Lesson 24 & 25: Solubility Equilibrium I

text: 374-395

what to know:

-solubility terminology and effect of temperature on solubility, §9-1
-solubility, molar solubility and solubility product constant and their interconvertability, §9-2
-effect of common ion on solubility(qualitative), §9-3
-effect of pH on the solubility, §9-4
-concept of complex ions and their solubility(qualitative), §9-5
-lead all around you (page 403)

questions:

1.What is the effect of temperature on the solubility of salts?
2.Write the equilibrium equation for the dissolving of the following and the K_{sp} expression.
AgCl $PbBr_2$ Bi_2S_3 $Fe(OH)_3$
3.Given the solubility of CaF_2 (78 g/mole) as 0.0016 g/100 mL in water.
a. What is the $[Ca^{2+}]$ of a saturated solution of CaF_2?
b. What is the $[F^-]$ of a saturated solution of CaF_2?
c. What is the K_{sp} of CaF_2?
4.Calculate the molar solubility of $PbCl_2$ (278 g/mole) in water if its K_{sp} is 1.7×10^{-5}.

5.Circle those of the following which are soluble in aqueous HCl.
AgBr $CaCO_3$ $Fe(OH)_3$ $BaSO_4$ PbI_2 $AlPO_4$ ZnS

6.The molar solubility of $Mg(OH)_2$ in water is 1.4×10^{-4} M at 25 °C.
a. What is the K_{sp} for magnesium hydroxide at this T?
b. What is the pH of a saturated magnesium hydroxide solution?
c. Show with equations why the solubility of magnesium hydroxide is increased in acidic solutions.
7.Given the K_{sp} of Ag_2CrO_4 as 1.0×10^{-12}. What is its molar solubility?
8.The K_{sp} for $Ca(OH)_2$ is 8.0×10^{-6}. Show that a precipitate will not form when 2.00 mL of 0.200 M NaOH is added to 1.00 L of 0.100 M $CaCl_2$?
9.The solubility of Ag_3PO_4 is 6.7×10^{-3} g/L. The molar mass of Ag_3PO_4 is 419 g/mole. What is the K_{sp} of Ag_3PO_4?
10.Limestone caverns are formed when the limestone is dissolved by acidic water.
a. What is the chemical composition of limestone?
b. What normal substance in the atmosphere makes rain water acidic?
c. How is this process related to "hard" ground water?
11.Which of the following pairs of equations would demonstrate that zinc hydroxide is amphoteric?
a) $Zn(OH)_2 + 2H^+ \text{===>} Zn^{2+} + 2H_2O$, $Zn(OH)_2 + 2OH^- \text{===>} Zn(OH)_4^{2-}$
b) $Zn(OH)_2 + H^+ \text{===>} Zn(OH)^+$, $Zn(OH)^+ + H^+ \text{===>} Zn^{2+} + 2H_2O$
c) $Zn(OH)_2 + OH^- \text{===>} Zn(OH)_3^-$, $Zn(OH)_3^- + OH^- \text{===>} Zn(OH)_4^{2-}$
12.K_{sp}s for $Cu(OH)_2$ and $Mg(OH)_2$ are 2.2×10^{-20} and 6×10^{-12} respectively. When adding aqueous NaOH drop by drop to a solution containing equal molar concentrations of Cu^{2+} and Mg^{2+}, which hydroxide would begin to precipitate with the least number of drops?