

# Chapter 1

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## Sociometry and Chemical Equations

### Fundamental Definitions

-Atoms:

-Elements:

-Compounds:

-Molecules:

-Chemical Formulas:

### Uncertainty

- The last digit is the uncertain digit
- Addition and subtraction is lowest decimal places
- Multiplication is fewest sig figs

1 mole = the number of atoms in 12grams of pure C

Avagadro's number =  $N_A = 6.022 \times 10^{23}$  units in one mole

### Atomic Isotopes

X= Atomic symbol of the element

A= Mass ( $A=Z+N$ )

Z= Atomic number

### Elemental Molar Mass

- Elements exist as a mixture of isotopes (different number of neutrons)
- $EMM = \text{mass of isotope 1} \times \text{percent}/100 + \text{mass of isotope 2} \times \text{percent}/100$
- And then all added together

Conversion Between Amount, Mass, and Number

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Solutions

Concentration	Symbol	Equation
Molarity	c	$n / V$
Mass %	m/m%	$m / m = \text{mass of solute in g} / 100\text{g solution}$
Mole Fraction	X	$X = n / n$
Molality	m	$m / m = n / 1\text{kg solvent}$

$C_1V_1=C_2V_2$

Ions in Solution

If you have a 0.30M  $\text{KMnO}_4$ , this means that

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What happens if Na CO is dissolved in water?

- This is a strong electrolyte -> completely dissociates in water

Equations for Aqueous Ionic Reactions

1) Molecular Equation - Ionic species written in non-dissociated form

2) Net Ionic Equations - Cancel out aqueous ions appearing on both sides of equation

Naming Compounds

Cations

Anions

### The Law of Mass Conservation

Total mass before reaction = Total mass after the reaction

- The number of atoms of each atoms of each element is conserved in a chemical reaction
- This is why we must balance equations

### Stoichiometry

### Reaction Yield Calculation

$\% \text{yield} = \text{Actual amount of product} / \text{Theoretical amount of product} \times 100\%$

### Multi step reactions

Overall Yield =  $(0.8)(0.8)(0.5)(1)\dots \times 100\%$

### Limiting Reagent

- The reactant that produces the least amount of moles of product

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Example Problems Chapter 1