

Topics: Polyprotic Acids
Hydrolysis
Solubility Equilibria
Gaseous Equilibria
Heterogeneous Equilibria

1. Discuss why $K_{a1} > K_{a2} > K_{a3}$ for a polyprotic acid.
- ~~2. Given the appropriate equilibrium constants and the initial concentration of a weak polyprotic acid, calculate the concentrations of all species present at equilibrium.~~
3. Given the appropriate equilibrium constant and the concentration of a solution of a salt of a containing the conjugate base of a weak acid or conjugate acid of a weak base, calculate K_h (K_a or K_b), $[OH^-]$, $[H^+]$, pOH , pH , and/or percent hydrolysis.
4. Given the formula for any soluble salt, determine if either or both of its ions is a weak acid or a weak base in water, and if its aqueous solution is acidic, basic, or neutral.
5. Partial neutralization of ion (that is the conjugate acid of a weak base or conjugate base of a weak acid) with a strong acid or strong base. (ie. Partial neutralization of NH_4^+ with $NaOH$ or partial neutralization of $C_2H_3O_2^-$ with HCl)
5. Calculate pH of solution at equivalence/end point of titration of weak acid with strong base or titration of weak base with strong acid.
6. Given K_{sp} values for several slightly soluble substances, predict which has the highest or lowest molar solubility.
7. Given the solubility (in g/L and/or $mole/L$) of a slightly soluble substance, calculate K_{sp} .
8. Given the K_{sp} for a slightly soluble substance, calculate its molar solubility or solubility in g/L .
9. Given K_{sp} , calculate the solubility of a slightly soluble substance in a solution of a common ion of known concentration.
9. Given the K_{sp} and the ion product (or sufficient information to calculate the ion product) predict whether or not precipitation will occur.
10. Given the appropriate K_{sp} values and the initial concentrations of two ions that will be precipitated with a common precipitating agent, (a) determine which salt will precipitate first upon addition of the precipitating agent and (b) calculate the concentration of the ion of the less soluble salt at the point that the solution is saturated with respect to both salts (ie. the second salt is just ready to precipitate).
11. Using common ion to control hydroxide ion concentration to prevent precipitation of a metal hydroxide. (Like the problem on page 28 in your lecture notes)
- ~~11. Given K_p or information from which K_p can be calculated and the temperature at which equilibrium is measured, calculate K_c .~~
- ~~12. Given K_c or information from which K_c can be calculated and the temperature at which equilibrium is measured, calculate K_p , and vice versa.~~
13. Calculate K_c from equilibrium concentrations of gases.
14. Use K_p to calculate the partial pressure of a gas at equilibrium.
15. Given K_c and initial concentration, calculate the equilibrium concentration of a gas.
- ~~16. Heterogeneous equilibrium problem.~~
17. Solve assigned homework problems—including Worksheets & textbook problems