Analytic chemistry : deals with identification , characterization, and measurement of the chemical species present in a sample .

Qualitative analysis : is to determine what the constituents are in the sample .

Quantitative analysis : is to determine how much of each of constituent is in the sample .

Thus the role of an analytical chemist is essential not only to chemical science but also to allied areas in biology , food science , medicine , biochemistry engineering .

In pharmacology , accurate adjustment of a drug does for an individual may necessitate determination of its levels in the blood stream and in the pharmaceutical industry the quality of the manufactured drugs in tablet , solution , and emulsion from must be carefully controlled. Slight changes in composition or in purity of the drug itself can effect the therapeutic value .

The analytical chemist and the analysis :

The concept of measurement is basic to analytical chemistry. A simple measurement may involve properties such as mass, current, voltage ,volume , or time . The measurement of such properties as absorption or emission of energy ,optical rotation , over voltage , refractive index , equilibrium constant , rate constant activation energy , or heat of reaction is more complex. Whether simple or complex , the reliability , utility , accuracy and specifity of these measurement are the responsibility of the analytical chemist. The analytical chemist is not only concerned with carrying out the analysis ,but also with the how , why and where of using such measurement for analysis separation, for the elucidation of the fundamental chemistry involved in problem.

Volumetric analysis :

A quantitative analysis based upon the measurement of volume.

Titration :is the process by witch the quantity of analyte in a solution is determined from the amount of a standard reagent it consumes .

Standard solution : the reagent of exactly known concentration that is used in a titration .

The concentration of a standard solution is established either directly or indirectly :

1- By dissolving carefully weighed quantity of the pure reagent and diluting to an exactly known volume .

2- By titrating a solution containing a weighed quantity of a pure compound with the reagent solution .

Standardization : the process whereby the concentration of a standard solution is determined by titration of a primary standard is called a Standardization .

Indicator

Is the chemical compound used to detect the end – point in volumetric analysis that exhibits a change in color as a result of concentration change occurring near the equivalence point.

Primary standard :

Good primary standard include the following :-

1- Highest purity.

2- Stability.

3- Absence of hydrate water.

4- Ready availability at reasonable cost.

5- Reasonably high equivalent weight.

Standard solution :

An idea standard solution for titrimetric analysis would have the following properties **:**

1-Its concentration should remain constant for months or years after preparation to eliminate the need for re-standardization.

2- Its reaction with the analyte should be rapid , complete and can be described by balanced chemical equation.

3- A method must exist for detecting the equivalence point between the reagent and the analyte ;that is a satisfactory end point is required .

End point in volumetric methods :

End point are based upon are physical property which changes in characteristic way at or near the equivalence point in the titration. The most common end point involves as color change due to the reagent, the analyte or an indicator substance. Other physical properties such as electrical potential , conductivity, temperature, and refractive index, have also been employed to locate the equivalence point in titrations.

It is convenient to classify volumetric methods according to four Reaction types :-

1- Precipitation reactions :-

$$AgNO_3 + NaBr \longrightarrow AgBr_{(S)} + NaNO_3$$

2- Neutralization reactions :-

$NaOH + HCl \longrightarrow H_2O + NaCl$

3- Oxidation - reduction reaction :-

$Sn^{+2} + Hg^{+2} + 2Cl^{-} \longrightarrow HgCl_2 + Su^{+4}$

4- Complex - formation reaction :-

$2CN^{-} + 2Ag^{+} \longrightarrow Ag[\ Ag(CN)_2]_{(S)}$

absorption measurement

$A = \log \frac{It}{Io}$ A = Absorbance , I_o = incident radiation power

I_t = transmitted radiation power.

$T\% = \frac{Io}{It} \times 100$ T% = percentage Transmittance.

$A \ \alpha \ c$ c = path length .

$A \ \alpha \ C$

$A = \varepsilon c C$ ε = molar absorptivity, C = concentration

$A = \log T$ T = Transmittance.