

Q.1. $\Delta [\quad]$

2
3
3
3
8
8
27
4
2

Δ R.O.R.	Order
2	1
9	2
27	3
3	1
2 \longrightarrow	$\frac{1}{3}$
4	$\frac{2}{3}$
3 \longrightarrow	$\frac{1}{3}$
8 \longrightarrow	$\frac{3}{2}$
$2 \cdot 8 \cdot 2$ $= 2 \cdot \sqrt{2} = 2 \cdot 2^{1/2} = 2^{3/2}$	$2^{3/2} = 2^x$ $x = 3/2$

$A \rightarrow B$
$R = k[A]^x$
$2R = 2^x \cdot R$
$x = 1$
$3R = 3^x \cdot R$
$3^2 = 3^x \Rightarrow x = 2$
$2R = 8^x \cdot R$
$2^1 = (2^3)^x$
$2^1 = 2^{3x} \Rightarrow 1 = 3x$
$x = 1/3$
$2^2 = 2^{3x} \Rightarrow 3x = ?$
$x = 2/3$

$\textcircled{2.1.}$ $\Delta []$ $\Delta R.O.R.$ Order
 3 5.2 $3/2$
 $= 3 \cdot \sqrt{3} = 3^{3/2}$

Mechanism of Reaction :-

(1) Elementary Reaction (2) Complex Reaction.

$\textcircled{1}$ Elementary Reaction :- Those reactions which are completed in a single step and which have exponents/coefficients/power of reactants in rate law is equal stoichiometry coefficients of reactants
Ex:- If $A + 2B \rightarrow C$, it elementary reaction.

$$\boxed{r = k[A]^1 \cdot [B]^2} \rightarrow \text{rate law.}$$

$$\text{Order of rxn} = 1 + 2 = 3.$$

Zero-order reaction can never be elementary reaction.

/ Zero-order reaction always complex reaction.

For elementary reaction fractional order is not possible.

(2) Complex reaction =

Those reactions which are completed in multiple steps (more than one step), for these reactions a mechanism is proposed.

For complex reaction overall rate of reaction is controlled by its slowest step. Which is called rate determining step.

In rate law expression, rate of reaction depend on concentration of reactant of slowest step, which must be free from intermediate.

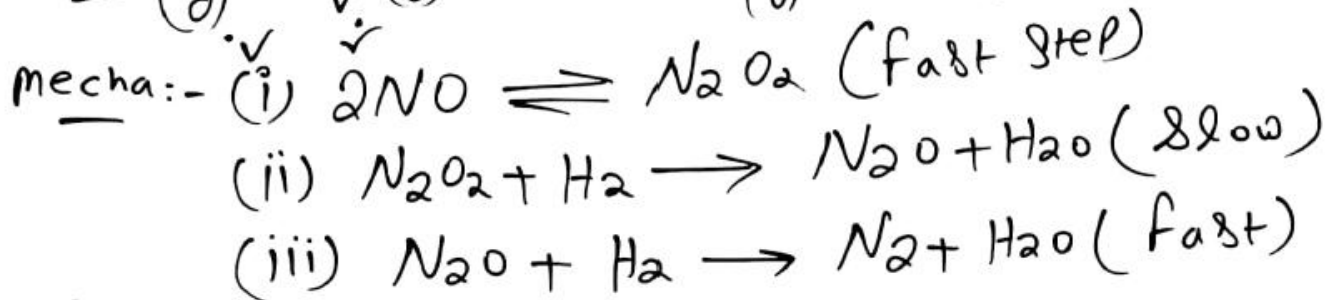
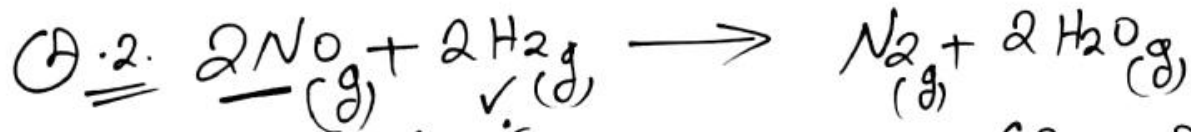
ex: Q.1. $2NO_2Cl \rightarrow 2NO_2 + Cl_2$, The mechanism of reaction is -
 mech: (i) $NO_2Cl \rightleftharpoons NO_2 + Cl$ (slowest step) ✓
 (ii) $NO_2Cl + Cl \rightarrow NO_2 + Cl_2$ (fast step.)
 So determined rate law.?

Sol. Apply rate law in R.D.S. (rate determining step.)

$$r = k[NO_2Cl]^1 \rightarrow \text{rate law.}$$

↑

Order = 1



Determine rate law.

Sol.

Apply rate law in slowest step. (R.D.S.)
 Put $[\text{N}_2\text{O}_2]$ in eq. ① -

$r = k[\text{N}_2\text{O}_2] \cdot [\text{H}_2]$ - ①

↑
intermediate

$r = k k_1 [\text{NO}]^2 \cdot [\text{H}_2]$

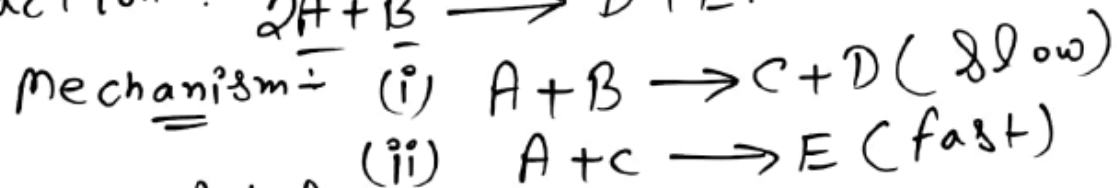
$r = k' [\text{NO}]^2 \cdot [\text{H}_2]$ → rate law

Apply L.M.A in step-(i)

$k_1 = \frac{[\text{N}_2\text{O}_2]}{[\text{NO}]^2} \Rightarrow [\text{N}_2\text{O}_2] = k_1 [\text{NO}]^2$ - ②

Order of
 $r_{\text{exn}} = 2 + 1 = 3$

Q.3. following mechanism has been proposed for the reaction: $2A + B \rightarrow D + E$.



Determine rate law.

Sol. Apply rate law in R.D.S. - Step (i)

$$r = k [A]^1 [B]^1 \Rightarrow \text{rate law} \Rightarrow \text{Order of rxn} = 1 + 1 = 2.$$

Q.4. A Hypothetical Reaction. $A_2 + B_2 \rightarrow 2AB$; follow the mechanism as given below. Determine rate law.

