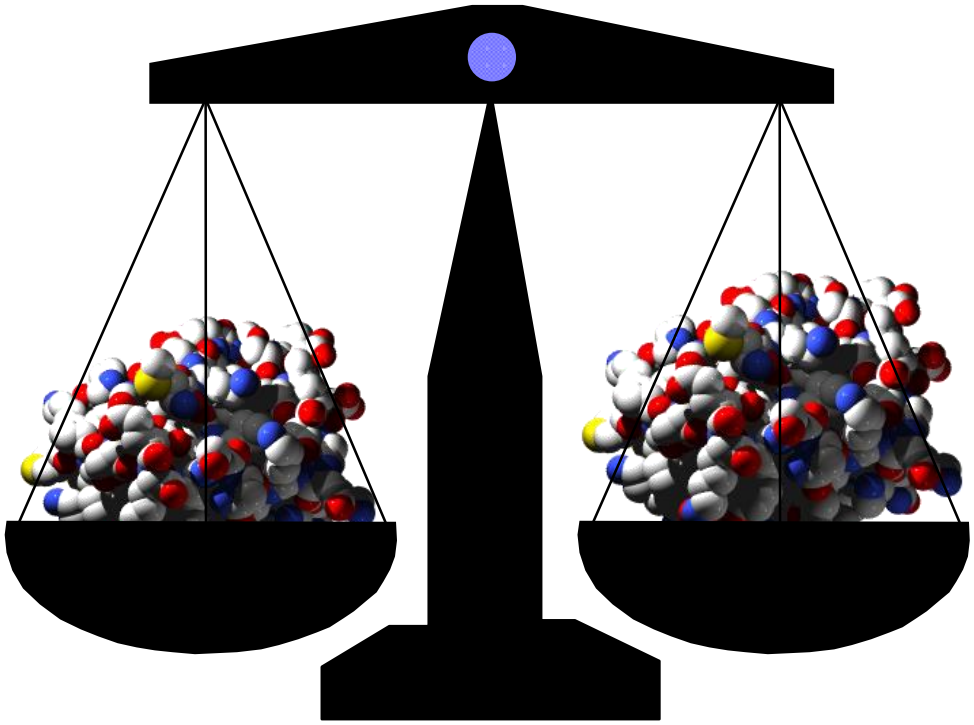
Interfacing GC with other Methods

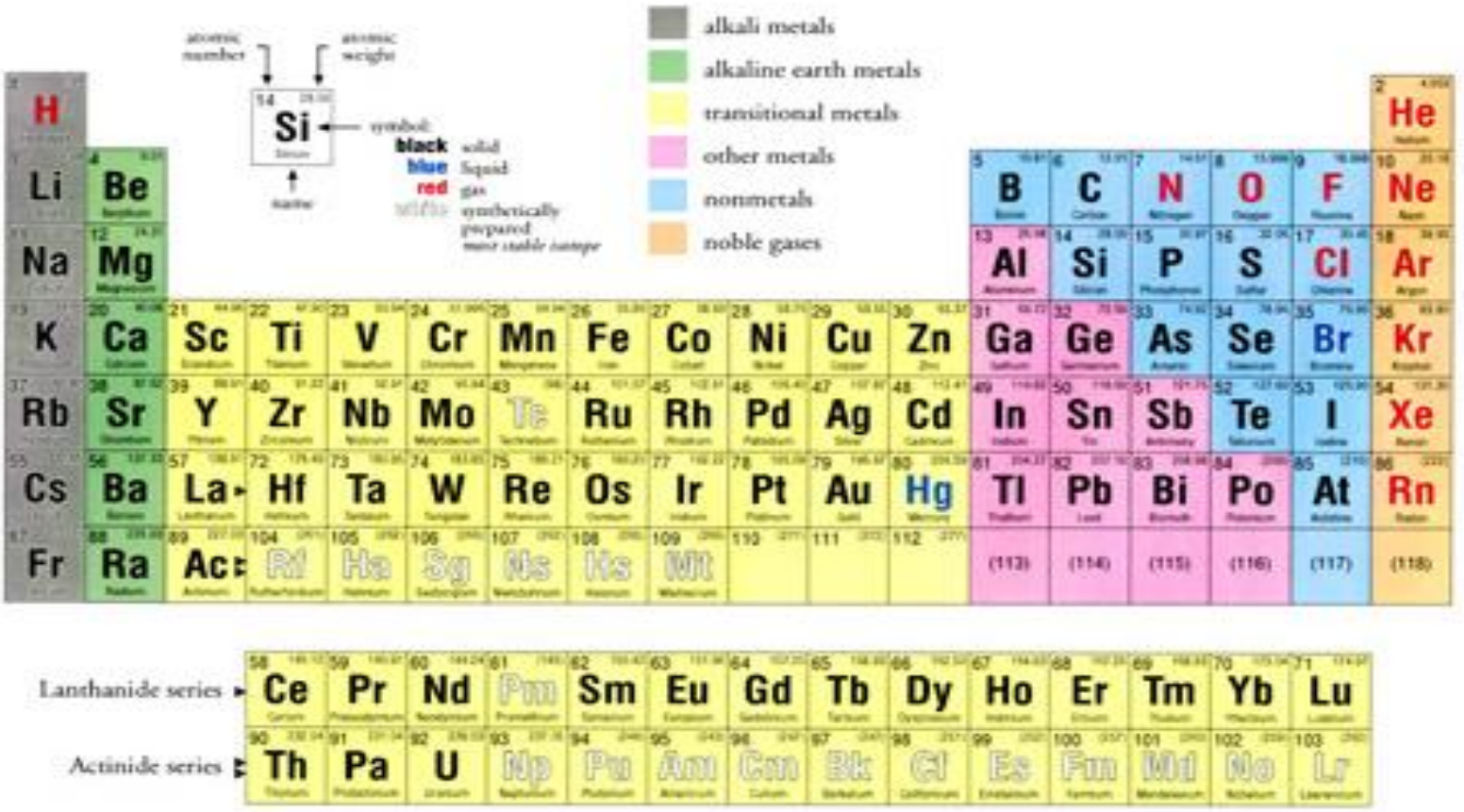
As mentioned previously, chromatographic methods (including GC) use retention times as markers for qualitative analysis. However, this characteristic does not absolutely confirm the existence of a specific analyte as many analytes may have very similar stationary phases. GC, as other chromatographic techniques, can confirm the absence of a solute rather than its existence. When GC is coupled with structural detection methods, it serves as a powerful tool for identifying the components of complex mixtures. A popular combination is GC/MS.

Mass Spectrometry

Analytical method to measure the molecular or atomic weight of samples



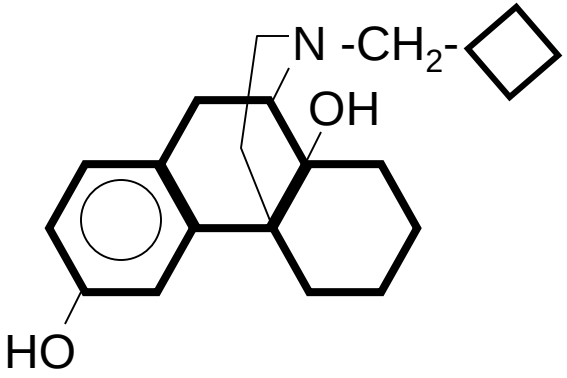
Different elements can be uniquely identified by their masses



MS Principles

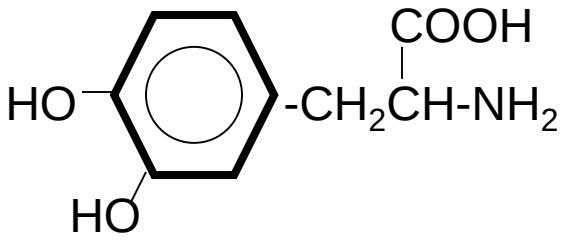
Different compounds can be uniquely identified by their masses

Butorphanol



MW = 327.1

L-dopa



MW = 197.2

Ethanol

CH_3CH_2OH

MW = 46.1

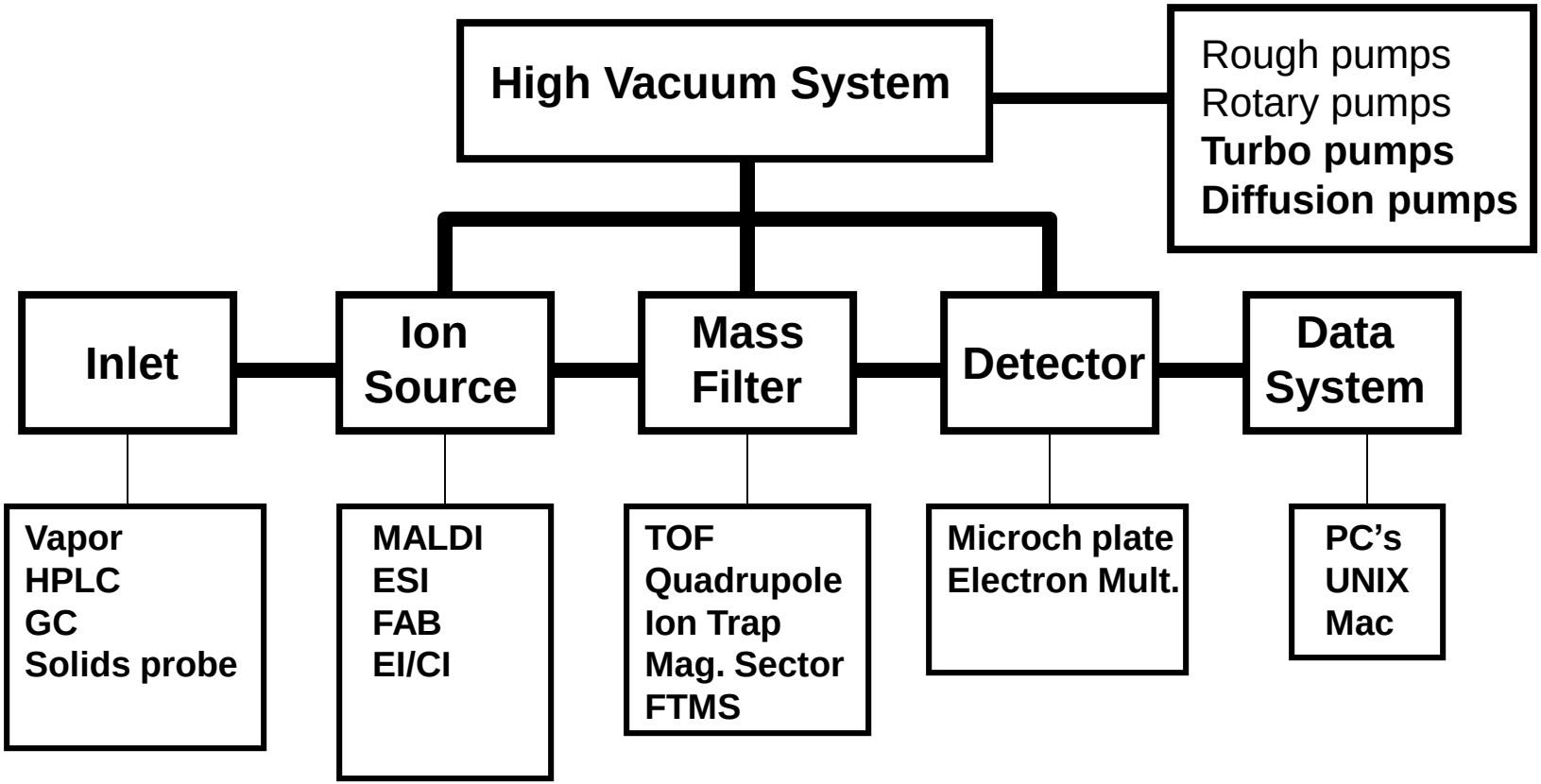
Mass Spectrometry

- **For small organic molecules the MW can be determined to within 5 ppm or 0.0005% which is sufficiently accurate to confirm the molecular formula from mass alone**
- **For large biomolecules the MW can be determined within 0.01% (i.e. within 5 Da for a 50 kD protein)**
- **Recall 1 dalton = 1 atomic mass unit (1 amu)**

MS Principles

- Find a way to “charge” an atom or molecule (ionization)
- Place charged atom or molecule in a magnetic field or subject it to an electric field and measure its speed or radius of curvature relative to its mass-to-charge ratio (mass analyzer)
- Detect ions using microchannel plate or electron multiplier tube

Mass Spectrometer Schematic



Mass Spec Principles