Worksheet  17.6-17.10

1. Predict whether the following salts will from a solution that is acidic, basic or neutral.
   a. FeCl₃
   b. NH₄ClO
   c. K₂CO₃
   d. CaBr₂
   e. NaF
   f. LiClO₄
   g. C₆H₅NH₃NO₂
   h. NH₄Br

2. Which of the following can form a buffer?
   a. HCl and CH₃COOH
   b. H₂CO₃ and NaHCO₃
   c. NaOH and NaCl
   d. NaCH₃COCOO and CH₃COCOOH
   e. HCIO and KCIO
3. Calculate the pH of an aqueous buffer solution made from 0.150M NH₄Cl and 0.100M NH₃. \( K_a \) for \( NH_4^+ \) is \(5.61 \times 10^{-10}\).

4. Calculate the pH of a buffer solution made by adding 25.5g of NaCH₃CO₂ (MW: 82.034g/mol), in a sufficient volume of 0.550M HCH₃CO₂ to make 500mL of the buffer. \( K_a = 1.8 \times 10^{-5}\).
5. What mass of NaCH₃CO₂ (MW: 82.034g/mol) must be dissolved in 0.300L of 0.25M HCH₃CO₂ to produce a solution with pH=5.09? Kₐ = 1.8x10⁻⁵. Assume the volume remains constant.

6. Which of the following buffer systems would be the best choice to create a buffer with pH of 7.20?
   a. HC₂H₃O₂/NaC₂H₃O₂ (Kₐ HC₂H₃O₂=1.8x10⁻⁵)
   b. NH₃/NH₄Cl (Kₜ NH₃=1.76x10⁻⁵)
   c. HClO₂/KClO₂ (Kₐ HClO₂=1.1x10⁻³)
   d. HClO/KClO (Kₐ HClO=2.9x10⁻⁸)
7. What is the pH of 250.0mL of a buffer solution that is 0.0955M HCH₃CO₂ and 0.125M NaCH₃CO₂. $K_a=1.8\times10^{-5}$. What is the pH of the system if 20.0mL of 0.455M HCl (aq) is added? What is the pH of the system if instead, 20.0mL of 0.455M Ca(OH)₂ (aq) is added? (this are 3 separate questions)
8. What two conditions affect the buffering ability of a buffer?
9. For the following graphs answer the following
   a. What type of titration was performed?
   b. What is the approximate pH at the equivalence points
   c. For graphs (a) and (d), what is the pKa of the analyte?
10. Consider the titration of a 20.0mL sample of 0.105M HCN with 0.125M NaOH. Determine the following:

   a. $K_a$ HCN = 4.9x10^{-10}
   d. Initial pH
   e. The volume of added base required to reach equivalence point
   f. The pH at 10.0mL of added base
   g. The pH at equivalence point
   h. The pH after adding 5.0mL of base beyond the equivalence point
   i. Which indicator(s) can be used for this titration
11. Construct, by calculation, a titration curve for the titration of 40.0mL of 0.200M NH₃ with 0.500M HClO₄. (Kₐ NH₃=1.76×10⁻⁵)

j. Initial pH
k. Volume of titrant required to reach the equivalence point and pH
l. pH after the addition of 5.00mL of acid
m. pH at half equivalence point
n. pH after the addition of 16.0mL of acid
o. After the addition of 20.0mL of acid
p. Which indicator(s) can be used for this titration
12. You require 36.78mL of 0.0105M HCl to reach the equivalence point in the titration of 25.0mL of aqueous ammonia (NH₃). $K_b(\text{NH}_3)=1.76\times10^{-5}$
   
   q. What is the concentration of NH₃ in the original ammonia solution?
   
   r. What is the original pH of the NH₃ solution (before any acid was added)
   
   s. What is the equilibrium concentration of $\text{H}_3\text{O}^+$, $\text{OH}^-$ and $\text{NH}_4^+$ at the equivalence point?
   
   t. What is the pH of the solution at the equivalence point?