LeChatlier's Principle

System moves away from "stressor"

Reactants ⇌ Products

↑ Temp

↑ P (Gas)

↑ [ ]

+ Catalyst

$2A_{(g)} \rightleftharpoons B_{(g)}$

More Moles (g) →

Feb 14-7:37 AM

If ..... Then ....

$2A_{(g)} \rightleftharpoons B_{(g)}$

If ↑ P on entire system.

Then $2A_{(g)} \rightarrow B_{(g)}$

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$2A_{(s)} + B_{(g)} \rightleftharpoons 3C_{(s)} + 2D_{(g)}$

If ↑T overall then .....

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PS15

② ① ½ rxn $K^{1/2}$ or $\sqrt{K}$

② flip $\frac{1}{K^{1/2}}$ or $\frac{1}{\sqrt{K}}$

or $K^{-1/2}$

Feb 14-7:58 AM

③ $\frac{K_c}{1} = \frac{[HI]^2}{[H_2][I_2]}$

$\frac{54}{1} = \frac{[HI]^2}{(0.021)(0.013)}$

Feb 14-8:01 AM

④ $2S + 2O_2 \rightleftharpoons 2SO_2$ $\frac{1}{(2.5 \times 10^{-53})^2}$

$2SO_2 + O_2 \rightleftharpoons 2SO_3$ $\frac{1}{(4 \times 10^{-13})^2}$

$2S + 3O_2 \rightleftharpoons 2SO_3$

$\frac{1}{2.5 \times 10^{-53}} = 0.4 \times 10^{53} \rightarrow (4 \times 10^{52})^2 \Rightarrow 16 \times 10^{104}$

$\frac{1}{4 \times 10^{-13}} = 0.25 \times 10^{13} \rightarrow (2.5 \times 10^{12})^2 \Rightarrow 6.25 \times 10^{24}$ *

100×10^{128}

1.00×10^{130}

Feb 14-8:04 AM

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$$Q = \frac{[Br_2][Cl_2]}{[BrCl]^2} = \frac{(0.05)(0.05)}{(0.05)^2} = 1$$

$Q = 1$ $K = 32$

$Q < K$

not there yet

→

Feb 14-8:16 AM

8 $K_c = ?$ $H_{2(g)} + I_{2(g)} \rightleftharpoons 2HI_{(g)}$

1 + 1 2

$$K_p = K_c (RT)^{\Delta n}$$ $\Delta n = 2_{prod} - 2 = 0$

$$K_p = K_c (RT)^0$$

1

$$K_p = K_c$$

Feb 14-8:20 AM

(9) $3N_2H_4 + 4ClF_3 \rightleftharpoons 12HF + 3N_2 + 2Cl_2$

	N_2H_4	ClF_3	HF	N_2	Cl_2
I	0.88M	0.88M	0	0	0
D	−	$-\frac{4}{3}(0.525)$	+	+0.525	+
E		0.18		0.525	

(10) $K_p = K_c(RT)^{\Delta n}$

$6.8\times10^5 = K_c((0.08206)(298))^{-2}$

$\frac{6.8\times10^5}{1} = \frac{K_c}{(0.08206(298))^2}$

Feb 14-8:22 AM

(12) $2NOCl \rightleftharpoons 2NO + Cl_2$

$Q = \frac{(NO)^2(Cl_2)}{(NOCl)^2} = \frac{(1.2)^2(0.6)}{(1.3)^2} = 0.51$

$K = 0.51$

$\longleftrightarrow$

EQ

Feb 14-8:26 AM

(15) $NH_{3(g)} + H_2S_{(g)} \rightleftharpoons NH_4HS_{(s)}$

	NH_3	H_2S	NH_4HS
I	1	1	~~0~~
Δ	−x	−x	~~+x~~
E	1−x	1−x	~~x~~

$1 - 0.68 = 0.32$

$$K_c = \frac{9.7}{1} = \frac{1}{[NH_3][H_2S]} = \sqrt{\frac{1}{(1-x)^2}} = \sqrt{\frac{9.7}{1}}$$

$$\frac{1}{1-x} = \frac{3.11}{1}$$

$$3.11 - 3.11x = 1$$
$$-3.11 \qquad -3.11$$
$$-3.11x = -2.11$$
$$x = 0.68$$

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(14) $4PCl_{3(g)} \rightleftharpoons P_{4(g)} + 6Cl_{2(g)}$

	PCl_3	P_4	Cl_2
I	1	0	0
Δ	−4x	+x	+6x
E	1−4x	x	6x

MOLE RATIO

$$K_c = \frac{(P_4)(Cl_2)^6}{(PCl_3)^4} = \frac{(x)(6x)^6}{(1-4x)^4}$$

Feb 14-8:43 AM

E206

① $A \rightarrow 2C$

$$\frac{2}{1} \times -\frac{\Delta[A]}{\Delta t} = +\frac{1}{2}\frac{\Delta[C]}{\Delta t} \times \frac{2}{1}$$

Feb 14-8:56 AM

④ $E_a = 123\ kJ$

$K_1 = 0.2\ sec^{-1}$ at T_1 311 K

$K_2 = 0.4$ $T_2 = ?$

$$\ln \frac{K_1}{K_2} = \frac{E_a}{R}\left(\frac{1}{T_2} - \frac{1}{T_1}\right)$$

$$\ln \frac{0.2}{0.4} = \frac{123}{8.314\times10^{-3}}\left(\frac{1}{T_2} - \frac{1}{311}\right)$$

$$\frac{(8.314\times10^{-3})\,0.693}{123} = \left(\frac{1}{T_2} - \frac{1}{311}\right)$$

$$+\frac{1}{311} \qquad +\frac{1}{311}$$

$$= \frac{1}{T_2}$$

Feb 14-9:09 AM

$$A + B \rightarrow C$$

$$Rate = K[A]^2 [B]^{\emptyset}$$

Feb 14-9:15 AM