

Determination of sodium hydroxide molar concentration

(Acid – Base titration)

Titration is an analytical method used to determine the exact amount of a substance by reacting that substance with a known amount of another substance. The completed reaction of a titration is usually indicated by a color change or an electrical measurement .

Chemicals reagents are commonly referred to as reagent. It is a large class of pure chemical substances with various standard purities .A **reagent** is a chemical substance that is used to create a reaction in combination with some other substance

A standard solution is a solution containing a precisely known concentration of an element or a substance. A known weight of solute is dissolved to make a specific volume. It is prepared using a standard substance, such as a primary standard. Standard solutions are used to determine the concentrations of other substances, such as solutions in titration.

Properties of a standard solution for titrations

1. Its concentration must remain constant all the time. This is so that there is no need for restandardization.
2. Its reaction with the analyte must be rapid in order to minimize the waiting period after addition of each reagent.
3. Its reaction must be reasonably complete.
4. It should be possible to describe the reaction by a balanced chemical reaction.
5. A method must exist for detecting the equilibrium point.

Types of titrations

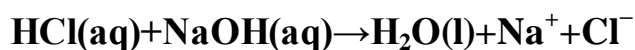
There are many types of titrations with different procedures and goals.

1. Acid–base titration
2. Oxidation-Reduction Titration
3. Precipitation Titration
4. Complexometric Titrations

Acid-base Titrations

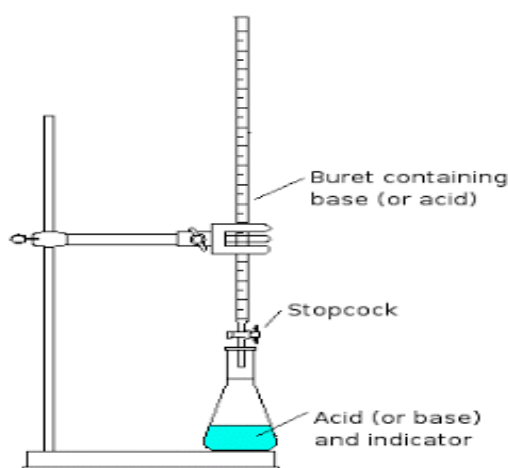
Acid-base titrations depend on the neutralization between an acid and a base when mixed in solution. In addition to the sample, an appropriate indicator is added to the titration chamber, reflecting the pH range of the equivalence point. The acid-base indicator indicates the endpoint of the titration by changing color..

The balanced neutralization reaction:



$$\text{moles HCl} = \text{moles NaOH}$$

$$\text{Ma} \times \text{Va} = \text{Mb} \times \text{Vb}$$



In this experiment, a **phenolphthalein** color indicator will be used. Phenolphthalein is colorless in acidic solutions and pink in basic solutions.

Endpoint and equivalence point

Equivalence point is the theoretical completion of the reaction at which the number of moles of titrant is equal to the number of moles of analyte . Endpoint is actually measured, a physical change in the solution as determined by an indicator or an instrument pH. The endpoint and the equivalence point are not exactly the same because the equivalence point is determined by the stoichiometry of the reaction while the endpoint is just the color change from the indicator.

Procedure :

1. Put 10 ml of sodium hydroxide in a conical flask.
2. Add 1-2 drop of ph-.ph as an indicator .
3. Fill the burette with 0.1 N of hydrochloric acid solution .
4. Add hydrochloric acid drop by drop into conical flask until the color of the solution appears colorless.
5. Record the volume of HCl used .