Chemistry I Chapter 22 Quiz #2 Name__Teoche__

SHOW ALL WORK

1. At 25°C, 3.6×10^{-19} mole of nickel (II) phosphate dissolves in (2.0) liter of water. What is the K_{sp} of $Ni_3(PO_4)_2$?

$$Ni_3(PO_4)_2 \longrightarrow 3Ni^{2+} + 2PO_4^{3-}$$
$$1.8 \times 10^{-19} \qquad 5.4 \times 10^{-19} \qquad 3.6 \times 10^{-19}$$
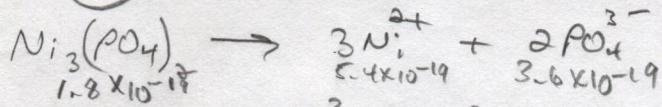
$$K_{sp} = \{Ni^{2+}\}^3 \{PO_4^{2-}\}^2$$

$$\left(5.4 \times 10^{-19}\right)^3 \left(3.6 \times 10^{-19}\right)^2$$

$$\left(1.57 \times 10^{-55}\right)\left(1.296 \times 10^{-37}\right)$$

$$\boxed{K_{sp} = 2.0 \times 10^{-92}}$$

2. The K_{sp} of $Pb(IO_3)_2$ is 2.6×10^{-13} at 25°C. What is the concentration of Pb^{2+} and IO_3^- in the saturated solution?

$$Pb(IO_3)_2 \rightleftharpoons Pb^{2+} + 2IO_3^-$$

$$K_{sp} = \{Pb^{2+}\}\{IO_3^-\}^2$$
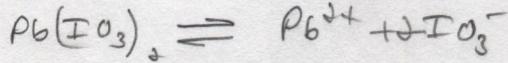
$$2.6 \times 10^{-13} = (x)(2x)^2$$

$$2.6 \times 10^{-13} = 4x^3$$

$$6.5 \times 10^{-14} = x^3$$

$$x = \boxed{\{Pb^{2+}\} = 4.0 \times 10^{-5}} \qquad \{IO_3^-\} = 8.0 \times 10^{-5}$$

3. Decide whether a precipitate will form when 40.0 mL of 0.0010 M K_2CO_3 is added to 60.0 mL of 1.0×10^{-6} M $AgNO_3$.

$$K_2CO_3 \rightarrow 2K^+ + CO_3^{2-}$$
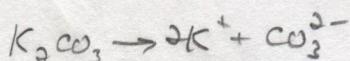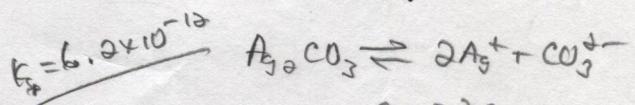
$$\left. \begin{array}{c} 0.0010 \, M \\ 0.040 \, L \end{array} \right\rangle \, 4.0 \times 10^{-5} \text{ moles } CO_3^{2-}$$

$$\frac{4 \times 10^{-5}}{0.100 \, L} = \underline{4 \times 10^{-4} \, M \, CO_3^{2-}}$$

$$AgNO_3 \rightarrow Ag^+ + NO_3^-$$

$$\left. \begin{array}{c} 1.0 \times 10^{-6} \, M \\ 0.060 \, L \end{array} \right\rangle \, 6.0 \times 10^{-8} \text{ moles } Ag^+$$

$$\frac{6.0 \times 10^{-8}}{0.100 \, L} = \underline{6.0 \times 10^{-7} \, M \, Ag^+}$$

$$K_{sp} = 6.2 \times 10^{-12} \qquad Ag_2CO_3 \rightleftharpoons 2Ag^+ + CO_3^{2-}$$

$$Q_{sp} = [Ag^+]^2 [CO_3^{2-}]$$

$$Q_{sp} = (6.0 \times 10^{-7})^2 (4.0 \times 10^{-4})$$

$$Q_{sp} = (3.6 \times 10^{-13})(4.0 \times 10^{-4})$$

$$\underline{Q_{sp} = 1.4 \times 10^{-16}}$$

Since $Q_{sp} < K_{sp}$

$$\boxed{NO \, PPT}$$