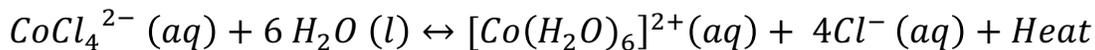


Chemical Equilibrium*Chem P Lab***Introduction:**

In this lab you will observe reactions according to the equation below. In this equation $CoCl_4^{2-}$ is observed to be blue, and $[Co(H_2O)_6]^{2+}$ is observed to be pink. In this experiment you will observe what happens to the equilibrium when it is disturbed.



Blue

Pink

Pre-lab Questions:

1. What is an equilibrium? (You can answer in terms of some of the examples in the reading)
2. Answer the following questions using the equation below. The answers to these questions are your predictions.

$$A + B \leftrightarrow C + D$$
 - a. What does the double arrow " \leftrightarrow " represent?
 - b. If the above equation is in equilibrium, what do you think would happen to reaction if more "A" was added?
 - c. If the above equation is in equilibrium, what do you think would happen to the reaction if some of product "D" was removed?
3. What are some ways you think a chemical equilibrium could be disturbed? (What are some ways that I could make a chemical reaction not be in equilibrium anymore?)

Safety:

$AgNO_3$ (Silver Nitrate) can burn your skin and also it will stain your skin a brownish-black color. Please be careful when handling the silver nitrate and your goggles must be worn at all times.

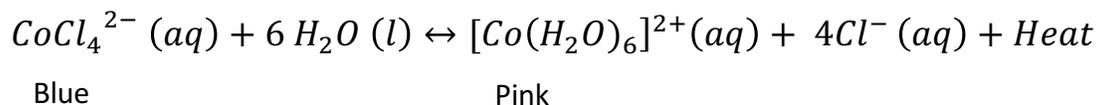
Test 1: Adding HCl to the solution.

(Demonstration to be done by your instructor)

Experiment	Observations (Color of the solution)	What species are you effecting in the reaction?	Are you adding this species or removing it?
Adding concentrated 6 M HCl			

Name: _____ Per _____

1. What does the color change mean?
2. Why do you think the color change took place? Explain in terms of excess species. Use the reaction below to help you formulate your response.



Test 2: Heating the Reaction

Predict: What do you think will happen when the reaction is heated? _____

1. Pour approximately 25 mL of Cobalt (II) Chloride into a small beaker.
2. Put the beaker onto the hotplate and heat for approximately 5-10 minutes.
3. Record your observations in the table below.
4. Remove the beaker from the hotplate and pour approximately half into another small beaker.

Test 3: Cooling the Reaction

Predict: What do you think will happen when the reaction is heated? _____

1. Take one of the beakers (with approximately 12.5 mL of solution) from Test 2 and put this beaker in ice.
2. Record your observations in the table below.

Test 4: Adding AgNO₃

Predict: What do you think will happen when AgNO₃ is added to the solution? _____

1. Take the second beaker from Test 2 and add approximately 15 mL of AgNO₃ to the beaker.
2. Record your observations in the table below.

Results:

Experiment	Observations (Color of the solution)	What species are you effecting in the reaction?	Are you adding this species or removing it?
Heating the Reaction			
Cooling the Reaction			
Adding AgNO ₃			

Additional Questions:

1. What is a chemical equilibrium?

Name: _____ Per _____

2. How can an equilibrium be altered? What factors can shift an equilibrium?
3. Is the reaction that you studied in this experiment endothermic, or exothermic? How do you know?
4. When you added AgNO_3 to your solution you observed a shift in equilibrium and the formation of a precipitate. What was the precipitate that formed?
5. What problems did you encounter in your experiments? List at least **two** possible sources of error, and **explain each source**.

Discussion

Write 1 paragraph about your experiment on a separate sheet of paper. Identify the three factors that you learned disturbed equilibrium. Explain how each of these factors disturbed the equilibrium and support your claim with evidence from your experiments.