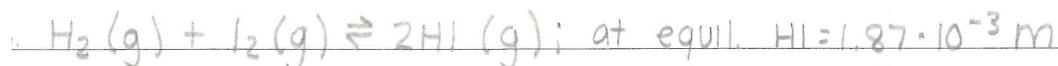


Calculating Equilibrium Constants



6. $K = \frac{[NH_3]^2}{[N_2][H_2]^3} \rightarrow \frac{[.031]^2}{[.84][.35]^3} =$

$[N_2][H_2]^3$ $[.84][.35]^3$



6. Started with $H_2 = 1.00 \cdot 10^{-3}M$, $I_2 = 2.00 \cdot 10^{-3}M \rightarrow$ how do we find at equil?

1. ICE TABLES

	$[H_2]$	$[I_2]$	$[HI]$
Initial	$1.00 \cdot 10^{-3}$	$2.00 \cdot 10^{-3}$	0
Change	$-9.35 \cdot 10^{-4}$	$-9.35 \cdot 10^{-4}$	$+1.87 \cdot 10^{-3}$
Equilibrium	$6.5 \cdot 10^{-5}$	$1.065 \cdot 10^{-3}$	$1.87 \cdot 10^{-3}$

stoichiometry tells that half the product must come from the 2 reactants!



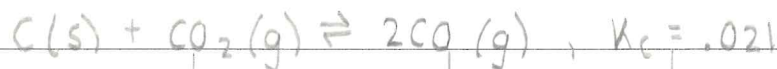
6. $K = \frac{[\text{ethyl acetate}]}{[\text{ethanol}][\text{acetic acid}]} \rightarrow \frac{[.25]}{[.75][.75]}$

$[ethanol][acetic acid]$ $[.75][.75]$

	$[ethanol]$	$[acetic acid]$	$[ethyl acetate]$
I	1	1	0
C	$-.25$	$-.25$	$+.25$
E	.75	.75	.25

1:1:1 ratio

6. If you know K, you can find equilibrium concentrations

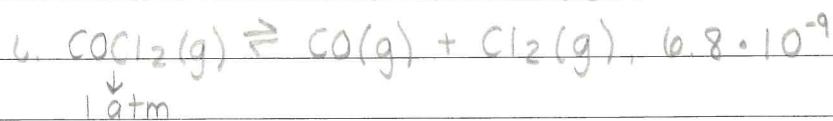


	$[CO_2]$	$[CO]$
I	1	0
C	$-x$	$+2x$
E	$1-x$	$2x$

1. $K = \frac{[CO]^2}{[CO_2]} \rightarrow \frac{(2x)^2}{(1-x)} = .021 \rightarrow 4x^2 = .021 - .021x \rightarrow 4x^2 + .021x - .021 = 0$

$$2. \frac{-.021 \pm \sqrt{(.021)^2 - 4(4)(-.021)}}{2(4)} = .70, -.075 \rightarrow \text{throw out negative!}$$

F. Tricks to Avoid the Quadratic



1. $K_p = \frac{P_{\text{CO}} P_{\text{Cl}_2}}{P_{\text{COCl}_2}}$

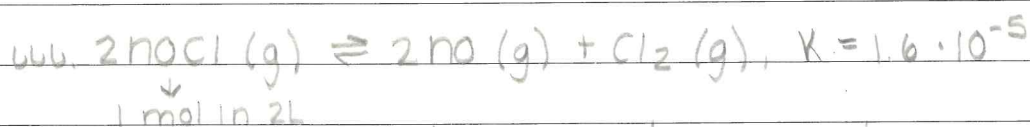
a.		P_{COCl_2}	P_{CO}	P_{Cl_2}
	I	1 atm	0	0
	C	-x	+x	+x
	E	1-x	x	x

b. $\frac{(x)(x)}{1-x} \rightarrow \frac{x^2}{1-x} = 6.8 \cdot 10^{-9}$, since K_p is small assume that $1-x$ is 1: $\sqrt{x^2} = \sqrt{6.8 \cdot 10^{-9}}, x = 8.2 \cdot 10^{-5} \text{ atm}$

u. 5% Rule: If $x \cdot 100 \leq 5\%$, then this trick works

[Init]

1. $\frac{8.2 \cdot 10^{-5} \cdot 100}{1} \leq 5\% \checkmark$



a.		NOCl	NO	Cl_2
	I	.5 M	0	0
	C	-2x	+2x	+x
	E	.5 - 2x	2x	x

b. $\frac{(2x)^2(x)}{(.5-2x)^2} \rightarrow \text{Assume } x \ll .5 \rightarrow \frac{4x^3}{.5^2} = 1.6 \cdot 10^{-5}, x = .01$

G. Is it at Equilibrium



1. Q, the reaction quotient calculated like equilibrium constant, BUT with actual concentrations