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Expt. No. 7

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EXPERIMENT: Determine the strength of sodium hydroxide solution by titration with standard hydrochloric acid (0.1N) conductometrically.

THEORY: There is a decrease in H^+ ion concentration upon addition of NaOH solution to the HCl solution, resulting in decrease in conductivity of the solution.
During titration, conductivity of solution first decreases upto equivalence point, then increases due to increase in hydroxyl ion concentration. Initially, with the addition of the alkali to the acid there will be a decrease in conductance. After the neutralization is complete, further addition of alkali would result in increase of conductance, since the additional OH^- ions from the NaOH are no longer used up in the chemical reaction.
So, if we plot conductivity versus volume of HCl and NaOH, we get V-shaped curve. From the titration curve an equivalence point can be obtained.

PROCEDURE: 1. Take 50ml of HCl solution in a clean beaker and immerse / dip the conductivity cell in it. Make sure that the two platinum electrodes of the cell are completely dipped in the solution.
2. Connect the cell to the bridge. Note down the conductivity.
3. Add NaOH from the burette at an interval of 0.5ml each time, stir the contents and note down the conductivity every time. The conductivity will first decrease and then increase.
4. Plot the conductance against the volume of NaOH added. The equivalence point can be determined from the intersection of two

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APPARATUS: Pipette, burette, beakers, funnel, burette stand, clamp, conductometer and conductivity cell.

CHEMICALS: Standard hydrochloric acid (HCl) and sodium hydroxide (NaOH)

CHEMICAL REACTIONS:

$$NaOH + HCl \longrightarrow NaCl + H_2O$$

DIAGRAM:

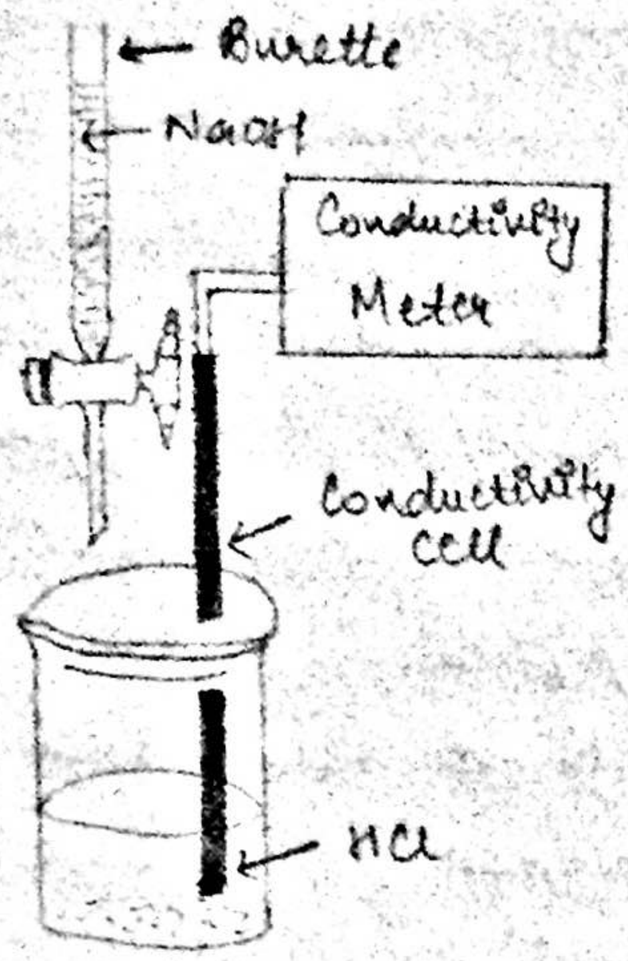


Fig. 1: Apparatus

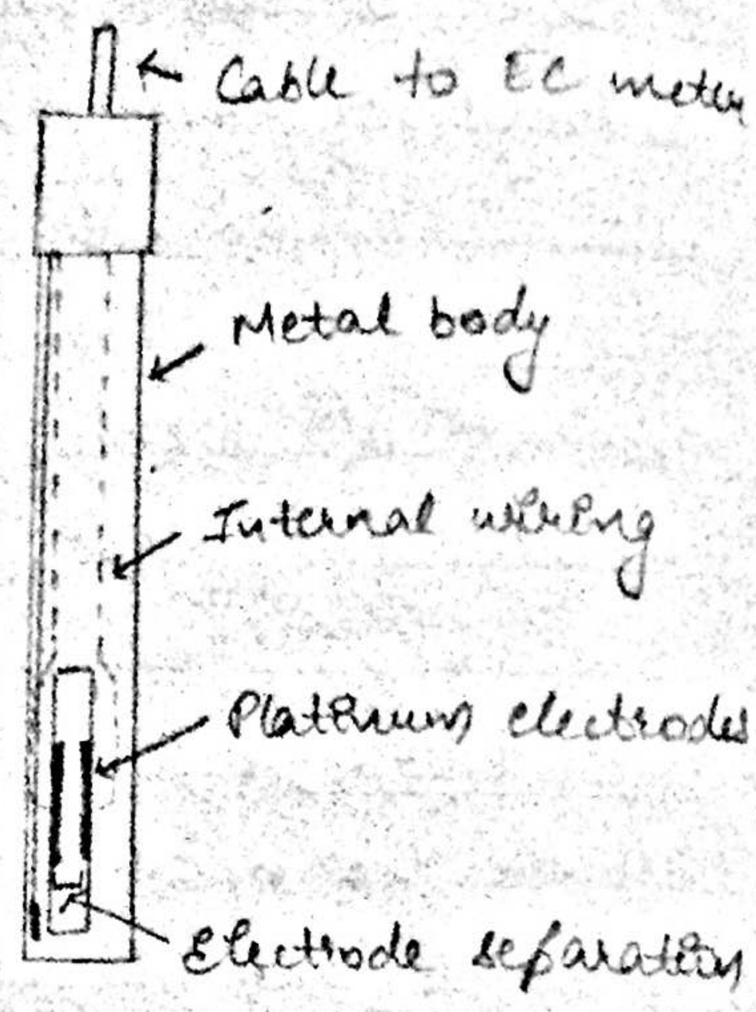
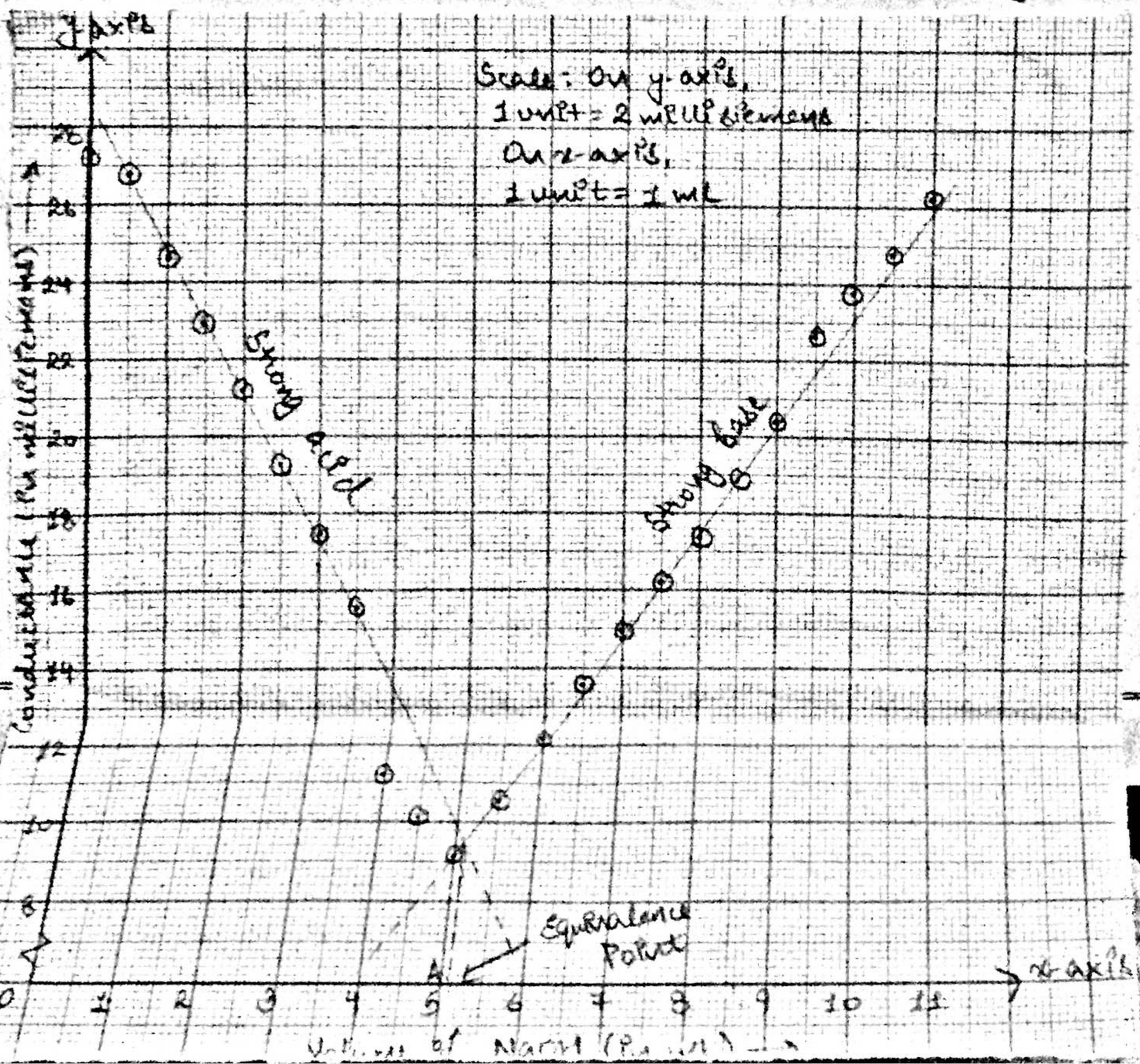


Fig. 2: Conductivity cell

GRAPH:



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Plus on the graph and hence the strength of NaOH solution can be calculated. This procedure can also be applied to find the strength of mixtures of two acids or bases and also in the precipitation titration.

RESULT: The strength of sodium hydroxide present in the given sample is 39.2 gm/L.

PRECAUTIONS: 1. The platinum electrode should be correctly placed in the beaker and should not be used as a stirrer.
2. The drops of NaOH should fall directly into the beaker from the burette and not on the walls of beaker or electrode.
3. Rinse the apparatus before experimenting.

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OBSERVATION :

Volume of 0.1N HCl taken in the beaker = 50 ml

Sr. No.	Volume of NaOH added from the Burette (in ml)	Conductance (in milli mhos)
1.	0	27.1
2.	0.5	26.3
3.	1.0	24.6
4.	1.5	22.9
5.	2.0	21.1
6.	2.5	19.3
7.	3.0	17.5
8.	3.5	15.6
9.	4.0	13.2
10	4.5	10.1
11.	5.0	9.1
12.	5.5	10.6
13.	6.0	12.2
14.	6.5	13.6
15.	7.0	15.0
16.	7.5	16.2
17.	8.0	17.4
18.	8.5	18.9
19.	9.0	20.4
20	9.5	22.7
21.	10.0	23.8
22.	10.5	24.8
23.	11.0	26.2

CALCULATIONS: Applying Normality Equation

$$N_{NaOH} = N_{aq} \times (50/A) = 0.1 \times (50/5.1)$$
$$= 0.98N$$

Strength of NaOH (gm/L) = $0.98 \times 40 = 39.2$ gm/L

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