

# Prelab #9—Week 1—Equilibrium

Name \_\_\_\_\_

Lab section: M T W Th F

## Reading Assignment:

- Theory of experiment—see lab manual.
- Equilibrium and Le Chatelier's Principle—Zumdahl, Chapter 6.

## Questions:

1) In the space available, define the following terms in your own words:

a. Le Chatelier's Principle \_\_\_\_\_  
\_\_\_\_\_

b. Beer's Law (see Vitamin Pill lab) \_\_\_\_\_  
\_\_\_\_\_

2) Review the procedure for Part I where two reactants will be added as outlined in the data table below.

- a. Fill in the shaded cells in the table below. The concentrations that you will fill in refer to the concentration immediately after the reactants are mixed but before any reaction occurs to bring the system to equilibrium. Using the stock solution concentrations and the amounts of each reactant, calculate the initial concentration of the reactants. Then calculate the molar ratio.

Solution	Stock solution: 0.2M Fe <sup>3+</sup> in 0.5 HNO <sub>3</sub>		Stock solution: 0.002M SCN <sup>-</sup> in 0.5 HNO <sub>3</sub>		Water Vol. (mL)	TOTAL Vol. (mL)	Molar Ratio of Fe <sup>3+</sup> to SCN <sup>-</sup>
	Fe <sup>3+</sup> Vol. (mL)	Fe <sup>3+</sup> Conc.* (M)	SCN <sup>-</sup> Vol. (mL)	SCN <sup>-</sup> Conc.* (M)			
1	1.00		5.00		44	50.00	

\* This is the concentration immediately after the reactants are mixed but before any reaction occurs to bring the system to equilibrium

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- b. Fill in the shaded portions of the table below. For the second solution you will be making, you will take 5.0 mL of solution 1, which will be at equilibrium, and perturb the equilibrium by adding additional  $\text{Fe}^{3+}$ . How much iron (III) nitrate  $[\text{Fe}(\text{NO}_3)_3]$  will you need to add in order to make 5.0mL of a solution that has an initial  $\text{Fe}^{3+}$  concentration of 0.18M? (Hints: You will need to calculate the molar mass of iron (III) nitrate. Assume that the initial  $\text{Fe}^{3+}$  concentration from solution 1 is insignificant and does not contribute to the 0.18M. First calculate the grams of iron (III) nitrate then fill in the other cells.)

Solution	Solution composition	$\text{Fe}^{3+}$ Conc.* (M)	$\text{SCN}^-$ Conc.* (M)	TOTAL Vol. (mL)	Molar Ratio of $\text{Fe}^{3+}$ to $\text{SCN}^-$
2	5.0 mL of solution 1 + _____ g iron (III) nitrate $[\text{Fe}(\text{NO}_3)_3]$ crystals	0.18M = (initial $\text{Fe}^{3+}$ from solution 1) + (added $\text{Fe}^{3+}$ )		5.0	

\* This is the concentration immediately after the reactants are mixed but before any reaction occurs to bring the system to equilibrium

- c. Now make a hypothesis about the relative color intensity you expect for solutions 1 and 2 once they have a chance to come to equilibrium. Explain your prediction using Le Chatelier's Principle and Beer's Law.