

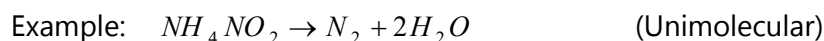
Molecularity of Reaction.

"It is the sum of the number of molecules of reactants involved in the balanced chemical equation".

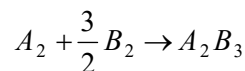
Or

"It is the minimum number of reacting particles (Molecules, atoms or ions) that collide in a rate determining step to form product or products".

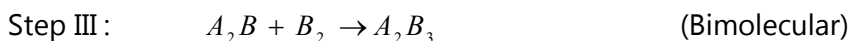
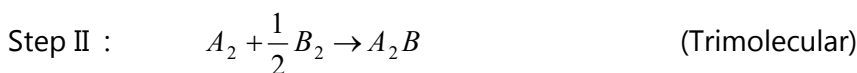
- Molecularity of a complete reaction has no significance and overall kinetics of the reaction depends upon the rate determining step. Slowest step is the rate-determining step. This was proposed by **Van't Hoff**.



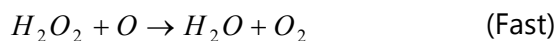
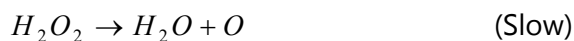
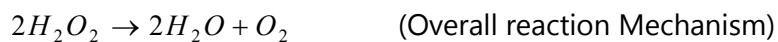
- Molecularity of a reaction can't be Zero, negative or fractional.
- Molecularity of a reaction is derived from the mechanism of the given reaction.
- Molecularity cannot be greater than three because more than three molecules may not mutually collide with each other.



Mechanism

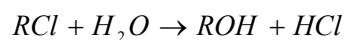


Example: Decomposition of H_2O_2



Rate = $K[H_2O_2]$; the reaction is Unimolecular

(1) **Pseudo Unimolecular Reaction:** Reaction whose actual order is different from that expected using rate law expression are called **pseudo-order reaction**. For example,



Expected rate law: $Rate = k[RCl][H_2O]$; Expected order = 1 + 1 = 2

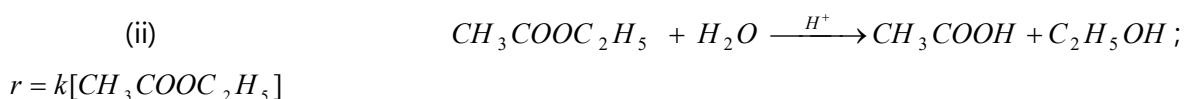
Actual rate law: $Rate = k[RCl]$; Actual order = 1

Because of water is taken in excess amount; therefore, its concentration may be taken constant. The reaction is therefore, pseudo first order. Similarly the acid catalyzed hydrolysis of ester, viz.,

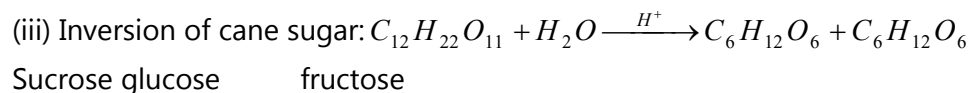


Those reactions which may have order of reaction as one while Molecularity of reaction 2 or more than two are as follows:

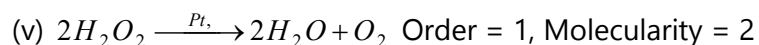
Examples: (i) $2N_2O_5 \rightarrow 4NO_2 + O_2$; Order = 1; Molecularity = 2



Order = 1, Molecularity = 2



Order = 1, Molecularity = 2



Difference between Molecularity and Order of reaction

Molecularity	Order of Reaction
It is the number of molecules of reactants terms taking part in elementary step of a reaction.	It is sum of the power of the concentration terms of reactants in the rate law expression.
Molecularity is a theoretical value	Order of a reaction is an experimental value
Molecularity can neither be zero nor fractional.	Order of a reaction can be zero, fractional for integer.
Molecularity has whole number values only i.e., 1, 2, 3, etc.	Order of a reaction may have negative value.
It is assigned for each step of mechanism separately.	It is assigned for overall reaction.
It is independent of pressure and temperature.	It depends upon pressure and temperature.