

Quiz 1
Fall 2003
Chem 311

Name:

1.00 g of sodium fluoride (a soluble salt) and 2.00 g calcium fluoride are added to a 100.00 ml volumetric flask. The flask is diluted to the mark and thoroughly mixed. The solution has reached equilibrium. Calculate the concentration of Ca^{2+} .

$$\text{MW}(\text{NaF}) = 41.9882 \text{ amu}$$

$$\text{MW}(\text{CaF}_2) = 78.0748 \text{ amu}$$

$$K_{\text{sp}}(\text{CaF}_2) = 3.9 \times 10^{-11}$$

The NaF will completely dissolve, giving a $[\text{F}^-]_{\text{NaF}} = (1.00 \text{ g} / 41.9882 \text{ g/mol}) / (0.1 \text{ L}) = 0.2382 \text{ M}$

Some of the CaF_2 will dissolve.

$$K_{\text{sp}} = [\text{Ca}^{2+}] \{2[\text{F}^-]_{\text{CaF}_2} + [\text{F}^-]_{\text{NaF}}\}^2$$

$$[\text{Ca}^{2+}] = 2 [\text{F}^-]_{\text{CaF}_2}$$

$$\text{let } x = [\text{Ca}^{2+}]$$

$$3.9 \times 10^{-11} = x * (2x + 0.2382)^2$$

assume $0.24 \gg \gg \gg \gg 2x$

$$x = 3.9 \times 10^{-11} / (0.2382)^2 = 6.9 \times 10^{-10} \text{ M} = [\text{Ca}^{2+}]$$