Summary of Calculations for Weak Acid and Weak Base Titrations

Region	HA titrated with $\mathrm{OH^-}$	B titrated with $\mathrm{H_3O^+}$
Initial (no added titrant)	$K_a = \frac{[\mathrm{H_3O^+}]^2}{[\mathrm{HA}]}$ $= \frac{[\mathrm{H_3O^+}]^2}{C_{\mathrm{HA}} - [\mathrm{H_3O^+}]}$ Often, $[\mathrm{H_3O^+}] = \sqrt{K_a C_{\mathrm{HA}}}$	$K_b = \frac{[\mathrm{OH^-}]^2}{[\mathrm{B}]}$ $= \frac{[\mathrm{OH^-}]^2}{C_{\mathrm{B}} - [\mathrm{OH^-}]}$ Often, $[\mathrm{OH^-}] = \sqrt{K_b C_{\mathrm{B}}}$
Before Equivalence Point (Buffer Region)	$K_a = \frac{[\mathrm{H_3O^+}]\, C_{\mathrm{A^-}}}{C_{\mathrm{HA}}}$ $[\mathrm{H_3O^+}] = K_a \times \left(\frac{\text{mmol HA}}{\text{mmol A}^-}\right)$	$K_b = \frac{[\mathrm{OH^-}]\, C_{\mathrm{BH^+}}}{C_{\mathrm{B}}}$ $[\mathrm{OH^-}] = K_b \times \left(\frac{\text{mmol B}}{\text{mmol BH}^+}\right)$
Half Titration Point	$[\mathrm{A^-}] = [\mathrm{HA}]$ $[\mathrm{H_3O^+}] = K_a$ $\mathrm{pH} = \mathrm{p}K_a$	$[\mathrm{BH^+}] = [\mathrm{B}]$ $[\mathrm{OH^-}] = K_b$ $\mathrm{pOH} = \mathrm{p}K_b$
Equivalence Point	$K_b^{\mathrm{A^-}} = \frac{K_{\mathrm{w}}}{K_a^{\mathrm{HA}}}$ $[\mathrm{OH^-}] = \sqrt{K_b^{\mathrm{A^-}} C_{\mathrm{A^-}}}$	$K_a^{\mathrm{BH^+}} = \frac{K_{\mathrm{w}}}{K_b^{\mathrm{B}}}$ $[\mathrm{H_3O^+}] = \sqrt{K_a^{\mathrm{BH^+}} C_{\mathrm{BH^+}}}$
After Equivalence Point	$[\mathrm{OH^-}] = \left(\frac{\text{mmol excess OH}^-}{\text{total volume}}\right)$	$[\mathrm{H_3O^+}] = \left(\frac{\text{mmol excess H}_3\text{O}^+}{\text{total volume}}\right)$