

WEAK ACIDS AND BASES CALCULATIONS

- Dissociation is a reversible reaction!
- So use Equilibrium Expressions, K values, and Ice Tables to find []'s before doing pH type calculations
- Equilibrium Expression still $\frac{\text{Products}}{\text{Reactants}}$ which will be $\frac{[\text{Dissociated Ions}]}{[\text{Undissociated Molecule}]}$
- To find pH (or pOH) of something you first have to know the $[\text{H}_3\text{O}^+]$ (or $[\text{OH}^-]$)
 - For weak acids/bases you need to do the following steps to find those []'s
 - Step 1 – ICE Table
 - Step 2 – Write a K_a expression (or K_b depending on the problem)
 - Step 3 – Solve for x using either quadratic or 5% rule
 - Step 4 – put x back into ICE Table to find the actual [] answers
 - Step 5 – use your $[\text{H}_3\text{O}^+]$ (or $[\text{OH}^-]$) to find the pH (or pOH)

MONOPROTIC VS. POLYPROTIC – HOW MANY IONS COME OFF?

- Monoprotic acids/bases → only have one H^+ or OH^-
- Diprotic acids/bases → have two H^+ or OH^-
- Triprotic acids/bases → have three H^+ or OH^-
- Strong Bases
 - all OH^- come off
 - Take that into account with your stoichiometry when finding the $[\text{OH}^-]$
 - 1 M $\text{Ca}(\text{OH})_2 = 2$ M of OH^- ions
- Strong Acids
 - The first H^+ comes off and it would be a normal strong acid type pH calculation
 - No K_a value needed
 - No ICE Table needed.
 - The second/third/etc H^+ might come off BUT
 - That would be a weak reaction and you would need:
 - K_a value for that second H^+ coming off
 - Would need to do an ICE table
 - Then add the $[\text{H}^+]$ from the ICE Table calculation to the $[\text{H}^+]$ you found from the first H^+ coming off.
 - Example: $\text{H}_2\text{SO}_4 \rightarrow \text{H}^+ + \text{HSO}_4^-$
Only assume one H^+ comes off unless given K_a value for $\text{HSO}_4^- \rightarrow \text{H}^+ + \text{SO}_4^{2-}$
- Weak Acids/Bases
 - For the given K_a or K_b value assume only one H^+/OH^- comes off.
 - You would need a second K_a or K_b value to do a second ICE Table for the second H^+/OH^- coming off, and then would need to add your []'s from each ICE Table calculation.