4TH SEM

ORGANIC CHEMISTRY

ZERO ORDER REACTION

DEPTH OF BIOLOGY

- A reaction is a process in which the reactants gets converted into product

- WHAT IS ZERO ORDER REACTION ?
- A chemical reaction in which the rate is independent of the concentration of the reactants, i.e. the rate does not change when the concentration of the reactants increases or decreases.

Examples- $H_2 + Cl_2 \rightarrow 2HCl$

$N_2O \rightarrow N_2 + 1/2\ O_2$

$CH_3COCH_3 + I_2 \rightarrow ICH_2COCH_3 + HI$

- **suppose a reaction in which reactant A gets converted into product B**

	Reactant A	Product B
At time =0, {when reaction hasn't started} concentration=	C_o	0
At time =t, concentration=	C_t	b_t

- differentiation rate law [D.R.L.]-
- r= -dc/dt
- here negative sign is used because there is decrease in concentration of the reactant
- Rate law = r= K [C]°
- [C]°= 0 . So then, r=K & also r= -dc/dt

K is used as a constant & ° signifies that it is zero order reaction

- Hence by using above 2 equations
- K= -dc/dt
- Now , we will multiply this equation with dt as reaction is occurring w.r.t. time & then integrate it

- $$\int_0^t K \times dt = \int_{C_0}^{C_t} \frac{-dc}{dt} \times dt$$

K is a constant so it's integration cannot be done

$$K\int_0^t dt = -\int_{C_0}^{C_t} dc$$

Here integration & differentiation will cancel out each other

- In integration: upper limit - lower limit. So,

$$K\,[t-0] = -\,[Ct - Co]$$

$$-\,Kt = [Ct - Co]$$

$$Ct = -kt + Co$$

DEPTH OF BIOLOGY

- WHAT is HALF LIFE OF A REACTION?

- The half-life of a chemical reaction can be defined as the time taken for the concentration of a given reactant to reach 50% of its initial concentration (i.e. the time taken for the reactant concentration to reach half of its initial value).
- It is denoted by the symbol ‘t1/2’ and is usually expressed in seconds.

- **HALF LIFE OF Zero order reaction -**

- **For a zero-order reaction, the units of the rate constant are mol.L-1.s-1.**
- In half life the concentration of reactant will be Co/2 and that of the product will be bt/2 and time will be t1/2 because half of the reactant will get converted into product

$Ct = -kt + Co$

substituting $Ct = Co/2$ & $t = t\ ½$ in the above equation, we get

$$Co/2 = - k\ t½ + Co$$
$$Co/2 - Co = -k\ t\ ½$$
$$Co/2 = - k\ t\ ½$$
$$Co/2k = t\ ½$$

Or $t\ ½ = Co/2k$

This is the life half of zero order reaction