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LeChatelier’s Principle and Equilibrium Lab

Co(H2O)6+2(aq) + 4Cl-(aq) 🡸🡺 CoCl4-2(aq) + 6 H2O(l)

Pink Blue

The above reaction is the equilibrium equation that is achieved when CoCl2 is dissolved in water to make a solution of cobalt chloride. When the solution appears pink the reactants are favored and the concentration of reactants is higher than that of the products. When the solution appears blue the products are favored and the concentration of the products are greater than the concentration of the reactants. When the solution is a purple color neither the reactants or products and the concentrations of reactants and products are close to equal.

Purpose: The purpose of this lab is to determine how the system above at equilibrium will react when different stresses are added to it.

Hypothesis: If CaCl2 is added to the system above in equilibrium the system will shift \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

If water is added to the system above in equilibrium the solution will shift \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

The process above will be (endothermic/exothermic)

Procedure:

1. Fill three test tubes with one pipette of 0.2M CoCl2. This system is currently at equilibrium. Record the color in the data table.

2. In 2 of the 3 test tubes dissolve enough CaCl2 in the test tubes to make the solution purple. Use the solutions on the front desk as a guide for the colors. The third test tube will be a control.

3. In one of the test tubes with purple solution add more CaCl2 to the system until you see a color change. Record the color in the data table

4. Place the other test tube with purple solution in an ice bath until a color change is noticed. Record this color in the data table.

5. Allow the test tube from step 4 to return to room temperature and then place it in a hot water bath until a color change is noticed. Record this color in the data table.

6. Allow the test tube from step 5 to return to room temperature. Add water to the test tube until a color change is noticed. Record this color in the data table.

7. Dispose of everything in the beaker in the fume hood.

Data:

|  |  |  |
| --- | --- | --- |
| Stress Added | Color | Reactants/Products Favored |
| Original Equilibrium (control) |  |  |
| Addition of CaCl2 |  |  |
| Ice Water Bath |  |  |
| Hot Water Bath |  |  |
| Addition of Water |  |  |

Analysis Questions:

1. Why did adding the CaCl2 cause the reaction to shift the direction it shifted?

2. Is heat a reactant or product in the original equation? Explain how you know.

3. Is the original reaction endothermic or exothermic? How do you know?

4. Why did adding water cause the reaction to shift the direction it shifted?

5. Which direction would the equilibrium shift if Chlorine ions were removed from the system?

6. Which direction would the equilibrium shift if water was removed from the system?

7. In step 2 when you created a purple solution was either side of the reaction favored? Explain.

Conclusion:

Write a five sentence conclusion discussing whether your hypothesis was supported or rejected. Discuss each of your three predictions and use evidence from the lab to explain why the prediction was correct or incorrect.

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