



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: Spring

Session: 2022-2023

NO EXPERIMENT, NO REPORT

Experiment No: 1

Name of the Experiment: Standardization of Sodium Hydroxide (NaOH)

Solution with Standard Oxalic Acid ($C_2H_2O_4 \cdot 2H_2O$) Solution.

Date of Performance: 8th February, 2023, Date of Submission:

Course-Teacher: DR. MOHAMMAD TARIQUL 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 offset 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: TRIDIB SARKAR
ID No.: 22-46499-1, Section: F, Group: 3

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Faculty comments: Signature:
Date:

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

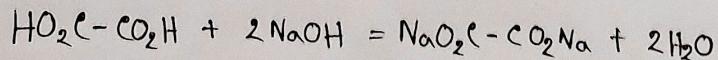
Theory:

(i) Methods: In presence of a suitable indicator the volumetric analysis in which a standard solution is added in another solution (whose strength is not known) to reach its end point to determine the strength of that solution is called Titration.

A solution of known concentration is called a standard solution.

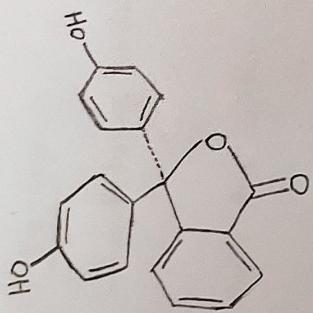
A secondary standard is a substance which may be used for standardizations and whose content of active substance has been found by comparison against of a primary standard. On the other hand, Primary standard is a compound of sufficient purity form which a standard solution can be prepared by direct weighting of a quantity if it followed by dilution to give a defined volume of solution.

(ii) Reactions:



This is an acid-base neutralization reaction. Oxalic acid reacted with NaOH and produce $\text{NaO}_2\text{C}-\text{CO}_2\text{Na}$ and water.

(iii) Indicator: Phenolphthalein



In acid it is colourless and in base it is pink. It is used when a strong base reacted with weak acid.

$(HO_2C-CO_2H) \rightarrow$ This is weak acid.

$(NaOH)$ \rightarrow This is strong base.

Required chemicals:

Name of the chemicals	Chemical formula
1. Supplied Sodium Hydroxide Solution	NaOH
2. Standard Oxalic Acid Solution	$\text{C}_2\text{H}_2\text{O}_4$
3. Phenolphthalein Indicator	$\text{C}_{20}\text{H}_{14}\text{O}_4$

Apparatus:

- (i) Burette (50 ml)
- (ii) Pipette (10 ml)
- (iii) Conical flask (250 ml)
- (iv) Volumetric flask (100 ml)
- (v) Watch glass
- (vi) Pipette filler
- (vii) Dropper
- (viii) Stand and Clamp

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Experiment 1

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

EXPERIMENT NO. 1: STANDARDIZATION OF SODIUM HYDROXIDE (NaOH) SOLUTION WITH STANDARD OXALIC ACID (HO₂C-COOH, 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:* HO₂C-COOH + 2NaOH = NaO₂C-CO₂Na + 2H₂O
- (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:

$$\text{Strength of oxalic acid solution} = \frac{\text{Weight taken (in gm)} \times 0.1}{0.63} (\text{N}) = \frac{0.67 \times 0.1}{0.63}$$
$$= 0.10635 \text{ N}$$

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	9.50	9.50
2	10	18.90	18.90
3	10	28.50	28.50
4	10	37.60	37.60

CALCULATIONS:

Strength of supplied NaOH solution:

$$\begin{aligned} V_{\text{NaOH}} \times N_{\text{NaOH}} &= V_{\text{Oxalic acid}} \times N_{\text{Oxalic acid}} \\ \Rightarrow 10 \times N_{\text{NaOH}} &= 9.40 \times 0.10635 \\ \therefore N_{\text{NaOH}} &= 0.09992 \end{aligned}$$

RESULTS:

The strength of supplied NaOH solution is 0.10 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.

5. Discussion:

Precautions:

1. Took the apparatus carefully.
2. Added standard oxalic acid solution drop by drop from a burette.
3. Calculated the strength properly.

Possible errors:

1. End point error.
2. Misreading the volume.
3. Using the equipment incorrectly.