BASIC CONCEPTS OF CHEMISTRY

CONCENTRATION TERMS

MOLARITY
$$\frac{\text{No. of moles of Solute}}{\text{Volume of Solution in L}}$$

MOLALITY
$$\frac{\text{no. of moles of solute}}{\text{weight of solvent in kg}}$$

W/V%
$$\frac{\text{Weight of solution Kg}}{\text{Volume of Solution in L}}$$

MOLE FRACTION
$$\frac{\text{Moles of solute or Solvent}}{\text{Total moles of Solution}}$$

V/V%
$$\frac{\text{Volume of Solute in L}}{\text{Volume of Solution in L}}$$

W/W%
$$\frac{\text{Weight of Solute in kg}}{\text{Weight of Solution in kg}} \times 100$$

NORMALITY
Molarity × n-factor

PPM PARTS PER MILLION
$$\frac{\text{Weight of Solute in kg}}{\text{Weight of Solution in kg}}$$

EMPERICAL & MOLECULAR FORMULA

Step 1 → Conversion of mass % to grams
Step 2 → Convert into number of moles of each element
Step 3 → Divide the mole value obtained above by the smallest Number
Step 4 → Write Emperical formula by Mentioning the no. after writing the symbols of respective elements
Step 5 → Writing Molecular Formula
(a) Determine EF mass. Add the atomic masses of various atoms present in the EF
(b) Divide molar masses by EF mass
(c) Multiply EF by n obtained above

KEY STOICHIOMETRY TERMS

- Stoichiometry: Using the mole ratio in the balanced equation and information about one compound to find information about another in the reaction.
- Dimensional Analysis: Method of converting units by multiplying by ratio of equalities.
- Molar Mass: Sum of all the atomic masses (from the periodic table) in the compound.
- Solute: Substance being dissolved in a homogeneous mixture (solution).
- Concentration: Measure of how much solute is dissolved in how much solution.
- Molarity (M): A concentration unit in moles per unit liter. Standard Temperature and Pressure (STP): 1 atm (or 101.3 kPa) and 273 K (0°).
- Molar volume of a Gas: 1 mole of any gas at STP is 22.4 liters.
- Limiting Reactant: Reactant that stops the reaction by running out first. Actual Yield: The amount actually produced in the lab.
- Theoretical Yield: Amount that should be theoretically produced based on stoichiometric calculations.
- Percent Yield: Compares the actual yield to the theoretical yield (their ratio with %).

LIMITING REACTANTS

- Once a reactant has run out, the reaction will stop.
- Do stoichiometry for each given reactant quantity to the same product each time.
- Choose the calculation that gives the smallest amount of product.
- The reactant that produced the smallest amount of product is the limiting reactant.
- Steps to determine the limiting reactant: grams reactant → moles reactant moles product grams product.
- Alternatively, use the m/c method below.
- Simple Limiting Reagent Finder Mnemonic: Find the moles of each reactant and divide the moles of each reactant by its coefficient.
- The reactant with the smallest number is the limiting reagent = "Smallest m/c is Limited".

% YIELD

Actual yield/
Theoretical yield x 100

LIMITING REAGENT

The reactant that is entirely used up in a reaction

% OF ELEMENT IN COMPOUNP

mass of element / mass of organic compound x100

STOICHIOMETRY

BALANCING CHEMICAL EQUATION

Write correct formulas of reactant & products
↓
Balance number of Catoms
↓
Balance number of H atoms
↓
Balance number of O atoms
↓
Verify number of atoms of elements

CONSTANTS

- One Mole of any substance: 6.02 x 10^23 particles.
- Molar volume: 22.414 dm^3
- Standard temperature: 273.16 K or 25*C
- Standard pressure: 1 atm

FORMULAS

- Molecular Formula: Tells the number of atoms of the elements in a compound
- Empirical Formula: Simplest whole number ratio of atoms of elements in a compound

CONVERTING UNITS

- Volume
- 1m=10 dm = 100 cm
- $1m^3$ =103 dm^3 = 100^3 cm^3
- $1m^3$= 1000 dm^3= 1 000 000 cm^3
- $1dm^3$ = 1 m^3 /1000 =1 x 10^3 m^3
- $1cm^3$ = 1 m^3/1000000 =1 x 10^{-6} m^3

NO. OF SPECIES

- Number of atoms of an element = mass of an element[Na]/atomic mass Numbers of molecules of compound = mass of compound [Na]/molecular mass
- Number of ions of an ionic species = mass of ion [Na]/ionic mass

MOLES

- N= given mass n/avagadro's no = n/ NA
- N= given mass /molor mass = m/M
- N = given volume / 22.4L = V/ 22.4L

KUDOS FOR STOICHIOMETRIC PROBLEMS

- Method to solve word problems:
- K = Known. Identify all the known information (given quantities, balanced equation, etc.).
- U = Unknown. What quantity and what compound does the problem ask for?
- D = Definition. Identify the equalities that will be needed during dimensional analysis to convert from the known to the unknown.
- O = Output. Perform the dimensional analysis.
- S = Substantiation. Check for reasonableness, units and correct significant figures.