Week 8 Problems
Section 63
TA: Amy Carlson

1. When 0.45 M HCN is added to a 0.50 M NaCN solution, what is the pH of the solution after equilibrium is established?
2. When 1.00 mole of NaF is added to a 1 liter 0.5 M HF solution, what is the pH of the solution after equilibrium is established? Assume no change in volume.
3. How many mL of 2.0 M KOH is necessary to neutralize 300 mL of 0.85 M HCl?
4. What is the pH at the halfway point of titrating 200 mL of 2.0 M acetic acid with 0.4 M NaOH? How many mL of NaOH are necessary to reach the equivalence point and what is the pH?

Conceptual questions:

5. A solution of an acid and a salt of its conjugate base (e.g. HCl & NaCl) will be less acidic/more acidic than a solution of the acid alone.
6. Around what pH would a mixture of $NaHSO_4$ and $CaSO_4$ best buffer?
7. What are the two different ways to make a buffer?
8. Generally, how do buffers work? What makes a buffer “good”?
9. What are the major species in solution for the titration of acetic acid with NaOH?
    a. At the halfway point
    b. At the equivalence point
    c. Beyond the equivalence
    d. For the situations in a,b, and c, which constitute a buffered solution?
10. For the following scenarios, would the final pH be equal to, greater than, or less than 7 at the equivalence point?
    a. Titrating acetic acid with NaOH
    b. Titrating KOH with HCl
    c. Titrating ammonium chloride with NaOH
11. What are the characteristics of an appropriate indicator for a titration?
12. In blood, the primary buffering system is composed of bicarbonate (HCO_3^-) in equilibrium with carbonic acid (H_2CO3). The healthy range of blood pH is 7.35-7.45. Is this within the optimal buffering range for this buffer? Why or why not?