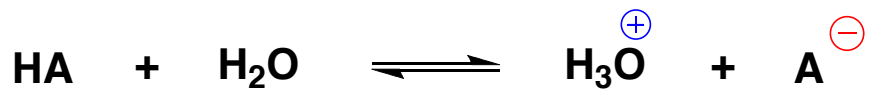


The Henderson - Hasselbalch Equation



$$K_{\text{eq}} = \frac{[\text{H}_3\text{O}^{\oplus}] [\text{A}^{\ominus}]}{[\text{HA}] [\text{H}_2\text{O}]}$$

$$K_{\text{a}} = K_{\text{eq}} [\text{H}_2\text{O}] = \frac{[\text{H}_3\text{O}^{\oplus}] [\text{A}^{\ominus}]}{[\text{HA}]}$$

Definition: $-\log X = \text{p}X$

$$-\log K_{\text{a}} = -\log \left(\frac{[\text{H}_3\text{O}^{\oplus}] [\text{A}^{\ominus}]}{[\text{HA}]} \right)$$

$$-\log K_{\text{a}} = -\log [\text{H}_3\text{O}^{\oplus}] - \log \left(\frac{[\text{A}^{\ominus}]}{[\text{HA}]} \right)$$

$$\text{p}K_{\text{a}} = \text{pH} - \log \left(\frac{[\text{A}^{\ominus}]}{[\text{HA}]} \right)$$