**Problem Set on Solubility Equilibrium**

1. Calculate the molar solubility of the following compounds:

a. PbCO3 Ksp = 7.4 x 10-14

b. Ag2CrO4 Ksp = 1.3 x 10-12

c. La(IO3)3 Ksp = 1.2 x 10-11

d. Fe3(PO4)2 Ksp = 1.0 x 10-36

2. Convert the molar solubility of each compound in problem 1 to the solubility expressed in grams /L.

3. Can one predict the relative solubility of a series of compounds such as the list of compounds in problem 1 by using only the Ksp value? Use BaCO3 and SrF2 as a test of your hypothesis. Ksp of BaCO3 = 5.0 x 10-9 Ksp of SrF2 = 3.2 x 10-9

4. If the carbonate ion concentration in a saturated lead(II) carbonate solution is adjusted to 0.020M, what is the concentration of lead(II) ion in solution? How does this quantitatively demonstrate LeChatelier’s Principle? Kxp for lead(II) carbonate is 7.4 x 10-14

5. If the phosphate ion concentration in a saturated iron(II) phosphate solution is adjusted to 0.50M, what is the concentration of iron(II) ion in solution? How does this quantitatively demonstrate LeChatelier’s Principle? Ksp for iron(II) phosphate is 1 x 10-36

6. Carbonate ion is added drop wise to a solution containing 0.30M Ca2+ and 0.30 M Ni2+. The Ksp for CaCO3 is 4.5 x 10-9 and the Ksp for NiCO3 is 1.3 x 10-7.

a. Which cation will precipitate first?

b. What will be the concentration of the less soluble cation remaining in solution when the more soluble cation begins to precipitate?

7. What is the concentration of Co(III) ions in solution if the pH of the solution is 9.00?

Ksp for Co(OH)3 = 3.0 x 10-45

8. Will a precipitate form if 400 mL of 2.0 x 10-4 M Ca(NO3)2 is mixed with 600 mL of 1.5 x 10-3M KIO3? Ksp of Cd(IO3)2 = 2.3 x 10-8

9. Will a precipitate form if 300 mL of 5.0 x 10-3M Ca(NO3)2 is mixed with 400 mL of 3.5 x 10-4 M Na2CO3? Ksp of CaCO3 = 4.5 x 10-9

10. a. When additional Ba2+ ions are added to a saturated Ba3(PO4)2, one observes additional precipitate from in the container. Explain this observation in terms of LeChatelier’s Principle.

b. When a saturated solution of Ba3(PO4)2 is acidified, the precipitate dissolves. Explain.

c. When the solution from 10 b. is treated with base, the precipitate reappears. Explain.