

***Experiment Number: — 01***

***Name of the Experiment: —***

***Standardization of Sodium  
Hydroxide solution with standard Oxalic Acid solution***

***Course: CHEM-114***

***Name:-Monjur Morshed Rabby***

***Roll: — 201111032***

***Department: — MME***

***Date of Performance: — 19-05-2012***

***Date of Submission: — 19-05-2012***

***Objective:—***

The object of this experiment is to make us familiar with neutralization reaction of acid or base and also to introduce us with some important terms such as titration, standardization, indicator, acid-base reaction, etc.

The main purpose of the experiment is to determine the strength of a base with the help of a standard acid solution.

**Theory:—**

In this experiment we shall determine the strength of NaOH solution by a standard solution of Oxalic Acid. This is done by means of “Titration”. The important matters that are related with the experiment are stated below :

**Titration:—**

In presence of a suitable indicator, the volumetric analysis in which a standard solution is added in another solution (whose strength is not known) to reach its end point to determine the strength of that solution is called ‘titration’.

**Standard Solution:—**

A solution of known concentration is called a ‘standard solution’.

**Indicator:—**

In our acid-base titration there is an important use of indicator. An ‘indicator’ is a chemical substance that detects the equivalent point (i.e. the end point) of reaction by changing its color.

**Equivalent Point:—**

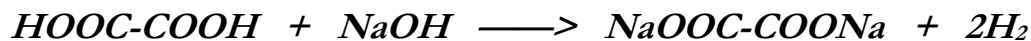
The ‘equivalent point’ is the point in a titration when a stoichiometric amount of reactant has been added.

**Normality:**

The number of gram equivalent weight of a solute per liter of solution is called normality.

$$\text{Normality (N)} = \frac{\text{gm equivalent of solute}}{\text{liters per solution.}}$$

In this experiment the reaction we shall use is as follows:



The formula required to determine the strength of NaOH solution is:-

$$V_{base} \times S_{base} = V_{acid} \times S_{acid}$$

or ,  $V_b \times S_b = V_a \times S_a$   
where 'V' represents volume and 'S' represents strength.

The volume of Oxalic acid is measured by watching the Equivalent point. The point at which acid-base neutralizes each other is called "Equilibrium point". This point is determined with the help of an indicator.

**Why Phenolphthalein is used as indicator:**

In this experiment, 'Phenolphthalein' is selected as indicator whose working pH range is 8.3-10.0 i.e. it works when the environment is acid. This indicator gives pink color in basic solution and becomes colorless when the base is neutralized.

| Indicator name  | pH range | Colour in Alkaline solution | Colour in Acid solution |
|-----------------|----------|-----------------------------|-------------------------|
| Phenolphthalein | 8.3-10.0 | Pink                        | Colourless              |

In this experiment we are using NaOH and Oxalic acid. NaOH is a strong base but Oxalic acid is a weak acid. So the solution at equilibrium point consists of a salt whose basic part is strong. As a result there will be more OH<sup>-</sup> in the solution than H<sup>+</sup> as the salt will be dissociated in the aqueous solution. So, the solution would be basic which provides phenolphthalein to work properly. So Phenolphthalein becomes the perfect indicator to determine the end point of this reaction.

**Apparatus:—**

1. Conical flask
2. Burette
3. Pipette
4. Volumetric flask
5. Stand

**Name of the chemicals used:—**

1. NaOH (sodium hydroxide, base)
2. HOOC-COOH (Oxalic-acid)
3. Phenolphthalein (indicator)

**Chart for collecting Data and calculation**

**Standardization of NaOH solution with standard Oxalic Acid Solution**

| Number of Observation | Volume of NaOH in ml | Burette reading in ml |               | Volume of Acid in ml | Average Reading in ml | Strength Of NaOH N |
|-----------------------|----------------------|-----------------------|---------------|----------------------|-----------------------|--------------------|
|                       |                      | Initial Reading       | Final Reading |                      |                       |                    |
| 01                    | 10                   | 39.2                  | 49.8          | 10.6                 | 10.7                  | 0.1029             |
| 02                    | 10                   | 37.8                  | 48.6          | 10.8                 |                       |                    |
| 03                    | 10                   | 28.5                  | 39.2          | 10.7                 |                       |                    |

**Calculation:—**

from

$$V_{\text{acid}} \times S_{\text{acid}} = V_{\text{base}} \times S_{\text{base}},$$

we get

$$V_{\text{Oxalic-acid}} \times S_{\text{Oxalic-acid}} = V_{\text{NaOH}} \times S_{\text{NaOH}}$$

Here,

$$V_{\text{Oxalic-acid}} = 10.7 \text{ ml (average)}$$

$$S_{\text{Oxalic-acid}} = 0.9619 \text{ M}$$

$$V_{\text{NaOH}} = 100 \text{ ml}$$

$$S_{\text{NaOH}} = ?$$

$$\begin{aligned} \text{so, } S_{\text{NaOH}} &= (10.7 \times 0.9619) / 100 \text{ N} \\ &= 0.1029 \text{ N} \end{aligned}$$

**Result:—**

**Determined strength of NaOH solution is:**

$$\mathbf{S_{NaOH} = 0.1029\ N}$$