LAB-AIDS® #87 CHANGING OF EQUILIBRIUM – LE CHATELIER'S PRINCIPLE
Student Worksheet and Guide

Some substances react to produce results, which then react to form the original substances. Such reactions are described as being reversible. The competition between the "forward" reaction and the "reverse" reaction produces an equilibrium mixture. The composition of the equilibrium mixture may be changed by a change in temperature, pressure or concentration of the reactants. Le Chatelier's Principle enables us to predict the result to be expected when these conditions are changed. In this experiment, concentrations will be changed, and observations made of changes in colors and phases.

Procedure:

Part I - The Equilibrium Between CrO_4^{-2} and $Cr_2O_7^{-2}$

1. Place 4–5 drops of Potassium chromate solution in cavities #1–4 in the Lab-Aids Chemplate™. Place 4–5 drops of Potassium dichromate solution in cavities #5–8. The colors of the solutions are characteristic of the aqueous chromate ion, CrO_4^{-2}, and the aqueous dichromate ion, $Cr_2O_7^{-2}$.

   The color of $CrO_4^{-2}{}_{(aq)}$ is _____.
   The color of $Cr_2O_7^{-2}{}_{(aq)}$ is _____.

2. **Effect of increasing the concentration of $H^+_{(aq)}$.**
   Add dilute HCl dropwise to a cavity that contains a solution of K_2CrO_4. **Note:** When a reaction occurs, it appears after the addition of 4–5 drops. In some cases no reaction will be observed.

   Observe the result and record. _____
   _____
   Add dilute HCl dropwise to a cavity that contains a solution of $K_2Cr_2O_7$. Record what you observe _____
   _____

3. **Effect of increasing the concentration of $OH^-_{(aq)}$.**
   Add NaOH solution dropwise to a cavity that contains a solution of K_2CrO_4. Record what you observe _____
   _____
   Add NaOH solution dropwise to a cavity that contains a solution of $K_2Cr_2O_7$. Observe the result. Record what you observe
   _____
   Write a balanced equation which describes the equilibrium between $CrO_4^{-2}{}_{(aq)}$, $Cr_2O_7^{-2}{}_{(aq)}$, $H^+_{(aq)}$, $OH^-_{(aq)}$
   _____ + _____ = _____ + _____

Part II - The Equilibrium Between Solid Barium chromate and a Saturated Solution of its Ions

$BaCrO_{4(s)} = Ba^{+2}{}_{(aq)} + CrO_4^{-2}{}_{(aq)}$

1. Add Barium nitrate solution dropwise to the cavity that contains Potassium chromate solution. Record the result.
   _____
2. Add Barium nitrate solution dropwise to the cavity that contains Potassium dichromate solution. Record the result.
   _____
   What do you conclude about the relative solubilities of Barium chromate and Barium dichromate?
   _____
3. Add dilute Hydrochloric acid dropwise to the cavity that contains Barium chromate. Record your observations.
   _____
4. Add Sodium hydroxide solution to the cavity that contains Barium dichromate. Record your observations.
   _____
5. How could the changes you observe be reversed? Try it, and record what you did, and the result.
   _____
6. Examine the equations obtained in Part I and in Part II, and explain the results you have just obtained.
   _____
   _____

Student's Name _____ Date _____

