Element

forward reaction

Similarly $r_b \propto [C]^x \cdot [D]^y$

$r_b = K_b [C]^x \cdot [D]^y$

At the Equilibrium

$r_f = r_b$

$K_f \cdot [A]^m [B]^n = K_b [C]^x [D]^y$

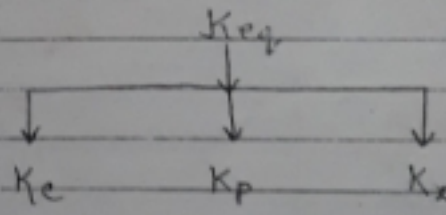
$$\frac{K_f}{K_b} = \frac{[C]^x [D]^y}{[A]^m [B]^n}$$

$$\therefore \frac{K_f}{K_b} = K_{eq} = \frac{[C]^x [D]^y}{[A]^m [B]^n}$$

* EQUILIBRIUM CONSTANT:-

The ratio of rate constant of forward reaction and rate constant of backward reaction is Equilibrium constant.

$$K_{eq} = \frac{K_f}{K_b}$$



$[Zn] = 1$

moles are raised to a power at constant temperature.

$A \longrightarrow$ Product

According to law of mass action,

rate of $r_f \propto [A]$

$2A \longrightarrow$ Product rate if $r_f \propto [A]^2$

$A + A \longrightarrow$ Product

rate if $r_f \propto [A]^1 \cdot [A]^1$

$r \propto [A]^2$

$r = K_f [A]^2$

$A + B \longrightarrow C + D$

$r_f \propto [A]^1 \cdot [B]^1$

$r_f = K_f [A][B]$ (conc. = $\frac{\text{moles}}{\text{litre}}$ = molarity)

* DERIVATION FOR LAW OF MASS ACTION:-

Suppose a reversible reaction is represented as

$$m_A + n_B \rightleftharpoons x_C + y_D$$

here m and n are the number of moles of reactant A and B respectively and x and y are the number of moles of product C and D respectively

$r_f \propto [A]^m \cdot [B]^n$

$r_f = K_f [A]^m \cdot [B]^n$ ——— (i)

where K_f is known as proportionality constant or rate constant of forward reaction or Velocity constant of

Metal Non-Metal Metalloid Homogeneous

* CHARACTERISTICS OF EQUILIBRIUM :-

(i) Some observable properties becomes constant at Equilibrium.

(ii) Equilibrium is exhibited when non of the reactant or Product is allowed to Escape.

(iii) At chemical Equilibrium the rate of forward reaction is Equal to the rate of backward reaction.

(iv) Equilibrium is dynamic in nature i.e, the reaction takes place in both direction, but the observable properties like temperature, Pressure, Concentration, density, Colour etc does not change is called Dynamic Equilibrium.

(v) Catalyst does not affect the Equilibrium if the reaction condition kept constant.

(vi) Equilibrium can be attained from either direction i.e, either starting from reactant or either starting from Product.

* LAW OF MASS ACTION *

Law of mass Action was proposed by M. Guldberg and P. Waage in 1864.

According to this law :- The rate of chemical reaction at which they react is directly proportional to the product of active mass of reactant (molar concentration) in which the mass is :-

matter ex...
chair, bench.

Universe

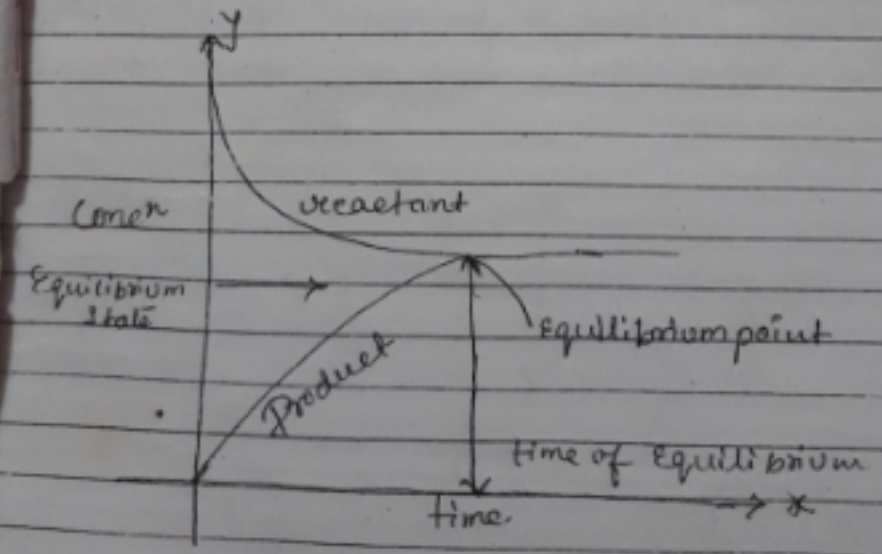
* Types of Chemical reaction on the basis of direction.

of condensation is equal to rate of poration is known as Gas-Liquid uilibrium.

* CHEMICAL EQUILIBRIUM *

Equilibrium in which chemical reaction es place and some observable properties ge temperature, pressure, concentration. ecance constant is called chemical Equilibrium. At chemical Equilibrium the rate of forward reaction is equal to rate of backward reaction.

$$r_f = r_b$$



* Types of Chemical reaction on the basis of direction.

On the basis of direction there are two types of chemical reaction:-

(i) Reversible Reaction.
(ii) Irreversible Reaction.

(i) * REVERSIBLE REACTION:- These chemical reaction in which reactant reacts to give product and again product reacts to give reactant back Under the Experimental condition is called Reversible reaction. It is one way traffic. It is denoted by $\rightleftharpoons$

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

$H_2 + I_2 \rightleftharpoons 2HI$

$N_2 + O_2 \rightleftharpoons 2NO$

$CH_3COOH + C_2H_5OH \rightleftharpoons CH_3COOC_2H_5 + H_2O$.

$PCl_5 \rightleftharpoons PCl_3 + Cl_2$

$2SO_2 + O_2 \rightleftharpoons 2SO_3$

(ii) * IRREVERSIBLE REACTION:- These chemical reaction. in which reactant reacts to give product only but not reactant back at the Experimental condition is called Irreversible reaction It is of many way traffic. It is denoted by →