Monoprotic Weak Acid Salt

Constants: \( K_b, K_w, C_0 \)

Five species: \([HA], [A^-], [H^+], [OH^-], [Na^+]\)

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

\[ K_w = [H^+][OH^-] \] water dissociation

\[ [Na^+] + [H^+] = [A^-] + [OH^-] \] charge balance

\[ C_0 = [HA] + [A^-] \] mass balance 1

\[ C_0 = [Na^+] \] 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:

\[ [A^-] = C_0(1 + \frac{K_b}{[OH^-]})^{-1} \]

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