Worksheet 9: Six Easy things from chapters 15 & 16

1. What is the chemical reaction and equilibrium expression when a weak acid (HF) is dissolved in water?
   \[ HF(aq) + H_2O(l) \rightleftharpoons H_3O^+(aq) + F^-(aq) \]

2. What is the chemical reaction and equilibrium expression when a weak base (NaF) is dissolved in water?
   \[ F^-(aq) + H_2O(l) \rightleftharpoons OH^-(aq) + HF(aq) \]

3. Is there a chemical reaction when weak acid (HF) a weak base (NaF) are mixed together in water? What is the best way to represent this mixture in a chemical equilibrium equation?
   Cit does not react with its conjugate base. Either equation in 1 or 2 is sufficient to describe the equilibrium that exists between the conjugate acid/base pair.

4. What is the \([H_3O^+]\) and pH of 0.10 M HF in water (use \(K_a = 3.5 \times 10^{-4}\))? 
   \([H_3O^+] = 0.00574 \text{ M (can’t ignore change due to } x) \text{ and pH } = 2.24\)

5. What is the \([OH^-]\), \([H_3O^+]\) and pH of 0.10 M NaF in water?
   \([OH^-] = 1.7 \times 10^{-6} \text{ M, } [H_3O^+] = 5.9 \times 10^{-9} \text{ M and } pH = 8.23 \text{ (ignoring auto-ionization of water)}\)

6. What is the pH if a solution is made to be 0.15 M HF and 0.22 M NaF? (use \(K_a = 3.5 \times 10^{-4}\))
   \(3.62\)

Four Easy things you should know, refresh, or learn for the first time from Chem 201A:

7. How to calculate how many moles are present in 113 mL of 0.13 M NaOH (0.0147 moles)

8. The final concentrations of HCl and of NaCl if 113 mL of 0.13 M NaOH is added to 243 mL of 0.055 M HCl (see problems in Chapter for more practice. 0.01469 moles NaOH – 0.01337 moles HCl = 0.001325 mol NaOH left, in 0.356 L

9. The pH of 0.0015 M HCl, and why you can’t do the same calculation with 0.015 M HF.

10. How to calculate the molarity of a substance when given volume and concentration.

The hardest problems of Chapter 16 combine lots of the above easy steps into more complex problems.