

Chem M3LC. R. Corn

Monoprotic Weak Acid Salt

Constants: K_b , K_w , C_{tot}

Five species: $[HA]$, $[A^-]$, $[H^+]$, $[OH^-]$, $[Na^+]$

$$K_b = \frac{[OH^-][HA]}{[A^-]} \quad \text{base dissociation}$$

$$K_w = [H^+][OH^-] \quad \text{water dissociation}$$

$$[Na^+] + [H^+] = [A^-] + [OH^-] \quad \text{charge balance}$$

$$C_{tot} = [HA] + [A^-] \quad \text{mass balance 1}$$

$$C_{tot} = [Na^+] \quad \text{mass balance 2}$$

Full Cubic for $[OH^-]$

$$[OH^-][HA] = K_b[A^-]$$

$$[OH^-]([OH^-] - [H^+]) = K_b(C_{tot} - [HA])$$

$$[OH^-]^2 - K_w = K_b(C_{tot} - [OH^-] + K_w/[OH^-])$$

$$[OH^-]^2 = K_b(C_{tot} - [OH^-] + K_w/[OH^-]) + K_w$$

Iterative Equations:

$$[A^-] = C_{tot} (1 + K_b/[OH^-])^{-1}$$

$$[OH^-] = \sqrt{K_b[A^-] + K_w}$$