Experiment No.(2):- Preparation and standardization of 0.1 N sodium hydroxide solution using Direct Titration

Theory:-

Potassium hydrogen phthalate, often called simply **KHP**, is an acidic salt

Compound. It forms white powder, colorless crystals; it is solid and air-stable, making it easy to weigh accurately. KHP is a useful standard for NaOH and Total Organic Carbon (TOC) testing. Most TOC analyzers are based on the oxidation of organics to carbon dioxide and water, with subsequent quantization of the carbon dioxide.

This experiment demonstrates the most common method for obtaining standard solutions for titrimetric analysis. It involves preparation of a solution that has the

Approximate concentration desired determination of the concentration by direct **titration** against a **primary standard**. We will standardize the 0.1 N NaOH solution (the titrant) with potassium hydrogen phthalate (KHP, $KC_8H_4O_4H$) using phenolphthalein as the indicator. KHP is a weak acid and reacts with base in the following way:-

$$C_8H_4O_4H^- + OH^- \longrightarrow C_8H_4O_4^{-2} + H_2O$$

Procedure:-

1.Preparation (50 ml)0.1N KHP:-

$$N = \frac{Wt.(gm)}{Eq.wt.} * \frac{1000}{V(ml)}$$

Wt. = N* Eq.Wt * 0.05

= 0.1 * 204 * 0.05

= 1.02 gm

Weigh 1.02 gm from KHP and dilute in 30 ml D.W, transfer solution to volumetric flask capacity 50 ml and complete the volume to the mark by D.W.

2. Preparation (50 ml) 0.1 N NaOH :-

$$N = \frac{\text{Wt.(gm)}}{\text{Eq.wt.}} * \frac{1000}{\text{V(ml)}}$$

Wt. = N* Eq.Wt * 0.05

= 0.1 * 40 * 0.05

= 0.2 gm

Weigh 0.2 gm from NaOH and dilute in 30 ml D.W, transfer solution to volumetric flask capacity 50 ml and complete the volume to the mark by D.W.

3. Transfer 5 ml volume of the sodium hydroxide solution, with a pipette, to a conical flask then adds one or two drops of phenolphthaline. The solution has the pink color

4. Add the (0.1 N KHP) from the burette gradually with continuous swirling of the solution in the conical flask, and near the end point, the KHP is added drop by drop. Continue the addition of the KHP until the color of the solution discharged.

5. Repeat the experiment three times and tabulate your results then take the mean of the three readings.

Calculations:-Calculate the normality and % of NaOH:-

$$\text{meq. NaOH} = \text{meq KHP}$$

$$(N * V)_{NaOH} = (N * V)_{KHP}$$

$$\frac{Wt.}{Eq.Wt} * 1000 = (N * V)_{KHP}$$

$$\frac{Wt.}{40} * 1000 = 0.1 * \frac{V_1 * V_2 * V_3}{3}$$

$$\% \text{ NaOH} = \frac{Wt.}{Wt. \text{ of sample}} * 100$$

Discussion:-

1. Give 3 reasons why NaOH is not used as a primary standard?

2. Calculate ppm and ppt of KHP in this experiment?

3. Why is KHP used as a primary standard?
4. Why NaOH percentage less than 100%?
5. Why used ph.ph indicator?