IV SEMESTER

PRACTICAL MANUAL FOR SECOND B.Sc. CHEMISTRY

(w. e. f. 2020 – 2021)

PRACTICAL – 5

(CONDUCTOMETRIC AND POTENTIOMETRIC TITRIMETRY LAB)

PREPARED BY

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SYLLABUS

Course outcomes

At the end of the course, the student will be able to:

1. Use glassware, equipment and chemicals and follow experimental procedures in the laboratory
2. Apply concepts of electrochemistry in experiments
3. Be familiar with electro analytical methods and techniques in analytical chemistry which study an analyte by measuring the potential (volts) and/or current (amperes) in an electrochemical cell containing the analyte.

Conductometric and Potentiometric Titrimetry 50M

1. Conductometric titration- Determination of concentration of HCl solution using standard NaOH solution.
2. Conductometric titration- Determination of concentration of CH_3COOH Solution using standard NaOH solution.
3. Conductometric titration- Determination of concentration of CH_3COOH and HCl in a mixture using standard NaOH solution.
4. Potentiometric titration- Determination of Fe (II) using standard $K_2Cr_2O_7$solution.
5. Determination of rate constant for acid catalyzed ester hydrolysis

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SCHEME OF VALUATION

Time: 3 Hours Maximum Marks: 50M

Record Marks:5M

Viva-Voce Marks:5M

Practical Marks: 40M

Writing procedure in 15 minutes	10M
For graph with scale	5M
For tabular form and correct calculations	5M
For correct value	20M

HOD OF CHEMISTRY

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EXPERIMENT – 1

DETERMINATION OF CONCENTRATION OF HCL SOLUTION USING STANDARD NAOH SOLUTION

Aim

Determination of strength of HClconductometrically using standard NaOH.

Apparatus

1. Conductometer
2. Beaker
3. Burette
4. Pipette
5. Magnetic stirrer

Required solutions

1. 1N oxalic acid
2. 0.1N HCl
3. 1N NaOH

a) Preparation of 1N oxalic acid solution

Take 6.3 g of oxalic acid in 100 mL volumetric flask and dissolved with distilled water then makeup to the mark.

$$\text{Normality} = \frac{\text{Wt X 1000}}{\text{G M Wt X V}}$$

$$\text{Weight} = \frac{1\ X\ 63.035\ X\ 100}{1000} = 6.3035 \text{ g}$$

b) Preparation of 0.1 N HCl solution in 500 mL

Take 4.3 mL of HCl in 500 mL volumetric flask and makeup with distilled water up to the mark.

c) Preparation of 1 N NaOH solution

Take 10 g of NaOH pellets into 250 mL volumetric flask and dissolved with distilled water and makeup to the mark.

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PROCEDURE

STEP – 1

STANDARDISATION OF NaOH BY USING OXALIC ACID

Take 10 mL of oxalic acid solution into a conical flask to this add 10 mL of distilled water and 2 – 3 drops of phenolphthalein indictor then titrate with NaOH solution until the end point is pink colour appears.

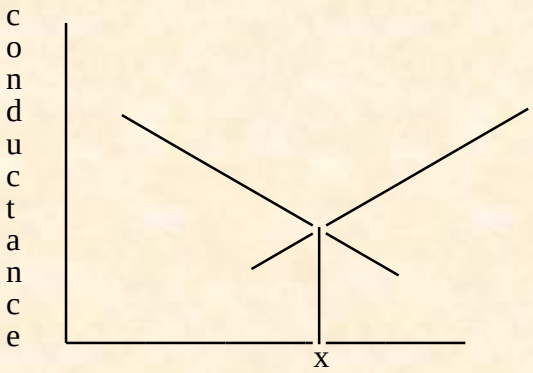
STEP – 2

STANDARDISATION OF HCl BY USING NaOH CONDUCTOMETRICALLY

The conductivity cell is kept in conductive water for few minutes before the use of instrument. 100 mL beaker is first cleaned with distilled water. 25 mL of 0.1 N HCl and 25 mL of water is taken into 100 mL of beaker and is stirred well and the cell conductance is measure, the process is continued until the volume of NaOH solution is added to it and the conductance value corrected for volume corrected by multiplying each volume with $(U + \frac{v}{U})$, where U is the volume of mixture and v is the volume of NaOH.

Graph

A graph is plotted with volume of NaOH along X-axis and corresponding corrected conductance along Y-axis. Two straight lines are obtained, when these two lines are extended, the two lines meet at one point.



Volume of NaOH

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Calculations

1. **Standardistation of NaOH by using oxalic acid solution**

S.No	Volume of oxalic acid solution	Burette readings		Volume of NaOH solution
		Initial	Final	

$N_1V_1 = N_2V_2$

0.9967 X 10 = N_2 X BR

Normality of NaOH$N_2 = \frac{N1\ V1}{V_2}$

N1= $\frac{\mathbf{Wt\ X\ 1000}}{\mathbf{G\ M\ Wt\ X\ V}}$

N1= $\frac{\mathbf{x\ X\ 1000}}{\mathbf{63.035\ X\ 100}}$

= 0.9967N or ≈ 1

2. Standardisation of HCl by using NaOHconductometrically

S.No.	Volume of NaOHV mL	Conductance

$N_1V_1 = N_2V_2$

Normality of HCl N_1= ?

Volume of HCl V_1= 25 mL

Normality of NaOH N_2=1 (from step 1)

Volume of NaOH V_2= (from graph)

$N_1 = \frac{N2\ V2}{V_1}$ N

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EXPERIMENT – 2

DETERMINATION OF CONCENTRATION OF ACETIC ACID SOLUTION USING STANDARD NAOH SOLUTION

Aim

Determination of strength of CH_3COOH conductometrically using standard NaOH.

Apparatus

1. Conductometer
2. Beaker
3. Burette
4. Pipette
5. Magnetic stirrer

Required solutions

1. 1N oxalic acid
2. 0.1N CH_3COOH
3. 1N NaOH

a) Preparation of 1N oxalic acid solution

Take 6.3 g of oxalic acid in 100 mL volumetric flask and dissolved with distilled water then makeup to the mark.

$$\text{Normality} = \frac{\text{Wt X 1000}}{\text{G E Wt X V}}$$

$$\text{Weight} = \frac{1\ X\ 63.035\ X\ 100}{1000} = 6.3035\ \text{g}$$

b) Preparation of 0.1 N CH_3COOH solution in 500 mL

Take 2.9 mL ofCH_3COOH in 500 mL volumetric flask and makeup with distilled water up to the mark.

c) Preparation of 1 N NaOH solution

Take 10 g of NaOH pellets into 250 mL volumetric flask and dissolved with distilled water and makeup to the mark.

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Procedure

STEP – 1

STANDARDISATION OF NaOH BY USING OXALIC ACID

Take 10 mL of oxalic acid solution into a conical flask to this add 10 mL of distilled water and 2 – 3 drops of phenolphthalein indictor then titrate with NaOH solution until the end point is pink colour appears.

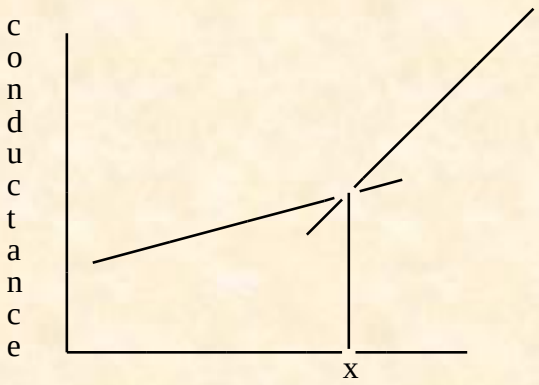
STEP – 2

STANDARDISATION OF CH_3COOH BY USING NaOH CONDUCTOMETRICALLY

The conductivity cell is kept in conductive water for few minutes before the use of instrument. 100 mL beaker is first cleaned with distilled water. 25 mL of 0.1 N CH_3COOH and 25 mL of water is taken into 100 mL of beaker and is stirred well and the cell conductance is measure, the process is continued until the volume of NaOH solution is added to it and the conductance value corrected for volume corrected by multiplying each volume with $(U + \frac{v}{U})$, where U is the volume of mixture and v is the volume of NaOH.

Graph

A graph is plotted with volume of NaOH along X-axis and corresponding corrected conductance along Y-axis. Two straight lines are obtained, when these two lines are extended, the two lines meet at one point.



Volume of NaOH

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Calculations

1. Standardistation of NaOH by using oxalic acid solution

S.No	Volume of oxalic acid solution	Burette readings		Volume of NaOH solution
		Initial	Final	

2. Standardisation of CH_3COOH by using NaOHconductometrically.

S.No.	Volume of NaOHV mL	Conductance

$N_1V_1 = N_2V_2$

Normality of $CH_3COOH N_1$= ?

Volume of $CH_3COOH V_1$= 25 mL

Normality of NaOH N_2 = 1 (from step 1)

Volume of NaOH V_2= (from graph)

$$N_1 = \frac{N2\ V2}{V_1}\ N$$

$$\mathbf{N2} = \frac{\mathbf{Wt\ X\ 1000}}{\mathbf{G\ M\ Wt\ X\ V}}$$

$$\mathbf{N2} = \frac{\mathbf{10\ X\ 1000}}{\mathbf{40\ X\ 250}}$$

= 1 N

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