CONDUCTOMETRIC TITRATION
DETERMINATION OF STRENGTH OF AN ACID

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Aim:To determine the strength of a given solution of HCl using the given NaOH solution by conductometric titration.

- Apparatus required
- 1) Burette
- 2) pipette
- 3) Standard measuring flask
- 4) glass rod
- 5) Beaker
- 6) Wash bottle
- 7) funnel
- 8) Conductivity meter
- 9) conductivity cell

Reagents

1) sodium hydroxide solution(0.1N)

2) distilled water

3) HCl solution whose concentration is to be determined

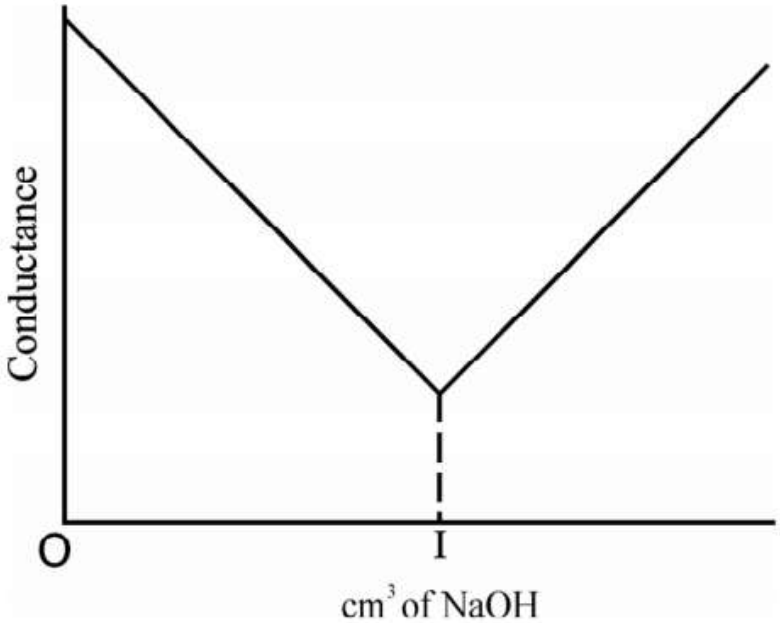
Principle:

- Conductance depends upon the number of ions present in a solution and their ionic mobility.
- For a neutralization reaction between an acid and a base, the addition of the base would lower conductivity of the solution initially.
- This is because the H^+ ions would be replaced by the slow moving Na^+ ions of the base.
- After the equivalence point is reached, further addition of excess alkali introduces fast moving OH- ions and hence the conductance of the solution increases.
- Therefore, two straight lines with opposite slopes will be obtained when the conductance values are plotted graphically against volume of sodium hydroxide added.
- The point where these two lines intersect is the equivalence point.

Procedure:

- Burette solution: NaOH solution
- Pipette solution:10ml of the made up HCl solution
- The given HCl solution is made upto 100ml in a standard flask.
- 10ml of the made up HCl solution is pipetted out into a 250ml beaker.
- It is diluted with 90ml distilled water so that the conductivity cell is completely immersed in the solution.
- The solution is stirred well with a glass rod and the initial conductance of the solution is noted.
- 1ml NaOH is added from the burette and conductance is measured after each addition.
- Initially, the conductance decreases and at one point it starts increasing.
- The point at which the conductance starts increasing shows the end point has been reached.
- A plot of Conductance against volume of sodium hydroxide gives the end point.
- The intersection of the two straight lines and the volume corresponding to the intersection point to the x-axis is noted.
- In order to get the accurate end point, the fair titration is performed in the same manner, by adding NaOH in increments of 0.2ml before and after the end point.
- The strength of HCl can be calculated using the formula
- $V_1N_1=V_2N_2$

Model Graph(Common for both pilot and fair titration)



Conductometric titration of a strong acid (HCl) vs. a strong base (NaOH)

Table 1:Standard sodium hydroxide Vs unnown Hcl(Pilot titration)

S.No	Volume of NaOH (ml)	Conductance(Ω^{-1})

Table 1:Standard sodium hydroxide Vs unnown HCl(Fair titration)

S.No	Volume of NaOH (ml)	Conductance(Ω^{-1})

- Calculations
- V_1=Volume of HCl solution(10ml)
- N_1=Normality of HCl solution
- V_2=Volume of NaOH(From the graph)
- N_2=Normality of NaOH(0.1N)
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- $N_1=V_2N_2/V_1$
- Hence N_1-the strength of HCl can be calculated
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- Result:
- The strength of the given HCl solution= _____N