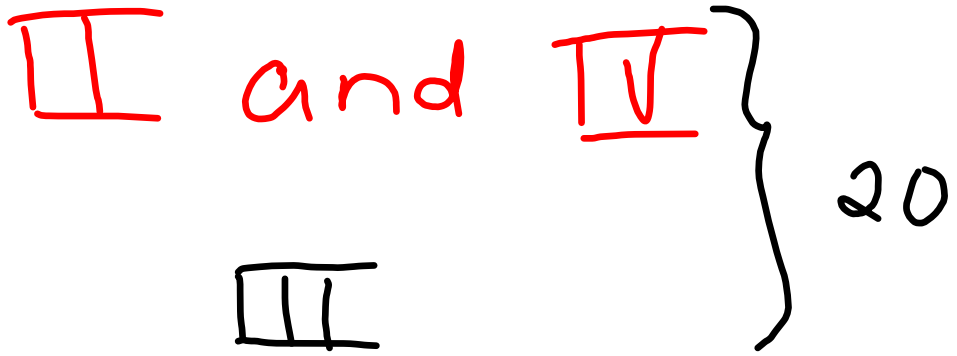

II and IV
20
III

$2Mg + O_2 \longrightarrow 2MgO$

Rxn went all the way

heat + $2NO \rightleftharpoons N_2O_4$

white brown

1960s brown

1980s white

What is equilibrium?

When two opposing processes occur at the same rates so that the concentrations of the species stay the same.

Haber Process

4 2

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

1. change temp by ↓
2. change pressure by ↑
3. ↑ $[N_2]$ ↑ $[H_2]$
4. removing ammonia every time it forms

Le Châteliers Principal

1. concentration
2. pressure
3. temp.
4. common ion effect

equilibrium constant

$$K = \frac{\text{Products}}{\text{reactant}}$$ at a certain temp.

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

$$K = \frac{[NH_3]^2}{[H_2]^3 [N_2]}$$

The equilibrium expression does not include any solids or pure liquid b/c the Concentrations do not change.

$K = 3.8 \times 10^{4}$ favors product

$K = 3.8 \times 10^{-4}$ favors reactant

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

0 0 2.5×10^{-4}

reaction goes back toward reactants

$3H_2 + N_2 \rightleftharpoons 2NH_3$

0.0031 0.250 0

moves toward product

$3H_2 + N_2 \rightleftharpoons 2NH_3$

0 0.12 0.0078

moves towards reactants

$3H_2 + N_2 \rightleftharpoons 2NH_3$

2.3 3.3 0.0

towards the products

$3H_2 + N_2 \rightleftharpoons 2NH_3$

.0055 0 0

it is not going to go at all b/c there is no N_2

D.

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

1.2×10^{-4} 3.3×10^{-5} 2.2×10^{-1}

Q the equilibrium constant at that pt in time.

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

$Q = 8.5 \times 10^{14}$

$K = 3.8 \times 10^{4}$

$Q > K$

moves toward reactants

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

1.6 0.05 2.4

$$Q = \frac{(2.4)^2}{(1.6)^3(.05)} \qquad \frac{M^2}{M^3\ M}$$

$Q = 28$

$K = 3.8 \times 10^4$

$Q < K$

goes toward the product

	H_2	+ I_2	$\rightleftharpoons 2HI$
st	0	1.2	4.0
eq.	x	1.2+~~x~~	4.0-~~2~~x

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

$$x = .07619$$

$$\frac{.07619}{1.2} \times 100 = 6.34\%$$

$$\frac{2(.07619)}{4.0} \times 100 = 3.80\%$$

as long as the percentages are less than 10% than the − or + of the x can be ignored.

H_2	+ I_2	$\longleftrightarrow 2HI$
.076M	1.2+.076	4.0-2(.076)
.076M	1.3M	3.8M

2a

	H_2	+	I_2	$\leftrightarrow$	$2HI$
ST	0		0		1.5
$r=q$	x		x		$1.5-2x$

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

$$x_1 = \sqrt{\frac{(1.5)^2}{175}} = .113389$$

$$\frac{2(.11389)}{1.5} \times 100 = 15.11\%$$

$$x_2 = \sqrt{\frac{((1.5-(2\times .113389))}{175}}^2$$

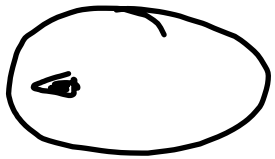
ANS

$x_3 = .096246536$

$x_4 = .098838233$

$$\sqrt{((1\ 1.5 - (2 \times \text{ANS}))^2 / 175)}$$

x_1 .113389



=

x_2 .096246

x_3 .098838

x_4 .098464

x_5 .098505