



AMERICAN INTERNATIONAL UNIVERSITY - BANGLADESH

Department of Natural Science (Chemistry)

Faculty of Science & Technology

Programs: B.Sc. Eng'g (EEE/CSE/IPE)

CHEM 1101: CHEMISTRY

Chemistry Lab Report

Semester: Summer

Session: 2021-2022

NO EXPERIMENT, NO REPORT

Experiment No: 01

Name of the Experiment: Standardization of Sodium hydroxide (NaOH) solution with standard Oxalic acid ($\text{H}_2\text{C}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$) solution.

Date of Performance: 31-05-22

Date of Submission: 07-06-22

Course-Teacher: Dr. Saiful Islam

Instructions:

1. A lab report consists of three parts: a cover page, body of the report and a data and results sheet (lab-sheet).
2. This is the cover page of a report and students will collect and preserve the lab-sheet of a particular experiment to be performed.
3. Body of the report includes-(1) Objective of the Experiment, (2) Theory, (3) Name of the Chemicals, (4) Name of the Apparatus, (5) Percentage of Error (if necessary) and (6) Discussion (I. Precautions taken, II. Possible errors).
4. Use A4-size off-set paper, write on one side of the paper by hand keeping suitable margin.
5. Staple the lab-sheet at the end of the report and cover page on the top.
6. Submit the report in time to avoid deduction of marks.
7. Students working in a group will write and submit the report individually.
8. Copying of the report from others is strictly prohibited.

Name of the Student: Khondoker Md. Sabit Hasan

ID No: 21-45306-2

Section: M, Group: 09

FOR FACULTY USE ONLY

Faculty comments:

Signature:

Date:

Objective: To know the strength of a secondary standard solution (NaOH) against a primary standard solution ($C_2H_2O_4 \cdot 2H_2O$) by acid-base titration.

Theory:

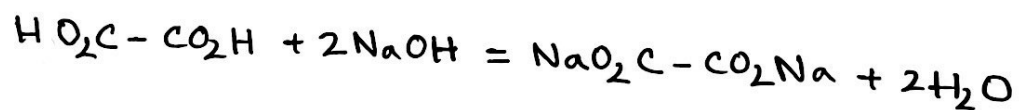
(i) Methods:

An acid-base titration is a method in chemistry that allows quantitative analysis of the concentration of an unknown acid or base solution.

Quantitative analysis is concerned with the determination of concentration or the amount of a known substance quantitatively by Volumetric Analysis (Titration)

(ii) Reactions:

Neutralization reaction between NaOH and oxalic acid is,



(iii) Indicator:

Indicator is a complex organic compound that indicates the end point by changing its colour, at which a chemically equivalent amount of the reagent has been added. Since, it is a weak acid-strong base titration, we use phenolphthalein ($C_{20}H_{14}O_4$) as an indicator in this experiment.

Apparatus:

Burette (50 mL), pipette (10 mL), conical flask (250 mL), volumetric flask (100 mL), watch glass, pipette filler, dropper, stand and clamp etc.

Required chemicals:

1. Supplied NaOH solution. $[\text{NaOH}]$
2. Standard oxalic acid solution. $[\text{HO}_2\text{C}-\text{CO}_2\text{H} \cdot 2\text{H}_2\text{O}]$
3. Phenolphthalein indicator. $[\text{C}_{20}\text{H}_{14}\text{O}_4]$

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Experiment 1

CHEM 1101: CHEMISTRY (EEE/CoE/CSE/IPE)

EXPERIMENT NO. 1: STANDARDIZATION OF SODIUM HYDROXIDE (NaOH) SOLUTION WITH STANDARD OXALIC ACID (HO₂C-CO₂H, 2H₂O) SOLUTION.

OBJECTIVE: To know the strength of a secondary standard solution (for example, NaOH) against a primary standard solution by acid-base titration.

THEORY:

- (i) *Methods:* Acid-base titration,
- (ii) *Reactions:* $\text{HO}_2\text{C}-\text{CO}_2\text{H} + 2\text{NaOH} = \text{NaO}_2\text{C}-\text{CO}_2\text{Na} + 2\text{H}_2\text{O}$
- (iii) *Indicator:* Phenolphthalein

APPARATUS:

Burette (50mL), pipette (10mL), conical flask (250mL), volumetric flask (100mL), watch glass, pipette filler, dropper, Stand and clamp etc.

REQUIRED CHEMICALS:

1. Supplied NaOH solution
2. Standard oxalic acid solution
3. Phenolphthalein indicator

PREPARATION OF APPROX. 0.1N OXALIC ACID SOLUTION. Transfer approx. 0.63 gram of pure oxalic acid (HOOC-COOH.2H₂O) in a 100 ml measuring flask and then dissolve it with distilled water up to the mark. Normality of the prepared acid solution will be calculated as follows:

$$\begin{aligned} \text{Strength of oxalic acid solution} &= \frac{\text{Weight taken (in gm)} \times 0.1}{0.63} \text{ (N)} \\ &= \frac{0.51 \times 0.1}{0.63} = 0.08095 \text{ N} \end{aligned}$$

PROCEDURE: Take 10 mL of NaOH solution in a conical flask by means of a pipette and dilute it to about 50 ml. Add 1-2 drops of phenolphthalein indicator to the solution. Then add standard oxalic acid solution drop by drop from a burette. Shake the flask frequently while adding the acid solution. Stop the addition of oxalic acid solution as soon as the pink color of the solution just disappears. Note the burette reading. The burette reading should be taken carefully at the lower meniscus of the liquid. Difference of the initial and final burette reading gives the volume of the acid added. The process should be repeated at least thrice. Take the mean of the readings. Calculate the normality of the supplied NaOH solution.

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(Expt.1 contd.)

EXPERIMENTAL DATA:

Table: 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	10.5	10.5	10.83
2	10	10.5	21	10.5	
3	10	21	32.5	10.5	
4	10			11.5	

CALCULATIONS:

Strength of supplied NaOH solution:

$$V_{\text{NaOH}} \times N_{\text{NaOH}} = V_{\text{Oxalic acid}} \times N_{\text{Oxalic acid}}$$

$$\Rightarrow 10 \times N_{\text{NaOH}} = 10.83 \times 0.08095$$

$$\Rightarrow N_{\text{NaOH}} = 0.08767 \text{ N}$$

RESULTS:

The strength of supplied NaOH solution is 0.08767 N.

Students should know

- What are gram-equivalent weight, normality and molarity?
- Atomic weight, molecular weight of NaOH and HOOC-COOH, 2H₂O
- Why phenolphthalein is used?
- Reasons behind the change of colour.

Text: M. Mahbul Huque and A. Jabber Mian, "Practical Chemistry", 2nd ed. (1972)

May, 2022

Chemistry Lab Sheet

Discussion:

(a) Precautions taken:

1. Avoid skin and eye contact with the chemicals.
2. Identify the safety equipment.
3. Wear clothing that covers torso and legs.

(b) Possible errors:

1. Might added more than 100 mL distilled water in the oxalic acid solution.
2. Error might be occurred while taking the burette reading.
3. using the equipment incorrectly.