Chemical Equilibrium and Le Chatelier's Principle **NAME:**

Background

According to Le Chatelier's Principle, when a system in equilibrium experiences a change in a property (such as temperature, concentration, or pressure,) the system will react in such a way as to counteract the change. In this experiment, the following equilibrium system will be studied:

Fe^{3+} + SCN^- ⇔ $Fe(SCN)^{2+}$ + Heat
(light brown) (red)

A change in the equilibrium mixture will be qualitatively assessed by comparing the color of the solution in each test sample to a control test tube. You will first be asked to predict the way the equilibrium will shift for each of several changes, explain your reasoning, and then describe what you should visibly see happen in comparison to the control solution.

Materials

Test tube rack
7 large test tubes
Hot plate
2 - 250ml beakers
3-50ml or 100ml beakers
Solid Na_2CO_3
Ice
0.10M $FeCl_3$
0.10M KSCN
0.10M KCl solution
DI Water
Masking tape

Procedure

1. Number 7 test tubes 1 through 7 and put them in a test tube rack (you can label the rack with the tape as in previous experiments).
2. Add 1 pipette-full of 0.10 M $FeCl_3$ to a 100 ml beaker. Add 1 pipette-fulls of 0.10 M KSCN to the same beaker. Fill the beaker to the 80 ml line with distilled water, which should produce a solution that is a light reddish-orange color. Divide the solution equally among the 7 test tubes. Use test tube 1 as a control for comparison.
3. Using a dropper pipet, add about 1 pipet-full of 0.10 M $FeCl_3$. Observe and record the color change that takes place.
4. Repeat step 3, but instead of $FeCl_3$, add the following and shake/stir:
   - Test tube #3 0.10 M KSCN
   - Test tube #4 solid Na_2CO_3 (1 heaping spatula tip full)
   - Test tube #5 0.10 M KCl
5. Place Test tube #6 in a hot water bath. Allow it to sit in the bath until the color changes observably from the control solution in test tube 1. Record your observations.
6. Place test tube #7 in an ice water bath. Allow it to sit in the bath until the color changes observably from the control solution in test tube 1. Record your observations.
7. Dispose of waste as instructed.

Observations and Data

Sample	Color: describe and compare to the control sample. (Be specific) (Could we take photos with our phones and print in color for comparison?)
Test Tube # 1 (CONTROL)	
Test Tube # 2	
Test Tube # 3	
Test Tube # 4	
Test Tube # 5	
Test Tube # 6	
Test Tube # 7	

CONCLUSION AND QUESTIONS

1.Write the equilibrium equation for the reversible reaction that takes place.

2.Write the equilibrium constant expression for the reaction and explain how this is both similar to and different from the reaction quotient.

3.Using Le Chatelier's Principle, and your expression for the equilibrium constant/reaction quotient, explain how the changes made to the solutions in test tubes #2-7 affected the equilibrium. Use your observations of the color changes in supporting your explanations. (Hint: use the concept of stress applied and the shift of equilibrium.)

a)Test tube 2

b) Test tube 3

c) Test tube 4

d) Test tube 5

e) Test tube 6

f) Test tube 7