Fundamentals of Analytical Chemistry

Titrmetric Methods
Chapter 13a-c

Homework
- 2, 10, 13, 15, 16, 18, 23, 26, 27, 29

Titration
- 3 types
  - Gravimetric
    - Last measurement is a mass
  - Coulometric
    - Electrochemically generate titrant
      - Last measurement is time with a fixed current
  - Volumetric
    - Last measurement is a volume
    - Most common in academic laboratories

Definitions
- Volumetric Titration
  - Addition of a solution (titrant) [usually from a buret] to a second solution containing the analyte until the reaction is complete
- Back titration
  - An excess of a standard titrant is added to react completely, and then the amount of the excess titrant is determined by titration with a second standard solution

Definitions
- Equivalence point
  - The point at which you have stoichiometrically equivalent amounts of titrant and analyte.
- End point
  - The point at which you stop a titration
- Assumption is that the end point is related to the equivalence point:
  - Usually the same
  - Sometimes matrix effects are accounted for
  - Difference is “titration error”
- Indicator
  - Used to produce an observable physical change in solution

Primary Standard
- Highly purified compound
- Reference for preparation of solutions for titrations
- Properties for ideal primary standard
  - High, known purity
  - Stable
  - Anhydrous
  - Cheap
  - Soluble
  - High MW
Primary Standard

- No ideal primary standard
  - Several compounds close
- Relatively few compounds meet the criteria for a primary standard
  - Many of these compounds (i.e. strong acids and strong bases) THAT ARE NOT PRIMARY STANDARDS make ideal compounds for titration analysis

Solutions

- Standard Solution
  - Solution of known concentration
    - Primary standard – concentration obtained by careful measurement of primary standard mass and dilution volume
    - Secondary standard – concentration obtained by titration of primary standard.
    - Tertiary standard – concentration determined by comparison to secondary standard.

Calculations

- Molarity
  - mol / L
  - mmol / mL
- Process for solving titration problems
  - Amount of A (mass, volume, …)
  - Millimoles (or moles) of A
  - Millimoles (or moles) of B
  - Amount of B

- Amount → mmol (or mmol → amount)
  - Concentration
  - Molecular weight
  - Purity
  - AOS
- mmol A → mmol B
  - BALANCED CHEMICAL EQUATION