6/05/2023

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CHM 213 [PRACTICAL CHEMISTRY I]

Topics.

* Activative Energy.
* Arrhenius Equations & its Application.
* Elementary Treatment of Fast Rxn and theories of Rxn Rate.
* Introduction to Catalysis.
- Homogeneous & Heterogeneous Catalysis.

13/05/2023 Chemical Kinetics. [Theories of Rxn Rate].

Energy of a Substance in motion.

$A \rightarrow B$

The rate of the reactant decrease while the rate of the product increase.

$A_{Reactant} \rightarrow B_{Product}$

$\text{rate} = -\frac{d[A]}{dt}$ OR rate of rxn $= \frac{d[B]}{dt}$.

where d is infinitely decimally small. [infinity]

Order of Rxn.

Zero order Rxn = the Conc of the reactant does not affect the Rate of rxn.

First order Rxn.

Second order Rxn: the two molecules of involved.

Suitable Rxn: they are involved in the rxn but they are in excess.

* For molecule to react all molecules need to be breakdown.
According to the collision theory for rxn to take place the molecules are always colloding together with enough kinetic energy higher than the activation energy.
Secondary the molecule of the reactant must collide with the right orientations. [effective collision.].

e.g. (A) ⟶ ⟵ (A) need the A and B to react
(B) ⟶ (B) to give effective collision.

(A) (A)
(B) (B)
(A) (B) [effective collision]

e.g If the orientation is not ok colliding zig-zagally.

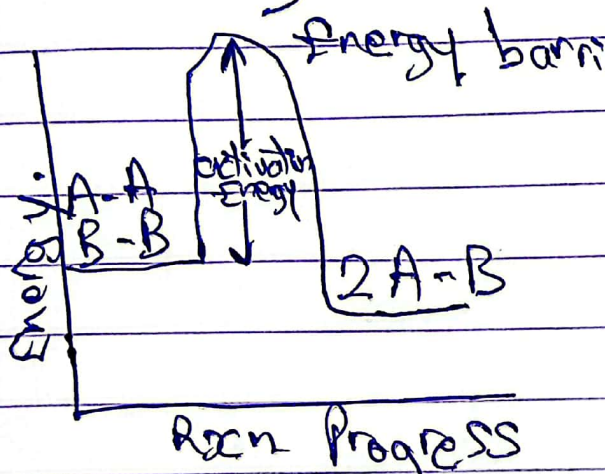
(A)(A) (B)(B) will give ineffective collision.

(A) (B)(B)
(A)
(A)(A) (B)(B).

Theories of Rxn Rate.

1) Collision theory of Rxn Rate.
Tell us that the chm. Rxn take place only by collision between the rxn particle. [molecule] but not all collision are effective only a small fraction of collision produce a rxn.
Two main condition for effective collision.

1. The colliding molecule must processes sufficient kinetic energy to cause of Rxn
2. The colliding molecule must collide with proper orientation.



$A\text{-}A + B\text{-}B \rightarrow 2A\text{-}B$

For rxn to occur it require sufficient kinetic energy to break bond [Reactant] and formed new bond [product]. Only molecule colloding with K.E greater than E.A that able to give through the energy barrier and react. the once colloding with $K.E \leq E.A$ Fail to ~~cross~~ the energy barrier, Hence they will not react Rather they will bounce up or and other.

2b. The reactant must collide with Favorable orientation [Reactive position] the correct orientation is that will ensure direct contact between the atom involves in the breaking and forming of bonds.

The rate of elementary process

e.g $A+B \rightarrow C+D$

rate $= F \times P \times Z$,

where F = Fraction of the molecule which process sufficient energy to react.

P = Probable Fraction of Collision with effective orientation,
Z = Collision Frequency.

Limitations of collision theory:

1. The theory is only apply to simple gaseous rxn only.