CONDUCTOMETRIC TITRATION AND IT'S ADVANTAGES

To find end point in Volumetric titration on the basis of the number of ions and their mobalities.

Acid is taken in Conductometric Vessel and alkali is added from burette in acid - base titrations.

(1) Strong acid HCl Vs strong base NaOH : —

When ALKali (NaOH) is added gradually the hydrogen ion is replaced by slowly moving Sodium ion.

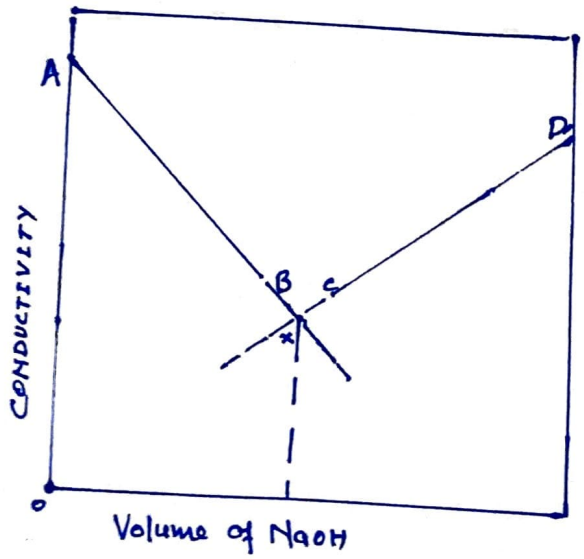
$$H^+(Aq.) + Cl^-(Aq) + Na^+(Aq.) + OH^-(Aq.) \longrightarrow Na^+(Aq.) + Cl^-(Aq.) + H_2O(l)$$

In this case the Conductivity will go on decreasing till the acid has been Completely Neutralised. Any further addition of alkali will introduce fast moving OH^- ions.

The Conductivity after the end-Point increases

On Plotting a graph, Conductivity Vs the Volume of alkali added then the point of intersection of two straigh lines will give the end-Point.

A graph of Conductivity Vs Volume of Alkali is as follows.



(2) Strong Acid (HCl) Vs Weak base (NH_4OH) :—

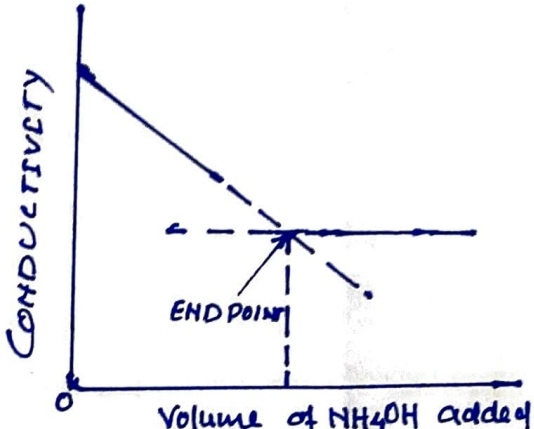
Under conductometric titration of HCl Vs NaOH, the conductivity will fall due to fast moving H^+ ion is replaced by slow moving NH_4^+ ion.

But after neutralisation, further addition of weakly ionised NH_4OH will not cause any change in conductivity

Reaction occurs like

$$H^+ + Cl^- + [NH_4OH] \rightarrow NH_4^+ + Cl^- + H_2O(l)$$

On plotting the graph conductivity Vs the volume of alkali added, the point of intersection of two straight lines will give the end-point.



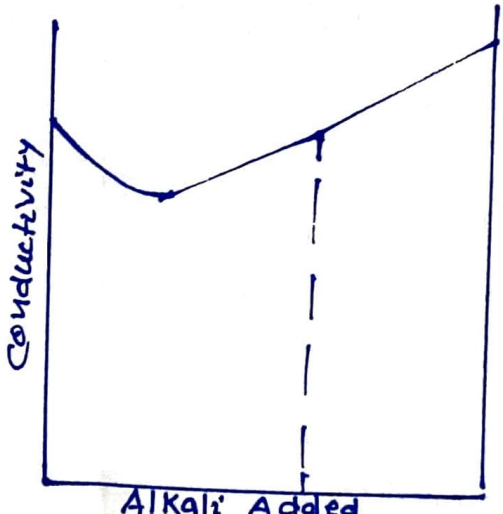
(3) Weak acid (CH_3COOH) Vs Strong base (NaOH) →

Weak acid dissociated poorly so conductivity will be low. On continued addition of Alkali (NaOH), a highly ionised $CH_3COO^-Na^+$ is formed and hence Conductivity begins to increase

But after neutralisation, futher addition of alkali introduces the excess of fast moving OH^- ions. Thus Conductance beegns to increase more sharply.

$$CH_3COOH + [Na^+ + OH^-] \rightarrow CH_3COO^- + Na^+ + H_2O$$

On Plotting a graph between Conductivity Vs Volume of alkali added, the Point of intersection of the two straight lines will give the end Point.

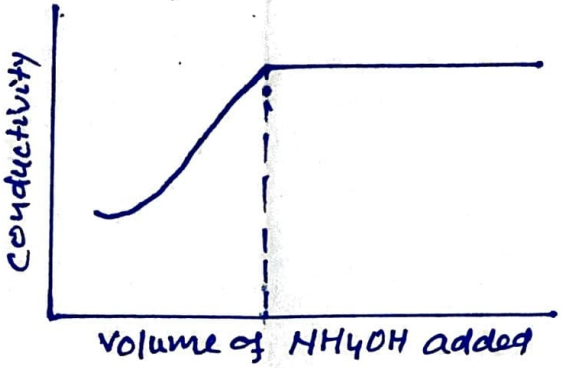


(4) Weak acid (CH_3COOH) Vs Weak base (NH_4OH) :-

$$CH_3COOH + NH_4OH \longrightarrow CH_3COO^-NH_4^+ + H_2O$$

Initially increase in the conductivity due to formation of ionisable $CH_3COO^-NH_4^+$. After the end-point any subsequent addition of NH_4OH would not change the conductance.

Hence a horizontal line is obtained. The point of intersection of the two st. lines gives the End-Point.



(5) Precipitation Titrations :- [($AgNO_3$) Vs (KCl)] :-

$$Ag^+(aq.) + NO_3(aq.) + [K(aq.) + Cl^-(aq.)] \rightarrow K^+(aq.) + NO_3(aq.) + AgCl(s)$$

In the precipitation titration, the change in Conductivity on addition of KCl is almost constant due to identical mobility of K^+ and Ag^+ ions.

The conductivity starts to increase only after End-Point.

On Plotting a graph between Conductivity Vs the Volume of KCl added; the point of intersection of the two st. lines give the End-Point.