

Chem 151. R. Corn

Monoprotic Weak Acid Salt

Constants:  $K_b$ ,  $K_w$ ,  $C_0$

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

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

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

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

$$C_0 = [HA] + [A^-] \quad \text{mass balance 1}$$

$$C_0 = [Na^+] \quad \text{mass balance 2}$$

Full Cubic for  $[OH^-]$

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

$$[OH^-]([OH^-] - [H^+]) = K_b(C_0 - [HA])$$

$$[OH^-]^2 - K_w = K_b(C_0 - [OH^-] + K_w/[OH^-])$$

$$[OH^-]^2 = K_b(C_0 - [OH^-] + K_w/[OH^-]) + K_w$$

Iterative Equations:

$$[A^-] = C_0(1 + K_b/[OH^-])^{-1}$$

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