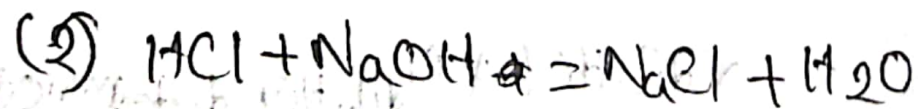
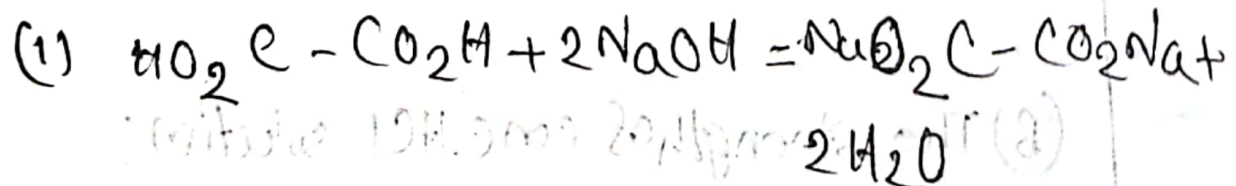


Exp 2: Standardization of Hydrochloric Acid (HCl) solution with standard sodium hydroxide (NaOH) solution.

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Theory: Methods: Acid-base titration  
Reactions:



Indicators: Phenolphthalein, methyl orange

Experimental Data:

$$\begin{aligned}\text{The strength of oxalic acid solution} &= \frac{\text{Weight taken (in gm)} \times 10}{0.63} \\ &= \frac{0.62 \times 10}{0.63} \text{ N} \\ &= 0.0984 \text{ N}\end{aligned}$$

Table 1: Standardization of supplied NaOH solution against standard oxalic acid solution by acid-base titration:

No of reading	Vol of NaOH (in ml)	Vol of Oxalic acid (burette reading) (in ml)			Mean (in ml)
		Initial	Final	Difference	
1	10	0.00	8.50	8.50	$\frac{8.50 + 8.70 + 8.60}{3}$ = 8.60
2	10	8.50	17.20	8.70	
3	10	17.20	25.80	8.60	

The strength of supplied NaOH solution:

$$\begin{aligned}N_{\text{NaOH}} \times V_{\text{NaOH}} &= V_{\text{oxalic acid}} \times N_{\text{oxalic acid}} \\ \Rightarrow N_{\text{NaOH}} &= \frac{8.60 \times 0.0984}{10}\end{aligned}$$

$$= 0.0896 \text{ N}$$

$$\approx 0.089 \text{ N}$$

Table 2: Standardization of supplied HCl solution against standard NaOH solution by acid-base titration:

No of Reading	Vol of NaOH (ml)	Vol of HCl (burette reading) (in ml)			Mean (in ml)
		Initial	Final	Difference	
1	10	0.00	9.70	9.70	$\frac{9.70 + 9.80 + 9.80}{3}$ $= 9.77$
2	10	9.70	19.50	9.80	
3	10	19.50	29.30	9.80	

Calculations:

(A) The strength of supplied dil. HCl solution:

$$V_{\text{NaOH}} \times N_{\text{NaOH}} = V_{\text{dil. HCl}} \times N_{\text{dil. HCl to be determined}}$$

$$\Rightarrow N_{\text{dil. HCl to be determined}} = \frac{10 \times 0.0896}{9.77}$$

$$\approx 0.087 \text{ N}$$

$$\approx 0.09 \text{ N}$$

(B) The strength of conc. HCl solution:

$$1000 \text{ ml} \times V_{\text{dil. HCl}} \times N_{\text{dil. HCl determined}} = V_{\text{conc HCl taken}} \times N_{\text{conc HCl to be determined}}$$

$$\Rightarrow 1000 \times 0.087 = 10 \times N_{\text{conc. HCl}}$$

$$\Rightarrow N_{\text{conc. HCl}} = 8.7 \text{ N}$$

Results:

(A) The strength of suppli dil. HCl solution  
is 0.09 Normality

(B) The strength of conc. HCl solution is  
8.7 Normality