CHEMISTRY

Class: XI Neet/jee

Chapter 1

SOME BASIC CONCEPT OF CHEMISTRY

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Some Basic Concepts of Chemistry

Law of chemical combination of elements & compounds.

① Law of Conservation of Mass.

- In simple terms, this law state that matter can neither be created nor destroyed. In other words, the total mass that is the sum of the mass of reacting of mixture and the products formed remains constant
- Antoine Lavoisier gave this Law in the year 1789
- Mass before reaction = Mass after reaction.

eg.

$$NCl + NaOH \rightarrow H_2O + NaCl$$

$$1+35.5 + 23+16+1 = 2+16 + 23+35.5$$

$$= 36.5 + 40 = 18 + 58.5$$

$$= 76.5 = 76.5.$$

② Law of Definite proportions

- Joseph Proust, a french chemist stated that "A chemical compound always contains the same element combine together in fixed proportion by mass. i.e a chemical compound has a fixed proportion and it does not depend upon method of preparation or from the source from which it is obtained. (Law of definite composition)

For eg - whatever sample of carbondioxide is taken, it is observed that C and O are always combined in the ratio of 12:32

③ Law of multiple proportion

- This law states that if two element combine to form more than one compound, the masses of these element in the reaction are in the ratio of small whole numbers.

This Law was given by Dalton in the year 1803.

For example, Hydrogen combines with oxygen to form two compounds, namely water & hydrogen peroxide.

Hydrogen + Oxygen → water

Hydrogen + oxygen → Hydrogen peroxide
2g 32g 34g

Here the masses of oxygen (i.e 16g and 32g) which combine with a fixed mass of hydrogen (2g) bear a simple ratio, i.e 16:32 or 1:2. similarly when C and O combine to form CO and CO_2

GAY LUSSAC'S LAW OF Gaseous Volume.

- In 1808, Gay Lussac
- This law states that when gases are produced or combine in a chemical reaction, they do so in a simple ratio by volume given that all the gases are same temperature & volume.
- This Law can be considered as another form of law of definite proportion
- The only difference between these two laws of chemical combinations is that Gay Lussac's law is stated with respect to volume while the law of definite proportions is stated with respect to mass.
- $N_2 + 3H_2 \longrightarrow 2NH_3$
- Hydrogen + oxygen → water.

100ml 50ml 100ml. Thus the volume of hydrogen and oxygen which combine (i.e 100ml and 50ml) bear a simple ratio of 2:1.

Avogadro's Law.

- Avogadro proposed in the year 1811
- It stated that under the same condition of temperature and pressure, an equal volume of all gases contain an equal number of molecules.
- This implies that 2 litres of hydrogen will have the same number of molecules as 2 litres of oxygen given that both the gases are at same temperature & pressure

Dalton's Atomic Theory

According to Dalton- Matter is composed of small indivisible particles called 'a - tomio' (meaning - indivisible)

Postulates

- Matter consists of indivisible atoms
- All atoms of a given element have identical properties, including identical mass, Atoms of different element differ in mass
- Compounds are formed when atoms of different elements combined in in a fixed ratio

4. Chemical reactions involve reorganisation of atoms. These are neither created nor destroyed in a chemical reaction.

Limitations

→ Daltons theory could explain the law of chemical combinations. However it could not explain the law of gaseous volume. It could not provide the reason for combining atom, which was answered later by other scientists

Atomic Mass.

- The atomic mass or the mass of an atom is actualy very-very small because atoms are extremely small.
- Relative Atomic Mass (RAM) $\frac{\text{Mass of one atom of element}}{1/12^{th} \text{ of mass of an atom of C-12}}$
- In this system, 12C is assigned a mass of exactly 12 atomic mass unit (amu) and masses of all other atom are given relative to this standard.
- One atomic mass unit is defined as a mass exactly equal to

And 1 amu = 1.66056×10^{-24} g.

- At present 'amu' has been replaced by 'u' which is known as unified mass

Atomic Mass = Mass of an atom

Atomic mass = Relative atomic mass × 1 amu.

Gram atomic mass = Mass of 6.022×10^{23} atom or mass of one mole of atom

eg. oxygen → RAM = 16

Atomic mass = 16 amu

Gram atomic mass = $16 \times 6.022 \times 10^{23}$

$= 16 \times 1.66 \times 10^{-24} \times 6.022 \times 10^{23}$

$= 16$ gm

Molecular Mass.

Sum of atomic mass of all the atoms is called molecular mass

Average atomic mass → element → Isotope (Atomic no. same, Mass no. different)

Isotope → Same Position

$$\text{Avg Atomic Mass} = \frac{\text{Mass of one isotope} \times \% + \text{Mass of 2nd isotope} \times \%}{100}$$

Avg atomic mass = mass of isotope × Relative abundance + mass of 2nd isotope × Relative abundance

Formula mass -

Some substances such as sodium chloride, don not contain discrete molecules their constituent units. In such compounds, positive (sodium ion) and negative (chloride ion) entities are arranged in a three dimensional structure.

Mole concept

In SI system, mole (symbol mol) was introduced as seventh base quantity for the amount of a substance.

e.g 1 mol = 6.02×10^{23}

1 mol Na^+ = 6.02×10^{23} Na^+ ion.

① Given weight

$$n = \frac{\text{Given weight}}{\text{Atomic weight OR Molecular weight}}$$

② Gases

$$n = \frac{V_{STP}}{\text{Volume (L)}} \quad \frac{V_{STP}}{22.4\,(L)}$$

$$n = \frac{V_{STP}}{22.4\,(L)}$$

③ No of particle given

$$n = \frac{\text{no. of particle}}{N_A}$$