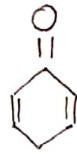


Quinonoid theory: An acid-base indicator exists in tautomeric forms - one of which can exist only in acid medium while another only in alkaline medium. As the pH of such solution changes, the solution shows a change of colour due to intramolecular change from one form to another. The quinonoid form is generally more deep in colour than benzenoid form.

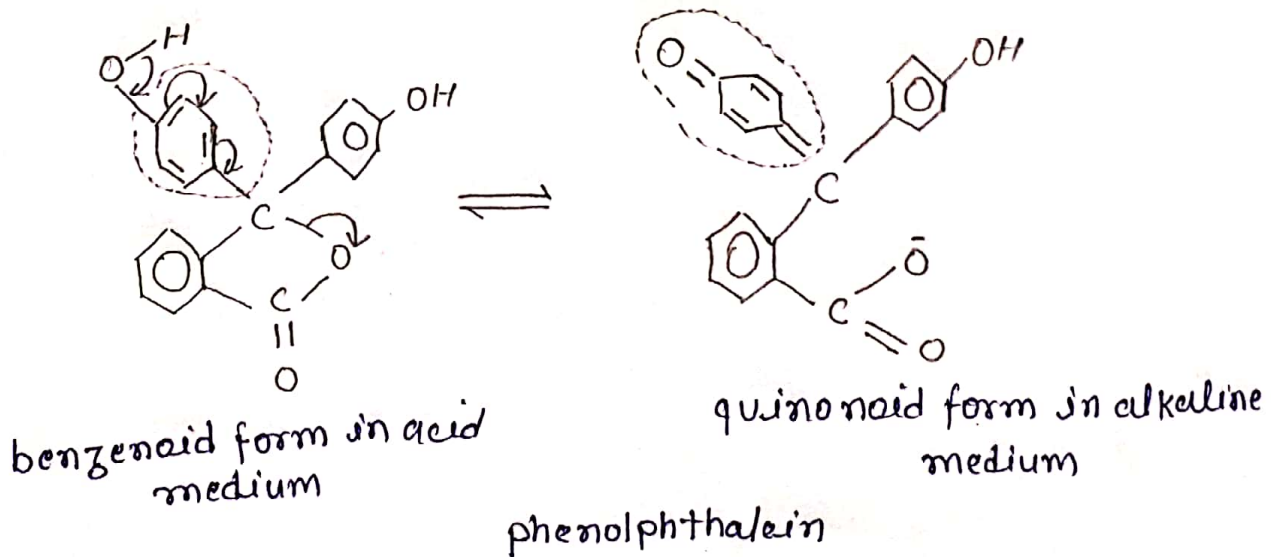


Benzene

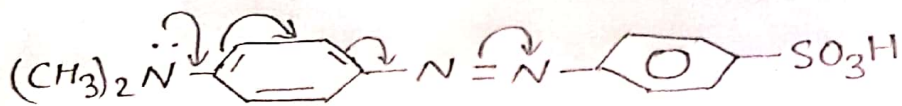


quinone

The phenolphthalein is colourless in acid solution (benzenoid) but shows a red colour in alkaline solution (quinonoid form):

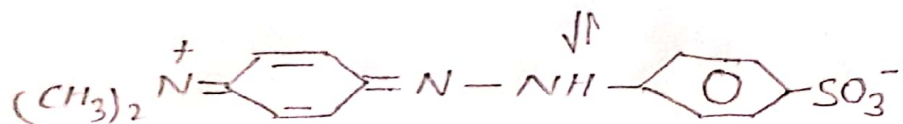


Similarly the methyl orange has two tautomeric forms - red form in acid solution and yellow form in alkaline solution.



yellow

Benzenoid form in alkaline medium



(Red)

Quinonoid form in acid medium.

Limitations: (i) weak acid Vs. weak base cannot be titrated with either methyl orange or phenolphthalein (ii) it does not actually indicate the acidic or alkaline solution but indicates particular pH range of the solution (iii) Coloured solutions cannot be titrated (iv) Much care is needed near the end-point.