CHEM 1332 (Guloy) Homework (for extra credit): Due April 16, 2008.
(NOTE: <u>You will need to hand a hardcopy of the completed homework after the class on Wednesday, April 16, 2008</u>)

Name:_____

1. You have a saturated solution of $Gd_2(SO_4)_3$. It follows that:

a) $[Gd_3^+] > [SO_4^{3-}]$ b) $[Gd_3^+] = (Ksp/36)^{1/5}$ c) $[Gd_3^+] = 3/2\ (Ksp)^{1/5}$
d) $[Gd_3^+] = 2/3\ [SO_4^{2-}]$ e) $[Gd_3^+] = (Ksp)^{1/5}$

2. Given the following Ksp data, which silver salt when dissolved in water has the highest concentration of silver ions?
Ag_2CO_3; Ksp = 8.1×10^{-12} AgCl; Ksp = 1.6×10^{-10} AgBr; Ksp = 5.0×10^{-13}

a) Ag_2CO_3 b) AgCl c) AgBr
d) The solutions have equal $[Ag^+]$ e) Cannot be determined since the volume of water is unknown.

3. What is the molarity of $Fe(CN)_6^{4-}$ in a saturated solution of $Ag_4[Fe(CN)_6]$?
(Ksp = 1.6×10^{-41})

a) 5.2×10^{-8} b) 1.6×10^{-8} c) 2.3×10^{-9}
d) 6.9×10^{-9} e) 1.1×10^{-9}

4. The solubility of $Ba_3(AsO_4)_2$ is 6.9×10^{-2} g/100 mL. What is the Ksp?
(Formula weight = 690)

a) 1.1×10^{-13} b) 6.0×10^{-13} c) 1.1×10^{-11}
d) 3.1×10^{-12} e) 1.0×10^{-15}

5. What is the concentration of Ba^{2+} when BaF_2 (Ksp = 1.0×10^{-6}) begins to precipitate from a solution that is 0.30 M in F^-?

a) 9.0×10^{-7} b) 3.3×10^{-5} c) 1.1×10^{-5}
d) 1.0×10^{-6} e) 3.0×10^{-7}

6. What is the concentration of Pb^{2+} when PbI_2 (Ksp = 1.0×10^{-8}) begins to precipitate from a solution that is 0.40 M I^-?

a) 2.5×10^{-9} b) 1.6×10^{-9} c) 4.0×10^{-8}
d) 1.0×10^{-8} e) 6.3×10^{-8}

7. What is the minimum pH necessary to cause a precipitate of $Cu(OH)_2$ to form in a 0.001 M $CuCl_2$ solution? (Ksp = 2.6×10^{-19})

a) 7.93 b) 6.21 c) 7.02
d) 7.42 e) 6.51

8. What is the molar solubility of $Fe(OH)_2$ at pH=13.00 (Ksp = 8.0×10^{-16})?

a) 8.0×10^{-15} b) 8.0×10^{-14} c) 8.0×10^{-17}

d) 8.0×10^{-16} e) 8.0×10^{-18}

9. What is the minimum pH required to prevent the precipitation of PbS in a solution that is 1.0×10^{-6} M $Pb(NO_3)_2$ and saturated with H_2S (0.10 M)? (Ksp = 8.0×10^{-28} ; $K_1K_2 = 1.3 \times 10^{-20}$)

a) 0.21 b) 1.22 c) 0.62
d) 0.95 e) 1.53

10. What is the concentration of Cu^{2+} in a solution that is 0.10 M $Cu(NH_3)_4^{2+}$?
($K_f = 1.2 \times 10^{12}$)

a) 8.5×10^{-5} b) 8.0×10^{-4} c) 3.8×10^{-4}
d) 5.1×10^{-4} e) 2.8×10^{-4}

11. What is the molar concentration of Cd^{2+}? in a 0.20 M solution of $[Cd(CN)_4]^{2-}$?
($K_f = 1.3 \times 10^{17}$)

a) 7.0×10^{-5} b) 2.0×10^{-4} c) 4.0×10^{-4}
d) 3.0×10^{-4} e) 9.0×10^{-5}

12. A solution is 0.10 M $AgNO_3$ and 0.10 M $Ba(NO_3)_2$. If solid Na_2SO_4 is added to the solution, what is $[Ba_2^{+}]$ when Ag_2SO_4 begins to precipitate?
(Ksp $BaSO_4 = 1.1 \times 10^{-10}$; $Ag_2SO_4 = 1.1 \times 10^{-5}$)

a) 2.4×10^{-6} b) 1.1×10^{-7} c) 2.4×10^{-7}
d) 3.2×10^{-6} e) 5.1×10^{-6}

13. What mass of AgI will dissolve in 1.0 L of 1.0 M NH_3?
(Ksp AgI = 1.5×10^{-16}; K_f $Ag(NH_3)_2^{+} = 1.6 \times 107$)
(Atomic weights: Ag = 107.9; I = 126.9)

a) 0.035 b) 0.012 c) 0.0056
d) 0.0025 e) 0.022

14. If two salts, **AX** and $\mathbf{BX}_2$, have the same Ksp values of 4.0×10^{-12}, then

a) their molar solubilities in water are the same.
b) the salts are more soluble in 0.1 M Na**X** than in water.
c) the molar solubility of **AX** in water is less than that of $\mathbf{BX}_2$.
d) addition of Na**X** will not affect the solubilities of the salts.
e) None of the above statements are correct.

15. What is the molar solubility of lead sulfate in 1.0×10^{-3} M Na_2SO_4? Ksp ($PbSO_4$) = 1.8×10^{-8}

a) 1.8×10^{-2} b) 1.8×10^{-5} c) 1.3×10^{-4}
d) 5.0×10^{-6} e) 1.8×10^{-12}

20. The K_{sp} of $PbCl_2$ is 1.7×10^{-5}. Calculate its molar solubility in a solution that is 0.200 M NaCl.

a) 4.3×10^{-5} b) 8.5×10^{-5} c) 4.3×10^{-4}
d) 4.1×10^{-3} e) 4.1×10^{-6}

21. For which salt would the solubility be MOST sensitive to pH?

a) $Ca(NO_3)_2$ b) CaF_2 c) $CaCl_2$
d) $CaBr_2$ e) CaI_2

22. Which of the following salts would NOT be more soluble in acidic solution?

a) $Mg(OH)_2$ b) AgCl c) Ag_3PO_4
d) AgF e) all are more soluble in acidic solution

23. For which salt of the following pairs will the solubility depend on pH?
i) PbF_2, $PbCl_2$ and ii) $Sr(NO_3)_2$ $Sr(NO_2)_2$

a) They all depend on pH b) i. $PbCl_2$ ii. $Sr(NO_2)_2$ c) i. $PbCl_2$ ii. $Sr(NO_2)_2$
d) i. PbF_2 ii. $Sr(NO_2)_2$ e) i. PbF_2 ii. $Sr(NO_3)_2$

24. Typical "hard" water contains about 2.0×10^{-3} mol of Ca^{2+} per liter. Calculate the maximum concentration of fluoride ion which could be present in hard water. (Ksp $CaF_2 = 4.0 \times 10^{-11}$)

a) 1.4×10^{-4} M b) 4.0×10^{-3} M c)) 2.0×10^{-3} M
d) 2.0×10^{-8} M e) 8.0×10^{-14} M

25. Given the following values of K_{sp}, select the mixture below that would give rise to the formation of a precipitate.

AgCl Ksp $= 1.8 \times 10^{-10}$ $BaSO_4$ Ksp $= 1.1 \times 10^{-10}$ PbI_2 Ksp $= 7.9 \times 10^{-9}$

CaF_2 Ksp $= 3.2 \times 10^{-11}$ AgCN Ksp $= 2.2 \times 10^{-16}$

a) A solution that is 1.00×10^{-5} M $AgNO_3$ and 1.00×10^{-5} M NaCl

b) A solution that is 1.00×10^{-4} M $Ba(NO_3)_2$ and 1.00×10^{-6} M Na_2SO_4

c) A solution that is 1.00×10^{-3} M $Pb(NO_3)_2$ and 2.00×10^{-3} M NaI

d) A solution that is 1.00×10^{-3} M $Ca(NO_3)_2$ and 2.00×10^{-4} M NaF

e) A solution that is 1.00×10^{-8} M $AgNO_3$ and 2.00×10^{-8} M NaCN