ABLES KOTA

Order of rexn may be +ve, zero & fractional.

Unit of rate constant : Let a n^{th} order reaction rate law is –

$$r = k[A]^n$$

{Here k is rate constant}

$$k = \frac{r}{[A]^n} \Rightarrow k = \frac{mol.ltr^{-1}.sec^{-1}}{(mol.ltr^{-1})^n}$$

$$k = (mol.ltr^{-1})^1 (mol.ltr^{-1})^{-n}.sec^{-1}$$

$$\boxed{k = (mol.ltr^{-1})^{1-n}.sec^{-1}}$$

Case I. If $n = 0$, Zero Order Rexn.

Unit of $k = mol.ltr^{-1}.sec^{-1}$

Case II : If $n = 1$, First order Rexn.

$$K = (mol \cdot ltr^{-1})^0 \cdot sec^{-1}$$

$$\boxed{K = sec^{-1} / min^{-1} / Hr^{-1}}$$ **

{ex $2^0 = 3^0 = 4^0 = (\text{DeepakSir})^0$
$= 1$}

Case II ÷ $n = 2$, Second order.

$$K = (mol \cdot ltr^{-1})^{1-2} \cdot sec^{-1} \Rightarrow K = (mol \cdot ltr^{-1})^{-1} \cdot sec^{-1}$$

$$K = mol^{-1} \cdot (ltr^{-1})^{-1} \cdot sec^{-1}$$

{$(2^m)^n = 2^{m \cdot n}$}

$$\boxed{K = mol^{-1} \cdot ltr \cdot sec^{-1}}$$ **

ABLES® KOTA

Type - I :

Q.1 For a gaseous rexn rate law is, rate = $k[A].[B]^2$

(i) If Conc. of reactant is Reduced to $\frac{1}{4}$th of initial Conc. then rate of reaction 64 times ↓ time will be.

(ii) If Volume of Container is reduced 2 times of initial then rate ____ time will be.

Sol. given $r = k[A].[B]^2$ — ①

$r' = k\left[\frac{1}{4}A\right].\left[\frac{1}{4}.B\right]^2$

$r' = \frac{1}{4}\times\left(\frac{1}{4}\right)^2.k[A][B]^2$

$r' = \frac{1}{4}\times\frac{1}{16}.r$ {from eq. ①}

$\boxed{r' = \frac{1}{64}r}$ ⇒ 64 times decreases.

ABLES® KOTA

Type-I :-

Q.1 For a gaseous rexn rate law is, rate $= k[A].[B]^2$

(i) If Conc. of reactant is Reduced to $\frac{1}{4}$th of initial Conc. then rate of reaction ~~but times~~ time will be.

(ii) If volume of Container is reduced 2 times of initial then rate 8 times ↑ time will be.

Sol. given $r = k[A].[B]^2$ — ①

(ii) $C = \frac{n}{V} \Rightarrow \boxed{C \propto \frac{1}{V}}$

If $V' = V/2$

then $c' = 2c$

$r' = 2^1 . 2^2 . r$ {from eq. ①}

$\boxed{r' = 8r} \Rightarrow$ 8 times increases.

ABLES® KOTA

Type - II :

Q. 2. For a reaction, $3A \longrightarrow P$, it is found that rate of reaction double if [A] is increased 4-times. Cal. order of reaction. (a) 3 (b) 1 (c) 2 (d) $\frac{1}{2}$

Sol. APNA Rate law likhe -

$$r = k[A]^x \quad \text{— (1)}$$

$$2r = k[4A]^x \Rightarrow 2r = 4^x . k[A]^x$$

$$2r = (2^2)^x . r \Rightarrow 2^1 = 2^{2x}$$

Base Same then Power also equal

$$1 = 2x \Rightarrow \boxed{x = 1/2}$$

$$\Rightarrow \boxed{r = k[A]^{1/2}}$$

Order of rexn = 1/2 Ans.

Type - II :

Q.3. For a reaction, $A \longrightarrow B$, the rate of reaction double when the [A] is increased 8 times. then Cal. order of Rexn.

Sol. $r = k[A]^x$ — ①

$2r = (8)^x \cdot r$ — ②

$2^1 = (2^3)^x \Rightarrow 2^1 = (2)^{3x}$

$1 = 3x \Rightarrow \boxed{x = \frac{1}{3}}$

$\boxed{r = k[A]^{1/3}}$ $\boxed{\text{O. of rexn} = 1/3}$

Q.4. For a rexn, $A + B \longrightarrow P$, the rate of rexn was double when the [A]. was double. the rate was again double when the [A] & [B] were both double the determine (i) Order of rexn (ii) Order with respect to A & B.

Sol. $r = k[A]^x \cdot [B]^y$ —— (1)

$2r = 2^x \cdot r \Rightarrow 2^1 = 2^x \Rightarrow \boxed{x = 1}$

$2r = 2^x \cdot 2^y \cdot r \Rightarrow 2^1 = 2^{x+y} \Rightarrow 1 = x + y$

$1 = 1 + y \Rightarrow \boxed{y = 0}$

(i) $r = k[A]^1 \cdot [B]^0 \Rightarrow$ O. of rexn $= 1 + 0 = 1$

(ii) O. of A = 1, O. of B = 0.

Q. For a rexn, rate law is, $r = k[A]^2 \cdot [B]$, By what factor the initial rate of reaction will increases, if initial [A] is taken 1.5 times & [B] is taken tripled (3 times).