

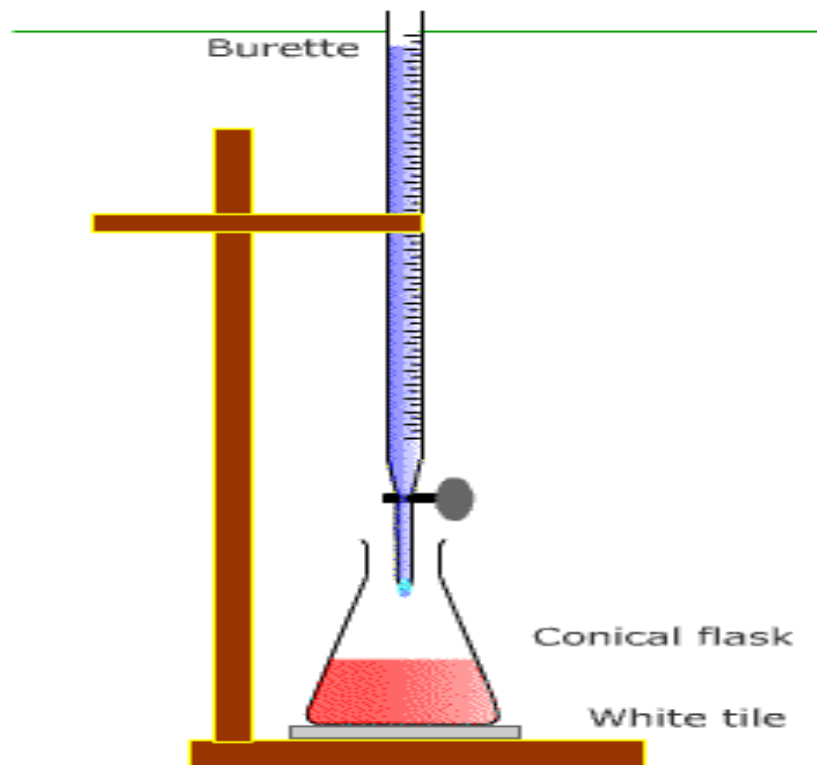


AL-Mustaqbal University College
Radiology Techniques Department

First Class

Practical General Chemistry

Third lecture (Titration)



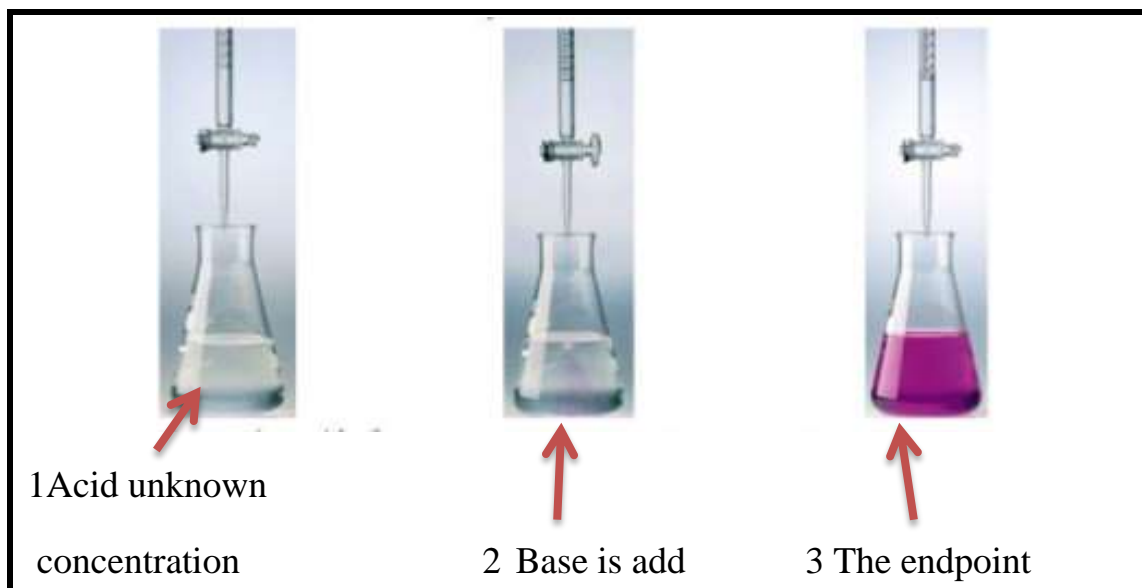
→ Titration ←

Is the slow addition of one solution of a known concentration (called a titrant) to a known volume of another solution of unknown concentration until the reaction reaches neutralization, which is often indicated by a color change. The solution called the titrant must satisfy the necessary requirements to be a primary or secondary standard. In a broad sense, titration is a technique to determine the concentration of an unknown solution.

Types of titrations

(1) Acid–base titration

is the simplest of the four types of titrations as it involves a strong acid and strong base that completely dissociate in water, thereby resulting in a strong acid–strong base neutralization reaction. This titration requires the use of a burette to dispense a strong base into a container of strong acid, or vice-versa, in order to determine the equivalence point.



Indicator: are substances whose solutions change color due to changes in pH. These are called acid-base indicators. They are usually weak acids or bases, but their conjugate base or acid forms have different colors due to differences in their absorption spectra.

Indicator	Color on acidic side	Range of color change (pH)	Color on basic side
Methyl violet	Yellow	0.0–1.6	Violet
Bromophenol blue	Yellow	3.0–4.6	Blue
Methyl orange	Red	3.1–4.4	Yellow
Methyl red	Red	4.4–6.3	Yellow
Litmus	Red	5.0–8.0	Blue
Bromothymol blue	Yellow	6.0–7.6	Blue
Phenolphthalein	Colorless	8.3–10.0	Pink
Alizarin yellow	Yellow	10.1–12.0	Red

(2)Redox titration

are based on a reduction-oxidation reaction between an oxidizing agent and a reducing agent. A potentiometer or a redox indicator is usually used to determine the endpoint of the titration, as when one of the constituents is the oxidizing agent potassium dichromate.

Oxidation	Reduction
1. gain of oxygen	1. Loss of oxygen
2. loss of hydrogen	2. Gain of hydrogen
3. loss of electrons	3. Gain of electrons
4. increase in oxidation number	4. Decrease in oxidation number

(3)Complex titration

In it, the proportions of many metal ions are determined by titration them with organic reagents that have the ability to form compounds that are soluble in water, and an example of these materials is EDTA.

(4)precipitation titration

Precipitation titration is a type of titration which involves the formation of precipitate during the titration technique. In precipitation titration, the titrant reacts with analyte and forms an insoluble substance called precipitate. It continues till the last amount of analyte is consumed.

Conditions for volumetric titration:

- 1- The process should represent a reaction that can be expressed in an equivalent chemical equation
- 2- The reaction is rapid.
- 3- There will be no side reactions.
- 4- That the reaction is complete, in which the reactions are transformed into known products.