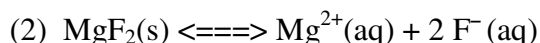


(1) An aqueous solution is prepared that is initially 0.100 M in CdI_4^{2-} . After equilibrium is established, the solution is found to be 0.013 M in Cd^{2+} .

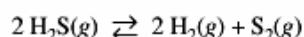
- Derive the expression for the dissociation constant, K_d , and determine the value of the constant.
- What will be the cadmium ion concentration arising when 0.400 mol of KI is added to 1.00 L of the solution in part **a**?
- A solution is prepared by mixing 0.500 L of the solution from part **b** and 0.500 L of 2.0×10^{-5} M NaOH. Will cadmium hydroxide, $\text{Cd}(\text{OH})_2$, precipitate? The K_{sp} for cadmium hydroxide is 2.2×10^{-14} .
- When the initial solution is heated, the cadmium ion concentration increases. Is the equilibrium an exothermic or an endothermic process? Explain how you arrived at your conclusion.



In a saturated solution of MgF_2 at 18°C , the concentration of Mg^{2+} is 1.21×10^{-3} molar. The equilibrium is represented by the equation above.

- Write the expression for the solubility-product constant, K_{sp} , and calculate its value at 18°C .
- Calculate the equilibrium concentration of Mg^{2+} in 1.000 liter of saturated MgF_2 solution at 18°C to which 0.100 mole of solid KF has been added. The KF dissolves completely. Assume the volume change is negligible.
- Predict whether a precipitate of MgF_2 will form when 100.0 milliliters of a 3.00×10^{-3} molar $\text{Mg}(\text{NO}_3)_2$ solution is mixed with 200.0 milliliters of a 2.00×10^{-3} molar NaF solution at 18°C . Calculations to support your prediction must be shown.
- At 27°C the concentration of Mg^{2+} in a saturated solution of MgF_2 is 1.17×10^{-3} molar. Is the dissolving of MgF_2 in water an endothermic or an exothermic process? Give an explanation to support your conclusion.

(3)



- When heated, hydrogen sulfide gas decomposes according to the equation above. A 3.40 g sample of $\text{H}_2\text{S}(\text{g})$ is introduced into an evacuated rigid 1.25 L container. The sealed container is heated to 483 K, and 3.72×10^{-2} mol of $\text{S}_2(\text{g})$ is present at equilibrium.
 - Write the expression for the equilibrium constant, K_c , for the decomposition reaction represented above.
 - Calculate the equilibrium concentration, in mol L^{-1} , of the following gases in the container at 483 K.
 - $\text{H}_2(\text{g})$
 - $\text{H}_2\text{S}(\text{g})$
 - Calculate the value of the equilibrium constant, K_c , for the decomposition reaction at 483 K.
 - Calculate the partial pressure of $\text{S}_2(\text{g})$ in the container at equilibrium at 483 K.
 - For the reaction $\text{H}_2(\text{g}) + \frac{1}{2} \text{S}_2(\text{g}) \rightleftharpoons \text{H}_2\text{S}(\text{g})$ at 483 K, calculate the value of the equilibrium constant, K_c .