HAFSA SAJJAD

"CHEMICAL Equilibrium"

FORWARD	REVERSE
Def type of reaction in which reactant form products	type of reaction in which product form reactant
Type	
Endothermic	Exothermic
Direction	
eft to right	right to left
Equilibrium	
ends to form product	tends to form reactant
Example	
$_2 \rightarrow CO_2$	$CO_2 \rightarrow C + O_2$

REVERSIBLE	IRREVERSIBLE
Direction	
oceeds in both directions	proceeds in one direction
Representation	
$\rightleftharpoons$	$\rightarrow$
Stability	
Unstable	Stable
Completetion	
ever complete	complete
Example	
$_2 + O_2 \xrightarrow[2\,atm]{V_2O_5} 2SO_3$ (1 atm)	SO_3 / $CO \rightarrow CO_2$

Importance of Equilibrium:

) It helps in determing the conc. of equilibrium ixture by knowing inntcal onc. of reactants.
ii) predict direction of reaction
iii) predict extint of reaction
iv) predict effect of changes in condition s of chemical reaction

Chemical equilibrium: is the state when forward & reverse reactions occurs at the same rate.

Dynamic equilibrium: Chemical equilibrium is dynamic equilibrium becuz the conc. of reactant & product remain unchanged when they reach equilibrium., but the reaction does not stop.

Catalyst: A substance which increase rate of reaction without participating in the reaction. They have no effect on equilibrium position once it is reached.

Le-chatellier Principle: If you impose a change in conc, temp., pressure of a reaction, the system respond in a way that opposes the change.

LAW OF MASS-ACTION: "The rate at which a substance react $\propto$ to active mass. The rate at which a reaction proceed $\propto$ to product of active masses of reactant".

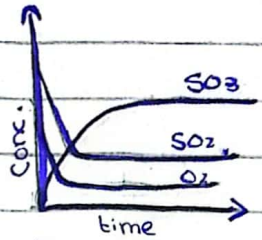
$aA + bB \rightleftharpoons cC + dD$

rate of FR $\propto [A]^a[B]^b$

rate of reverse $\propto [C]^c[D]^d$

rate of forward = reverse.

$K_f[A]^a[B]^b = K_r[C]^c[D]^d$



Graph: Conc-Time

Ways to Recognise Equilibrium:

* Physical:-
(i) Spectrometry
(ii) Polarimetry
(iii) Refractometry
* Chemical:
(i) Titration

CONDITIONS FOR EQUILIBRIUM

(i) catalyst unchanged
(ii) Pressure unchanged
(iii) Temp undisturbed
(iv) Conc of reactant and product should remain sdm
(v) If any of reactant or product is in gaseous state, container shuld be closed.

Equilibrium Constant

ratio of product of conc. of product to reactants raised to power equal to coefficients.

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

HAESA SATTAD

"ACIDS, BASES, SALTS"

General Characteristic

Acid	Base
Taste	
Sour	Bitter
Red litmus	
X	turns blue
Blue litmus	
turns red	X

Bronsted-Lowery Concept:

presented by G.N Bronsted & TM Lowery in 1923.

Acid: proton donor

Base: proton acceptor

pH Scale:

- Scale containing number 0-14 describing strengths.

Strong Acids	0 - 3
Weak Acid	4 - 6
Strong Base	12 - 14
Weak Base	8 - 11

Arrhenius Concept:

presented by Svuate Arrhenius in 1887.

Acid: gives H^+ ions in aq.

Base: gives OH^- ions in aq.

Example:-

- $HCl \xrightleftharpoons{H_2O} H^+ + Cl^-$
- $NaOH \xrightleftharpoons{H_2O} Na^+ + OH^-$

Limitations of Bronsted-Lowery:

- Does not consider apiotic Solvents.
- Does not explain reaction of electron deficient atoms.
- Does not explain neutralization reaction

FORMULA:

$pH + pOH = 14$.

SALT:

The compound formed by replacement of H atom by metal atom in acids

TYPE OF SALT: °Normal °Acidic °Basic

FORMATION OF SALTS:

(i) Acid + Base → Salt + H_2O

(ii) Acid + metal oxide → Salt + H_2O

(iii) Acid + metal → Salt + H_2

(iv) Acid + Metal Carbonate → Salt + CO_2 + H_2O

(v) Salt + Salt → Salt + Salt.

SALT CHARGE:

Cl^{-1}, NO_3^{-1}, SO_4^{-2}, PO_4^{-3}

LIMITATIONS of Arrhenius Concept:

(i) applies only to aqeous sol.

(ii) cannot be applied for substances not containing H^+ or OH^- ions.

(iii) It does explain why CO_2 & SO_2 are acidic & NH_3 is base.

(iv) It does not explain neutralization reaction & amphoteric behaviour.

Lewis Concept:

proposed by Lewis in 1923

Acid: e^- pair acceptor.

Base: e^- pair donor.

SELF IONIZATION OF H_2O

$H_2O \rightleftharpoons H^+ + OH^-$

Ionization Constant

$K_w = 1 \times 10^{-14}$ at 25°C

ACID-BASE INDICATOR:

- Phenolphatlein: Acid: X Base: Pink.
- Methyl Red: Acid: Red Base: Yellow
- Bromothymol Blue: Acid: Yellow Base: Blue.