Session #25: Homework Problems

Problem #1

Bi$_2$S$_3$ dissolves in water according to the following reaction:

$$\text{Bi}_2\text{S}_3 (s) \rightleftharpoons 2 \text{Bi}^{3+} (aq) + 3 \text{S}^{2-} (aq)$$

for which the solubility product, $K_{sp}$, has the value of $1.6 \times 10^{-72}$ at room temperature.

(a) At room temperature how many moles of Bi$_2$S$_3$ will dissolve in $3.091 \times 10^6$ liters of water?

(b) How many Bi$^{3+}$ ions will be found in the solution described in part (a)?

Problem #2

Calculate the volume of 0.25 M NaI that would be needed to precipitate all the Hg$^{2+}$ ion from 45 mL of a 0.10 M Hg(NO$_3$)$_2$ solution according to the following reaction:

$$2 \text{NaI}(aq) + \text{Hg(NO}_3)_2(aq) \rightarrow \text{HgI}_2(s) + 2 \text{NaNO}_3(aq)$$

Problem #3

(a) Strontium fluoride, SrF$_2$, has a $K_{sp}$ value in water of $2.45 \times 10^{-9}$ at room temperature. Calculate the solubility of SrF$_2$ in water. Express your answer in units of molarity.

(b) Calculate the solubility of SrF$_2$ in 0.03 M NaF (aq). Express your answer in units of molarity. Assume that NaF is completely dissociated in water.