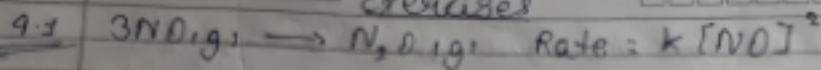


Q) What is rate of rxn? Write the important factors which affect rate of rxn?

Topic

Exercises

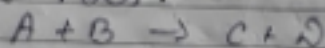
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Following are the important factors which influence the rate of rxn:

- (i) Concentration
- (ii) Temperature
- (iii) Catalyst
- (iv) Surface area
- (v) Light or radiation
- (vi) Activation energy
- (vii) Nature of reacting species

i. Conc<sup>n</sup> - With 1ing conc<sup>n</sup> rate of rxn ↑ ses.



$$\text{rate} \propto [A][B]$$

$$\text{Con} = (M)^n$$

Con<sup>n</sup> & n ∝ no. of molecules & frequency of collision & effective collision ∝ rate of rxn

Reason → With 1ing conc<sup>n</sup> no. of moles of reacting species increases.

→ With 1ing no. of moles, no. of molecules ↑ ses. So, frequency of collision ↑ ses.

→ With 1ing frequency of collision, effective no. of collision ↑ ses.

→ With 1ing effective collision, format of product i.e. rate of rxn ↑ ses.

Subject \_\_\_\_\_

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

For zero order reaction.

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

For 1st order reaction.

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

For 2nd order reaction.

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

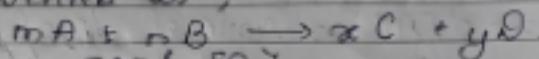
# Difference b/w rate of rxn & rate of const.

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

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

### Rate Const -

Suppose a general reaction is represented as,



$$\text{rate} \propto [A]^p \cdot [B]^q$$
$$\text{rate} = k \cdot [A]^p \cdot [B]^q$$

$$\text{Overall order} = p + q$$

$$\text{If } [A] = 1$$

$$[B] = 1$$

$$\text{rate} = k \cdot (1^p + 1^q)$$

$$\text{rate} = k$$

### Definition of rate const.

→ Rate const is the numerically equal to rate of reaction when, the conc<sup>n</sup> of reactant becomes unity.

### Unit of Rate of const.

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

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



Rate Law Expression :-

differential rate ex<sup>n</sup> w<sup>o</sup> st<sup>o</sup> stoichiometry coeff<sup>o</sup> -  
 $n_1 A + n_2 B \rightarrow n_3 C + n_4 D$

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

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

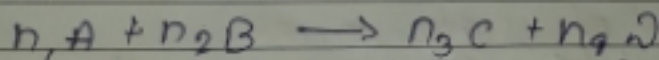
$$\text{rate} = -\frac{1}{n} \frac{d[A]}{dt} = \text{rate of reaction A}$$

w.r.t to coefficient

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

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.



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

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

This is known as rate law expression.

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