Name ______________________________ Period _________

Partner ______________________________ Date __________

Le Chateliers Principle Activity
A Particle View of Equilibrium

Throughout this experiment you will be studying the following equilibrium situation:

$$Fe^{3+}(aq) + SCN^{-}(aq) \leftrightarrows FeSCN^{2+}(aq)$$

Yellow clear brick red

Prelab Questions

1) What is equal at equilibrium? What is not equal at equilibrium?

2) Write the equilibrium constant expression for this system.

Materials

In this reaction the Fe^{3+} ions are represented by a yellow chip, the SCN^{-} by a colorless chip, and the $Fe(SCN)^{2+}$ is represented by a red chip (inverted yellow) with a clear chip on top of it. You should have ten yellow/red chips and ten clear chips in your bag.

Procedure:

This reaction is at equilibrium when 2 Fe^{3+} (yellow), 6 SCN^{-} (clear) and 3 $Fe(SCN)^{2+}$ (colorless on top of a red) are present simultaneously. On a sheet of white paper assemble this mixture. This white paper is your "test tube".

1) Fill in the following table with the number of each type of ions in your "test tube".

$[Fe^{3+}]$	$[SCN^{-}]$	$[Fe(SCN)^{2+}]$	Keq Value
Yellow Particles	Colorless Particles	Red with clear Particles	

2) Look at your test tube. Does it contain "equal" numbers of particles of reactants and products?

Using the numbers of particles above calculate the value of the equilibrium constant for this reaction and put it in the table above.

3) One of the stresses that can be placed on an equilibrium system is to add reactants or products. Add 4 yellow chips and one colorless chip to your system. At this time do not adjust the number of products. Now how many of each chip is in the system? Calculate the new value of Keq now and put it in the table below.

$[Fe^{3+}]$	$[SCN^{-}]$	$[Fe(SCN)^{2+}]$	New Keq Value
Yellow Particles	Colorless Particles	Red with clear Particles	

4) If your system is at equilibrium the value of the equilibrium constant should be the same as before. Calculate the value now and put it in the table above.

A reaction quotient has the same expression as an equilibrium constant. The difference is that it is measured away from equilibrium. If you calculate it you can have a value bigger than the Keq, smaller than the Keq, or equal to the Keq.

5) What would it mean if the value of Q was bigger than Keq? What would happen?

6) What would it mean if the value of Q was smaller than Keq? What would happen?

7) What would it mean if the value of Q was equal to Keq? What would happen?

8) Without removing any chips from the test tube reorganize them to bring the system back to equilibrium where the Keq is once again equal to ¼.

$[Fe^{3+}]$	$[SCN^{-}]$	$[Fe(SCN)^{2+}]$	Q Value
Yellow Particles	Colorless Particles	Red with clear Particles	

9) To the system above remove 2 yellow and 4 colorless chips. Fill in the table below and calculate the value of the equilibrium constant.

$[Fe^{3+}]$	$[SCN^{-}]$	$[Fe(SCN)^{2+}]$	Q Value
Yellow Particles	Colorless Particles	Red with clear Particles	

10) Is this system at equilibrium? How would you know?

11) Adjust the chips in the test tube until equilibrium is reestablished. Fill in those numbers in this table.

$[Fe^{3+}]$	$[SCN^{-}]$	$[Fe(SCN)^{2+}]$	Q Value
Yellow Particles	Colorless Particles	Red with clear Particles	

12) Can you come up with another scenario that would be in equilibrium using the chips in your bag?

$[Fe^{3+}]$	$[SCN^{-}]$	$[Fe(SCN)^{2+}]$	Q Value
Yellow Particles	Colorless Particles	Red with clear Particles	

This activity was adapted from one by the incredibly talented Alice Putti of Michigan.