

**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: Discrete (bonded) arrangement of atoms
  - o Changing the arrangement or connections changes the molecule and its physical properties
- Compound: Collection of molecules of the same type
  - o Water (H<sub>2</sub>O), Cholesterol (27 carbons, white crystalline powder, average male contains 80 g)
- Atomic Number: Number of protons in the nucleus of an atom
- Atomic Weight: Mass of protons and neutrons
- Molecular Weight (MW): Mass of atoms in a molecule
  - o H<sub>2</sub>O: MW = [(2 x 1 g/mol)H + (1 x 16 g/mol)O] = 18 g/mol

**Mole Concept**

- 1 mole =  $6.02 \times 10^{23}$  (Avogadro's number) (can be atoms, molecules etc.)
- 1 mole H = 1 g
- 18 g of H<sub>2</sub>O is  $6.02 \times 10^{23}$  molecules = 1 mole of H<sub>2</sub>O or  $6.02 \times 10^{23}$  molecules of water

**Typical Molecule**

- A few Angstroms (Å) in length
  - $1 \text{ Å} = 10^{-8} \text{ cm}$
- Example: Cholesterol is 18 Å across. If you lined all of the cholesterol molecules in an 80 g bottle end to end it would wrap around the earth roughly 5,000,000 times.

**Physical Properties**

- Defined by chemical structure
- Melting point (mp) and boiling point (bp): Each compound has a characteristic mp and bp.
- Taste, appearance, odour, and biological properties (how it interacts with other molecules).
- Density (g/cm<sup>3</sup>)
- Absorption of radiation
- Solubility

**Purity of Compounds**

- 1 mole of H<sub>2</sub>O ( $6.02 \times 10^{23}$  molecules) = 18 g, then add  $1 \times 10^6$  other molecules (e.g. sugar) → the purity of the water would be 99.999 999 999 999 999%.
- Purity: A pure compound shows no change in physical properties upon attempts to further purify (purity is a relative term).