$2Mg + O_2 \rightarrow 2MgO$

Goes to completion

$$Fe_2O_3 + 2Al \rightarrow 2Fe + Al_2O_3$$

What is equalibrium?

$\rightleftharpoons$

When the rate of rxn is equal and the Consentrations of all the Species are constant.

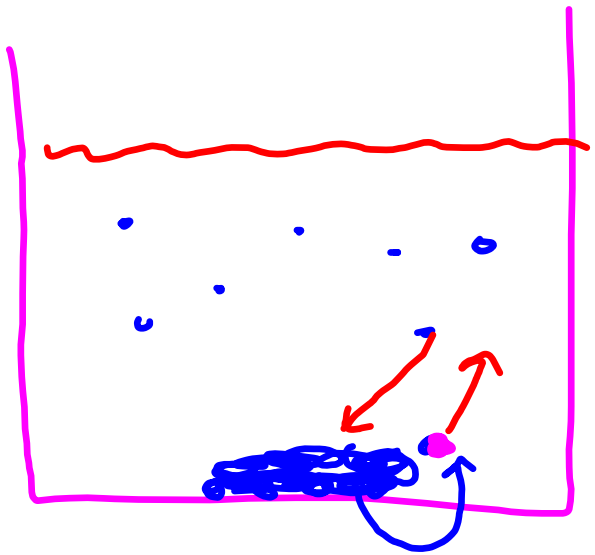
.1 M .06 M

[A] [B]

same rate

$A + B \rightleftharpoons C$ [C] 1.3M

$[A] \neq [B] \neq [C]$



The amount dissolved does not equal the amount undisolved

NO_x

$2NO_{2(g)} \rightleftharpoons N_2O_{4(g)}$

White brown

P LA rookies

1960s brown

1980s white

$$N_2 + 3H_2 \rightarrow 2NH_3$$

Haber process

4 mols → 2 mol

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

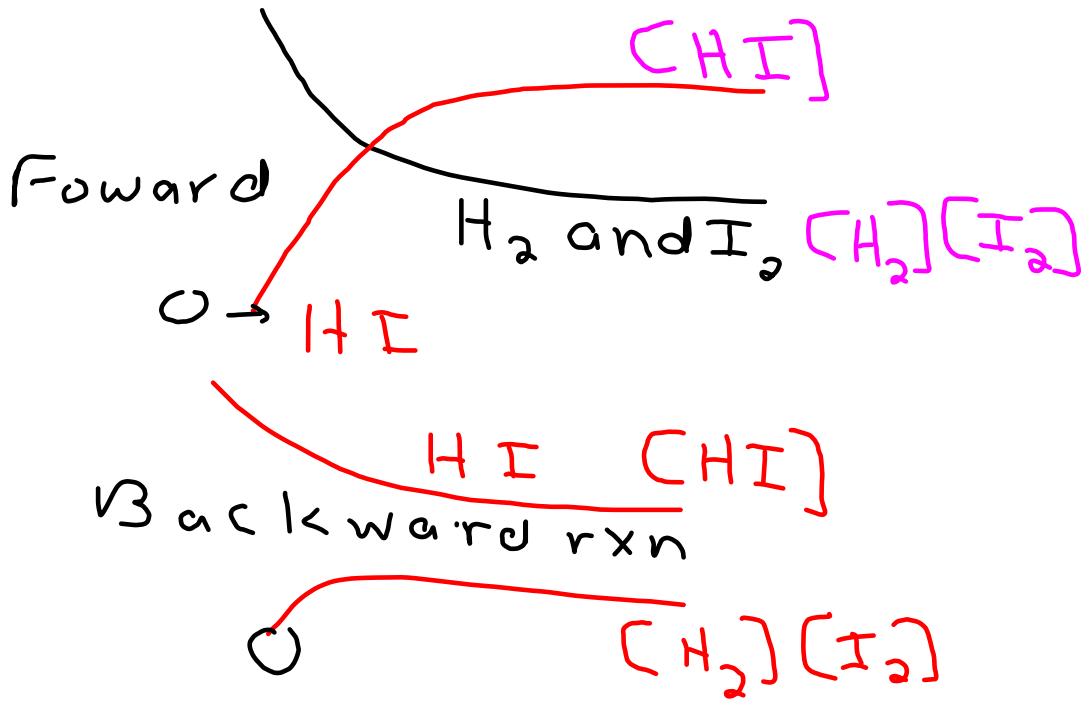
increase N_2 or H_2

decrease temp

increase press.

L'Chatlier's Principle

$$H_2 + I_2 \rightleftharpoons 2HI$$



Spike $[H_2]$ the system will move toward product

How to get to the web site to get the notes:

- Current Students
  - Academic Departments
    - Scroll down
      - Science, Enginnering and Architecture
        - Syllabi
          - Scroll down
          - CHM 106 General Chemistry II

.PDF

1 A reactants

B product

C reactants

E product

F cannot make NH_3
No rxn

G product

K = equilbrium constant at a certain temp

$$aA + bB \rightarrow cC + dD$$

$$K = \frac{\text{product}}{\text{reactants}}$$

$$K = \frac{[C]^c [D]^d}{[A]^a [B]^b}$$

K we want greater then 1

$$CuSO_4 \cdot 5H_2O_{(s)} \rightleftharpoons CuSO_{4(s)} + 5H_2O_{(g)}$$

$$K = [H_2O]^5$$

The equilbrium constant expression does not include terms of pure solid and liquid phases b/c their conc. do not change in the rxn

$$H_2 + I_2 \rightarrow 2\,HI$$

$$k = \frac{[HI]^2}{[I_2][H_2]}$$

$$K_p = \frac{P_{HI}^2}{P_{H_2} P_{I_2}}$$

$3H_2 + N_2 \rightarrow 2NH_3$

$K_c = 3.8 \times 10^4$ @ 127

$Q = \frac{\text{Products}}{\text{reactants}}$ at a certain point in time

$$\frac{(2.2 \times 10^{-1})^2}{(1.2 \times 10^{-4})^3 (3.3 \times 10^{-5})} =$$

8.48×10^{14}

$8.48 \times 10^{14} > 3.8 \times 10^4$

Q K

towards the reatants

$$3H_2 + N_2 \rightarrow 2NH_3$$

$$Q = \frac{(2.4)^2}{(1.6)^3(0.05)} =$$

$$28.125$$

$$\underset{Q}{28.125} < \underset{K}{3.8 \times 10^4}$$

towards the products

2.

$H_2 + I_2 \rightleftharpoons 2HI$

	H_2	I_2	$2HI$
B	∅	1.2	4.0
eq.	x	$1.2 + \cancel{x}$	$4.0 - \cancel{2x}$
	.07619 M		

assume that the +x and -2x is insignifigent

$$K = \frac{(4.0)^2}{(x)(1.2)} = 175$$

$x = .07619M$

$$\frac{.07619}{1.2} \times 100 = 6.349\%$$

If less than or equal to 10% do not worry about it.

$$\frac{.07619}{4.0} \times 100 = 1.9\%$$

$H_2 + I_2 \rightleftharpoons 2HI$

.07619 $\quad 1.2 + .07619 \quad 4.0 - 2(.07619)$

.07619 M $\quad 1.2761\,M \quad 3.84762\,M$

.076 M $\quad 1.3 \quad 3.8$

Quiz Fri.

① Whether towards reactants or products

② Using Q to find out whether it goes toward reactants or products

2 c.

limiting reactant

H_2	I_2	$2HI$
3.0	1.5	0
3.0 - 1.5	0	2(1.5)
1.5	0	3.0
1.5 + x	x	3.0 - 2x

$$\frac{(3.0)^2}{(1.5)(x)} = 175$$

$$x = .03428$$

$$\frac{.03428}{1.5} \times 100 = 2.2857\% \checkmark$$

$$\frac{2(.03428)}{3.0} \times 100 = 2.2857\% \checkmark$$

H_2	I_2	HI
1.5 + .034	.0342	3.0 - 2(.034)
1.5	.034	2.9

HW 2E, 2D

2A

H_2	I_2	$2HI$
0	0	1.5
x	x	$1.5-2x$

$\leftarrow$

$$\frac{(1.5)^2}{x^2} = 175$$

$x = .113389$

$$\frac{2(.113389)}{1.5} \times 100 = 15.11\%$$

problem

Use .113389. Must use x in k until the x is constant.

iterations

1st

$$\frac{(1.5 - 2(.113389))^2}{x^2} = 175$$

$x = .09624$

2nd

$$\frac{\left((1.5 - 2(.09624)\right)^2}{x^2} = 175$$

$$x = .0988$$

3rd

$$\frac{((1.5 - 2(.0988))^2}{x^2} = 175$$

$$x \doteq .09844$$

4th

$$\frac{\left((1.5 - 2(0.9844)\right)^2}{x^2} = 175$$

$x = .09850$

H_2	I_2	$2HI$
.09850	.09850	$1.5 - 2(.09850)$
9.850×10^{-2}		1.303
.099	.099	1.3

If K is not extremely high or low, usually you will do the problem using < until it becomes constant

$$Q = \frac{\text{products}}{\text{reactants}}$$

$$K = \frac{\text{products}}{\text{reactants}}$$

$Q < K$ product

$Q > K$ reactants

$Q = K$ at equalibrium

$$2HI \rightarrow H_2 + I_2$$

7.6 M $\quad$ 0 $\quad$ 0

$\longrightarrow$

product side

$$\frac{(2.00)^2}{(2.77)^3(2.59)} = .07266$$

$Q > K$

reactants

2E.

$$H_2 + I_2 \longrightarrow 2HI$$

8.2×10^{-3} 9.6×10^{-5} 2.2×10^{-8}

8.2×10^{-3} 0 2.2×10^{-8}

$- 9.6 \times 10^{-5}$ $+ 2(9.6 \times 10^{-5})$

8.104×10^{-3} 0 1.92×10^{-4}

8.104×10^{-3} $+ x \rightarrow 0$ x 1.92×10^{-4} $-2x \rightarrow 0$

$$\frac{(1.92 \times 10^{-4})^2}{(8.104 \times 10^{-3})(x)} = 175$$

Moving toward the product side ($K > 1$) then one of your reactants is the limiting reagent

$$x = 2.599 \times 10^{-8}$$

$$\frac{2.599 \times 10^{-8}}{.008104} \times 100 = .00032\% \checkmark$$

$$\frac{2(2.599 \times 10^{-8})}{1.92022 \times 10^{-4}} \times 100 = .02\% \checkmark$$

$H_2 + I_2 \rightleftharpoons 2HI$

.00814
+ x

.008104
+ 2.599×10^{-8}

.008104

8.1×10^{-3}

1.92022×10^{-4}
$-2(2.599 \times 10^{-8})$

2.599×10^{-8} 1.9202×10^{-4}

2.599×10^{-8} 1.9202×10^{-4}

2.6×10^{-8} 1.9×10^{-4}

2D

$$H_2 + 3I_2 \rightleftharpoons 2HI$$

H_2	$3I_2$	$2HI$
1.00	1.00	1.00
0	0	1.00 + 2(1.00) =
0	0	3.0
x	x	3.0 - 2x

$$\frac{(3.0)^2}{x^2} = 175$$

$$x = .22678$$

$$\frac{2(.22678)}{3.0} \times 100 = 15.11\%$$

$$\frac{(3.0 - 2(.22678))^2}{x^2} = 175$$

$x = .19249$

$$\frac{(3.0 - 2(.19249))^2}{x^2} = 175$$

8, Finish up 2D