Exp 3: Standardization of Hydrochloric Acid (HCl) solution with standard Sodium Carbonate (Na₂CO₃) solution.

Name: Nafincin Leo, Id: 20-42195-1, Section: U

Theory:

Methods: Acid-base titration

Reactions: (1) $Na_2CO_3 + HCl = NaHCO_3 + NaCl$ (pH ~9)

(2) $NaHCO_3 + HCl = NaCl + CO_2 + H_2O$ (pH ~4)

Indicators: Phenolphthalein, Methyl orange

Experimental Data:

Strength of sodium Carbonate solution

$$= \frac{weight\ taken\ (in\ gm) \times 0.1}{0.53}\ (N)$$

$$= \frac{0.44 \times 0.1}{0.53}\ (N)$$

$$= 0.083\ N$$

Table: standardization of supplied HCl solution against standard Na_2CO_3 solution by acid base titration.

No of reading	Vol of Na_2CO_3(in)	Vol of HCl (in mL)			Difference between (a) and (c) (in mL)	Mean (in mL)
		Initial(a)	1st end point(b)	2nd end point(c)		
1	10	0.00	5.60	10.00	10.00	$10 + 10.3 + 10.9$
2	10	10.00	14.60	20.30	10.30	$+10.10$
3	10	20.30	25.30	30.70	10.40	$\dfrac{}{4}$
4*	10	30.70	---	40.80	10.10	$= 10.20$

* 4th reading with methyl orange only

Calculations:

A) The strength of supplied dil HCl solution:

$$V_{Na_2CO_3} \times N_{Na_2CO_3} = V_{dilHCl} \times N_{dil.HCl} \text{ to be determin}$$

$$\Rightarrow N.dil = \frac{10 \times 0.083}{10.20} \, N$$

$$\Rightarrow N.dil = \cancel{0.08313N} \ 0.0813 \, N$$

$$\approx 0.08 \, N$$

(B) The strength of conc. HCl solution:

$$V_{dil.\,HCl} \times N_{dil.\,HCl\,determined} = V_{conc.\,HCl\,taken} \times N_{conc.\,HCl\,to\,be\,determined}$$
$$1000\,ml \qquad\qquad\qquad\qquad 10\,ml$$

$$\Rightarrow N_{conc.\,HCl} = \frac{1000 \times 0.0813}{10}\,N$$

$$\Rightarrow N_{conc.\,HCl} = 8.13\,N$$

Results:

(A) The strength of supplied dil. HCl solution

is 0.08 Normality

(B) The strength of conc. HCl solution

is 8.13 Normality