

EXPERIMENT NO. 1

Aim: To determine the percentage composition of NaCl and NaOH in a given solution prepared by mixing 5 gm. of the mixture in 1 Litre solution with the help of Na_2CO_3 .

Apparatus required: Burette, Pipette, beakers, Titration stand, conical flask and glass funnel etc.

Chemicals required: HCl, Na_2CO_3 . N/20, phenolphthalein and Methyl Orange.

Indicator – Methyl orange and phenolphthalein.

Theory: For the titration of solution of NaOH and NaCl and other solution needed is HCl. NaOH react with HCl whereas NaCl will remain as such.

The mixture solution will be treated with HCl solution by this way we can determine the normality and strength of NaOH. By subtracting the strength of NaOH from the total strength of solution we can find out the strength of NaCl and its % composition.

Reactions involved:

1. $\text{NaOH} + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O}$
2. $\text{HCl} + \text{Na}_2\text{CO}_3 \rightarrow \text{NaHCO}_3 + \text{NaCl}$
3. $\text{NaHCO}_3 + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O} + \text{CO}_2$

Procedure:

(I). Standardization of HCl ($\text{HCl}/\text{Na}_2\text{CO}_3$)

1. 50 ml of HCL is filled in the burette.
2. 10 ml of Na_2CO_3 is pipette out in the flask.
3. 2-3 drops of **Methyl Orange** are poured in the conical flask.
4. HCL is poured in the conical flask till the colour of the solution in flask changes from **yellow to pink**.
5. The experiment is repeated for obtaining concordant reading.

(II). Titration of Mixture [(NaOH + NaCl) with HCl]

1. 50 ml of HCl is filled in the burette.
2. 10 ml of mixture (NaOH + NaCl) is pipette out in the conical flask.
3. Add 2-3 drops of indicator phenolphthalein to the solution in conical flask.
4. HCl is poured now in the conical flask till the colour of the solution in conical flask changes from **Pink to colourless**.
5. The titration is repeated for obtaining concordant reading.

Observations-**Titration - I**

Solution in burette – HCl

Solution in conical Flask – Na_2CO_3

Indicator – Methyl Orange

End Point – Yellow to Pink

Observation Table:

Serial No.	Burette Reading		Volume of HCl (ml)
	Initial	Final	
1	0	16.5	16.5
2	16.5	32.9	16.4
3	32.9	49.3	16.4

Titration - II

Solution in burette – HCl

Solution in conical Flask – Mixture ($\text{NaOH} + \text{NaCl}$)

Indicator – Phenolphthalein

End Point – Pink to Colourless

Observation Table:

Serial No.	Burette Reading		Volume Used (ml)
	Initial	Final	
1	0	10.4	10.4
2	10.4	20.9	10.5
3	20.9	31.4	10.5

Calculations:**Titration -I (HCl Vs Na_2CO_3)**

$$N_1 V_1 = N_2 V_2$$

(HCl) (Na_2CO_3)

$$\begin{aligned}
 N_1 (\text{HCl}) &= N_2 V_2 / V_1 \\
 &= 0.05 \times 10 / 16.5 \\
 &= 0.03 \text{ N}
 \end{aligned}$$

Titration -II (HCl Vs Mixture)

$$\begin{aligned}
 N_1' V_1' &= N_2' V_2' \\
 (\text{HCl}) (\text{Mix.}) \\
 N_2' &= N_1' V_1' / V_2' \\
 &= 0.03 \times 10.5 / 10 \\
 N_2' (\text{NaOH}) &= 0.031 \text{ N}
 \end{aligned}$$

Total strength of Mix. = 5 g/L

Strength of NaOH = Normality X Eq. Wt.

$$\begin{aligned}
 \text{Strength}_{\text{NaOH}} &= 0.031 \times 40 \\
 &= 0.031 \times 40
 \end{aligned}$$

$$= 1.24 \text{ g/L}$$

$$\text{Strength}_{\text{NaCl}} = \text{Total Strength} - \text{Strength}_{\text{NaOH}}$$

$$= 5.0 - 1.24$$

$$= 3.76 \text{ g / L}$$

$$\% \text{ of NaOH} = (1.24/5) \times 100$$

$$= 24.8 \%$$

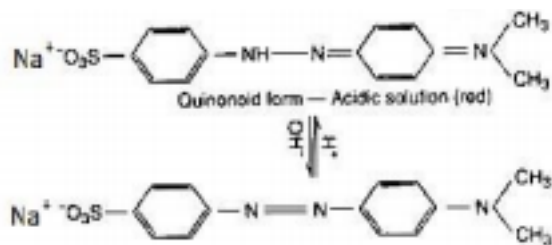
$$\% \text{ of NaCl} = (3.76/5) \times 100$$

$$= 75.2 \%$$

Structures:

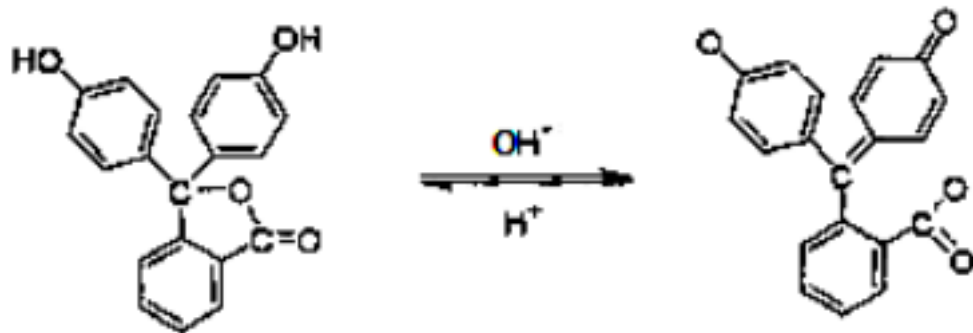
Methyl Orange

Pink (Acidic Medium)



Basic medium (Yellow)

Phenolphthalein



Colourless (Acidic Medium) Pink (Basic Medium)

Result:

NaOH in the given solution = 1.26 g/L = 25.2 %

NaCl in the given solution = 3.74 g/L = 74.8 %

Precautions:

1. Wash the apparatus before use.
2. Rinse the burette and pipette with the respective solution to be filled in it.
3. Do not rinse the conical flask with the solution to be taken in it.

Applications:

NaOH is used to make soap and main ingredient in household products such as liquid drain cleaners.