Equilibrium Constant Lab-Calculations

2. Initial $[SCN^-] = 0.0020 \times \frac{5}{10} = 0.0010\ mol/L$

3. Find equilibrium $[FeSCN^{2+}]$ – Well D3
ICE chart.

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

(initial) I	0.100	0.001	0
(change) C	-0.001	-0.001	+ 0.001
(equil.) E		0	0.001

assume all SCN^- is used up

4. Find $[FeSCN^{2+}]$ in each well.

C3 $0.001 \times \frac{8\ drops\ std.}{10\ drops\ well} = 0.0008\ mol/L$

D4 $0.001 \times \frac{7}{10} = 0.0007\ mol/L$

E3

D2

Calculations Continued

4. Find $[\ ]^{eq}$ in all wells.

C3

	Fe^{3+}	+ SCN^- ⇌	$FeSCN^{2+}$
I	0.040	0.001	0
C	-0.0008	-0.0008	+ 0.0008
* E	0.0392	0.0002	0.0008

Continue for wells D4, E3 & D2

^{eq} Analysis – Read #4

↳ $\frac{[FeSCN^{2+}]}{[Fe^{3+}][SCN^-]}$ $\frac{[Fe^{3+}][FeSCN^{2+}]}{[SCN^-]}$

C3
D4
E3
D2

high/low hi/low hi/low

6.0 402 7.2
0.1 1400 5.7
5.0 156 2.0

Mass Action Expression → equilibrium constant.

most constant

Mass Action Expression

Recall – Lab Calculations

$Fe^{3+} + SCN^- \rightleftharpoons FeSCN^{2+}$

using – $\frac{[FeSCN^{2+}]}{[Fe^{3+}][SCN^-]}$ ← products, ← reactants, as written

Generalized – $aA + bB \rightleftharpoons cC + dD$

equilibrium constant $K_{eq} = \frac{[C]^c[D]^d}{[A]^a[B]^b}$

Example –

1. $N_2O_{4(g)} \rightleftharpoons 2NO_{2(g)}$ $K_{eq} = \frac{[NO_2]^2}{[N_2O_4]}$

2. $2SO_{2(g)} + O_{2(g)} \rightleftharpoons 2SO_{3(g)}$

$K_{eq} = \frac{[SO_3]^2}{[SO_2]^2[O_2]}$

For heterogeneous equilibrium Substances in solid or liquid state are not part of the expression.

Questions – P. 497 # 1-5