Volumetric Methods Titration

An Overview of Titrations

Volumetric or titrimetric analyses are quantitative analytical techniques which employ a titration in comparing an unknown with a standard. In a titration, a volume of a standardized solution containing a known concentration of reactant "A" is added incrementally to a sample containing an unknown concentration of reactant "B". The titration proceeds until reactant "B" is just consumed (stoichiometric completion). This is known as the *equivalence point*. At this point the number of equivalents of "A" added to the unknown equals the number of equivalents of "B" originally present in the unknown.

To be successful, a titration must involve a chemical reaction between the two solutions which are being mixed. This chemical reaction should be simple, rapid and complete. Although a titration may involve an acid base reaction, a precipitation reaction, a complexation reaction, or an oxidation reduction reaction.

Titration : The gradual addition of one solution to another until the reaction is complete (as indicated by an "indicator "

Endpoint : Is the point at which the indicator dictates that the reaction is complete.

Indicators : Indicators are organic compounds that have different colors in solutions of different pH.

Equivalence point : Is the point at which the chemical reaction is complete.

Standard solutions : A standard solution is a solution of known and exactly defined concentration. A primary standard can be used to produce a standard solution

Primary Standards

A highly purified compound that serves as a reference material in volumetric methods. The basic requirements of primary standard substance are:

- 1. Obtainable in high purity.
- 2. Stable in air, can be stored, Nonhygroscopic.
- 3. Absence of hydrated water.
- 4. Low cost.

- 5. Moderate solubility.
- 6. Large molecular weight.
- 7. Reacts stoichiometrically and rapidly.

General Procedure of Titration

Burette

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A graduated cylinder with a stopcock at the bottom. The graduations start at 0 at the top, so it measures how much volume is *added* to the conical (Erlenmeyer) flask. It fill with either acid or base (usually of known concentration) called the *titrant*.

Conical (Erlenmeyer) flask

- Fill with the substance being titrated (usually unknown concentration), 10 to 25 mL of the substance measured with a graduated cylinder or pipette.
- Add the indicator to the Erlenmeyer flask 2 drops of indicator, a pH meter, thermometer, etc.
- Swirl the flask as you add the titrant (or use a magnetic stirrer).
- Add titrant until the endpoint is reached (color change, a steep increase in pH).

