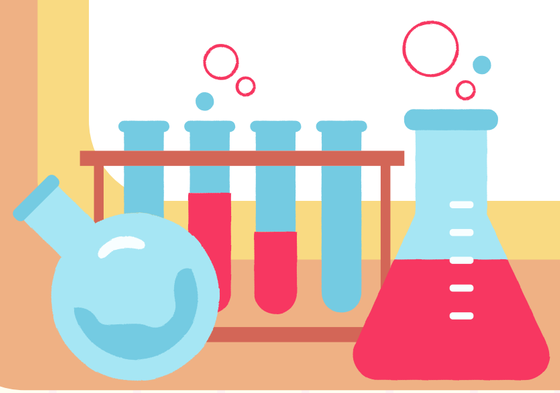
4TH SEM

ORGANIC CHEMISTRY

SECOND ORDER REACTION



DEPTH OF BIOLOGY

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

- WHAT IS FIRST ORDER REACTION ?

Second order reactions can be defined as chemical reactions wherein the sum of the exponents in the corresponding rate law of the chemical reaction is equal to two. The rate of such a reaction can be written either as r = k[A]2, or as r = k[A][B]

- Examples- 2 NO_2 → 2NO + O_2.
- 2HI → I_2 + H_2.

DEPTH OF BIOLOGY

- **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

DEPTH OF BIOLOGY

- 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 = $r = K [C]^2$ → 2 is used because it is first order reaction

- Hence by using above 2 equations
- $K [C]^2 = -dc/dt$

- $kdt = -dc /[C]^2$

integrating both sides

DEPTH OF BIOLOGY

$$\int_0^t K\,dt = \int_{C_0}^{C_t} \frac{-dc}{[C]^2}$$

$$K\int_0^t dt = \int_{C_0}^{C_t} -dc\,/[C]^2$$

$[C]^2$ become $[C]^{-2}$

$$k\int_0^t [t-0] = \int_{C_0}^{C_t} \left[-dc\,\frac{C^{-2+1}}{-2+1}\right] \qquad \frac{x^{n+1}}{n+1}$$

DEPTH OF BIOLOGY

$$kt = \int_{C_0}^{C_t} [dc\ C^{-1}]$$

$C^{-1} = 1/C$

$$kt = \int_{C_0}^{C_t} [dc\ 1/C] = 1/Ct - 1/Co$$

$$kt = 1/Ct - 1/Co$$

$$kt + 1/Co = 1/Ct$$

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.

$kt = 1/Ct - 1/Co$

$t = 1/k\ (1/Ct - 1/Co)$

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

$t½ = 1/k\ \{ 1/Co/2 - 1/Co \}$ $= 2/Co - 1/Co = 1/Co$

$t\ ½ = 1/k \times 1/Co$

$t\ ½ = 1/kCo$

This is the life half of second order reaction