

# Green University of Bangladesh

Dept. of Computer Science and Engineering



## Lab report-2

**Course Code: CHE-102**

**Course Title: Inorganic & Physical Chemistry Lab Report**

Submitted To:	Submitted By:
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Remarks

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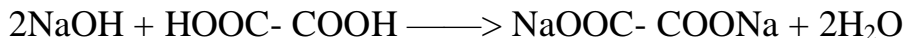
## Experiment No: 02

**Experiment name:** Standardization of Commercial Hydrochloric acid solution with standard Sodium Hydroxide solution.

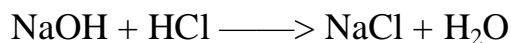
### Theory:

The strength determination of both commercial Hydrochloric acid and NaOH is done

by means of titration. In presence of a suitable indicator, a chemical substance that detects the end point of a reaction by changing its color, the volumetric analysis in which a standard solution is added in another solution to reach its end point and to determine the strength of that solution is called titration. The reaction between NaOH and Oxalic acid is ,



Indicator – Phenolphthalein, and the reaction between HCl and NaOH is -



Indicator – Methyl Orange

### Apparatus:

1. Conical flask,
2. Burette,
3. Pipette,
4. Volumetric flask,
5. Stand
6. Funnel

### Chemical Reagents:

1. Standardized NaOH solution
2. HCl solution
3. Distilled water
4. Oxalic Acid
5. Phenolphthalein
6. Methyl Orange

### Experimental Data:

Standardization of NaOH solution with standard Oxalic Acid solution

Number of Observation	Volume of NaOH (ml)	Burette Reading (ml)		Volume of Acid (ml)	Average Reading (ml)	Strength Of acid (M)
		Initial Reading	Final Reading			
1	10	0	10	10		
2	10	10	21.5	11.5	10	1
3	10	21.5	31.5	10		

Standardization of HCl solution with standard NaOH solution

Number of Observation	Volume of NaOH (ml)	Burette	Reading (ml)	Volume of Acid (ml)	Average Reading (ml)	Strength Of NaOH (M)
		Initial Reading	Final Reading			
1	10	0	15	15		
2	10	15	25.5	10.5	10.5	1
3	10	25.5	36	10.5		

## Calculation:

We know that,  $V_{\text{acid}} \times S_{\text{acid}} = 2V_{\text{base}} \times S_{\text{base}}$

### Determination of the molarity of NaOH :

Here,

$$\begin{aligned}V_{\text{acid}} &= 10 \text{ ml (average)} \\S_{\text{acid}} &= 0.5 \text{ M} \\V_{\text{base}} &= 10 \text{ ml} \\S_{\text{base}} &= ?\end{aligned}$$

$$\begin{aligned}\text{So, } S_{\text{base}} &= (2 \times 10 \times 0.5) / 12 \\&= 1 \text{ M}\end{aligned}$$

### Determination of Molarity of HCl :

Here,

$$\begin{aligned}V_{\text{acid}} &= 10.5 \text{ ml (average)} \\S_{\text{acid}} &= ? \\V_{\text{base}} &= 10 \text{ ml} \\S_{\text{base}} &= 1 \text{ M} \\\text{So, } S_{\text{HCl (dilute)}} &= (10 \times 1) / 10.5 \\&= 0.95 \text{ M}\end{aligned}$$

We also know,

$$V_{\text{concentrated}} \times S_{\text{concentrated}} = V_{\text{dilute}} \times S_{\text{dilute}},$$

Here,

$$\begin{aligned}V_{\text{HCl (concentrated)}} &= 4 \text{ ml} \\S_{\text{HCl (concentrated)}} &= ?\end{aligned}$$

$$V_{\text{HCl(dilute)}} = 100 \text{ ml}$$

$$S_{\text{HCl(dilute)}} = 0.95 \text{ M}$$

$$\begin{aligned}\text{So, } S_{\text{HCl (concentrated)}} &= (100 \times 0.95) / 4 \\ &= 23.75 \text{ M}\end{aligned}$$

## Result:

The strength of HCl (dilute) is found: 0.95 M

The strength of the supplied HCl (concentrated) is: 23.75 M

## Discussion:

The following causes can be assumed for the possible cause of error.

- 1) It is very difficult to determine the end point accurately. So the measured value is deviated from the actual value due to either over titration or under titration. This can also be one of the reasons of the error. This is the main cause of error.
- 2) Another problem may rise from faulty burette reading. If these causes could be avoided we could have got more accurate result of the strength of commercial Hydrochloric Acid.