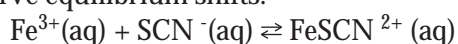




Investigating Le Chatelier's Principle

Introduction

Le Chatelier's principle states that if you have a system at equilibrium and then change something in the system, the equilibrium will shift to counteract the change. In this investigation, you will use the following reversible reaction to observe equilibrium shifts:



The ions involved in this system have characteristic colors that will allow you to follow shifts in equilibrium: Fe^{3+} is gold, SCN^{-} is colorless and FeSCN^{2+} is orange-rust.

Procedure

1. Put on goggles. Put 3 drops of 0.2 M FeCl_3 in the 250 mL beaker. Add 3 drops of 0.2 M KSCN . Swirl to mix.
2. Add distilled H_2O to the beaker to dilute the dark color to light orange. This may require 40-50 mL of H_2O or more. Swirl to mix.
3. Label 5 test tubes A to E. Fill test tubes about $\frac{3}{4}$ full of the light orange solution and place in test tube rack.
4. Test tube A will serve as a control.
5. Add 4 drops of 0.2 M $\text{Fe}(\text{NO}_3)_3$ to test tube B.
6. Add 4 drops of 0.2 M KCl to test tube C.
7. Add 4 drops of 0.2 M KSCN to test tube D.
8. Add 4 drops of 6.0 M NaOH to test tube E. CAUTION: The NaOH is very caustic – be extremely careful with it!
9. Examine test tubes B – E in comparison to test tube A. Note your observations/descriptions in the data table.
10. Clean up as directed by your teacher and wash your hands.

Materials

- Dropper bottles of:
 - 0.2 M FeCl_3
 - 0.2 M KSCN
 - 0.2 M $\text{Fe}(\text{NO}_3)_3$
 - 0.2 M KCl
 - 6.0 M NaOH
- distilled H_2O
- 250 mL beaker
- 5 test tubes
- test tube rack
- wax pencil



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Data Table

Chemical Added	Observations/ Description	Stress Ion	Spectator Ion	Direction of Equilibrium Shift
B: $\text{Fe}(\text{NO}_3)_3$				
C: KCl				
D: KSCN				
E: NaOH				

Analysis and Calculations

1. Using the equation in the introduction, determine the ion creating the stress in each test tube that had an equilibrium shift. Add to the data table.
2. Identify the spectator ion(s) for each test tube and add to data table.
3. Decide whether or not an equilibrium shift occurred in each test tube. On the data table, indicate the direction of equilibrium shifts with arrows.
4. How can you explain your observations in test tube E?