conductance against volume of NaOH added. 1st equivalence point in the curve corresponds to the neutralization of HCl and the difference of two equivalence point corresponds to the neutralization of CH_3COOH acid. Calculate the normality and amount of HCl and CH_3COOH present in 1000 cm^3 of its solution.

Calculation:

$$(NV)_{acid} = (NV)_{NaOH}$$

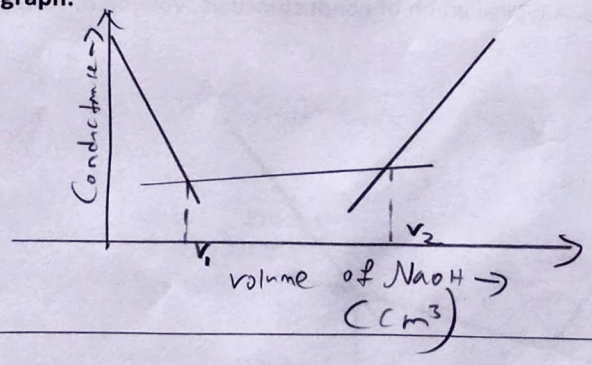
$$N_{acid} = \frac{(NV)_{NaOH}}{V_{acid}}$$

Amount of HCl or CH_3COOH present in 1000 cm^3 of its solution = N_{acid} x gram equivalent weight of acid

Model Procedure /Flow Chart:

pippete out 50cm³ of acid mixture into a beaker. Immerse the conductivity cell into it such that they touch the bottom of beaker. Connect the cells to the conductivity bridge & measure the conductance. Run down 0.2 cm³ of NaOH & measure the conductance after each addition. Conductance decreases in the beginning and then slightly increases. Finally it increases by a large value. Plot a graph of conductance vs Volume of NaOH. 1st eq. point is neutralization of HCl & diff. of 2 points is neutralization of CH_3COOH. Calculate normality & amount of HCl, CH_3COOH present in 1000cm³ of soln.

Model graph:



Model Calculation:

$$(NV)_{HCl} = (NV)_{NaOH}$$

$$N_{HCl} = \frac{(NV)_{NaOH}}{V_1}$$

$$(NV)_{CH_3COOH} = (NV)_{NaOH}$$

$$N_{CH_3COOH} = \frac{(NV)_{NaOH}}{(V_2 - V_1)}$$

wt of HCl = $N_{HCl} \times 36.5$ (Gram Eq. weight of Hcl)

wt of CH_3COOH = $N_{CH_3COOH} \times 60$ (Gram Equivalent weight of CH_3COOH)

Tabulation:

Volume of NaOH in cm^3	Conductance in mS
0.0	9.09
0.2	8.78
0.4	8.11
0.6	7.25
0.8	6.48
1.0	5.63
1.2	5.05
1.4	4.21
1.6	3.56
1.8	2.97
2.0	2.80
2.2	2.88
2.4	3.02
2.6	3.18
2.8	3.35
3.0	3.52
3.2	3.67
3.4	3.84

Volume of NaOH in cm^3	Conductance in mS
3.6	4.05
3.8	4.56
4.0	5.01
4.2	5.36
4.4	5.93
4.6	6.32
4.8	6.87
5.0	7.38
5.2	7.86
5.4	8.27
5.6	8.70
5.8	9.17
6.0	9.59

Calculation:

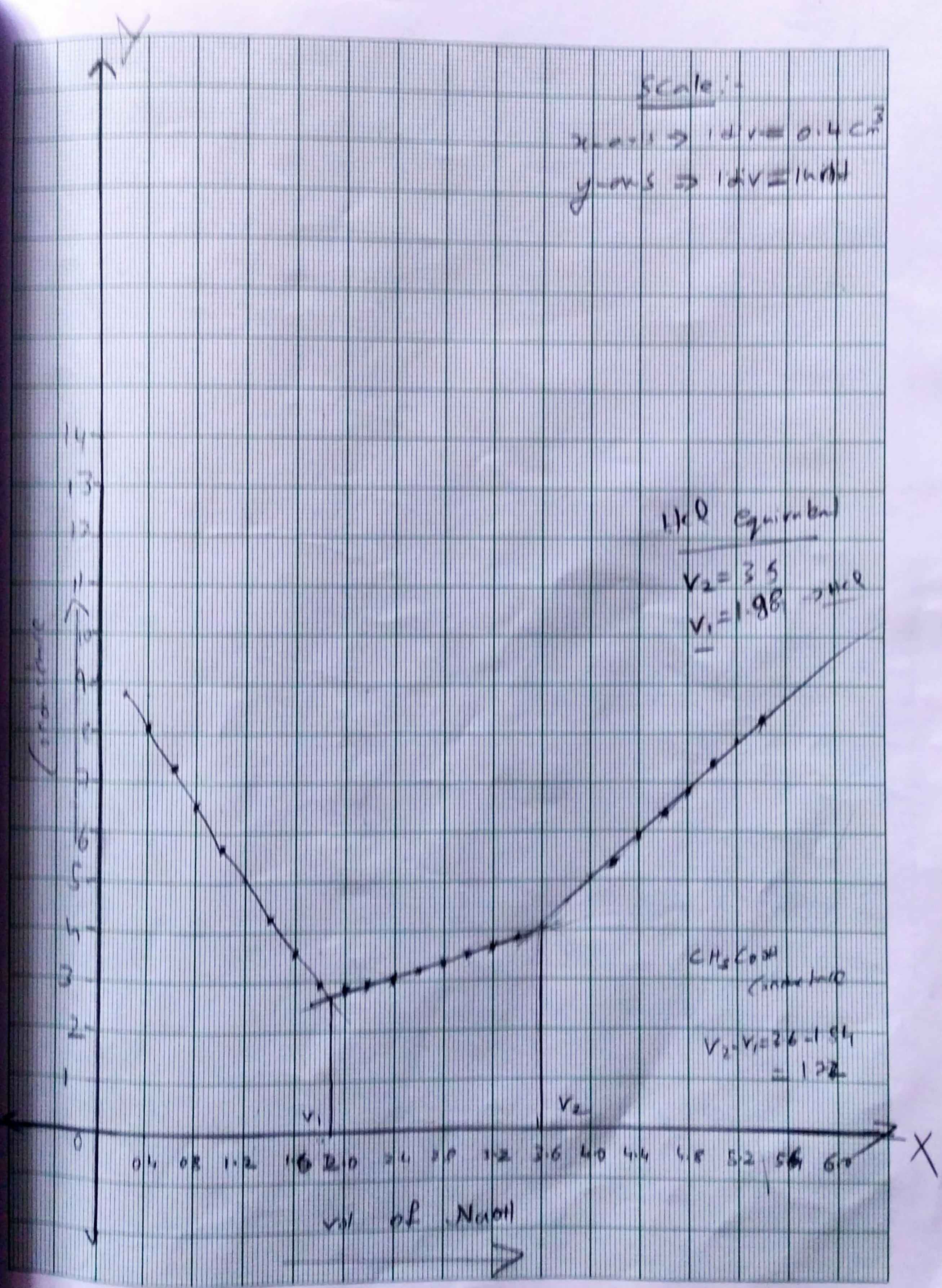
$(NV)_{acid} = (NV)_{NaOH}$

$N_{acid} = \frac{(NV)_{NaOH}}{V_{acid}}$

Equivalence point

$= 4.0 - 2.4 = 3.6 - 1.2$

$= 1.6 \quad = 1.26$



Scale:-
x-axis ⇒ 1 div = 0.4 cm³
y-axis ⇒ 1 div = 1 unit
HCl equivalent
V2 = 3.5
V1 = 1.98 → HCl
CH3COOH
V2 - V1
V1
V2
vol of NaOH
Y
X

$= \frac{0.05 \times 1.76}{50} = 0.00176N$ of CH_3COOH

$N_{Acid} = 0.00176N$ of CH_3COOH

Amount of CH_3COOH present in 1000 cm^3 of its soln

→ N_{acid} × eq wt of acid

$= 0.00176 \times 60$

$= 0.1032g$ of CH_3COOH

HCl equivalent point = $V_1 = 2.4 cm^3$

$(NV_{acid}) = (NV)_{NaOH}$

$N_{acid} = \frac{0.05 \times 1.88}{50} = 0.00188N$ of HCl

Amount of HCl present = N_{acid} × gm eq wt of Acid

$= 0.00188N \times 36.5 = 0.06862gm$ of HCl

Inference:

In this experiment, Conductance of solution depends on the no. of charge on ions, ions & molality.

HCl is a strong electrolyte & dissolves Completly after NaOH is added.

but CH_3COOH is not so it partially dissolves.

There is increase in conductance after a certain pH

Relevance to Society & Environment:

Conductometric titration can be used determine water purity. It can be used to measure pollution levels in the different water bodies like lakes and rivers etc

Report:

1. Normality of HCl = 0.00188 N, Normality of CH3COOH = 0.00172 N
2. Amount of HCl present in 1000 cm^3 of its solution = 0.06862 g
3. Amount of CH_3COOH present in 1000 cm^3 of its solution = 0.1032 g

Evaluation of experiment - 6		
Components	Marks	
	Max	Obtained
Model Procedure, Model Graph & Calculation	16	16
Equivalence Point & Execution	20	19
Inference & Societal Relevance	04	03
Total	40	38
Signature of Teacher		