

**Q. 1. Explain theories of Acid Base indicators.**

**Ans.**

1. **Ostwald's Theory:-** According to this theory, the indicators are either weak acid or weak bases and the dissociated form of indicator has different colour than the undissociated form.

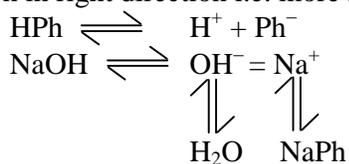
A basic indicator must possess a coloured cation and an acidic indicator must possess a coloured anion.

Eg. Phenolphthalein (HPh):

It is weak acid and is mostly unionized. Unionized molecules are colorless while on ionization it gives colorless  $H^+$  and pink colored  $Ph^-$  ions.



If  $H^+$  i.e. acid is added, ionization of HPh is suppressed due to common ion ( $H^+$ ) and solution is colorless. When a base like NaOH or KOH is added  $OH^-$  are produced that combines with  $H^+$  of HPh to form unionized  $H_2O$ . Removal of  $H^+$  causes dissociation of HPh in right direction i.e. more HPh will dissociate to produce  $Ph^-$  ions.



Less ionized      Highly ionised

Colour is produced in alkaline media due to presence of  $Ph^-$  ions.

2. **Quinonid Theory:** According to this theory indicators can exist in two tautomeric form having different colours; One can exist in acid medium another is alkaline medium. The two form possess different structures, one is known as benzenoid and other as quinonoid form. Usually color of quinonoid form is darker than benzenoid form. The colour change is due to inter conversion between these 2 forms.

