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Some Basic
Concepts in Chemistry

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Importance and Scope of chemistry:-

- ① In War:- chemistry plays an important role in the discovery of high explosive substances such as TNT and dynamite.
- ② In Industry:- chemistry is playing an important role in various industries such as glass, textiles, paper, paints etc.
- ③ In ~~_____~~ agriculture:- various kind of fertilisers and pesticides have been produced. This has increased and improved the quality of food production.
- ④ In health:- chemistry provided a large no. of life-saving drugs.

Classification of Matter

① Physical classification ② Chemical ~~_____~~ Classification

① Physical Classification

(A) Solid State

(C) Gaseous State

(B) Liquid State

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Solid State:- A solid has definite shape and possesses definite volume.
e.g. Wood, table, chair

Liquid State:- A liquid has definite volume but not definite shape.
e.g. Water, Milk.

Gaseous State:- A gas neither possesses a definite volume nor a definite shape.
e.g. H_2 , Air, Oxygen.

Chemical Classification:-

- ① Elements ② Compounds ③ Mixture

① **Element:-** An element is a substance that cannot be broken into simpler components by ordinary chemical and physical methods.
e.g. H_2 , O_2 , N_2 etc.

② **Compounds:-** A compound is a substance formed when two or more elements are chemically bonded together in a fixed ~~ratio~~ proportion by weight which can be decomposed by suitable chemical method.
e.g. Water and CO_2 .

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③ Mixture:- A combination of two or more elements or compounds in any proportion so that components do not lose their identity.
e.g Air, Sea Water.

Atom:- It is defined as the smallest particle of an element that retains the properties of an element. Atoms. An atom is made up of three tiny kinds of particles. i.e electron, proton and neutron.

Molecule:- A group of atoms bonded together, representing the smallest fundamental unit of a chemical compound that can take part in a chemical reaction.

It can be classified into two types:
i) Homoatomic Molecule ii) Heteroatomic Molecule

Homoatomic Molecules:- The molecules which are made up of atoms of ^{same} ~~different~~ elements.
e.g ~~_____~~ H_2, N_2

Heteroatomic Molecules:- The molecules which are made up of atoms of different elements.
e.g HCl, H_2O

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Symbol:- The short notation used for full name of an element is called its symbol.

Symbol of Hydrogen is H.

Symbol of Sulphur is S.

Significance of Symbol:- Symbol of an element conveys both qualitative and quantitative value.

Qualitatively:- It represents name of the element.

Quantitatively:- It represents one atom of the element and 1 mole of atom of the element.

Molecular Formula:- It is defined as the formula which gives the actual number of atoms of various elements present in 1 molecule of the compound.

e.g. Molecular Formula of Glucose is $C_6H_{12}O_6$.

Mol. formula = (Empirical formula) $_n$

n = is a simple whole no.

$n = \frac{\text{Mol. Formula wt.}}{\text{Emp. Formula wt.}}$

Ex

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Formula of Compounds containing cations and anions.

(1) Calcium Chloride
 Ca^{+2} Cl^{-1}

$CaCl_2$

Step I Ca^{2+} Cl^{-}

Step II Ca^2 Cl^1 (Remove Charges)

Step III $Ca \quad Cl$
 $\swarrow \quad \searrow$
 2 1

$CaCl_2$

(2) Sodium Carbonate Ion.

Step I Na^+ CO_3^{2-}

Step II Na^1 CO_3^2

Step III $Na \quad CO_3$
 $\swarrow \quad \searrow$
 1 2

Na_2CO_3

(3) Ferric Carbonate

Step I Fe^{+3} CO_3^{2-}

Step II Fe^3 CO_3^2

Step III $Fe \quad CO_3$
 $\swarrow \quad \searrow$
 3 2

$Fe_2(CO_3)_3$

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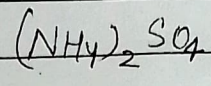
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④ Ammonium Sulphate
 NH_4^{+1} SO_4^{2-}

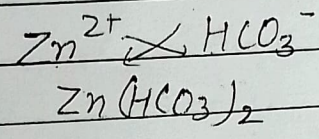
Step I NH_4^{+} SO_4^{2-}

Step II NH_4^{+} SO_4^{2-}

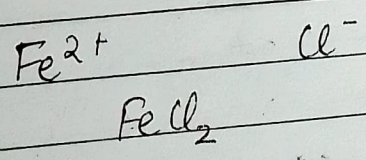
Step III NH_4 SO_4
1 2



⑤ Zinc Bicarbonate



⑥ Ferrous Chloride
Ferrous Ion Chloride Ion.



⑦ ~~ammonium carbonate~~ Ferrous Chloride.
Ferrous Ion Chloride
 Fe^{2+} Cl^-
 $FeCl_2$

Calculation of % age composition of a Formula.

Ex: Calculate the % age composition of $Mg_2P_2O_7$ [Mg=24, P=31, O=16]

Solⁿ Weight of Magnesium (Mg) = $24 \times 2 = 48$

" " Phosphorus = $31 \times 2 = 62$

" " Oxygen = $16 \times 7 = 112$

Mol. wt. of a compound = $48 + 62 + 112 = 222$

% of a particular element = $\frac{\text{Weight of element in a given compound}}{\text{Mol. weight of compound}} \times 100$

% of Mg = $\frac{48}{222} \times 100 = 21.62\%$

% of P = $\frac{62}{222} \times 100 = 27.92\%$

% of O = $\frac{112}{222} \times 100 = 50.45\%$

Que Calculate the % age composition of $(NH_4)_2SO_4$

Solⁿ N=14, H=1, S=32, O=16

Weight of Nitrogen = $14 \times 2 = 28$

Hydrogen = $1 \times 8 = 8$

Sulphur = $32 \times 1 = 32$

Oxygen = $16 \times 4 = 64$

Mol. wt of compound = $28 + 8 + 32 + 64 = 132$

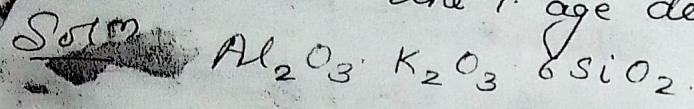
% age of N = $\frac{28}{132} \times 100 = 21.21\%$

% age of H = $\frac{8}{132} \times 100 = 6.06\%$

% age of S = $\frac{32}{132} \times 100 = 24.24\%$

% age of O = $\frac{64}{132} \times 100 = 48.48\%$

Ques. Calculate the % age decomposition of $Al_2O_3 \cdot K_2O_3 \cdot 6SiO_2$



$$= 2 \times 27 + 3 \times 16 + 2 \times 39 + 16 + 6(28 + 2 \times 16)$$
$$= 102 + 94 + 360$$
$$= 556$$

% age of $Al_2O_3 = \frac{102}{556} \times 100 = 18.34\%$

% age of $K_2O = \frac{94}{556} \times 100 = 16.90\%$

% age of $SiO_2 = \frac{360}{556} \times 100 = 64.74\%$

Ammonium Dichromate $\rightarrow (NH_4)_2Cr_2O_7$