FLINN SCIENTIFIC

Name_____

The Equilibrium Constant

Data Table

Temperature _____

Sample	$[Fe^{3+}]$*	$[SCN^-]$*	Absorbance
Test solution #1			
Test solution #2			
Test solution #3			
Test solution #4			
Test solution #5			
Reference solution #6			

*These are the concentrations of ions in solution immediately after mixing and before any reaction has occurred. See the Pre-Lab Questions for calculations.

Post-Lab Calculations and Analysis *(Use a separate sheet of paper to answer the following questions.)*

1. As discussed in the *Background* section and the *Pre-Lab Questions*, it is assumed that essentially all of the thiocyanate ions present in the reference solution will be converted to product. What is the concentration of $FeSCN^{2+}$ ions in the reference solution?

For Questions 2–7, construct a *Results Table* to summarize the results of the calculations.

2. For each test solution, the absorbance (A_n, where n = 1–5) should be directly proportional to the equilibrium concentration of $FeSCN^{2+}$ ions. The concentration of $FeSCN^{2+}$ ions can be calculated by comparing its absorbance versus that of the reference solution (A_{ref}). Use the following equation to calculate the equilibrium concentration of $FeSCN^{2+}$ ions in each test solution #1–5. Enter the results in the Results Table.

$$[FeSCN^{2+}]_n = (A_n/A_{ref}) \rightarrow [FeSCN^{2+}]_{ref}$$

3. Calculate the equilibrium concentration of Fe^{3+} ions in each test solution #1–5: subtract the equilibrium concentration of $FeSCN^{2+}$ ions from the initial concentration of Fe^{3+} ions (see the Data Table). Enter the results in the Results Table.

$$[Fe^{3+}]_{eq,n} = [Fe^{3+}]_{initial} - [FeSCN^{2+}]_n$$

4. Calculate the equilibrium concentration of SCN^- ions in each test solution #1–5: subtract the equilibrium concentration of $FeSCN^{2+}$ ions from the initial concentration of SCN^- ions (see the Data Table). Enter the results in the Results Table.

$$[SCN^-]_{eq,n} = [SCN^-]_{initial} - [FeSCN^{2+}]_n$$

5. Use Equation 4 in the *Background* section to calculate the value of the equilibrium constant K_{eq} for each test solution #1–5. Enter the results in the Results Table.
6. Calculate the mean (average value) of the equilibrium constant for the five test solutions.
7. Calculate the average deviation for K_{eq}: Find the absolute value of the difference between each individual value of the equilibrium constant and the mean. The average of these differences for solutions #1–5 is equal to the average deviation.
8. The average deviation describes the precision of the results. Does the precision indicate that the equilibrium constant is indeed a "constant" for this reaction? Explain.
9. Describe the possible sources of error in this experiment and their likely effect on the results.