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

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Theory: Methods: Acid-base titration

Reactions:

(1) $HO_2C-CO_2H + 2NaOH = NaO_2C-CO_2Na + 2H_2O$

(2) $HCl + NaOH = NaCl + H_2O$

Indicators: Phenolphthalein, methyl orange

Experimental Data:

The Strength of oxalic acid solution $= \frac{\text{Weight taken (in gm)} \times 0.1}{0.63}$

$= \frac{0.62 \times 0.1}{0.63}$ N

$= 0.0984$ N

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	$\frac{8.50+8.70+8.60}{3}$
2	10	8.50	17.20	8.70	
3	10	17.20	25.80	8.60	$= 8.60$

The Strength of supplied NaOH solution:

$$V_{NaOH} \times N_{NaOH} = V_{oxalic\ acid} \times N_{oxalic\ acid}$$

$$\Rightarrow N_{NaOH} = \frac{8.60 \times 0.0984}{10}$$

$= 0.0846\ N$

$\simeq 0.085 N$

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

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

Calculations:

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

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

$$\Rightarrow N_{dil.HCl \text{ to be determined}} = \frac{10 \times 0.0846}{9.77}$$

$$= 0.087\ N$$

$$\simeq 0.09 N$$

(B) The strength of conc. HCl solution:

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

1000 ml

10 ml

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

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

Results:

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

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