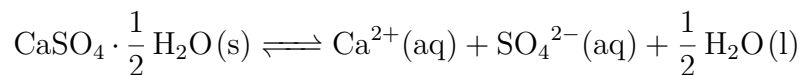


1. How much water would it take to dissolve 3.0 g of  $\text{CaSO}_4 \cdot \frac{1}{2} \text{H}_2\text{O}$  if its  $K_{sp} = 3.1 \times 10^{-7}$ ? You may disregard the water formed in the dissolving process.



2. (a) The solubility of  $\text{AgCl}(\text{s})$  in  $6.5 \times 10^{-3} \text{ M AgNO}_3$  is  $2.5 \times 10^{-8} \text{ M}$  at 298 K. What is the  $K_{sp}$  of  $\text{AgCl}$ ?

(b) Find the  $\Delta S^\circ$  for dissolving  $\text{AgCl}$  in water, given a reported  $\Delta H_{\text{sol}}^\circ$  of 61 kJ/mol.

- (c) True or False: "As the salt dissolves, heat is released, which increases the temperature of the solution, causing more salt to dissolve in solution." Briefly justify your answer.

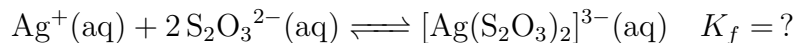
3. A small amount of  $\text{Ag}_2\text{C}_2\text{O}_4(\text{s})$  is added to 100 mL of a solution that is  $4 \times 10^{-3} \text{ M Sr}(\text{NO}_3)_2(\text{aq})$ . A single precipitate is present after the addition of  $\text{Ag}_2\text{C}_2\text{O}_4(\text{s})$ . What is the precipitate?

$$K_{sp}(\text{Ag}_2\text{C}_2\text{O}_4) = 3.5 \times 10^{-11} \quad K_{sp}(\text{SrC}_2\text{O}_4) = 5 \times 10^{-8}$$

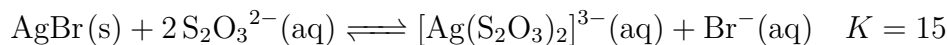
4.  $\text{AgBr}(\text{s})$  (MW = 187.77 g/mol) is used in black and white film. Once an image is formed, excess  $\text{AgBr}(\text{s})$  needs to be removed but it is not very soluble in water ( $K_{sp} = 5.3 \times 10^{-13}$ ).

(a) What is the solubility of  $\text{AgBr}$ ?

- (b) To increase the solubility of  $\text{AgBr}$ ,  $\text{Na}_2\text{S}_2\text{O}_3$  is added to water and the following equilibrium takes place:

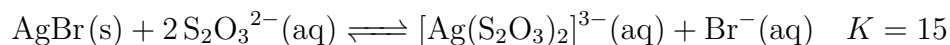


This leads to an overall equilibrium of:



Determine the value of  $K_f$ .

5.



This system is at equilibrium, and  $\text{AgBr}(s)$  is added. Immediately:

- (a)  $Q$ :  increases    decreases    stays the same  
(b)  $K$ :  increases    decreases    stays the same  
(c)  $\Delta G_{\text{toeq}}$ :  is positive    is negative    equals 0

This system is at equilibrium, and  $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}(s)$  is added. Immediately:

- (a)  $Q$ :  increases    decreases    stays the same  
(b)  $K$ :  increases    decreases    stays the same  
(c)  $\Delta G_{\text{toeq}}$ :  is positive    is negative    equals 0

### Homework Problem 26

1. The  $K_{sp}$  of  $\text{Ba}(\text{NO}_3)_2$  at 298 K is  $4.63 \times 10^{-3}$ . At 350 K it is  $9.96 \times 10^{-3}$ .

(a) What is the solubility of  $\text{Ba}(\text{NO}_3)_2$  at 350 K?

(b) What is the sign of  $\Delta H_{sol}$  of  $\text{Ba}(\text{NO}_3)_2$ ?

(c) 10.0 mL of a solution that is 0.005 M  $\text{Ba}^{2+}(\text{aq})$  is mixed with 20.0 mL of 0.25 M  $\text{NO}_3^{-}(\text{aq})$  at 298 K. Then a single crystal of solid  $\text{Ba}(\text{NO}_3)_2$  is added. Will  $\text{Ba}(\text{NO}_3)_2$  dissolve, precipitate, or do nothing? Show work to justify your answer.