Acid-Base – Buffers/Titrations/SS **Name:** _____

For complete credit show all the work for the calculations and give the answers in the correct significant figures.

1) Which of the following solutions can be buffers?
   KCN/HCN $Na_2SO_4/NaHSO_4$ NaI/HI

2) Calculate the pH of the following two buffers. Which buffer is more effective as a buffer?
   a) 2.0 M CH_3COONa/2.0 M CH_3COOH ($K_a = 1.76 \times 10^{-5}$) (*ans: 4.74*)

   b) 0.20 M CH_3COONa/0.20 M CH_3COOH ($K_a = 1.76 \times 10^{-5}$) (*ans: 4.74*)

3) The pH of a hydrogen carbonate/carbonic acid buffer is 8.00. Calculate the ratio of $[H_2CO_3]/[HCO_3^-]$ needed to make the buffer. ($K_a = 4.3 \times 10^{-7}$) (*ans: 0.024*)

4) A 0.2688 g sample of monoprotic acid neutralizes 16.4 mL of 0.08133 M KOH. What is the molar mass of the acid? (*ans: 202g/mol*)

5) Calculate the pH of a 0.20 M NH_3/0.20 M NH_4Cl. What is the pH of the buffer after the addition of 10.0 mL of 0.10 M HCl ot 65.0 mL buffer. ($K_b = 1.8 \times 10^{-5}$) (*ans: 9.18*)

(***Strategy***: a) find the pH using Henderson Hasselbach eqn; b) find mols of HCl added; c) find mols of NH_3 and NH_4Cl present; c) set up ICE eqn to find new conc; **OR** add HCl mols to acid mols and subtract from base mols and find pH using Henderson Hasselbach eqn)

6) In a titration experiment of 20.4 mL of 0.883 M HCOOH neutralizes 19.3 mL of $Ba(OH)_2$. What is the concentration of the $Ba(OH)_2$ solution? ((*ans: 0.467 M*)

(***Strategy***: Write and balance the equation and don't forget the mol ratio!)

7) Calculate the pH at the equivalence point for the titration of 0.10 M HCOOH and 0.10 M NaOH. ($K_a = 1.7 \times 10^{-4}$) (*ans: 8.23*)

Bonus

8) A 10.0 mL solution of 0.300 M NH_3 is titrated with 0.100 M HCl solution. Calculate the pH after the addition of a) 0.0 mL, b) 10.0 mL and c) 30.0 mL HCl solution. ($K_b = 1.8 \times 10^{-5}$) (*ans:11.36, 9.55, 5.19*)