



(p718 Table of K_{sp})

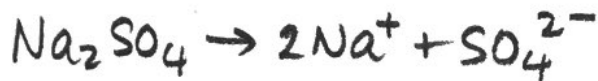
97. Will a precipitate form when 75.0 mL of 0.020 M BaCl_2 and 125 mL of 0.040 M Na_2SO_4 are mixed together?



$$M_1 V_1 = M_2 V_2$$

$$(0.020)(75.0) = (M_2)(200.0)$$

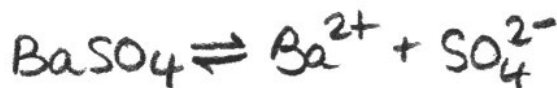
$$M_2 = 0.0075 \text{ M } \text{Ba}^{2+}$$



$$M_1 V_1 = M_2 V_2$$

$$(0.040)(125) = M_2(200)$$

$$M_2 = 0.025 \text{ M } \text{SO}_4^{2-}$$



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

$$Q = (0.0075)(0.025)$$

$$Q = 1.9 \times 10^{-4}$$

$Q > K_{sp}$ so $\text{BaSO}_4(s)$ will form



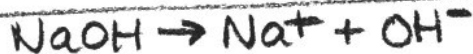
98. Will a precipitate form when 100.0 mL of $4.0 \times 10^{-4} \text{ M}$ $\text{Mg}(\text{NO}_3)_2$ is added to 100.0 mL of $2.0 \times 10^{-4} \text{ M}$ NaOH ?



$$M_1 V_1 = M_2 V_2$$

$$(4.0 \times 10^{-4})(100.0) = (M_2)(200.0)$$

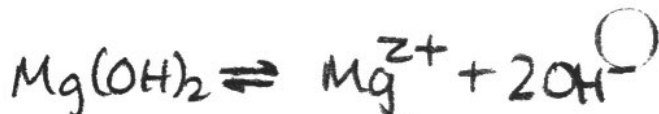
$$M_2 = 2.0 \times 10^{-4} \text{ M } \text{Mg}^{2+}$$



$$M_1 V_1 = M_2 V_2$$

$$(2.0 \times 10^{-4})(100.0) = (M_2)(200.0)$$

$$M_2 = 1.0 \times 10^{-4}$$



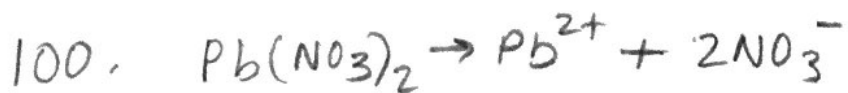
$$K_{sp} = [\text{Mg}^{2+}][\text{OH}^-]^2$$

$$Q = (2.0 \times 10^{-4})(1.0 \times 10^{-4})^2$$

$$Q = 2.0 \times 10^{-12}$$

$Q < K_{sp}$ so $\text{Mg}(\text{OH})_2$ will not ppt.

99. Calculate the final concentrations of $\text{K}^+(aq)$, $\text{C}_2\text{O}_4^{2-}(aq)$, ...



$$M_1 V_1 = M_2 V_2$$

$$(0.10)(50.0) = M_2(100.0)$$

$$M_2 = 0.050 \text{ M} = [\text{Pb}(\text{NO}_3)_2]$$

$$[\text{Pb}^{2+}] = 0.050 \text{ M}$$



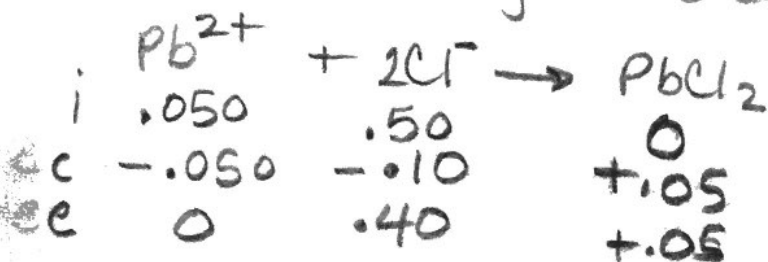
$$M_1 V_1 = M_2 V_2$$

$$(1.0)(50.0) = M_2(100.0)$$

$$M_2 = 0.50 \text{ M} = [\text{KCl}]$$

$$[\text{Cl}^-] = 0.50 \text{ M}$$

* assume ppt rxn goes to completion



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

$$1.6 \times 10^{-5} = (x)(0.40 + 2x)^2$$

$$x = 1.0 \times 10^{-4} \text{ M} = [\text{Pb}^{2+}]$$

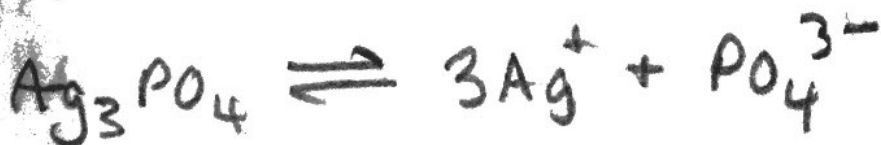
$$[\text{NO}_3^-] = 0.10 \text{ M}$$

$$[\text{Pb}^{2+}] = 1.0 \times 10^{-4} \text{ M}$$

$$[\text{K}^+] = 0.50 \text{ M}$$

$$[\text{Cl}^-] = 0.40 \text{ M}$$

101. A solution contains $1.0 \times 10^{-5} M$ Na_3PO_4 . What is the minimum concentration of AgNO_3 that would cause precipitation of solid Ag_3PO_4 ($K_{sp} = 1.8 \times 10^{-18}$)?



$$K_{sp} = [\text{Ag}^+]^3 [\text{PO}_4^{3-}]$$

$$1.8 \times 10^{-18} = [\text{Ag}^+]^3 [1.0 \times 10^{-5} M]$$

$$[\text{Ag}^+] = [\text{Ag}] = 5.6 \times 10^{-5} M$$

$[\text{Ag}_3\text{PO}_4] = \rightarrow$ any amount over this will result in ppt.