

How To Determine Empirical and Molecular Formula:

- Step 1: Conversion of mass percent to grams.
- Step 2: Convert into number moles of each element.
- Step 3: Divide the mole value obtained above by the smallest number.
- Step 4: Write empirical formula by mentioning the number after writing the symbols of respective elements.
- Step 5: Writing molecular formula
Determine empirical formula mass. Add the atomic masses of various atoms present in the empirical formula.

Divide molar mass by empirical formula mass.

Empirical Formula: Simplest number ratio of various atoms present in a compound.
Molecular Formula: Shows exact number of different types of atoms present in a molecule of a compound.

Limiting Reagent: Reactant which gets consumed and limits the amount of product formed.

$$\text{Mole Fraction of A} = \frac{n_A}{n_A + n_B + n_C}$$

$$\text{Mole Fraction of B} = \frac{n_B}{n_A + n_B + n_C}$$

Homogenous:
Uniform composition (Sugar solution, air)

Heterogenous: Non-uniform composition (Mixtures of salt and sugar.)

Elements: Contains one type of particles i.e., atoms, molecules (Na, Cu)

(i). Gay Lussac's Law of Gaseous Volume:
When gases combine or all produced in a chemical reaction they do so in simple ratio by volume provided all gases are at same temperature and pressure.

(ii). Avogadro Law: Equal volumes of gases at the same temperature and pressure should contain equal number of molecules.

(iii). Dalton's Atomic Theory:
• Matter consists of indivisible atoms.
• All the atoms of a given element have identical properties including identical mass.
• Compounds are formed when atoms of different elements combine in a fixed ratio.
• Atoms are neither created nor destroyed in chemical reaction.

How To Balance A Chemical Equation:

- Step 1: Write correct formulas of reactants and products.
- Step 2: Balance number of C atoms.
- Step 3: Balance number of H atoms.
- Step 4: Balance number of O atoms.
- Step 5: Verify the number of atoms of each element.

Deals with the calculation of masses of the products and reactants involved in a reaction.

Stoichiometry

Atomic Mass Unit (amu): A mass exactly equal to one-twelfth the mass of one carbon-12 atom.

Molecular Mass: Sum of atomic masses of the elements present in a molecule.

Formula Mass: Sum of the atomic weights of atoms in a molecule. One Mole is the amount of a substance that contains as many particles/entities as there are atoms in exactly 12g (or 0.012 kg) of the ^{12}C isotope.

Molar Mass: Mass of one mole of a substance in grams.

Mass Percent

$$\text{Mass Percent} = \frac{\text{Mass of solute}}{\text{Mass of solution}} \times 100$$

Molarity

$$\text{Molarity} = \frac{\text{No. of moles of solute}}{\text{Mass of solute in kg}}$$

$$\text{Molarity} = \frac{\text{No. of moles of solute}}{\text{Volume of solution in litres}}$$

Some Basic Concepts of Chemistry

Importance of Chemistry

In meeting human needs for food, health care products and other products required for improving quality of life.

In diverse areas such as weather patterns, functioning of brain and operation of a computer.
In chemical industries

Matter: Anything which occupies space

(i). Solids: Particles are held very close to each other in an orderly fashion with no freedom of movement.

Have definite volume and shape.

(ii). Liquids: Particles are close and can move around.

Have definite volume but no definite shape.

(iii). Gases: Particles are far apart and their movement is easy and fast.

Neither have definite volume nor definite shape.

Properties of Matter:

(i). Physical: Properties measured/observed without changing the identity or composition of substance. (Colour, odour)

(ii). Chemical: Properties measured/observed when a chemical reaction occurs. (Acidity or Basicity, combustibility)

Measurement of Matter:

- International System of Units (SI): (Length-m)
- Mass is the amount of matter present in a substance.
- Weight is the force exerted by gravity on an object.
- Uncertainty of measurement: Range of possible values within which the true, value of the measurement lies.
- Significant figures: Meaningful digits known with certainty.
- Precision: Closeness of various measurements for same quantity.
- Accuracy: Agreement of a particular value to true value of result.

Law of Conservation of Mass:
Matter can neither be created nor destroyed. It was given by Antoine Lavoisier.

Law of Definite Proportions: A given compound always contains exactly the same proportion of elements. It was given by Joseph Proust.

Law of Multiple Proportions: If two elements can combine to form more than one compound, the masses of one element that combine with a fixed mass of the other element are in ratio of small whole numbers. It was given by Dalton.

Compounds: Two or more atoms of different elements (H_2O , NH_3)

Classification

Mixtures: Two or more substances present in any ratio. (air, tea)

Pure Substance: Fixed composition (Cu, Ag)