

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 of 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

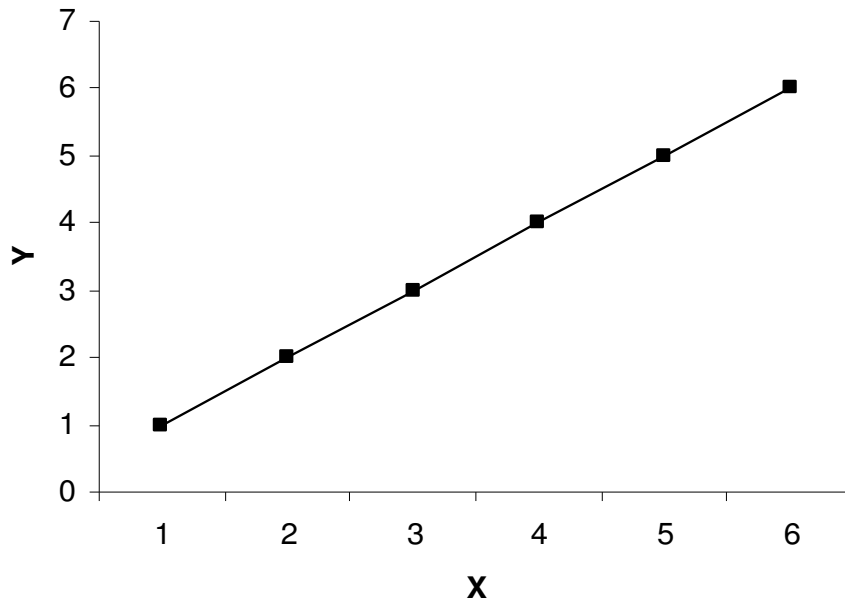
Calibration & Measurement

-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.