

Principles of Titration

Medical Chemistry Lab.2

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What is titration?

- > Titration is a chemical technique used to determine the concentration of a particular substance in a solution
- > Titration is based on a chemical reaction between the substance of known concentration and the substance whose concentration is to be known
- > Titration is one of the basic methods in analytical chemistry



Types of titration:

Acid-base titration: To determine the concentration of an acid or base

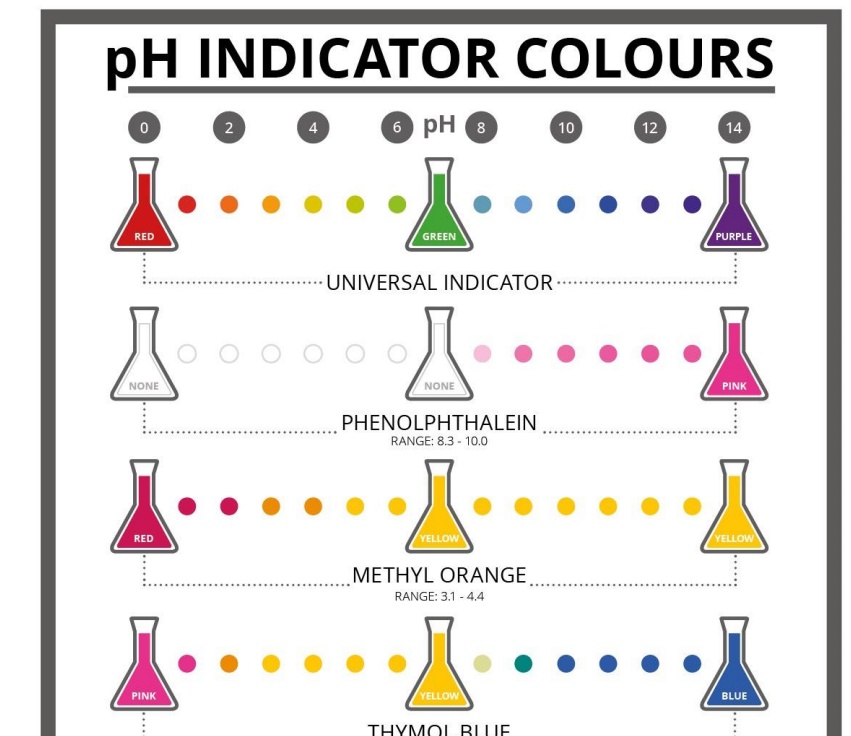
Precipitation titration: Based on the formation of a precipitate

Oxidation-reduction titration: Used for reactions that involve the transfer of electrons

Complex titration: Based on the formation of complex compounds

Tools used in titration

1. Burette
2. Conical Flask
3. Standard Solution
4. Indicators(chemical reagent)
5. Holder and clamp



A chemical reagent or Indicator : is a substance or compound that is added to the experiment to cause a chemical reaction or is added to occurrence of the reaction.



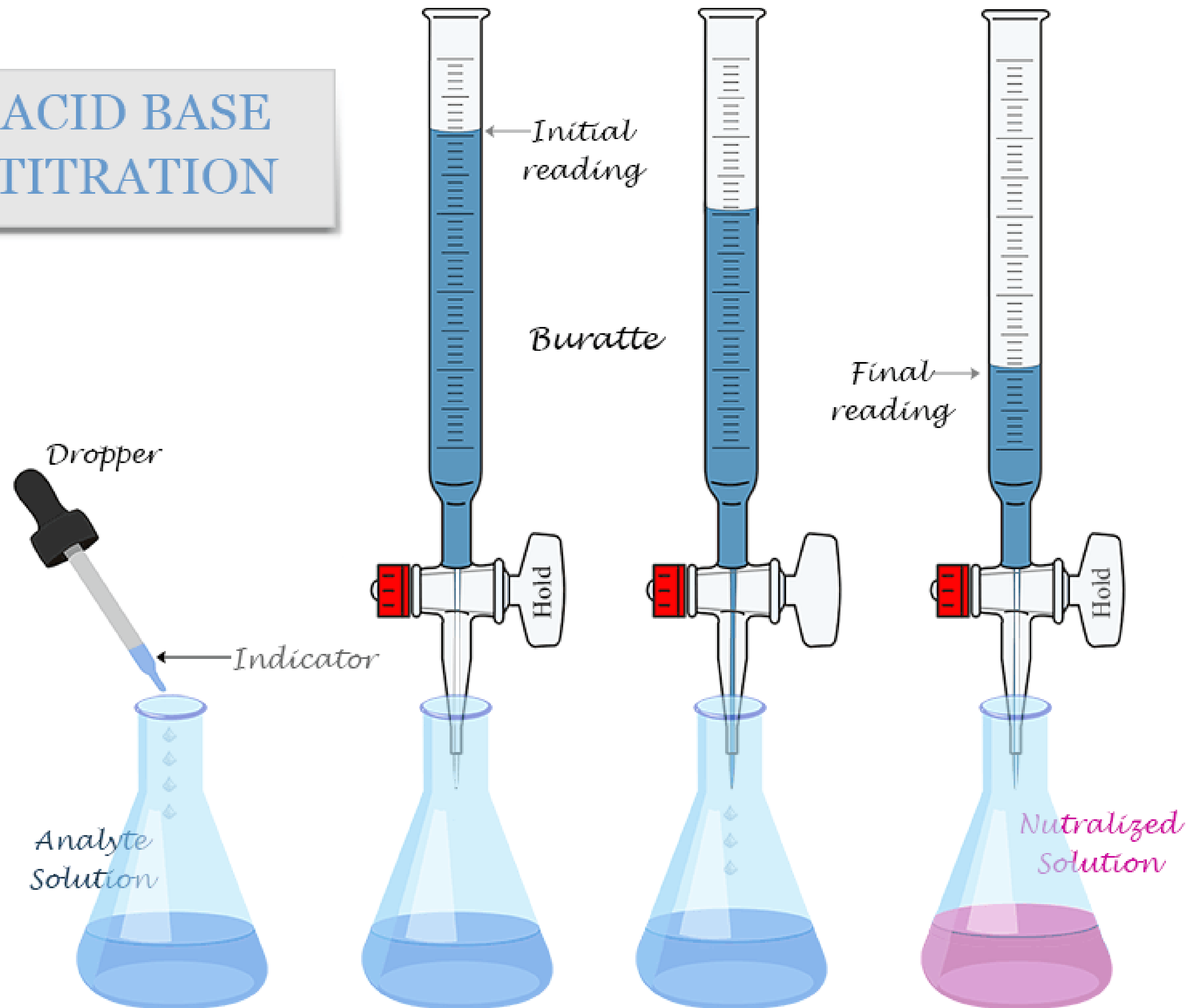
Titration steps

- .1 Prepare the standard solution in the burette.
- .2 Place the sample in the conical flask.
- .3 Add the appropriate reagent (such as phenolphthalein).
- .4 Open the burette tap and add the standard solution gradually.
- .5 Stop at the equivalence point (change in the color of the reagent).

Requirement of a primary standard substance:-

- 1- It must be of the highest purity .
- 2- A primary standard substance should be stable it should not be attacked by constituent of the atmosphere .
- 3- A primary standard should be readily available and not too expensive.
- 4- The compound should not be hygroscopic .
- 5- finally, it should have a reasonably high equivalent weight . ,
A high equivalent weight will tend to minimize weighing errors.

ACID BASE TITRATION



What is the **equivalence point**?

- The equivalence point is the point at which the number of moles of the substance with known concentration is equal to the number of moles of the substance with unknown concentration.
- Usually indicated by the change in the color of the reagent.

What happens at the equivalence point?

At the equivalence point, the number of moles of acid equals the number of moles of base.

$$n_{\text{base}} = n_{\text{acid}}$$

Titration Applications

- 1. In food industries.**
- 2. In water analysis.**
- 3. In chemical research.**
- 4. In the pharmaceutical industry.**

Tips for accurate titration

1. Use clean and accurate tools.
2. Calibrate the burette before starting.
3. Add the standard solution slowly.
4. Record the data accurately.
5. The reaction must have a clear end point
6. The reaction must be irreversible so that it continues to the end in the same direction.

Abstract

- **Titration is an essential tool in analytical chemistry for determining the concentration of substances.**
- **It requires accuracy and attention to achieve reliable results.**