Name______________
Partner_____________

Calculating the Equilibrium Constant, K

Purpose: *To calculate the equilibrium constant for the equilibrium*

$$Fe^{+3}_{(aq)} + SCN^{-1}_{(aq)} = FeSCN^{+2}_{(aq)}$$

Procedure:

1. Line up five clean test tubes and label them 1, 2, 3, 4, and 5.
2. Add 5.0 ml of 0.00200 M KSCN to each of the five test tubes.
3. To **test tube 1,** add 5.0 ml of 0.200 M $Fe(NO_3)_3$.
4. Measure 10.0 ml of 0.200 M $Fe(NO_3)_3$ in your ***larger*** graduated cylinder.
5. Now to the same cylinder, add 15.00 mL of water to get to the 25.0 mL mark.
6. Pour the 25.0 ml mixture into a clean beaker and stir.
7. From the beaker, measure out 5.0 ml with a ***small*** gr. cylinder and pour it into **test tube 2**. Save the rest of the beaker-solution for the next step.
8. Take 10.0 ml of the beaker's remaining 20.0 ml and pour (10.0 ml) into a clean graduated cylinder.
9. The rest of the beaker's solution should go down the drain, and clean the beaker.
10. Add 15 ml of water to the graduated cylinder until you reach the 25.0 ml mark
11. Pour into a clean beaker to mix.
12. From the beaker, measure 5.0 ml with a ***small*** gr. cylinder and pour it into **test tube 3**. Save the rest of the beaker-solution for the next step.
13. Take 10.0 ml of the beaker's remaining 20.0 ml and pour it into a graduated cylinder.
14. The rest of the beaker's solution should go down the drain, and clean the beaker.
15. Add 15 ml of water to the graduated cylinder until you reach the 25.0 ml mark
16. Pour into a clean beaker to mix.
17. From the beaker, measure 5.0 ml with a ***small*** gr. cylinder and pour it into **test tube 4**. Save the rest of the beaker-solution for the next step.
18. Take 10.0 ml of the beaker's remaining 20.0 ml and pour it into a graduated cylinder.
19. The rest of the beaker's solution should go down the drain, and clean the beaker.
20. Add 15 ml of water to the graduated cylinder until you reach the 25.0 ml mark
21. Pour into a clean beaker to mix.
22. From the beaker, measure 5.0 ml with a ***small*** gr. cylinder and pour it into **test tube 5**.
23. With an eyedropper, remove solution from test tube 1 until it matches the colour of test tube 2, as viewed from the top. You should take out more than enough so that the colour actually *looks lighter* in test tube 1, and then add back slowly until you get a matching colour.

24. Record the height of both tube 1 and 2= n, and express as a ratio of h_1/h_n. BE CAREFUL WITH THE RULER. Some do not star at zero.

25. With an eyedropper, remove solution from test tube 1 again until it matches the colour of **test tube 3**, as viewed from the top. You should take out more than enough so that the colour actually *looks lighter* in test tube 1, and then add back slowly until you get a matching colour.

Remember that you always remove liquid from test tube 1 only.

26. Record the height of both tube 1 and 3 = n, and express as a ratio of h_1/h_n.

27. With an eyedropper, remove solution from test tube 1 again until it matches the colour of **test tube 4**, as viewed from the top. You should take out more than enough so that the colour actually *looks lighter* in test tube 1, and then add back slowly until you get a matching colour.

28. Record the height of both tube 1 and 4 = n, and express as a ratio of h_1/h_n.

29. With an eyedropper, remove solution from test tube 1 again until it matches the colour of **test tube 5**, as viewed from the top. You should take out more than enough so that the colour actually *looks lighter* in test tube 1, and then add back slowly until you get a matching colour.

30. Record the height of both tube 1 and 5 = n, and express as a ratio of h_1/h_n.

Data and Analysis:

Remember that you always remove liquid from test tube 1 only. *Complete column C with your experimental data, and then fill out the rest of the columns by carrying out the appropriate calculations.*

$$Fe^{+3}_{(aq)} + SCN^{-1}_{(aq)} = FeSCN^{+2}_{(aq)}$$

	A	**B**	**C**	**D**	**E**	**F**	
Test Tube (n)	$[SCN^{-1}]_{ini}$	$[Fe^{+3}]_{ini}$	$H_{tube1}/H_{tube\ n}$	$[FeSCN^{+2}]_{equi}$ =0.001*C	$[Fe^{+3}]_{equi}$ = B- D	$[SCN^{-1}]_{equi}$ = A- D	K
2	0.001M	0.080M					
3	0.001M	0.032M					
4	0.001M	0.0128 M					
5	0.001M	0.00512 M					
						average →	

Because you are "eyeballing" the colour intensities, expect seemingly large deviations for K.

- **Note that Columns D, E and F are equivalent to the last row of the"IRFE" chart.**
- **Include all units, except for K.**

If this experiment had been done with pipettes and a spectrophotometer, you would have a much smaller error.

1. What is the initial concentration of $FeSCN^{+2}_{(aq)}$ assumed to be?

Conclusion: **(As usual, don't leave out any important numbers or chemical equations or charges. Pay attention to sig figs. By doing so, you'll realize that your results are not as bad as they seemed.)**