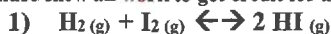


You must show all work to get credit for any part of this quiz.



The $[\text{H}_2] = 0.189 \text{ M}$ and $[\text{I}_2] = 0.189 \text{ M}$ and $[\text{HI}] = 0.965$

If the $K_{\text{eq}} = 3.5 \times 10^{-8}$ at 427 C, is the reaction at equilibrium. Explain your answer. If it's not at equilibrium, state in which direction the reaction is running.

- A) Write the Equilibrium expression (K_{eq}) (1pt)

$$K_{\text{eq}} = \frac{[\text{HI}]^2}{[\text{H}_2] \cdot [\text{I}_2]}$$

- B) Calculate Q (1pt)

$$Q = \frac{(0.965)^2}{(0.189)(0.189)} \Rightarrow Q = 26.07$$

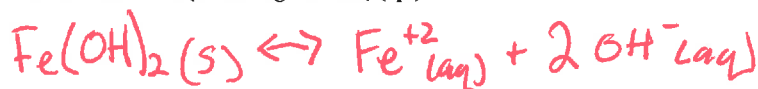
- C) Is the reaction @ equilibrium? If it isn't, explain if it is favoring the forward or reverse reaction. (3pt)

Rxn isn't at equilibrium b/c $K_{\text{eq}} \neq Q$. Since $K_{\text{eq}} < Q$ Rxn runs in the reverse direction

2.) What are the equilibrium concentrations of the dissolved ions in a saturated solution of $\text{Fe}(\text{OH})_2$ at 25 °C.

($K_{\text{sp}} = 8.05 \times 10^{-16}$)

- A) Write the dissolution (dissolving reaction) (1pt)



Let $x = [\text{Fe}^{+2}] = 5.86 \times 10^{-6} \text{ M}$
 Let $2x = [\text{OH}^{-}] = 1.17 \times 10^{-5} \text{ M}$

- B) Write the K_{sp} expression (1pt)

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

- C) Calculate the []'s of the ions (2pts)

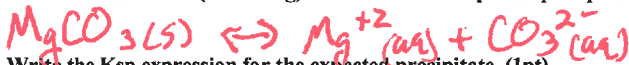
$$8.05 \times 10^{-16} = (x)(2x)^2 \Rightarrow 8.05 \times 10^{-16} = 4x^3 \Rightarrow \sqrt[3]{\frac{8.05 \times 10^{-16}}{4}} = x$$

$x = 5.86 \times 10^{-6}$

3.) A solution is prepared by adding 50 mL of $4.2 \times 10^{-2} \text{ M}$ of MgCl_2 to 50 mL of $6.8 \times 10^{-2} \text{ M}$ of Na_2CO_3 at 25 °C.

The expected precipitate has a $K_{\text{sp}} = 3.5 \times 10^{-8}$

- a. Write the dissolution (dissolving) reaction for the expected precipitate. (1pt)



- b. Write the K_{sp} expression for the expected precipitate. (1pt)

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

- c. Calculate the moles of Mg^{+2} in its initial solution (1pt)

$$4.2 \times 10^{-2} \text{ M} = \frac{x \text{ mol Mg}^{+2}}{0.050 \text{ L}}$$

$$\text{mol Mg}^{+2} = 2.1 \times 10^{-3} \text{ mol Mg}^{+2}$$

- d. Calculate the moles of CO_3^{2-} in its initial solution (1pt)

$$6.8 \times 10^{-2} \text{ M} = \frac{x \text{ mol CO}_3^{2-}}{0.050 \text{ L}}$$

$$\text{mol CO}_3^{2-} = 3.4 \times 10^{-3} \text{ mol CO}_3^{2-}$$

- e. Calculate the Molarity of Mg^{+2} after the solutions are mixed (1pt)

$$M = \frac{2.1 \times 10^{-3} \text{ mol}}{0.10 \text{ L}} = 2.1 \times 10^{-2} \text{ M}$$

- f. Calculate the Molarity of CO_3^{2-} after the solutions are mixed (1pt)

$$M = \frac{3.4 \times 10^{-3} \text{ mol}}{0.10 \text{ L}} = 3.4 \times 10^{-2} \text{ M}$$

- g. Solve for Q (1pt)

$$Q = (2.1 \times 10^{-2})(3.4 \times 10^{-2}) = 7.14 \times 10^{-4}$$

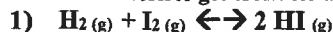
- h. Relate Q to K_{sp} and explain if a precipitate forms (1pt)

$K_{\text{sp}} \text{ vs } Q$
 $3.5 \times 10^{-8} < 7.1 \times 10^{-4}$ ∴ Rxn runs left & precipitate forms

Name: Key

Ksp and Keq Quiz

You must show all work to get credit for any part of this quiz.

The $[\text{H}_2] = 0.528 \text{ M}$ and $[\text{I}_2] = 0.528 \text{ M}$ and $[\text{HI}] = 4.823$ If the $K_{\text{eq}} = 54.0$ at 427 C , is the reaction at equilibrium. Explain your answer. If it's not at equilibrium, state in which direction the reaction is running.A) Write the Equilibrium expression (K_{eq}) (1pt)

$$K_{\text{eq}} = \frac{[\text{HI}]^2}{[\text{H}_2] \cdot [\text{I}_2]}$$

B) Calculate Q (1pt)

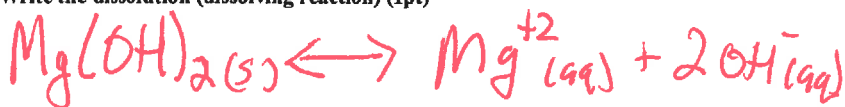
$$Q = \frac{(4.823)^2}{(0.528)(0.528)} \Rightarrow Q = 83.44$$

C) Is the reaction @ equilibrium? If it isn't. Explain if it is favoring the forward or reverse reaction. (3pt)

Rxn isn't at equilibrium b/c $K_{\text{eq}} \neq Q$. Since $K_{\text{eq}} < Q$ Rxn Runs
54.0 83.44 Reverse

2.) What are the equilibrium concentrations of the dissolved ions in a saturated solution of $\text{Mg}(\text{OH})_2$ at 25°C . ($K_{\text{sp}} 3.5 \times 10^{-8}$)

A) Write the dissolution (dissolving reaction) (1pt)



B) Write the Ksp expression (1pt)

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

C) Calculate the []'s of the ions (2pts)

$$3.5 \times 10^{-8} = (x)(2x)^2 \rightarrow \sqrt[3]{\frac{3.5 \times 10^{-8}}{4}} = x \quad x = 2.06 \times 10^{-3} \text{ M}$$

$$3.5 \times 10^{-8} = 4x^3 \quad 2x = 4.12 \times 10^{-3} \text{ M}$$

$$\left. \begin{array}{l} \text{Let } x = [\text{Mg}^{+2}] = 2.06 \times 10^{-3} \text{ M} \\ \text{Let } 2x = [\text{OH}^{-}] = 4.12 \times 10^{-3} \text{ M} \end{array} \right\}$$

3.) A solution is prepared by adding 50 mL of $7.5 \times 10^{-2} \text{ M}$ of CaCl_2 to 50 mL of $5.0 \times 10^{-2} \text{ M}$ of Na_2CO_3 at 25°C . The expected precipitate has a $K_{\text{sp}} = 2.8 \times 10^{-9}$

a. Write the dissolution (dissolving) reaction for the expected precipitate. (1pt)



b. Write the Ksp expression for the expected precipitate. (1pt)

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

c. Calculate the moles of Ca^{+2} in its initial solution (1pt)

$$7.5 \times 10^{-2} \text{ M} = \frac{x \text{ mol Ca}^{+2}}{0.050 \text{ L}} \quad \text{mol Ca}^{+2} = 3.75 \times 10^{-3} \text{ mol Ca}^{+2}$$

d. Calculate the moles of CO_3^{2-} in its initial solution (1pt)

$$5.0 \times 10^{-2} \text{ M} = \frac{x \text{ mol CO}_3^{2-}}{0.050 \text{ L}} \quad \text{mol CO}_3^{2-} = 2.5 \times 10^{-3} \text{ mol CO}_3^{2-}$$

e. Calculate the Molarity of Ca^{+2} after the solutions are mixed (1pt)

$$M = \frac{3.75 \times 10^{-3} \text{ mol}}{0.10 \text{ L}} = 3.75 \times 10^{-2} \text{ M} = [\text{Ca}^{+2}]$$

f. Calculate the Molarity of CO_3^{2-} after the solutions are mixed (1pt)

$$M = \frac{2.5 \times 10^{-3} \text{ mol}}{0.10 \text{ L}} = 2.5 \times 10^{-2} \text{ M} = [\text{CO}_3^{2-}]$$

g. Solve for Q (1pt)

$$Q = (3.75 \times 10^{-2})(2.5 \times 10^{-2}) \quad Q = 9.375 \times 10^{-4}$$

h. Relate Q to Ksp and explain if a precipitate forms (1pt)

$K_{\text{sp}} \text{ vs } Q$
 $2.8 \times 10^{-9} < 9.4 \times 10^{-4} \therefore \text{Rxn Runs Left} \hat{=} \text{precipitate forms}$