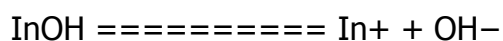


- The actual colour of the indicator, which depends upon the ratio of the concentration of the ionized and unionized forms, is thus directly related to the hydrogen-ion concentration. Eq. (2) may be written as

$$\text{pH} = \log \frac{[\text{In}^-]}{[\text{HIn}]} + \text{pK}_a \quad (3)$$

- In this equation [HIn] represents the concentration of the undissociated indicator molecule whose colour is called 'acid colour' while [In⁻] denotes the concentration of the indicator-anions, the colour of which is called 'alkaline colour'. K_a is the dissociation constant of the indicator- acid. The indicator base may be characterized similarly to the indicator acid



$$\frac{[\text{In}^+][\text{OH}^-]}{[\text{InOH}]} = K_b \quad (4)$$

- Taking the ionic product of water into consideration

$$\frac{[\text{In}^+]}{[\text{H}^+][\text{InOH}]} = K_b \quad (5)$$

$$[\text{H}^+] = \frac{K_b}{K_w} \frac{[\text{In}^+]}{[\text{InOH}]} \quad (6)$$

$$\text{pH} = \text{pK}_w - \text{pK}_b + \log \frac{[\text{InOH}]}{[\text{In}^+]} \quad (7)$$