

## **Experiment 12A Investigating Chemical Equilibrium**

### **Analysis of Results:**

1) If the molar concentration of NaOH is increased, the number of drops required for the colour change will decrease. A stronger concentration can have a more significant impact on the solution.

2) When the reagent 1.0 M of NaOH was added to the iron(III) thiocyanate equilibrium system, the solution's color changed from orange to yellow and the equilibrium shifted to the left. According to Le Chatelier's principle, when a change is applied to an equilibrium system, the system will counter that change to maintain a new equilibrium. In this case, the 1.0 M of NaOH reacts with the system to reduce the amount of  $\text{Fe}^{3+}$  present in the solution. This causes the product to break down and create more  $\text{Fe}^{3+}$  so a new equilibrium is created.

3) If hydrated cobalt (II) ion complex is placed in a refrigerator, the colour will probably turn purple red-ish.

4) The forward reaction is endothermic, because endothermic reactions absorb/take in heat from their surroundings. As we add heat to the reactant side, it starts to have a higher enthalpy compared to the products. The forward reaction rate is also increased when heat is added to the system.

5) NaCl will create additional Cl to the system, meaning that the equilibrium system will shift from high to low. The equilibrium will shift right to the product side.



7) According to Le Chatelier's Principle, when changes occur to a reaction, there will be a counter-act that counters the change to the system. In Part IV, steps 1 to 4, when  $\text{H}^+$  are added to the system, the reaction will shift from high to low.  $\text{K}_2\text{CrO}_4^{2-}$  with addition  $\text{H}^+$  will shift the equilibrium as the colour change from yellow to orange. For  $\text{K}_2\text{Cr}_2\text{O}_7^{2-}$  with addition  $\text{OH}^-$  the equilibrium will shift, and the colour will change from orange to yellow.

8)  $\text{BaCrO}_4$  is insoluble.  $\text{BaCr}_2\text{O}_7$  is soluble.

9) In step 7, there was additional  $\text{H}^+$  ions placed in the system before the system reacts with  $\text{Ba}(\text{NO}_3)_2$ . The  $\text{H}^+$  ions shift the system even further away from equilibrium, resulting in no colour changes. Therefore, no precipitate is formed in  $\text{K}_2\text{Cr}_2\text{O}_7$  in step 7.

### **Conclusion:**

This lab helps the group to further understand the concept of equilibrium. To confirm Le Chatelier's principles, the group conducted a series of experiments. In part 1, the group observed the effect of altering the pH concentrations in a equilibrium system. By raising or lowering the pH of the equilibrium system, the Thymol Blue in the solution changes color from yellow to blue. This shows the physical shift of the equilibrium as it counters the pH change. In part 2, the group discovers the effect of adding a reagent that, although is not in the equilibrium

# Lab 12a Investigating Chemical Equilib Answers Ium

**Mike Jess**



## **Lab 12a Investigating Chemical Equilib Answers Ium:**

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