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: 8
Name of the Experiment: DETERMINATION OF STRENGTH OF A WEAK ACID (CH_3COOH) AGAINST A STRONG AKALI ($NaOH$) SOLUTION BY MEASURING CONDUCTANCE

Date of Performance: 04.04.23, *Date of Submission:* 11.04.23

Course-Teacher: DR. MOHAMMAD ANISUR RAHMAN JAMIL

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: MD. SHOHANUR RAHMAN SHOHAN
ID No: 22-46013-1, *Section:* M, *Group:* 08

FOR FACULTY USE ONLY

Faculty comments: ....., *Signature:* .....
Date: .....

Objectives:

- To draw the titration curves by measuring the conductance.
- To find out the end-point of an acid-base reaction.
- To know the strength of of supplied sample solution.

Theory:

Method: Conductometric titration.

The conductance of an acid solution varies with the amount of alkali solution added to it because of change in number and nature of ions in the solution. The curve showing this variation in called the conductance titration curve. At the end point (also called neutralized) of acid-akali reaction, there ~~are~~ is a sharp change in the conductivity. Therefore, if the conductance titration curve between volume of akali vs conductance is drawn graphically, the end-point of the titration can easily be determined.

The conductance of a dilute acetic acid solution is due to the small ammounts of H^+ ions and acetate ions resulting from dissociation of the weak acid. When small amount of akails added and the H^+ ions are neutralized and equal amount of H^+ ions are not generated by further dissocationof the weak acid because

the acetate ions suppress the dissociation due to common ion effect. Therefore the conductance decrease. Upon further addition of alkali the conductance increase because of the addition of Na^+ ions and formation of acetate ions. After the end-point, the conductance increase at a sharper rate due to addition of fast moving OH^- ions, in addition to the Na^+ ions.

Reaction: The balanced reaction between NaOH and CH_3COOH is as follows:

$$CH_3COOH \longrightarrow CH_3COO^- + H^+$$

$$NaOH \longrightarrow Na^+ + OH^-$$

$$CH_3COOH + NaOH = CH_3COONa + H_2O$$

Required Chemical:

Name of the chemicals	chemical formula
1. Sodium Hydroxide	NaOH (0.1 N)
2. Acetic Acid	CH_3COOH (0.1N)

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Attention: Please bring one graph paper

AMERICAN INTERNATIONAL UNIVERSITY – BANGLADESH (AIUB)

Department of Chemistry

Experiment 8

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

EXPERIMENT NO. 8: DETERMINATION OF STRENGTH OF A WEAK ACID (CH_3COOH) AGAINST A STRONG ALKALI (NaOH) SOLUTION BY MEASURING CONDUCTANCE.

OBJECTIVE:

- To draw the titration curves by measuring the conductance
- To find out the end-point of an acid-base reaction
- To know the strength of supplied sample solution (acid or base)

THEORY:

(i) *Methods*: Conductometric titration,

The conductance of an acid solution varies with the amount of alkali solution added to it because of the change in the number and nature of the ions in the solution. The curve showing this variation in called the conductance titration curve. After complete neutralization, the conductance increases due to the addition of the conducting ions of the alkali. At the end-point there is a sharp change in the conductivity. Therefore, if the conductance titration curve is drawn graphically, the end-point of the titration can easily be determined. The conductance of a dilute acetic acid solution is due to the small amounts of H^+ ions and acetate ions resulting from the dissociation of the weak acid. When small amount of alkali is added and the H^+ ions are neutralized, an equal amount of H^+ ions are not generated by further dissociation of the weak acid because the acetate ions suppress the dissociation due to common ion effect. Therefore the conductance decreases. Upon further addition of alkali the conductance increases because of the addition of Na^+ ions and formation of acetate ions. After the end-point, the conductance increases at a sharper rate due to addition of the fast moving OH^- ions, in addition to the Na^+ ions.

(ii) *Reactions*:

$$CH_3COOH \rightarrow CH_3COO^- + H^+$$
$$NaOH \rightarrow Na^+ + OH^-$$
$$CH_3COOH + NaOH \rightarrow CH_3COONa + H_2O$$

APPARATUS:

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

REQUIRED CHEMICALS:

(1) Supplied 0.1N NaOH solution, (2) Supplied dil. CH_3COOH solution

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(*Expt.8 contd.*)

PROCEDURE:

Take 10 mL of the supplied CH_3COOH solution in a beaker. Place the previously washed (with hot water) conductance cell in it and add sufficient water (~200 mL) to keep the electrodes of the cell immersed. Measure the conductance of the acid solution (1st reading). Fill a burette with the supplied ~ 0.1 N NaOH solution. Add 2/1 mL NaOH solution from the burette, stir the solution and measure the conductance (2nd to 12th reading) after each addition. Get a graph paper ready for the plotting conductance data. Plot conductance data (in μs) against the final volume (in mL) of NaOH solution on graph paper and find the end-point. The end-point gives the required volume of NaOH equivalent to 10 ml of supplied dil. CH_3COOH solution. Now calculate the strength of CH_3COOH solution.

EXPERIMENTAL DATA:

Table: *Conductance-measurement of CH_3COOH and NaOH solutions using conductivity meter.*

No. of reading	*Vol. of CH_3COOH (in ml.)*	*Vol. of NaOH (burette reading) (in ml.)*				*Conductance (μs), Y*
		Initial	Final	Difference	Total X	
1	10	0	0	0	0	079
2	10	0	2	2	2	074
3	10	2	4	2	4	109
4	10	4	6	2	6	156
5	10	6	8	2	8	186
6	10	8	10	2 1	~~10~~ 9	216
7	10	10	11	1	~~11~~ 10	238
8	10	11	12	1	~~12~~ 11	257
9	10	12	13	1	~~13~~ 12	317
10		13	14	1	~~14~~ 13	
11		14	15	1	15	
12		15	16	1	16	

CALCULATIONS:

Strength of supplied CH_3COOH solution:

$$V_{CH3COOH} \times N_{CH3COOH} = V_{NaOH} \times N_{NaOH}$$

$$10 \times N_{CH_3COOH} = 8 \times 0.1$$

$$N_{CH_3COOH} = 0.08\ N$$

RESULTS: The strength of supplied CH_3COOH solution is 0.08 N

(*Attach the graph paper with this lab-sheet*)

Students should know

- Define (a) electrolyte, (b) specific conductance, (c) molar conductance
- What is conductance cell?
- How does the molar conductance of a strong electrolyte vary with concentration?
- How is the molar conductance at infinite dilution determined for (a) a strong electrolyte and (b) a weak electrolyte?

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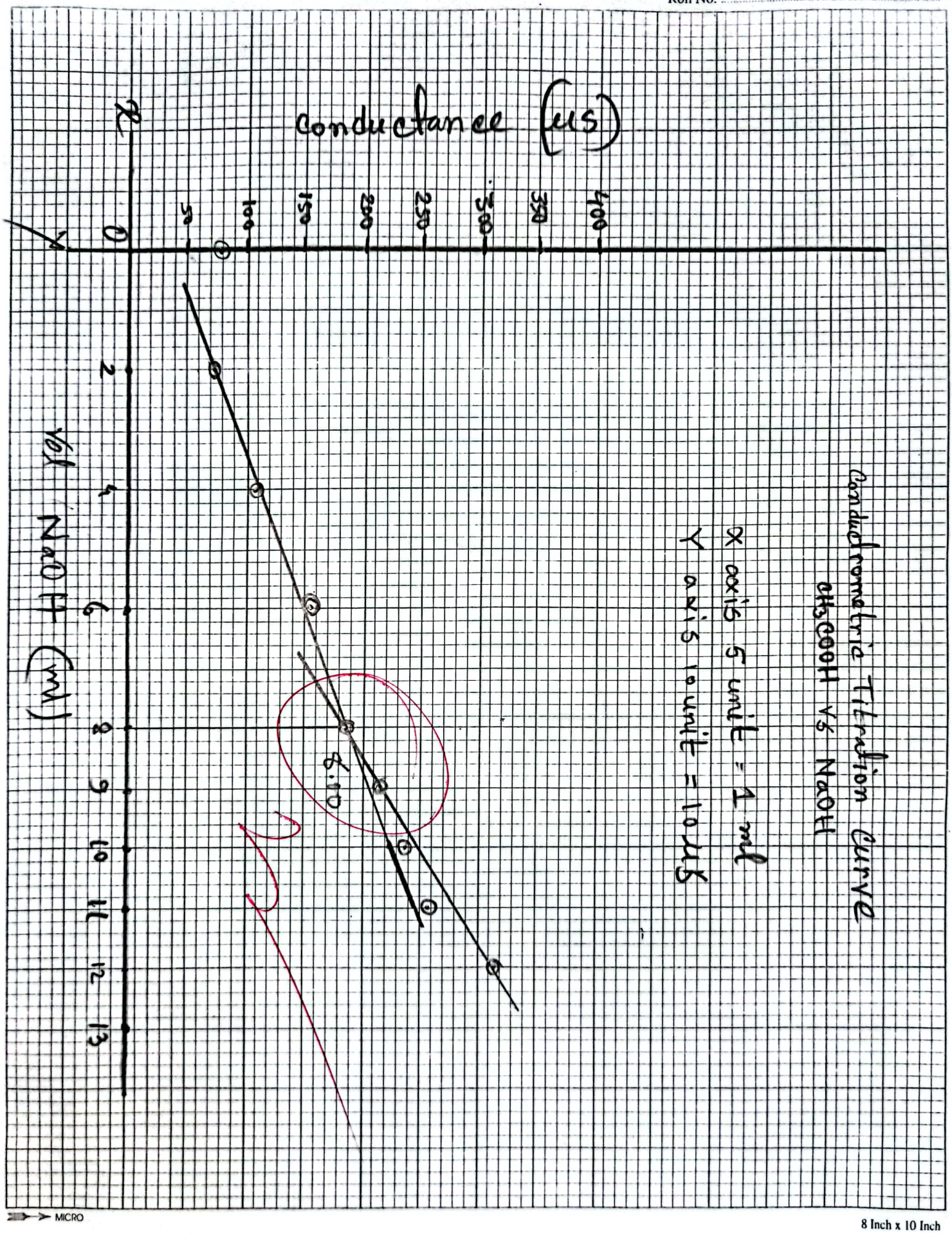
Roll No. .....



Conductrometric Titration Curve
CH_3COOH vs NaOH

X axis 5 unit = 1 ml
Y axis 1 unit = 10 μS

MICRO

8 Inch x 10 Inch

Apparatus:

1. Conductivity meter
2. Burette
3. Pipette
4. Conical flask
5. pipette filler
6. Dropper.
7. Funnel
8. Stand
9. Wash Bottle
10. Clamp.

Discussion:

Precaution Taken:

1. Apparatus were washed with distilled water.
2. Temperature should be kept constant throughout the experiment
3. The titrant should be 10 times stronger so that the volume change is as little as possible

Possible Errors:

1. Error might be happen wille measuring the conductance
2. Few drops of NaOH solution might have bee added.