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Chemistry

Analytical Chemistry



Chapter Eight , Nine & Ten

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Titration in Analytical Chemistry & The Measurement Process in Chemistry & Effect of Electrolytes on Chemical Equilibrium

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SOME TERMS USED IN VOLUMETRIC TITRATIONS

A **standard solution** (or a standard titrant) is a reagent of known concentration that is used to carry out a volumetric titration.

The **titration** is performed by slowly adding a standard solution from a buret or other liquid-dispensing device to a solution of the analyte until the reaction between the two is judged complete.

The volume or mass of reagent needed to complete the titration is determined from the difference between the initial and final readings.

It is sometimes necessary to add an excess of the standard titrant and then determine the excess amount by **back-titration** with a second standard titrant.

Back-titrations are often required when the rate of reaction between the analyte and reagent is slow or when the standard solution lacks stability.

Standard Solutions

The ideal standard solution for a titrimetric method will:

1. be sufficiently stable so that it is necessary to determine its concentration only once;
2. react rapidly with the analyte so that the time required between additions of reagent is minimized;
3. react more or less completely with the analyte so that satisfactory end points are realized;
4. undergo a selective reaction with the analyte that can be described by a balanced equation.

The accuracy of a titration depends on the accuracy of the concentration of the standard solution used. Two basic methods that are used to establish the concentration are:

1. Direct method
2. Standardization

The direct method is a method in which a carefully determined mass of a primary standard is dissolved in a suitable solvent and diluted to a known volume in a volumetric flask.

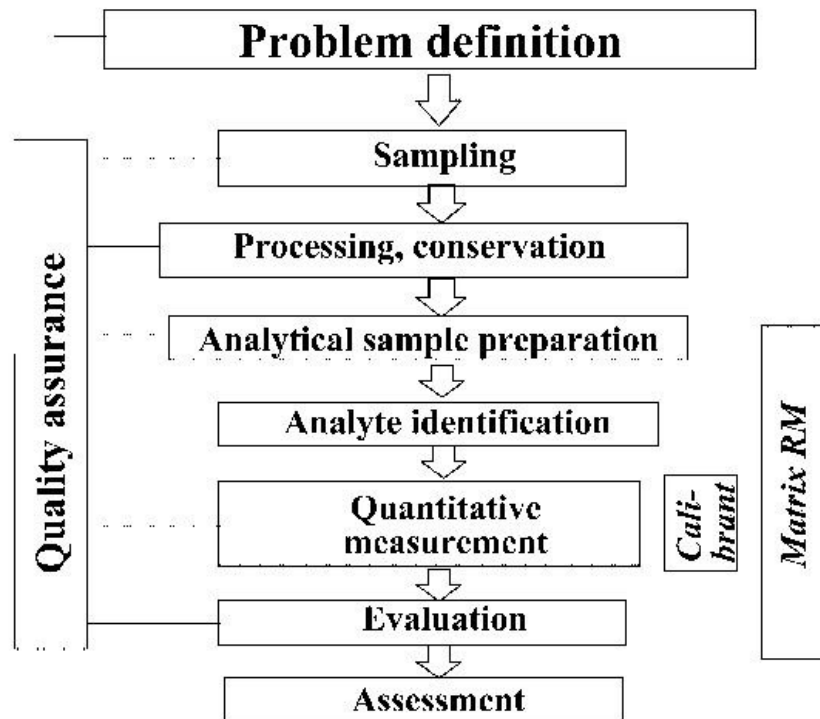
The second is by standardization in which the titrant to be standardized is used to titrate

- (1) a known mass of a primary standard,
- (2) a known mass of a secondary standard, or
- (3) a measured volume of another standard solution

Definition of Chemical Measurement Process

An analytical method of defined structure that has been brought into a state of statistical control, such that its imprecision and bias are fixed, given the measurement conditions. This is prerequisite for the evaluation of the performing characteristics of the method, or the development of meaningful uncertainty statements concerning analytical results.

General Steps of a Chemical Measurement Process



activity coefficient

The activity coefficient is defined as the effective concentration (i.e., activity) of an ion in solution divided by the actual concentration of that ion. For an ideal solution, the activity is equal to the actual concentration; that is, the activity coefficient is one.

