Review of Basic Concepts/Solutions and their Concentrations

The universe isn't "too complex" for our understanding, because it's our understanding that determines our universe.

Principles/Topics Covered

- Steps in Quantitative Analysis
- Methods in Quantitative Analysis
- Chemical Concentrations
- Stoichiometry
- Chemical Equilibrium

Terms to Understand

Students should be familiar, but not memorize terms at end of each chapter.

Homework/Problem Sheets

Students should work all homework problems and problem sheets.

Analytical Chemistry – the separation, identification and determination of relative amounts of components (analytes).

a) Qualitative Analysis – chemical *identity* of analyte.
b) Quantitative Analysis – *amount* of analyte.

Involves two measurements:

1) Measurement of some physical property proportional to amount of analyte in sample;
2) Volume or mass of sample.

*Combined= concentration of analyte to be determined

-Analytical methods classified according to *nature* of physical property measured.

Classical

1) Gravimetric – mass of analyte;
2) Volumetric (Titrimetric) – volume of solution containing sufficient reagent to react completely with analyte.

Instrumental

1) Spectroscopic – measures electromagnetic radiation absorbed or emitted by analyte;
2) Electroanalytical – properties resulting from oxidation/reduction behavior or analyte.

Questions/Discussions when choosing method

1) What level of accuracy and precision is required
2) Interferences
3) Number of samples

Sampling issues (environmental)

1) Must be representative of bulk sample, e.g. water body
2) May limit accuracy and precision
3) Contamination (need for *in situ* instrumentation)

Preparing a sample

1) Replicates – portions of sample treated identically
2) Homogeneity
3) Matrix considerations
4) Isolation – separation, interferences

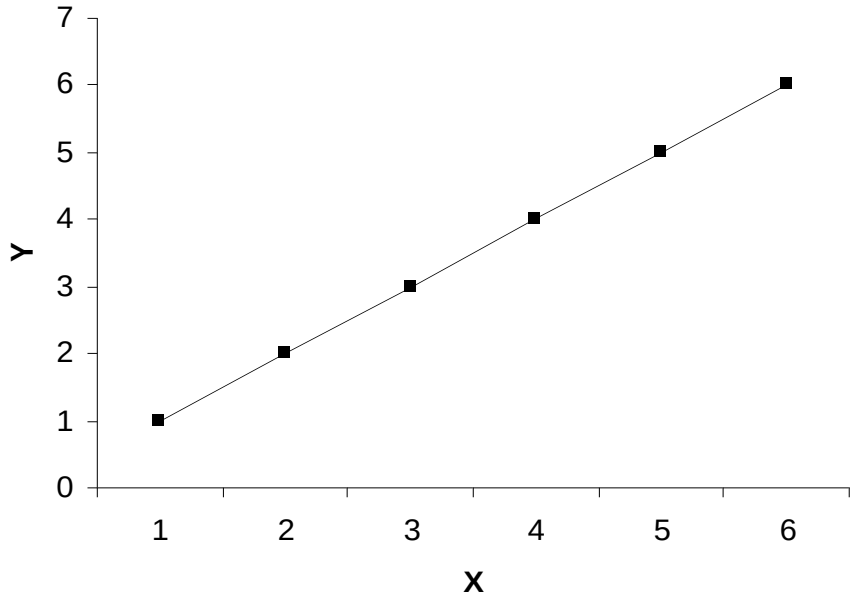
Calibration & Measurement

-measurement of the physical property is directly proportional to the concentration:

$$C_A = kx$$

where, C_A = concentration of analyte, k = proportionality constant and x = physical property measured.

Calibration Graph



Solutions and their concentrations

Molar concentration (C_A) - Molarity

$$C_A = \frac{\#mol\ solute}{\#L\ solution}$$

Molality – concentration expressed as moles per substance per kg of solvent (not total solution).

$$M = \frac{mol\ solute}{kg\ solvent}$$

Normality (N) = N=nM
Where n is the # of electrons donated or accepted by a species in a chemical reaction.