

Chem M3LC. R. Corn

Monoprotic Weak Acid

Constants: K_a , K_w , C_{tot}

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

$$K_a = \frac{[H^+][A^-]}{[HA]} \quad \text{acid dissociation}$$

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

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

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

Full Cubic for $[H^+]$

$$[H^+][A^-] = K_a[HA]$$

$$[H^+]([H^+] - [OH^-]) = K_a(C_{tot} - [A^-])$$

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

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

Iterative Equations:

$$[HA] = C_{tot} (1 + K_a/[H^+])^{-1}$$

$$[H^+] = \sqrt{K_a[HA] + K_w}$$