Name Teacher Class _____ Date _____

Calculations Involving Solubility Product

Given a dissociation equation, a solubility product expression can be written by setting the mass-action expression (the product of the solubilities of ions, raised to appropriate powers) equal to the solubility product constant, K_{sp}. Such expressions allow calculation of equilibrium concentrations, prediction of precipitation, or calculation of K_{sp}, if it is not already known.

Solve the following problems. Show your work.

1. The equilibrium concentrations of Ag^+ and Br^- ions are both 7.1×10^{-7} M. Write the balanced dissociation equation and the solubility product for AgBr, and calculate K_{sp}.

1.

$AgBr_{(s)} \rightleftarrows Ag^+_{(aq)} + Br^-_{(aq)}$

$K_{sp} = [Ag^+][Br^-]$

$(7.1 \times 10^{-7})(7.1 \times 10^{-7})$

$K_{sp} = 5.0 \times 10^{-13}$

2. The value of K_{sp} for CdS is 1.0×10^{-28}. Write the balanced dissociation equation and the solubility product for CdS, and calculate the equilibrium concentrations of Cd^{2+} and S^{2-}.

2.

$CdS_{(s)} \rightleftharpoons Cd^{2+}_{(aq)} + S^{2-}_{(aq)}$

$K_{sp} = [Cd^{2+}][S^{2-}]$

$1.0 \times 10^{-28} = x^2$

$x = 1.0 \times 10^{-14}$ M

3. A solution contains CO_3^{2-} ions and Ba^{2+} ions in equilibrium. K_{sp} for $BaCO_3$ equals 2×10^{-9}, and $[CO_3^{2-}]$ equals 1.0×10^{-2} M. Calculate $[Ba^{2+}]$. (First, write the balanced equation and solubility product expression.)

3.

$BaCO_{3(s)} \rightleftharpoons [Ba^{2+}][CO_3^{2-}]$

$2 \times 10^{-9} = [Ba^{2+}][1.0 \times 10^{-2}]$

$2 \times 10^{-7} = [Ba^{2+}]$