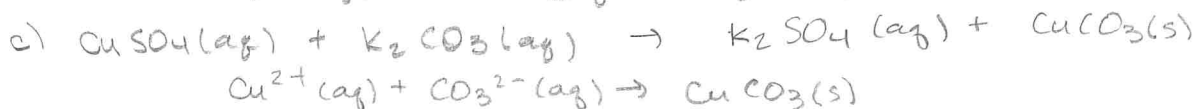
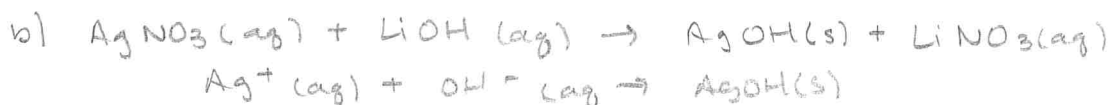
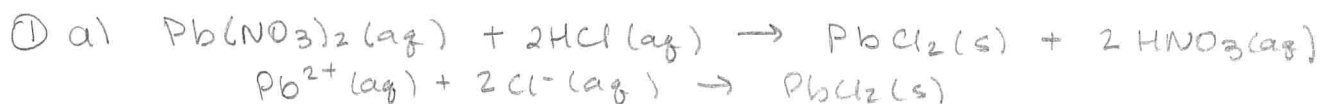


wkst 7d - Solubility + K_{sp}



b) $K_{sp} = [Ca^{2+}]^3 [PO_4^{3-}]^2$

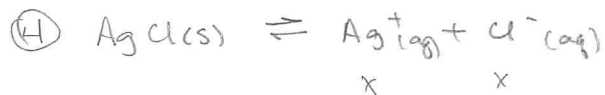
c) $Ca_3(PO_4)_2 \rightleftharpoons 3Ca^{2+} + 2PO_4^{3-}$
 $\begin{matrix} 3x & 2x \\ 3(7.1 \cdot 10^{-7} M) & 2(7.1 \cdot 10^{-7} M) \\ 2.1 \cdot 10^{-6} & 1.4 \cdot 10^{-6} M \end{matrix}$ $K_{sp} = (2.1 \cdot 10^{-6})^3 (1.4 \cdot 10^{-6})^2 = 1.8 \cdot 10^{-29}$



$K_{sp} = [Ba^{2+}][F^-]^2$ $1.7 \cdot 10^{-6} = (x)(2x)^2 = 4x^3$

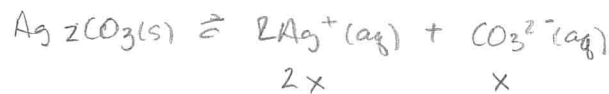
$x = .0075 M$

b) $\frac{.0075 \text{ mol } BaF_2}{L} \Bigg| \frac{175.33 g}{1 \text{ mol}} = 1.3 g/L$



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

$1.8 \cdot 10^{-10} = x^2$ $x = 1.3 \cdot 10^{-5} M$



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

$8.1 \cdot 10^{-12} = (2x)^2 (x)$ $x = 1.03 \cdot 10^{-4} M$

NO, because $[Ag^+]$ is squared in K_{sp} expression for Ag_2CO_3 , the actual molar solubility of Ag_2CO_3 is greater

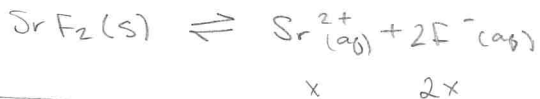
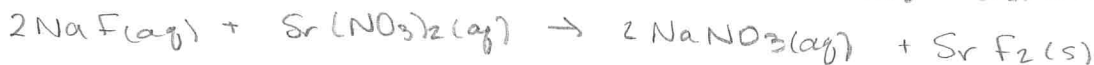
* optional challenge *

⑤ 75 mL 0.060 M NaF

$$M_1 V_1 = M_2 V_2$$

$$(0.060 M)(75 \text{ mL}) = (M_2)(100 \text{ mL})$$

$$M_2 = [\text{NaF}] = 0.045 M$$



$$[\text{NO}_3^-] = 2 \cdot 0.038 M = 0.076 M$$

$$[\text{Na}^+] = 0.045 M$$

$$[\text{F}^-] = 7.4 \cdot 10^{-4} M$$

$$[\text{Sr}^{2+}] = 0.015 M$$

25 mL 0.15 M $\text{Sr}(\text{NO}_3)_2$

$$M_1 V_1 = M_2 V_2$$

$$(0.15 M)(25 \text{ mL}) = (M_2)(100 \text{ mL})$$

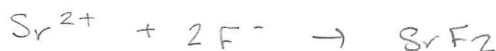
$$M_2 = [\text{Sr}(\text{NO}_3)_2] = 0.038 M$$

$$K_{sp} = [\text{Sr}^{2+}][\text{F}^-]^2$$

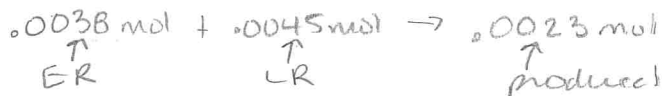
$$2.0 \cdot 10^{-10} = (x)(2x)^2 = 4x^3$$

$$x = 3.7 \cdot 10^{-4} M$$

$$2x = 7.4 \cdot 10^{-4} M$$



$$0.038 M \quad 0.045 M$$



0.0015 mol Sr^{2+} left over



$$\begin{array}{ccc} \text{I} & & 0 & & 0.010 M \\ \text{C} & & +x & & +x \\ \text{E} & & x & & 0.010 + x \end{array}$$

$$K_{sp} = [\text{Ca}^{2+}][\text{CO}_3^{2-}]$$

$4.9 \cdot 10^{-9} = (x)(0.010)$ ← x is negligible b/c of small K_{sp}

$$4.9 \cdot 10^{-9} = (x)(0.010)$$

$$x = 4.9 \cdot 10^{-7} M$$



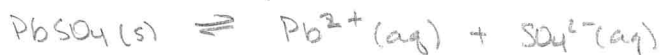
$$K_{sp} = 3.6 \cdot 10^{-5}$$

$$K_{sp} = [\text{Sr}^{2+}][\text{CrO}_4^{2-}]$$

$$Q = (1.0 \cdot 10^{-3} M)(3.0 \cdot 10^{-5} M) = 3.0 \cdot 10^{-8}$$

$$Q < K_{sp}$$

no precipitate



$$K_{sp} = [\text{Pb}^{2+}][\text{SO}_4^{2-}]$$

$$6.3 \cdot 10^{-7} = (1.0 \cdot 10^{-4})[\text{SO}_4^{2-}]$$

$$[\text{SO}_4^{2-}] = 6.3 \cdot 10^{-3} M$$



$$K_{sp} = [\text{Sr}^{2+}][\text{SO}_4^{2-}]$$

$$3.4 \cdot 10^{-7} = (2.0 \cdot 10^{-3} M)[\text{SO}_4^{2-}]$$

$$[\text{SO}_4^{2-}] = 1.7 \cdot 10^{-4} M$$

once $[\text{SO}_4^{2-}] > 1.7 \cdot 10^{-4} M$, SrSO_4 will precipitate

$6.3 \cdot 10^{-3} M > [\text{SO}_4^{2-}] > 1.7 \cdot 10^{-4} M$, only SrSO_4 will precipitate.