General Chemistry II w/ Dr. Mattson

Sunday: I apologize — I wasn't feeling well and was not able to make it
Feel free to email me questions
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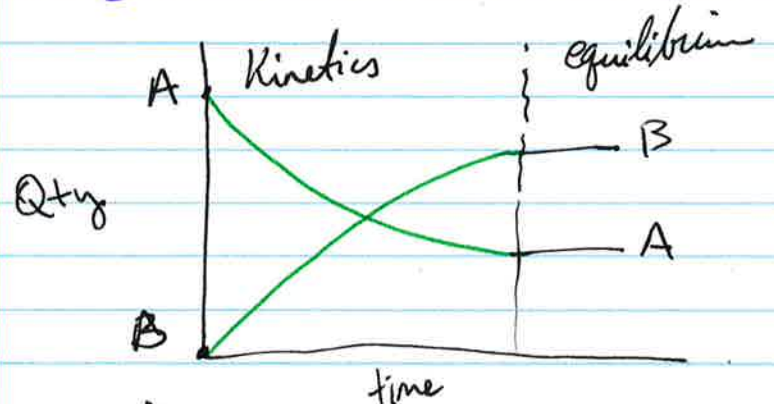
Today Feb 2/6 Section ~~[illegible]~~ 14.4 – 14.5

Tuesday Feb 2/7 Review Session 5–6:30 pm

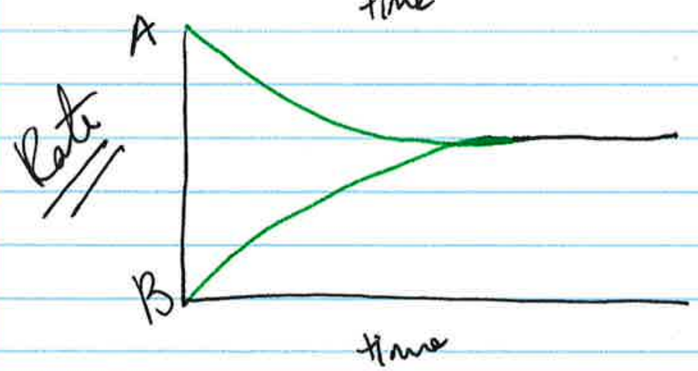
Wednesday Feb 2/8 Section 14.6 – 14.8

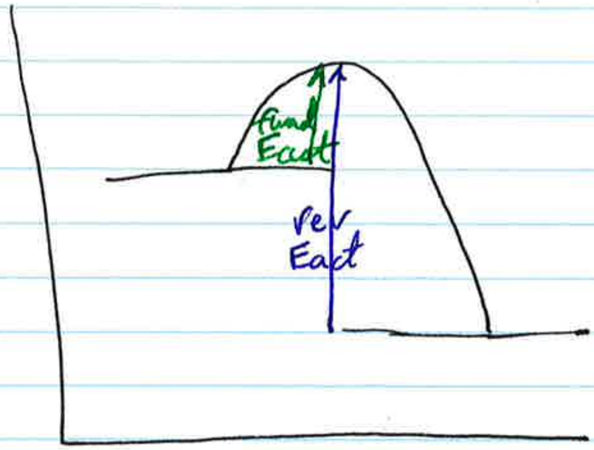
Thursday Feb 2/9 Lab!



$$A \rightleftharpoons B$$

$$K_c = \frac{[B]}{[A]} > 1$$





$A \rightarrow B$ $\quad K_c = \frac{.2}{.1} = 2.0$

E 0.1 $\quad$ 0.2

$C \rightarrow 3D$ $\quad K_c = \frac{.2}{.1^3} = 200$

E 0.1 $\quad 0.2^3$

opposite $K_c = \frac{.1^3}{.2}$ = small

K_c will never be negative

* ignore solids + liquids in K_c and K_p expressions

$$K_p = K_c (RT)^{\Delta n_{gas}}$$

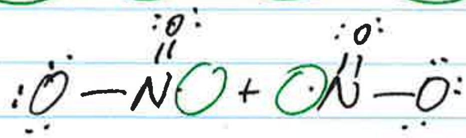
$$WO_{3(s)} + 3H_{2(g)} \rightleftharpoons W_{(s)} + 3H_2O_{(g)}$$

$K_c = \frac{[H_2O_{(g)}]^3}{[H_{2(g)}]}$ $\quad K_p = \frac{(P_{H_2O})^3}{(P_{H_2})^3}$ $\quad \Delta n_{gas} = 0$

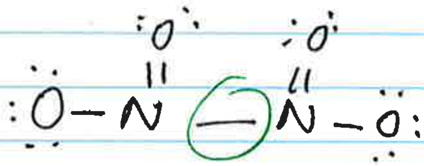
$K_c = K_p$

$$N_{2\,(g)} + 3H_{2\,(g)} \rightleftharpoons 2NH_{3\,(g)}$$

$$K_c = \frac{[NH_3]^2}{[N_2][H_2]^3} \qquad K_p = \frac{(P_{NH_3})^2}{P_{N_2}(P_{H_2})^3} = K_c(RT)^{-2}$$

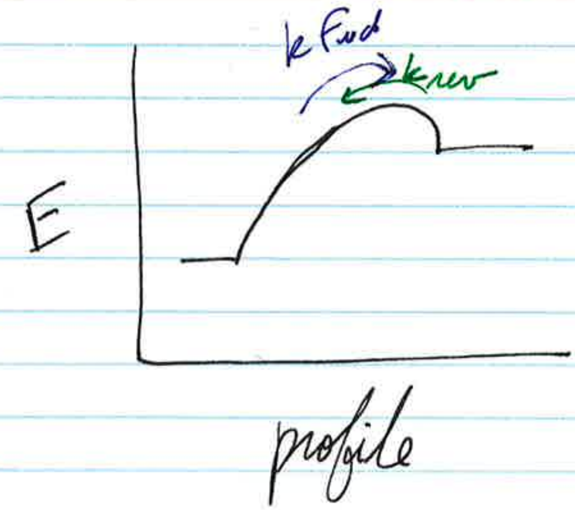


$$N_2O_4 \rightleftharpoons 2NO_{2\,(g)}$$



Breaking bonds: you break it, you pay for it
Reaction is endothermic

$\Delta H = +58$ kJ



$K_c = \frac{k_{fwd}}{k_{rev}} < 1$ (!)

M	$N_2O_{4(g)} \rightleftharpoons$	$2NO_{2\,(g)}$
I	5.34	0
C	$-x$	$+2x$
E	$5.34 - x$	1.30

$\Delta H = +58$ kJ

$2x = 1.30$

$x = 0.65 \Rightarrow 5.34 - 0.65 = 4.69$

$$K_c = \frac{[NO_2]^2}{[N_2O_4]} = \frac{0.65^2}{4.69} = 0.0901$$

M	N_2O_4	$\rightleftharpoons 2NO_2$
I	4.00	2.00
C	+x	−2x
E	4.0+x	2.0−2x

← $Q_c = \frac{[NO_2]^2}{[N_2O_4]} = \frac{2.00^2}{4.00} = 1.00$

$0.0901 = K_c \neq Q_c = 1.00$

If $Q_c < K_c$ (too small) shift to the right

If $Q_c > K_c$ (too big), shift to the left

Our $Q_c > K_c$, so shift left

$$K_c = \frac{[NO_2]^2}{[N_2O_4]} = \frac{2.00-2x}{4.00+x} = 0.090$$

$$4.00 - 8.00x + 4x^2 = 0.090(4.00+x)$$

$$\underset{c}{3.64} - \underset{b}{8.09}x + \underset{a}{4}x^2 = 0$$

$$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$$ The quadratic eqn!

$$= \frac{8.09 \pm \sqrt{8.09^2 - 4 \times 4 \times 3.64}}{2 \times 4}$$

$$x = 1.35,\ 0.67$$

Do a check to see which one gives you a negative concentration. throw that one out.

$x = 0.676$

$E = 4.00 + x = 4.68$ $[N_2O_4]$

$2.00 - 2x = 0.649$ $[NO_2]$

Check work

$$K_c = \frac{[NO_2]^2}{[N_2O_4]} = \frac{(.649)^2}{4.68} = 0.090$$

M	N_2O_4	$\rightleftharpoons 2NO_2$
I		
C		
E	4.68	0.649

Suppose we disturb the equilibrium by adding 1.0 mol/L of N_2O_4

M	N_2O_4	$\rightleftharpoons 2NO_2$
I	5.68	6.49
C	$-x$	$+2x$
E	>4.68 <5.68	>6.49

$K_c = 0.090$

$\leftarrow Q_c = \frac{NO_2^2}{N_2O_4} = \frac{0.649^2}{5.68} = 0.074$

$Q_c < K_c$, shift right!