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

*(Look up the $K_a$ and $K_b$ from data tables of your text book)*

1) Which of the following solutions can be buffers?
   KCl/HCl  $KHSO_4/H_2SO_4$  $KNO_2/HNO_2$

2) Calculate the pH of the following buffers:
   a) 0.15 M $NH_3$/0.35 M $NH_4Cl$ ($K_b = 1.8 \times 10^{-5}$)(*ans: 8.89*)

   b) 0.10 M $Na_2HPO_4$/0.15M $KH_2PO_4$ ($K_a = 6.3 \times 10^{-8}$) (*ans: 7.03*)

3) The pH of a sodium acetate/acetic acid buffer is 4.50. Calculate the ratio of $[CH_3COO^-]$/ $[CH_3COOH]$ needed to make the buffer. ($K_a = 1.76 \times 10^{-5}$) (*ans: 0.58*)

4) In a titration experiment 12.5 mL of 0.500 M $H_2SO_4$ neutralizes 50.0 mL of NaOH. What is the concentration of the NaOH solution? (*ans:0.25M*)

5) Calculate the pH of a 1.00 L of a buffer 1.00 M $CH_3COONa$/1.00 M $CH_3COOH$ before and after the addition of a) 0.080 mol NaOH and b) 0.12 mol HCl. (Assume there is no change in volume) ($K_a = 1.76 \times 10^{-5}$) (*ans: 4.82; 4.64*)

6) Calculate the pH at the equivalence point for the titration of 0.20 M HCl and 0.20 M ($CH_3NH_2$). ($K_b = 4.4 \times 10^{-4}$) (*ans: 5.82*)

7) A 25.0 mL of 0.100 M $CH_3COOH$ is titrated with 0.200 M KOH solution. Calculate the pH after the addition of a) 0.00 mL, b) 5.0 mL and c) 12.5 mL of the KOH. ($K_a = 1.76 \times 10^{-5}$) (*ans:2.87, 4.56, 8.78*)