EQUILIBRIUM

LAW OF CHEMICHAL EQUILIBRIUM

$$aA + cB \rightleftharpoons cC + dD \text{ , GENERAL EQUATION}$$

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

Kc = equilibrium constant

- Find the Kc of following chemichal equation?

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

ANS:-

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

On reversing a reaction

$$Kc' = \frac{1}{Kc}$$

RELATION BETWEEN Kp AND Kc

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

$\Delta ng =$ No of gaseous product – no of gaseous reactants

- Write the relation between kp and kc of reaction $N2 + 3H2 \rightleftharpoons 2NH3$?

Ans:-

$\Delta ng =$ 2-4=-2

Ie, $K_P = \frac{[NH_3]^2}{[N_2][H_2]^3}(RT)^{-2}$

Aplication of Kc

1. To predict the extent of the reaction

Ithentha vechal oru chemichal reaction nadkuo lye njmlk predict chyn pattm ith njn oru reaction ndaki appo athinte kc kandt aah reaction nadkuo lye kand pidkn pattm athahn 1st pareeeneth

P=product

R=reactants

Kc > 10^3 ⇒ reaction almost complete,P>R

Kc 10 cubenekaalm koodyal almost reaction complte aavm reactantnekaalm product koodtheleykm

Kc < 10^{-3} ⇒ reaction procede rarely,R > P

Ith vechaaal njml oru reactionte kc kand value 10^{-3} ithinekaaalm korvaahnel ath rare aaayte reaction nadkn lle chnce llu reactant eykm productnekaaal koodthl

10^{-3} < Kc < 10^3 = midway,both reactant and product are formed

Ith vechal aaah rand value nte nadkaan njml Kc kandt value kittnel mid range aahn possibilty ithil reactantm productm ndavm

2. **For predicting direction of a reaction**

Njml oru reaction equilibrium attain chythaaal aaahn Kc kaaana aaah reaction at equilibrium aaavnm.aaah reactioequilibrium attain chynthinte munne aahn kc kaaannenkl athin vere per aahn parya Qc reaction quotient ith manslaaaakivekknm
note:- Kc= at equilibrium

Qc=before attaining equilibrium,reaction quotient

Qc < Kc ⇒ forward reaction

Qc > Kc⇒ backward reaction

Qc = Kc⇒ at equilibrium

Kc nekaalm korvaahnel Qc avda forward reaction nadkm

Kc nekaaalm koodthlaahnel Qc ath backward eykm

If rand value equal ahnenkil ath equilibrium attain chythndavm

LE CHATLIERS PRINCIPLE

Le Chateliers' Principle

When the concentration, pressure or temperature of a system at equilibrium is changed, the system will readjust itself so as to nullify the effect of that change and attain a new state of equilibrium.

$\Delta H = -ve\ exothermic$

$\Delta H = +ve\ endothermic$

Concentration effect

.When concentration of reactants increases and concentration of product decreases the forward reaction will take place

.when concentration of reactants decreases and concentration of product increases the backward reaction take place

Pressure effect

. When pressure increases the reaction will take place in that direction where number of moles decreases

.when pressure decreases the reaction will take place in that direction where number of moles increases

eg:-$\underline{N2+3H2} \rightleftharpoons \underline{2NH3}$

1+3 ⇌ 2 , ivda reactant 4 m product 2ndm aahn appo pressure kootya koodye nmbrn korneylek povm 4 lle 2 aaavne reaction nadkm ivda forward nadkm

Temperature effect

. If temperature increases Δ H=-ve backward reaction occurs

. If temperature increases Δ H=+ve forward reaction occurs

. If temperature decreases H=-ve forward reaction occurs

. If temperature decreases H=+ve backward reaction occurs

Q :- $N2 + 3H2 \rightleftharpoons 2NH3$, ΔH = -92 KJ/mol;what are the following effect for the following changes ?

1. increasing pressure
2. increaseing temperature
3. removal of ammonia
4. adding NH2

ANS :- 1.pressure increas chymbo koodthl lle nmbr korvlek povm appo ivda **forward reaction** occur chym

2.ivda temperature increase chymbo $\Delta H = -ve$ aahn so exothermic reaction aahn appo **backward reaction** occur chym

3. ammonia product aahn appo product remove chya parnl decrease chyya decrease chytha **forward reaction** increase chym

4. NH2 product aahn product increase chythal **forward reaction** increase chym

ACID BASE CONCEPT

1. ARRHENIUS CONCEPT

   Acids are H^+ donors eg:- HCL

   Base are OH^- producers eg:- NaOH

   Ithrellu ithil pareeennllu

2. LEWIS CONCEPT

   Acids are electron pair acceptors eg:-BF_3

   Base are electron pair donors eg :-NH_3

3. LOWRY-BRONSTED CONCEPT

Acids are H^+ donors

Bases are H^+ acceptors

$$NH_3 + HCL \rightleftharpoons \frac{NH_4^+}{C.A} + \frac{CL^-}{C.B}$$

ITH DIVISION ELLA UNDERLINE CHYTHTHA

Ivda conjugate acid aaahn NH_4^+ athengna kittye vechal $NH_3 + H^+$ ith chytherm Aahn

Cl^- veran reason $HCl - H^+$ ithondan lle hydrogen poypo avde minuse charge vann athrellu

C.A = S +H^+ C.B = S - H^+

SUBSTANCE	C.A	C.B
H_2O	H_3O^+	$(OH)^-$
HSO_4^-	H_2SO_4	SO_4^{2-}
NH_3	NH_4^+	NH_2^-
HCO_3^-	H_2CO_3	CO_3^{2-}

PH

PH = -log[H^+]

PH is the negative logarithm of concentration of H^+ ion

BUFFER SOLUTION

SOLUTION WHICH RESIST CHANGE IN PH EVEN THE ADDITION OF SMALL AMOUNT PF BASES OR ACID

EG:- BLOOD

Ith vechndel cherye amount acid or base aah solutionl ndel ath ph value change aavnd nikkm bloodl angne aahn njml foodpolthe chele acids okke ndavm blood resist chym blood engnm ph maarya njml dead

aaavm appo aah ph value change aavnethine resist chym athahn buffer solution

Two buffer solution

Acidic buffer	basic buffer
Eg:- mixture of	mixture of
Acetic acid	ammonium hydroxide
And	and
Sodium acetate	ammonium chloride

SOLUBILITY PRODUCT (KSP)

Solubilty product is the product of molar concentration of ions of a sparingly soluble salt
Solubilty product vechal oru sparingly soluble salt ne disociate chytht athinte ionsnte concentrationte product aahn
Disociate vecha oru compondnte athinte ions aayt maaati eythnth

$$BaSO_4 \rightleftharpoons Ba^{2+} + SO_4^{2-}$$

KSP= $[Ba^{2+}] + [SO_4^{2-}]$

$$NaCl \rightleftharpoons Na^{+} + Cl^{-}$$

KSP=$[Na^{+}] + [Cl^{-}]$

Ithpole thanne compoud disociate chythttt athinte concentration edthal athahn solubility product

RELATION B/W SOLUBILTY PRODUCT AND SOLUBILITY

$$KSP = X^{x}.Y^{y}\ (S)^{x+y}$$

$$Al2_2(SO4)_3 \rightarrow 2Al_3^{3+} + 3SO_4^{2-}$$

KSP= $3^3.\ 2^2(S)^{2+3}$

$=4 \times 27 \times (S)^5$

$=108(S)^5$

Ithil s aahn solubilty ksp solubilty product aahn ath disociate chytht athinte ionsnte concentration aaahn edkndye x mm y mm athinte ions aahn moles oriklm edkerth

COMMON ION EFFECT

The disociation of weak electrolyte can be suppressed by the addition of a strong electrolyte having a common ion is called common ion effect

Eg:- $NH_4OH \rightleftharpoons NH_4^+ + OH -$

$NH_4Cl \rightleftharpoons NH_4^+ + Cl^-$

Ithil nh4oh oru weak electrolyte aahn and nh4cl strongmm aahn ath randm add chymbo nh4+ eykm athil lle common ion avde nh4+ concentration increase chym ithrellu ith

SALT HYDROLYISIS

Salt on hydrolysis with water gives acidic,basic or neutral solution is called salt hydrolysis

Ithentha vechal oru salt water aayt react chymbo onenkil acid alenkil base alenkil nuetral aaytlle solution ndvm athahn salt hydrolysis ee salt vechal oru acidm oru basem koodi react chythl ndaavnthahn salt

Eg:- Na base aahn Cl acid aahn ath randm koodi react chythtaahn NaCl salt ndaavnth

1.salt of strong acid and base gives nuetral solution eg:- NaCl

2.salt of weak acid and strong base gives basic salt eg:- sodium acetate

3.salt of strong acid and weak base gives acidic salt eg:-NH_4Cl

4.salt of weak acid and weak base

Ithil oru equation vech kaananm

$$pH = 7 + \frac{1}{2}[pK_a - pK_b]$$

Acid ph – base ph chytht aah equationl substitue chytha mathi athinte value > 7 aahnenkl basic salt eykm weak acidm weak basem react chymbo if value < 7 aahnel ath acidic eykm

.....kaynjj.....