Q What is rate of rkn? Write the important factors which affect Rate of Rkn?

Subject ______ Exercises

9.1 $3NO_{(g)} \rightarrow N_2O_{(g)}$ Rate $= k[NO]^2$

Following are the important factor which influence the rate of rkn —

(i) Concentration (v) Light or radiation

(ii) Temperature (vi) Activation energy

(iii) Catalyst (vii) Nature of reacting species.

(iv) Surface area

(i) Concn - With ↑ing conn rate of rkn ↑ses.

$A + B \rightarrow C + D$

rate $\propto [A][B]$

Con = (m) ∝ n

conn ∝ n ∝ no. of molecules ∝ frequency of collision ∝ effective collision ∝ rate of rkn.

Reason → With ↑ing conn no. of moles of reacting species increased.

→ With ↑ing no. of moles, no. of molecules ↑ses. so, frequency of collision ↑ses.

→ With ↑ing frequency of collision, effective no. of collision ↑ses.

→ With ↑ing effective collision, formatn of product i.e. rate of rkn ↑ses.

$$k = (mol\ lit^{-1})^{1-n} \times sec^{-1}$$

For zero order reaction.

n = 0

$k = (mol\ lit^{-1})^{1-0} \times sec^{-1}$

$= mol\ lit^{-1}\ sec^{-1}$

For 1st order reaction.

n = 1

$k = (mol\ lit^{-1})^{1-1}\ sec^{-1}$

$k = sec^{-1}$

For 2nd order reaction.

n = 2

$k = (mol\ lit^{-1})^{1-2}\ sec^{-1}$

$= (mol\ lit^{-1})^{-1}\ sec^{-1}$

$= mol^{-1}\ lit\ sec^{-1}$

Difference b/w rate of rkn & rate of constt.

	Rate of reaction	Rate constt.
(i)	It is the change in conc of reactant or product / unit time is called rate of rkn.	It is the rate of rkn when the conc of reactant becomes unity.
(ii)	It depends upon initial conc	It does not depend upon initial conc.
(iii)	Its unit is $mol\ lit^{-1}\ sec^{-1}$	Its unit is $(mol\ lit^{-1})^{1-n}\ sec^{-1}$
(iv)	It depends upon temperature	It does not depends upon temperature

where n_1 is the order of reaction w.r.t reactant A.
n_2 is the order of of reaction w.r.t reactant B.
$n_1 + n_2$ is the over all order of reaction.

Rate Constt -

Suppose a general reaction is represented as,

$$mA + nB \longrightarrow xC + yD.$$

rate $\propto [A]^p \cdot [B]^q$

rate $= k \cdot [A]^p \cdot [B]^q$

Overall order $= p + q$

If $[A] = 1$

$[B] = 1$

rate $= k \cdot (1^p \cdot 1^q)$

rate $= k$

Definition of rate constt.

→ rate constt is the numerically equal to rate of reaction when, the conc of reactant becomes unity.

Unit of Rate of constt.

$$k = \frac{\text{rate}}{[A]^n}$$

$$k = \frac{mol^{1} \, lit^{-1} \, sec^{-1}}{[mol \, lit^{-1}]^n}$$

your writing partner

Subject

Rate Law Expression :-

differential rate ex. w.r.t. stiochometry coefficient

$n_1 A + n_2 B \longrightarrow n_3 C + n_4 D$

$$rate = -\frac{1}{n_1}\frac{d[A]}{dt} = -\frac{1}{n_2}\frac{d[B]}{dt}$$

$$= +\frac{1}{n_3}\frac{d[C]}{dt} = +\frac{1}{n_4}\frac{d[D]}{dt}$$

$rate = -\frac{1}{n}\frac{d[A]}{dt}$ = rate of reaction A w.r.t. to coefficient

$rate = -\frac{d[A]}{dt}$ = rate of disappearance of A

Law of mass Action -

The rate of reaction is directly proportional to the product of active mass of reactants in which the no. of moles are raised as a power.

$n_1 A + n_2 B \longrightarrow n_3 C + n_4 D$

$rate \propto [A]^{n_1} \cdot [B]^{n_2}$

$$\boxed{rate = k[A]^{n_1} \cdot [B]^{n_2}}$$

This is known as rate law expression.

where k is a constt which is called rate constt or velocity constt. or specific rate constt.