Chapter 2:- The Components of a Matter

Element :-

- Consists of only one Type of atom
- Cannot be broken Down to a simpler Substance

Ex:- Na, O_2

Compound :-

- Composed of two or more elements
- chemically Combined
- Present in fixed mass ratio
- Their properties are Different from it's elements Prop.

Ex: $NaCl$, NH_3

Mixture :-

- two or more elements / compounds
- Physically intermingled
- Can be separated By a physical change

Ex: $Nacl + Mg$
$NaCl + H_2O$

Heterogeneous mixture

غير متجانس

- has Visible Bounclries

homogeneous mixture

Solution

متجانس

- The Components are mixed as individual atoms, ions and molecules
- has no visible Bounclries

Notes :-

- Solutions in Water = aqueous Solutions
- Mass of Components = Mass of product
- A particular Compound is Composed of the same elements with the same percentage of masses

law of multiple Propotions :-

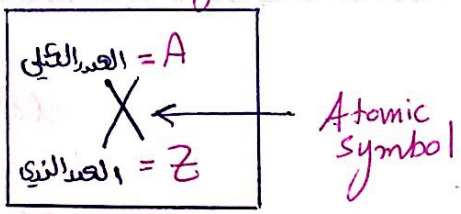
Two atomes A,B That composes two Compound where in the first one:- The percentage of A = X % and B = y %

Then in the Second Compound The percentages ratio should be propotional to The first Compounds mass ratio →

$r_1 = \frac{X}{y}$ so $r_2 = (k)\frac{X}{2y}$

Constant

Atomic Symbol :-



↳ Z: number of Protons • في الذرة المتعادلة = عدد الإلكترونات

↳ N: number of neutrons

↳ Z+N = A : mass number • مجموع عدد البروتونات والنيوترونات

Isotops :- Same numbers of Protons (Same Z) • النظائر

→ $\underset{Z_1}{X_1}$, $\underset{Z_2}{X_2}$, $\underset{Z_3}{X_3}$:- X_1, X_2, X_3 are Isotopes only if

$Z_1 = Z_2 = Z_3$

- How to Calculate the Atomic Mass of an Eleme
- multiply the Mass of each isotopes with It's Abundance and Adel the answers

Ex.	Isotopic Mass	Abundance
^{28}Si	27.97	92.23
^{29}Si	28.97	4.67
^{30}Si	29.97	3.10

Atomic mass of Silicon

$= (27.97 \times 0.9223) + (28.97 \times 0.0467) + (29.97 \times 0.03)$

To find the Abundance: Average = molar Mass of 1st isotope (X) + molar mass of 2nd Isotop (1−X) Abundance

find X ⇒

• Predicting The ion of an Element :-

• ننظر إلى العدد الذري ثم نجد الغاز النبيل ذو العدد الذري الأقرب لعنصرنا

مثال :-

Calcuim (20)

• العدد الذري للكالسيوم = 20 و الغاز النبيل ذو العدد الذري الأقرب هو الـ Ar 18 اذن يفقد الكالسيوم الكتريشن أي انه ايونه هو Ca^{+2}

Bonds :-

Ionic Bonds :-

- happens Between two ions
- if the charge increased, The Attraction increases
- if the size decreases, The Attraction increases
- No molecules exist in an ionic compound

Covalent Bond :-

- occurs between nonmetals
- forms molecules
- Molecules Can Be :- 2 Molecules → Diatomic → $H_2, F_2, O_2, N_2, Cl_2, Br_2, I_2$,
  4 Molecules → Tetratomic → P_4
  8 " → Octatomic → S_8, Se_8

• Chemical formulas

→ Ion's Chemical formula

- Cations first, anion Second — الايونات الموجبة أولاً ثم السالبة
- Cations :- same name as mets That ends with in- ium
- anions :- named by adeling suffix -ide to The root of the nonmetal name

Note:- Manatomic ion :

- يتكون من ذرة atom
مثال Na^+ , Ca^{+2}

Polyatomic ion :

- يتكون من أكثر من ذرة Atom (المجموعات الذرية)
مثال NO_3^{-2}

- Most main Group elements form one monatomic ion
- Transition elements form two manatomic ions

Naming Acids :-

There are two types of Acids

- Contains Oxygen
  - anion Contains Oxygen
  - You don't use The prefix hydro
  - Suffix :- It depends on the name of the original Oxyanion
    - Ends with -ate $\xrightarrow{\text{suffix is}}$ -ic
    - " " -ite $\longrightarrow$ -ous
  - Ex:- HNO_3 :- nitric acid
    HNO_2 :- nitrous acid

- Does not Contain Oxygen (Binary Acids)
  - You use the prefix hydro
  - add suffix -ic
  - Ex: Hydrochloric Acid

Naming Binary Covalent Compounds :-

two non-metals (Ex: Water)

- The element with the lower group n° in the periodic table is first in the name and formula
  - ↳ Prefix: Numerical

The Second Element :-

Prefix :- Numerical / indicates the number of atoms

di- , tri- ------ deca-

suffix :- -ide

Ex: N_2O_3 is dinitrogen trioxide

• Naming Straight-Chain Alkanes

Methane	CH_4	Hexane	C_6H_{14}
Ethane	C_2H_6	Heptane	C_7H_{16}
Propane	C_3H_8	Octane	C_8H_{18}
Butane	C_4H_{10}	Nonane	C_9H_{20}
Pentane	C_5H_{12}	Decane	$C_{10}H_{22}$

• Molecular Mass from chemical formulas

Sum of atomic Masses

Ex:- H_2O :- $2 \times 1.008 + 1 \times 16.00 = 18.02$

• نأخذ اربع منازل من الوالكتلة الذرية والجواب نتركه من اربع منازل

NAMES, FORMULAE, AND CHARGES OF SOME COMMON IONS

* *Aqueous solutions are readily oxidized by air.*
** *Not stable in aqueous solutions.*

Positive Ions (Cations)

Al^{3+}	Aluminum
NH_4^+	Ammonium
Ba^{2+}	Barium
Ca^{2+}	Calcium
Cr^{2+}	Chromium(II), chromous
Cr^{3+}	Chromium(III), chromic
Cu^+	Copper(I)*, cuprous
Cu^{2+}	Copper(II), cupric
H^+	Hydrogen
H_3O^+	Hydronium
Fe^{2+}	Iron(II)*, ferrous
Fe^{3+}	Iron(III), ferric
Pb^{2+}	Lead(II), plumbous
Pb^{4+}	Lead(IV), plumbic
Li^+	Lithium
Mg^{2+}	Magnesium
Mn^{2+}	Manganese(II), manganous
Mn^{4+}	Manganese(IV)
Hg_2^{2+}	Mercury(I)*, mercurous
Hg^{2+}	Mercury(II), mercuric
K^+	Potassium
Ag^+	Silver
Na^+	Sodium
Sn^{2+}	Tin(II)*, stannous
Sn^{4+}	Tin(IV), stannic
Zn^{2+}	Zinc

Negative Ions (Anions)

Br^-	Bromide
CO_3^{2-}	Carbonate
ClO_3^-	Chlorate
Cl^-	Chloride
ClO_2^-	Chlorite
CrO_4^{2-}	Chromate
CN^-	Cyanide
$Cr_2O_7^{2-}$	Dichromate
$H_2PO_4^-$	Dihydrogen phosphate
CH_3COO^-	Ethanoate, acetate
F^-	Fluoride
HCO_3^-	Hydrogen carbonate, bicarbonate
$HC_2O_4^-$	Hydrogen oxalate, binoxalate
HSO_4^-	Hydrogen sulphate, bisulphate
HS^-	Hydrogen sulphide, bisulphide
HSO_3^-	Hydrogen sulphite, bisulphite
OH^-	Hydroxide
ClO^-	Hypochlorite
I^-	Iodide
HPO_4^{2-}	Monohydrogen phosphate
NO_3^-	Nitrate
NO_2^-	Nitrite
$C_2O_4^{2-}$	Oxalate
O^{2-}	Oxide**
ClO_4^-	Perchlorate
MnO_4^-	Permanganate
PO_4^{3-}	Phosphate
SO_4^{2-}	Sulphate
S^{2-}	Sulphide
SO_3^{2-}	Sulphite
SCN^-	Thiocyanate