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CHEMICAL KINETICS

1. CLASSIFICATION OF REACTIONS: [IN TERMS OF RATES]

(i) There are certain reactions which are too slow eg. rusting of iron, weathering of rocks.

(ii) Instantaneous reactions i.e. too fast eg. Detonation of explosives, acid-base neutralization, precipitation of AgCl by NaCl and $AgNO_3$.

(iii) Neither too fast nor too slow. eg. Combination of H_2 and Cl_2 in presence of light, hydrolysis of ethyl acetate catalysed by acid, decomposition of azomethane

2. RATE OF REACTION:

The change in concentration of either reacta

or product per unit time.

Formula : $V = \pm \frac{dc}{dt}$

dc = change in Concentration in a small interval dt.

[-] sign is used when we refer to reactant Concentration.

[+] sign is used when we refer to product Concentration.

◆ Example: $N_2 + 3H_2 \longrightarrow 2NH_3$

(i) Rate of formation of ammonia $= +\frac{d[NH_3]}{dt}$

(ii) Rate of disappearance of nitrogen $= \frac{d[N_2]}{dt}$

(iii) Rate of disappearance of hydrogen $= \frac{d[H_2]}{dt}$

Rate of reaction $= +\frac{1}{2}\frac{d[NH_3]}{dt} = -\frac{d[N_2]}{dt} = -\frac{1}{3}\frac{d[H_2]}{dt}$

Thus Rate of reaction $= -\frac{d[N_2]}{dt} = \frac{1}{2}\frac{d[NH_3]}{dt}$

Or rate of formation of ammonia = Twice the rate of disappearance of nitrogen

i.e. $\frac{d[NH_3]}{dt} = \frac{2}{3}\left[-\frac{d[H_2]}{dt}\right]$

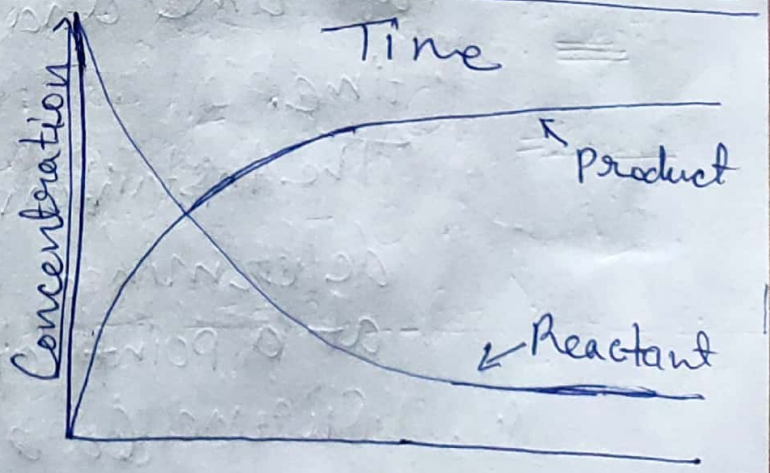
3. AVERAGE VELOCITY OF REACTION:

Change in the concentration of reactants or of Products per unit time is called average reaction velocity. If ΔC is the change in the Concentration of reactants and product in Δt time, then

Average velocity $= \pm \frac{\Delta C}{\Delta t}$

Or Average velocity = $\frac{(-)\text{ Change in the Concentration of reactants}}{\text{Time}}$

$\frac{(+)\text{ change in the Concentration of products}}{\text{Time}}$



Unit of average velocity

$= \frac{\text{unit of Concentration}}{\text{unit of time}} = \frac{\text{gram mole}}{\text{litre second}}$

$= \text{gram mole litre}^{-1}\text{ second}^{-1}$