CHEMICAL EQUILIBRIUM

EQUILIBRIUM CONSTANT 'K'-

For a General Reaction

The equilibrium constant expression is

$$K_c = \frac{[P]^P [Q]^q}{[A]^a [B]^b}$$

where K_c is the Equilibrium

Constant (or K_p if they are all gases)

RELATION BETWEEN Kp AND Kc

For the Reaction (aA + bB

$$K_{p} = \frac{[p_{c}]^{c} \times [p_{D}]^{c}}{[p_{A}]^{a} \times [p_{B}]^{b}} = \frac{[C]^{c} [D]^{d}}{[A]^{a} [B]^{b}} \frac{(RT)^{c+d}}{(RT)^{a+b}}$$

 $K_p = K_C (RT)^{\Delta ng}$

if
$$\Delta n_g = 0 \Longrightarrow K_p = K_c$$

Where, $\Delta n_g = (c+d) - (a+b)$

= no. of moles of gaseous products - no. of moles of gaseous Reactants

WHAT DOES THE VALUE OF 'K' MEAN?



If K>> 1, the reaction is productfavoured: product predominates at Equilibrium.

(a) K << 1

Reactants

Products

If K<< 1, the reaction is reactantfavoured; reactant predominates at Equilibrium.

(a) K = 1

The reaction lies in the middle (mix of reactants and products)

MAGNITUDE OF 'K'

Small (K < 10-3)

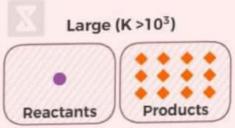


Mostly Reactants

Intermediate $(10^{-3} \le K \le 10^3)$



Significant amounts of reactants and products



Mostly Products



If a dynamic equillibrium is distrubed by changing the conditions, the position of equillibrium moves to counteract the change.



i will destroy your equilibrium

i will re-establish it



Reactants

Change

Products

Counteract

I will increase reactant concentration

I will steal products

I will increase pressure

I will decrease pressure

I will heat up your exothermic reaction

I will put your endothermic reaction in ice

I will catalyze your reaction

I will add noble gases to your reaction

CC

Then I will shift the reaction forward

I will shift the reaction forward

I will reduce number of moles

Then I'll increase number of moles

I'll shift the reaction backward

I'll warm it up by forward reaction

Hahaha.... It won't disturb my equilibrium

Hahaha.... It won't disturb my equilibrium

It's Le Chatelier's principle dear !

How did you bypass my tricks?