

## $K_{sp}$ Problems - Set I

1. Write an equilibrium reaction representing each of the following saturated solutions:

(a) barium fluoride  $\rightleftharpoons$

(b) magnesium hydroxide  $\rightleftharpoons$

2. Write the solubility product expression ( $K_{sp}$ ) for the ionic compound  $A_xB_y$ .

3. What is meant by term molar solubility (s)?

4. Calculate the concentration of ions in the following saturated solutions:

(a)  $[I^-]$  in AgI with  $[Ag^+] = 9.1 \times 10^{-9}$ . The  $K_{sp}$  of AgI is  $8.3 \times 10^{-17}$ . ( $[I^-] = 9.1 \times 10^{-9}$  M)

(b)  $[Al^{3+}]$  in  $Al(OH)_3$  with  $[OH^-] = 2.9 \times 10^{-9}$  M. (answer  $[Al^{3+}] = 9.7 \times 10^{-10}$  M)

5. The molar solubility of  $Zn(OH)_2$  is  $1.67 \times 10^{-5}$ , what is its  $K_{sp}$  value? Start by writing an equilibrium equation that represents a saturated solution of zinc hydroxide. ( $1.86 \times 10^{-14}$ )

6. If a saturated solution of zinc hydroxide has  $[OH^-] = 0.02$  M, what is the concentration of the zinc ion? ( $4.65 \times 10^{-11}$  M)

7. The molar solubility of calcium carbonate ( $CaCO_3$ ) in pure water is  $6.9 \times 10^{-5}$  M. What is the  $K_{sp}$ ? ( $4.8 \times 10^{-9}$ )

8. If  $[Pb^{2+}] = 0.0012M$  in a saturated solution of lead(II) iodide, calculate the  $K_{sp}$ . ( $6.9 \times 10^{-9}$ )
9. Given that the  $K_{sp}$  of silver chloride ( $AgCl$ ) is  $1.7 \times 10^{-10}$ , calculate its molar solubility in pure water. ( $1.3 \times 10^{-5}M$ )
10. Lead(II) chloride ( $PbCl_2$ ), with a  $K_{sp}$  of  $1.6 \times 10^{-5}$ , is among the more soluble of the salts considered "insoluble". What is its molar solubility in pure water? ( $0.016M$ )
11. The molar solubility ( $s$ ) of silver sulfide,  $Ag_2S$ , is  $1.14 \times 10^{-17}$  mol/L. What is the  $K_{sp}$  of  $Ag_2S$ ? ( $5.9 \times 10^{-51}$ )
12. 100 liters of saturated cadmium sulfide,  $CdS$ , is evaporated to dryness. How many grams of solid  $CdS$  can be recovered upon evaporation? The  $K_{sp}$  of  $CdS$  is  $8.0 \times 10^{-28}$ . ( $4.09 \times 10^{-10}$  g)
13. The solubility of an ionic compound  $M_2X_3$  (molar mass = 288g) is  $3.6 \times 10^{-17}$  g/L. What is the  $K_{sp}$  for the compound?  
( $3.29 \times 10^{-93}$ )