**Laboratory of Analytical chemistry**

Lab. of the first stage

Date / /

**Experimental 1:**

Analytical chemistry is studied the basic principles of chemical composition , its generally has three types:

**1-Qualitative analysis?** A group of operations in which the identification of the identity of the materials, Components or elements involved in the installation of a particular substance or a mixture of materials, whether in the solid or liquid state. This analysis does not mention the quantities and concentrations of substances.

**2-Physicochemical methods of Analysis**

**3-Quantitative analysis?** The group of processes that are looking at estimating the quantities of elements that inside composition of the chemical compound or mixture and what percentage.

Quantitative analysis includes two main sections:

1-Gravimetric analysis

2-Volumetric analysis: includes indirect method to determination of weighing or sub weighing for substances, as Titration methods.

**Titration?** The process of determining the amount of unknown material by measuring the amount of reagent (known substance) that requires access to full reaction with unknown substances at the end point.

**Titrant:** The reagent, which is added to a solution containing an analytical substance, is unknown in the standardization method.

A reagent, called the **Titrant**, of known concentration (a standard solution) and volume is used to react with a solution of the **analyte**, whose concentration is not known.

We have many type of volumetric Titration: as **standardization Titrimetric** that including**;**

**1- Neutralization Titration**

A - Strong acid with Strong Base

HCl + NaOH NaCl + H2O

B - Weak acid with Strong Base

HOAC + NaOH NaOAC + H2O

C - Strong acid with Weak Base

HCl + NH4OH NH4Cl + H2O

D - Weak acid with weak Base

HOAC + NH4OH ACONH4 + H2O

**2- Precipitations titration**

AgNO3 + NaCl AgCl + NaNO3

**3- Oxidation-Redaction Titration (Redox titration)**

8H+ + 5Fe3+ + MnO4- Mn2+ + 5Fe3+

**4**- Complexemetric Titration

AgNO3 + 2KCN KNO3 + KAg(CN)2

**Condition of Titration Reaction:**

1- The reaction should be rapid.

2- The reaction should be simple.

3- The reaction should be complete.

4- The reaction should be specific.

5- No side reaction between reagent with analyte or other material in solution.

6- Must have change color in end point reaction.

7- The reaction should be stable for a long time.

**Definitions and terms:**

Standardization? Is a process whereby the concentration of a solution is determined by titrating with a primary standard solution.

A standard solution? Is a reagent of known exactly composition and concentration so that used in titration.

**There are two types of standard solution as**:

**1- A primary standard?** Is a highly purified chemical compound and known composition.

**or**

Is a standard material from a known weight that dissolves in a known solvent and is used in the calibration of non-standard materials; as: Na2CO3, CaCO3, Na2B4O7, Na2C2O4, EDYS.

Requirements of a primary standard:

1- It must be of the highest purity.

2-Iit should be stable and not attacked by atmosphere.

3- It should not be hygroscopic.

4- It should be available and not too expensive.

5- It should have high equivalent weight to minimize weighing errors.

**2- Secondary standard?** is an material that does not depend on their solutions to calibration of other material unless calibrated with primary standard solution ;as HCl , H2SO4 , HNO3.

Equivalence point? Is the point where the number of milli-equivalents of titrant solution (standard solution) equal to the number of milli-equivalents of analyte material (unknown solution).

**N1V1=N2V2** Or **M1V1=M2V2**.

End point? Is the point that change then the color of the solution and indicate the end of the reaction.

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