Honors General Chemistry Test 3
Prof. Shattuck, practice Name_____

$R = 8.314\ J\ mol^{-1}\ K^{-1}$ $1\ L\ atm = 101.3\ J$ $T(0°C) = 273.2\ K$ $s^2 = K_{sp}\left(1 + \frac{[H^+]}{K_a}\right)$

Answer 8 of the following 10 questions. If you answer more than 8 cross out the ones you wish not to be graded, otherwise only the first 8 will be graded. (6 points each)

1. Is $PbBr_2$ more soluble in : (a) pure water, (b) 0.10 M NaBr, or (c) 0.10 M $Pb(NO_3)_2$?

2. Circle the stronger acid in each pair:
   (a) HF, HBr (b) H_3PO_4, H_3PO_3 (c) $HClO_3$, $HBrO_3$

3. Write the reactions that show why $CaCO_3(s)$ has increasing solubility with decreasing pH.

4. Are aqueous solutions of the following acidic, basic, or neutral?

   (a) NH_4Cl _____ (b) KNO_3 _____ (c) Na_2SO_4 _____

5. Consider the general reagents at 0.1 M concentration: HCl, H_2SO_4, NH_3, NaOH. Which of these four reagents do you add to get the following precipitates to dissolve? You can use each reagent only once (in other words you will use all four choices).
   (a). To dissolve $Cu(OH)_2$ (s) add _____
   (b). To dissolve $Zn(OH)_2$ (s) add _____
   (c). To dissolve AgCl (s) add _____
   (d). To dissolve CaF_2 (s) add _____

6. In the titration of ammonia with strong acid, is the equivalence point acidic, basic, or neutral? Show the reaction that determines the pH.

7. What are the two conjugate acid base pairs in the reaction: $H_2PO_4^- + H_2O \rightarrow H_3PO_4 + OH^-$ Make sure to indicate which in each pair is the acid and which the base.

8. For the following reactions, does the equilibrium position lie to the left or right?

   (a) $F^- + H_2O \rightleftarrows HF + OH^-$

   (b) $HF + H_2O \rightleftarrows F^- + H_3O^+$

9. ~~The volume of an ideal gas is increased from 1.00 L to 5.00 L at a constant pressure of 2.00 atm. Assume q = 0 and calculate the change in internal energy for this process. Remember to convert to J~~: (not this year)

10. Name the following compounds:

(a) HIO _____

(b) H_3PO_4 _____

(c) Na_2SO_3 _____

Part II.

11. Calculate the concentration of Cu^{2+} in a solution of 0.0100 M $Cu(NH_3)_4^{2+}$, with an ammonia concentration of 0.20 M. The formation constant is: Cu^{2+} (aq) + 4 NH_3 (aq) $\rightleftarrows$ $Cu(NH_3)_4^{2+}$ (aq) $K_f = 5.0 \times 10^{12}$.

12. Calculate the pH at the equivalence point of a titration of 30.0 mL of 0.100 M HClO with 0.100 M NaOH. For HClO, $K_a = 1.1 \times 10^{-8}$ M . Show the reaction that determines the pH.

13. What is the pH of a solution prepared by adding 1.00 L of 0.25M HCl to 1.00 L of 0.40 M ammonia. For ammonium ion $K_a = 5.5 \times 10^{-10}$M.

14. Calculate the solubility of $Mg(OH)_2$ in a solution buffered to a pH of 12.0. $K_{SP} = 1.8x10^{-11}$ M^3.

15. Calculate the solubility of LiF in a solution buffered at pH 7.00. The K_{sp} of LiF is $1.7x10^{-3}$. The K_a of hydrofluoric acid is $6.8x10^{-4}$.