Definitions

- Chemistry: Study of matter
- Organic Chemistry: Study of compounds containing carbon
- Atom: Is the smallest possible particle that defines a complete chemical element
- Molecules: Atoms connected in a particular arrangement
    - Changing the arrangement or connections changes the molecule and its physical properties.
- Compound: Collection of molecules of the same type
    - Water (H_2O), Cholesterol (27 carbons, white crystalline powder, average male contains 80g)
- Atomic Number: number of protons in nucleus of atoms
- Atomic Weight: mass of protons and neutrons
- Molecular Weight (MW): mass of atoms in molecule
    - Hydrogen = H, Atomic number = 1, 1 proton = $p^+ = (1H^+)$
    - Deuterium = D or d, Atomic number = 1, 1 proton and 1 neutron, Atomic Weight = 2 is an Isotope of Hydrogen
- Isotope: Different version of the same element; i.e. they have the same number of protons, but differ in their number of neutrons. E.g. Carbon has 3 isotopes, usually expressed as ^{12}C, ^{13}C and ^{14}C. Each of these have 6 protons, however ^{12}C has 6 neutrons, ^{13}C has 7 neutrons and ^{14}C has 8 neutrons. Thus their atomic masses are 12, 13 and 14 respectively.

Mole Concept

- 1 mole = 6.02×10^{23} (Avogadro's number) (can be atoms, molecules etc)
- 1 mole H = 1 g
- H_2O: MW = [(2 x 1 g/mol)H + (1 x 16 g/mol)O] = 18 g/mol
- 18g of H_2O is 6.02×10^{23} molecules = 1 mole of H_2O or 6.02×10^{23} molecules of water

Typical Molecule

- A few Angstroms (Å) in length
- 1 Å = 10^{-8} cm

Example: cholesterol is 18 Å across. If you lined all of the cholesterol molecules in a 80g bottle end to end it would wrap around the earth roughly 5,000,000 times.

Purity of Compounds

- 1 mole of H_2O (6.02×10^{23} molecules) = 18g then add 1×10^6 other molecules (eg. sugar) the purity of the water would be 99.999 999 999 999 999% pure.
- Purity: A pure compound shows no change in physical properties upon attempts to further purify. (purity is a relative term)

Physical Properties

- Defined by chemical structure.

- Melting point (mp) and Boiling point (bp): Each compounds has a characteristic mp and bp.
- Taste, appearance, odour, and biological properties (how it interacts with other molecules).
- Density (g/cm^3).
- Absorption of radiation.
- Solubility