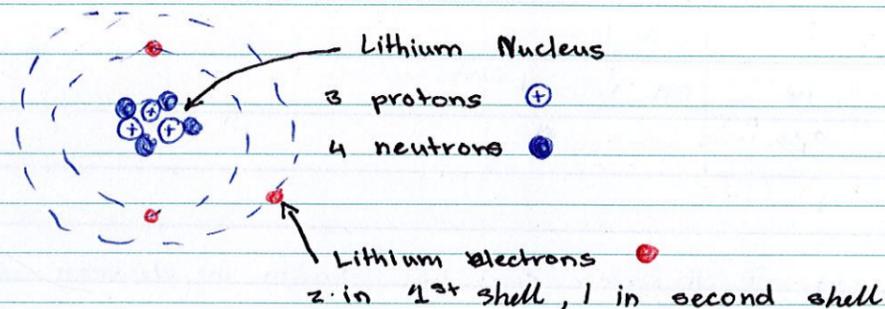
3 electrons ⊖

usually the same amount

\* protons attract electrons thats why electrons dont go flying away

electrons mass = 0.000549 amu (atomic mass unit)

Sub-Atomic Particle	Size	Charge	Position	Movement
Proton	very large	+	nucleus	○
Neutron	very large	0	nucleus	○
Electron	very tiny	-	around the nucleus	very fast around nucleus



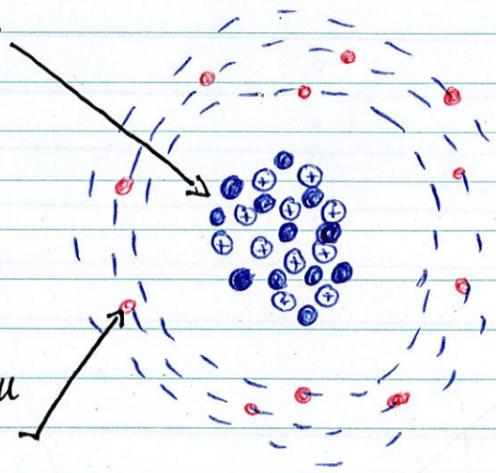
Sodium nucleus

11 protons ⊕

12 neutrons ●

Sodium electrons

2 in 1<sup>st</sup> shell  
8 in second shell  
1 in third shell



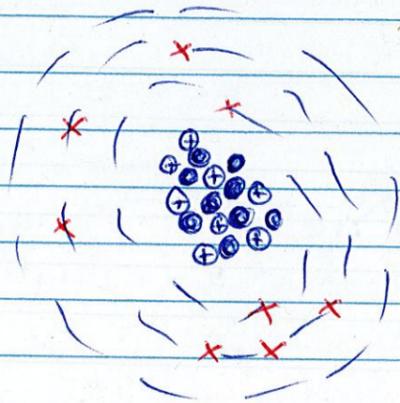
6c3 - I can explain and draw the structure of an atom in terms of the nucleus, protons, neutrons and electron arrangement.

## (1C) ELECTRON ARRANGEMENT (SHELLS)

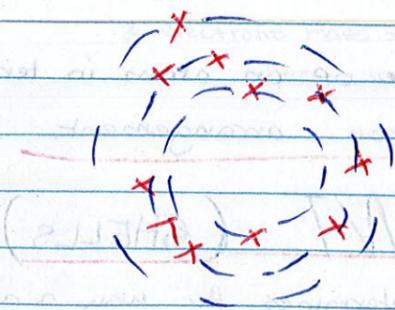
The way electrons are arranged in atoms determines the way a atom/element reacts. Luckily, electrons arrange themselves around the nucleus in a very simple way - in energy shells. Each electron shell is described by a number and the number of electrons it can hold.

Shell number	Number of electrons it can hold	Energy level
1	2	lowest
2	8	2nd lowest
3	8	3rd lowest
4	18	4th lowest
5	18	5th lowest
6	36	6th lowest

The arrangement of electrons can be drawn in electron shell diagrams.



Aluminium atom (11 electrons)



# Topic 2 CHEMICAL REACTIONS

2 a) SC7

A chemical change element is a collection of one or more of the same atom e.g.  $O_2$  New substance formed e.g. cooking an egg

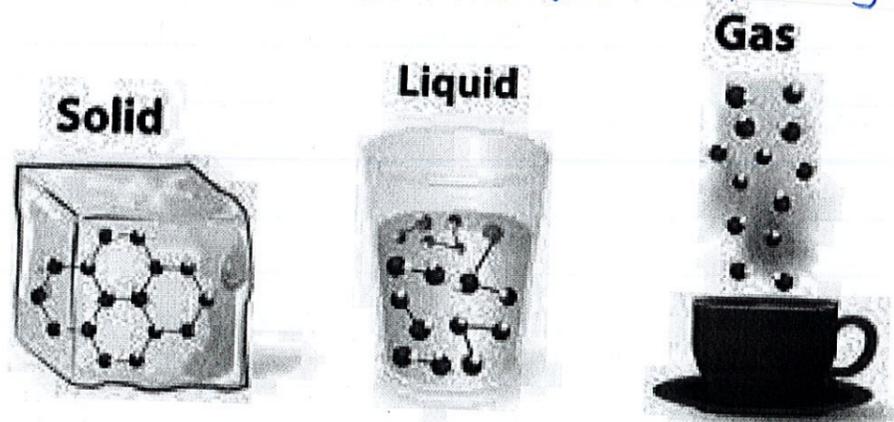
A compound is a chemical substance made of molecules which have more than one type of atom held together by chemical bonds. e.g.  $H_2O$  React and lose their original form still 2 or more different elements, can't be separated only by chemical

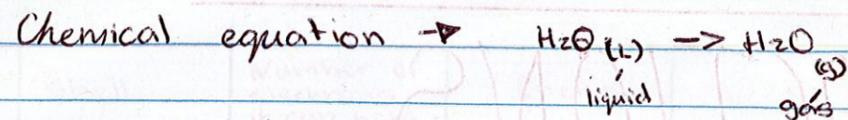
A mixture is a material made up of two or more different substances which are mixed but not joined, e.g. salt water ( $NaCl + H_2O$ ) can combine and separate

Physical change is a change in size, shape or state. It does NOT involve the arrangement of atoms.

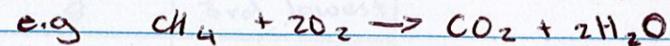
eg phase change  $\rightarrow$  ice  $\rightarrow$  water  $\rightarrow$  vapor  
Substance does NOT change e.g. breaking a glass bottle, melting ice

Phase Change  $\rightarrow$





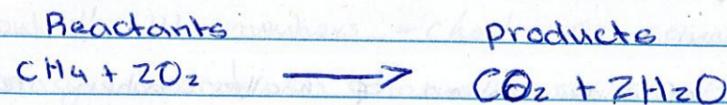
Chemical Reaction is a process that involves the breaking of bonds and the rearrangement of atoms to form NEW substances called products.



Chemical equation

# Representing Chemical Reactions

2B) 5c9, 5c10



**Reactants** - substances that take part in and undergo change during a reaction.

**Products** - substances that are formed as a result of a chemical reaction.

\* Chemical reactions can be communicated using words, diagrams or using chemical symbols.

\* These are called: word equations, chemical equations and diagrams.

\* All equations show the reactants, the products and must have an arrow to show the direction of the reaction.

e.g.

**Word equation:** Methane + Oxygen  $\rightarrow$  Carbon Dioxide + Water

**Chemical equation:**  $\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$



**Partical Q:** for the following reaction:

Identify the reactants and products, write the word equation and draw a diagram.

Q1

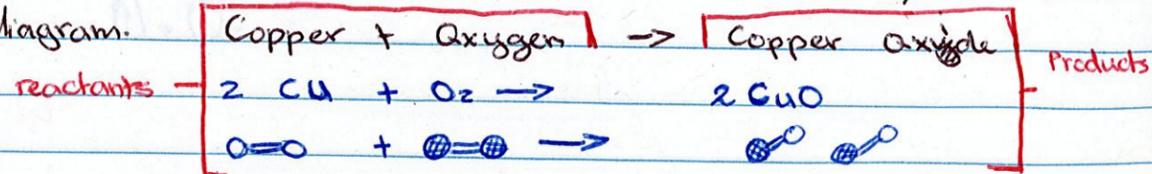


**word -** Hydrogen, Oxygen  $\rightarrow$  Hydrogen, Oxygen, <sup>water</sup>



Q2

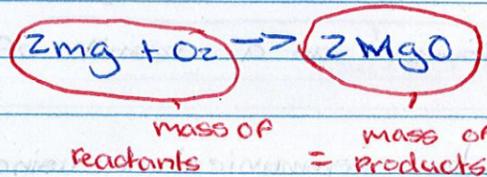
Identify the reactants and products, write the chemical equation and draw a diagram.



# The Law of Conservation of Mass

2c) Sc11: I can predict the products of chemical reactions given the reactants.

Sc12: I can apply the law of conservation of matter when rearranging and balancing chemical equation



Why???

\* Atoms are the smallest particles of an element that can take part in a chemical reaction.

\* During any chemical reaction no particles are created or destroyed:

the atoms are simply rearranged from the reactants to the products.

\* So there will be the same mass of atoms of an element in the products that there are in the reactants.

## Law of Conservation of Mass

The law of conservation of mass states that mass in an isolated system is neither created nor destroyed by chemical reactions or physical transformations. According to the law of conservation of mass, the mass of the products in a chemical reaction must equal the mass of the reactants.



H-12      H-12  
O-6        O-6

do a couple of practices

- brown

- purple

~~about even odds~~

about the little numbers - chart or something  
strange words on homework sheet

do study notes

- evening

- Names

- Metal and non metal = ionic compound and charges

Pyric table

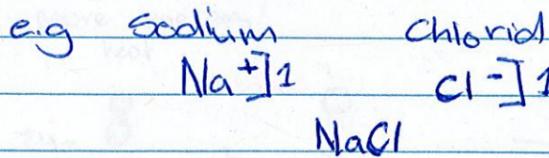
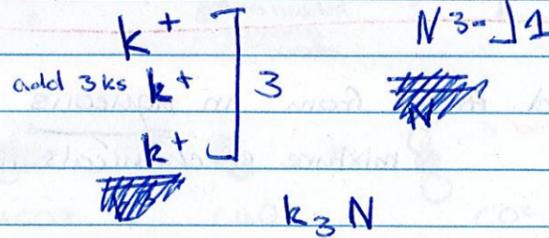
→ stair case - separates non metal

and metal

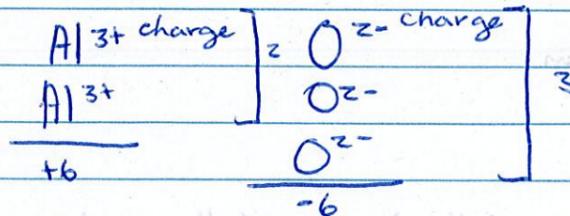


e.g. potassium Nitride

go to periodic table (and see the) and the charges AKA + and -  
and letters



e.g. Aluminium Oxide



# Practical: Flame Colours

Table 1: Flame Colours of metal ions

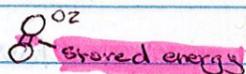
Metal Ion	Flame Colour
Calcium	pinkish, Red
Barium	orange
Lithium	Red pink and orange
Copper	green
Sodium	orange
Strontium	bright red and orange
Potassium	light pink and purple

## 2d) EXOTHERMIC and ENDOTHERMIC REACTIONS

Key indicators that a chemical reaction has occurred

- \* A precipitate forms (ie a solid forms from an aqueous solution mixture of chemicals in liquid form)
- \* A gas is produced
- \* A change in temperature
- \* ~~light~~ The release of light energy
- \* colour change

Energy is stored in the bonds of the molecules



Energy is absorbed to break bonds

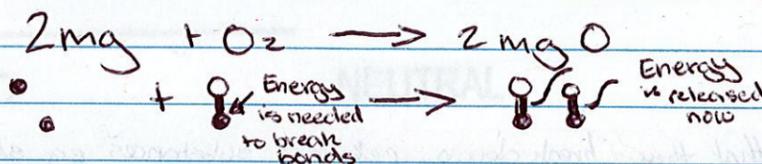
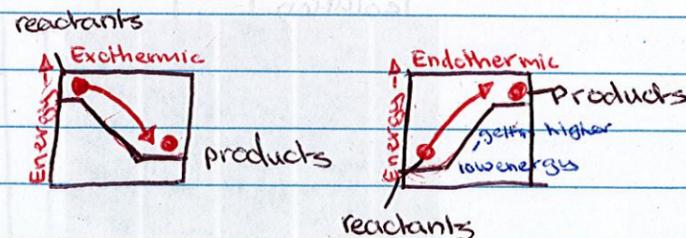
Energy is released when bonds form

### Endothermic Reaction

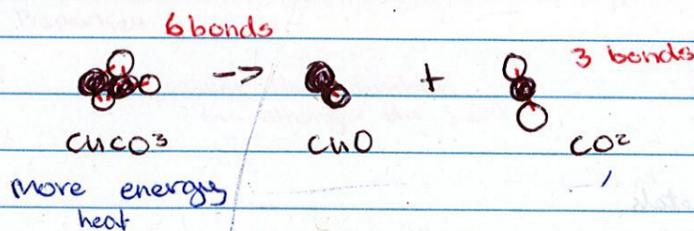
if more energy is required to break the bonds of the reactants than is released to form the bonds of the products, then the overall reaction will absorb energy. This is an endothermic reaction.

### Exothermic Reaction

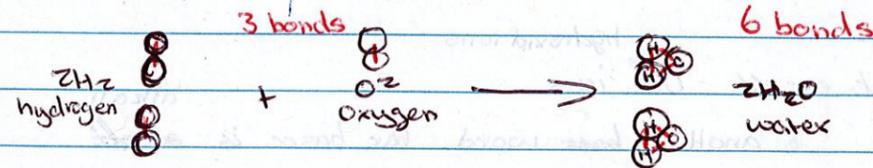
if less energy is required to break the bonds of the reactants than is released to form the bonds of the products, then the overall reaction will release energy. This is a exothermic reaction.



Overall reaction releases energy so it is an Exothermic reaction



it would be endo because less bonds formed than the products were produced than were the reactants therefore more energy was absorbed to break the bond than was released to form the bonds



water

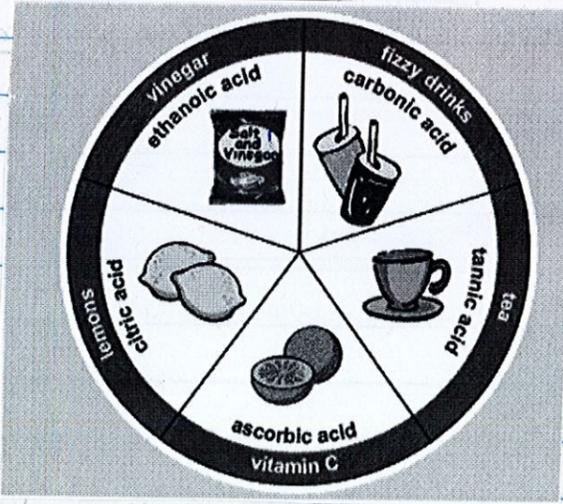
# Acids and Bases

3a)

a) acids - is a solution that has excess  $H^+$  ions

hydrogen ions

Latin word means sour and sharp



\* The more  $H^+$  ions, the more acidic the solution

ions - something with a positive charge

## Properties of acids

- corrosive, which means that they break down certain substances eg skin, fabric means burn/breaks down
- Tastes sour
- conduct electricity
- some acids react strongly with metals

## Bases

b) bases - is a solution that excess  $OH^-$  ions

hydroxide ions

alkali

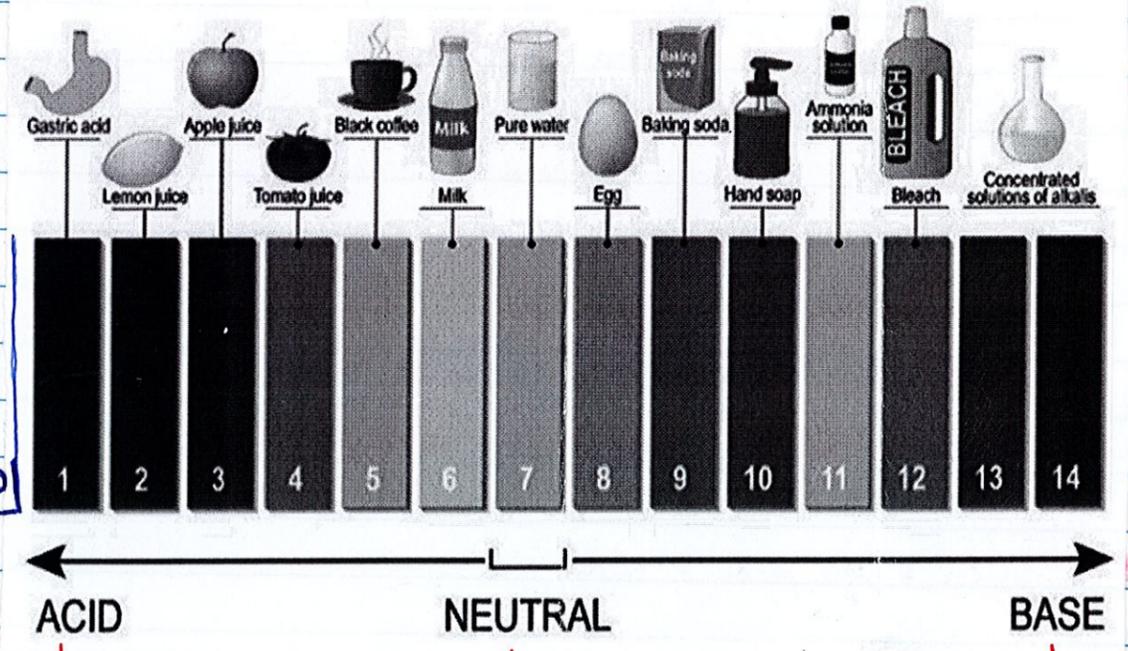
- another base word for bases is alkali
- bases are substances that can accept hydrogen ions.



## Properties of bases

- slippery feel
- taste bitter
- can conduct electricity (alkaline battery)
- corrosive
- Do not react with metals

3c) PH Scale



has acidic properties | neither acid or base | basic or an alkaline properties

Smaller the number the stronger the acid | greater the number the more base

### 3d) Acid and Base

Neutralisation - Acid + base  $\rightarrow$  salt + water

- the acidic Product or basic properties cancel each other out
- products are neutral

### Acids and metals

metal - shiny, solid, liquids (lustrous) malleable, ductile, conducts electricity and heat energy.

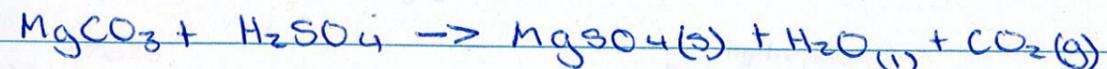
Metal + acid  $\rightarrow$  salt + hydrogen gas



aquous - means latin term for water

### Acids and carbonate

carbonate - any substance which has a metal combined with  $\text{CO}_3^{2-}$



Acid + carbonate  $\rightarrow$  salt + water + carbon dioxide

When bonds break require energy

When bond forms energy released