CHM152 Quiz 8b 25 Pts Fall 2011 Name: Key

SHOW ALL WORK TO RECEIVE CREDIT.

1. What is the molar concentration of silver ion in a solution containing $1.3 \times 10^{-4}$ M $CrO_4^{2-}$, saturated with $Ag_2CrO_4$? $K_{sp}$ of $Ag_2CrO_4 = 9 \times 10^{-12}$.

$Ag_2CrO_4(s) \rightleftharpoons 2Ag^+ + CrO_4^{2-}$

$K_{sp} = [Ag^+]^2 [CrO_4^{2-}]$

$9 \times 10^{-12} = [Ag^+]^2 [1.3 \times 10^{-4}]$

$[Ag^+] = 2.63 \times 10^{-4}$

2. What is the pH in a saturated solution of $Mg(OH)_2$ where $[Mg^{2+}] = 1.5 \times 10^{-5}$ M? $K_{sp}$ $Mg(OH)_2 = 1.5 \times 10^{-11}$.

$Mg(OH)_2(s) \rightleftharpoons Mg^{2+} + 2OH^-$

$K_{sp} = [Mg^{2+}][OH^-]^2$

$1.5 \times 10^{-11} = [1.5 \times 10^{-5}][OH^-]^2$

$[OH^-] = 0.0010$

$pOH = 3.00$

$pH = 11.00$

3. The solubility of $BaCO_3$ is $7.9 \times 10^{-3}$ g·L$^{-1}$. Calculate the solubility product, $K_{sp}$, ignoring hydrolysis. Molar Mass of $BaCO_3$ = 197 g/mol.

$BaCO_3(s) \rightleftharpoons Ba^{2+} + CO_3^{2-}$ $\quad \frac{7.9 \times 10^{-3}\ g}{L} \left| \frac{mol}{197\ g} \right. = 4.01 \times 10^{-5}$

$K_{sp} = [4.01 \times 10^{-5}]^2$

$K_{sp} = 1.61 \times 10^{-9}$

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

$CaF_2(s) \rightleftharpoons Ca^{2+} + 2F^-$

$K_{sp} = [Ca^{2+}][F^-]^2$

$4.0 \times 10^{-11} = [2.0 \times 10^{-3}][F^-]^2$

$[F^-] = 1.4 \times 10^{-4}$