Exp. 3: Preparation and standardization of HCl solution

HCl solutions are usually prepared by dilution of the concentrated solution which has a molarity of about 11. The molarity of the concentrated solution can be calculated from the knowledge of two pieces of density of the solution and percentage of HCl.

For example, the molarity of a HCl solution that is 32% and has a density of 1.20 g/mL can be calculated as follows:

\[
\text{Concentration (M)} = \frac{\text{Density} \times \text{percentage}}{\text{Molecular weight}}
\]

Any solution of lower molarity can be prepared by dilution using the relationship

\[
M_1 \times V_1 \times (\text{Conc}) = M_2 \times V_2 \times (\text{Dil})
\]

**Standardization of Approximately 0.1M HCl Solution using standard 0.1M NaOH solution**

The easiest method to achieve this standardization is to use a standard NaOH solution. The titration is reproducible and usually yields excellent results.

**Reaction**

\[
\text{HCl} + \text{NaOH} \rightarrow \text{NaCl} + \text{H}_2\text{O}
\]

**Reagents and Chemicals**

1. HCl solution 1 M.
2. NaOH standard solution 0.1M
3. Phenolphthalein indicator.

**Procedure**

1. By dilution from the 1M HCl solution prepare approximately 0.1 M solution

2. Transfer exactly 20 mL of the approximately 0.1 M HCl solution into a 250 mL conical flask.
3. Add 3 drops of phenolphthalein indicator.
4. Titrate against standard NaOH solution till the very first appearance of the permanent pink color.
5. Calculate the molarity of HCl.