D. B. College (Jaynagar) Lect:-17
Akhilesh Kumar Singh B.Sc (Hons) Part-I
Chemistry department
Mob:- 8750390927

7. DISTINCTION BETWEEN UNIT OF RATE AND RATE CONSTANT:

- Rate of a reaction: Its units are always mole litre^{-1} time^{-1}
- Rate Constant: Its units depends upon the order of reactions.

8. RATE LAW:

(a) It may also not depend upon the concentration of each reactant or product of the reaction

Suppose, $mA + nB \longrightarrow$ Product

$$R \propto [A]^m [B]^n$$

(b) Rate of a chemical reaction is directly proportional to the product of the concentrati-on of reactants raise to the power of their stoichiometric coffecient.

(c) The rate law represents the experimentally observed rate of reaction which depends upon slowest step of the reaction

(d) Rate law cannot be deduce from the equation for a given reaction. It can be find by experiments only.

(e) The rate law may not bear a simple relationship of the stoichiometric equation.

Ex.9 In the reaction, $A + 2B \rightarrow 6C + 2D$, if the initial rate $-\frac{d[A]}{dt}$ at $t = 0$ is $2.6\ 10^{-2}$ M sec^{-1}, what will be the value of $-\frac{d[B]}{dt}$ at $t=0$?

[A] 8.5 10^{-2} M sec^{-1}

[B] 2.5 10^{-2} M sec^{-1}

[C] 5.2 10^{-2} M sec^{-1}

[D] 7.5 10^{-2} M sec^{-1}

Soln [C]

From the reaction it is evident that when a mole of A is reacting, 2 moles of B must react. Hence the decrease in the concentration of B must be twice that of A

$$\therefore -\frac{d[B]}{dt} = 2\left[-\frac{d[A]}{dt}\right]$$

$= 2 \times 2.6 \times 10^{-2} = 5.2 \times 10^{-2}$ M sec^{-1}

Ex. 10 The dimension of rate constant of a second order reaction involves:

[A] time and concentration

[B] neither time nor concentration

[C] time only

[D] concentration only

Sol. $k = \frac{Rate}{[A]^2} = \frac{mol\ L^{-1} s^{-1}}{(mol\ L^{-1})^2} = \frac{s^{-1}}{mol\ L^{-1}} = (mol\ L^{-1})^{-1} s^{-1}$

Ans [A]

Ex. 11 The rate constant of a reaction has same units as the rate of reaction. The reaction is of

[A] zero order [B] first order [C] second order

[D] none of these

Sol^n [A]

For a zero order reaction, $r = k[A]$.

Thus the units of k are the same as that of rate of reaction.