

1. A gaseous chemical equilibrium has an equilibrium constant with the following form.

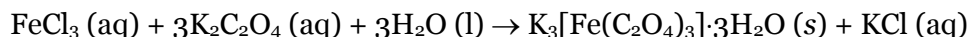
$$K_p = \frac{P_{\text{HI}}^2}{P_{\text{H}_2}P_{\text{I}_2}}$$

A) Write a balanced chemical equation for this system/reaction.

B) Write an expression for K_c and determine the relationship between K_p and K_c .

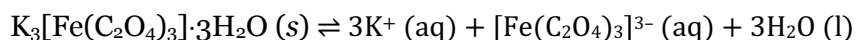
C) A container holds $[\text{H}_2] = 2.95 \times 10^{-3} \text{ M}$, $[\text{I}_2] = 5.22 \times 10^{-4} \text{ M}$, and $[\text{HI}] = 1.95 \times 10^{-3} \text{ M}$ at 25°C . If $K_c = 48.8$ at 25°C , in which direction will the reaction proceed in the container?

2. In the laboratory you synthesize emerald-colored crystals of trihydrate potassium ferrioxalate ($\text{K}_3[\text{Fe}(\text{C}_2\text{O}_4)_3] \cdot 3\text{H}_2\text{O}$) from aqueous solutions of FeCl_3 and $\text{K}_2\text{C}_2\text{O}_4$.



Recrystallization from a saturated aqueous solution of your products, contaminated with by-products and starting materials, served to purify your desired product.

A) Write a (solubility) equilibrium constant for dissolution of the crystals:



B) If cooling the saturated solution results in crystal formation, is the dissolution of the $\text{K}_3[\text{Fe}(\text{C}_2\text{O}_4)_3] \cdot 3\text{H}_2\text{O}$ and endothermic or exothermic process?

3. Consider the reaction between phosphorus(III) chloride and chlorine gas to produce phosphorus(V) chloride.



- A) A 1.00 L container at constant temperature contains $P_{\text{PCl}_3} = 1.5 \text{ atm}$, $P_{\text{Cl}_2} = 0.72 \text{ atm}$, and $P_{\text{PCl}_5} = 0 \text{ atm}$ initially. Calculate the partial pressures at equilibrium.

- B) Describe some ways in which we can increase the concentration of $\text{PCl}_5(\text{g})$.

- C) The energy diagram for the reaction is shown below. Determine how the equilibrium number of moles of PCl_5 would change if system were heated.

