

Effective Collision theory

In a chemical reaction reactants collide and get converted into products. There are 10^{27} collisions among reactant molecules per unit volume per second. If all the collisions result in product formation then reaction would be completed in no time. But in real life reaction takes a finite time for completion. The collisions which results in product formation are called effective collisions. For a collision to be effective, it should overcome

- i) Energy barrier
- ii) Orientation barrier.

Energy barrier

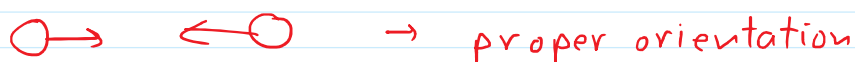
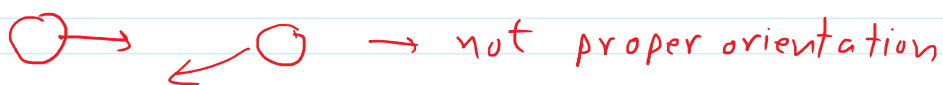
Energy with which reactant molecules collide must be greater than a particular value for collision to be effective. This particular value of energy is called threshold energy.

Threshold energy of a particular reaction is independent of temperature.

Threshold energy for different reactions is different

Orientation Barrier

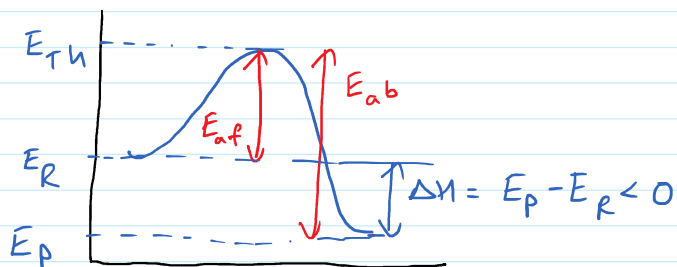
Collision between reactant molecules should be properly oriented for collision to be effective.



Activation energy

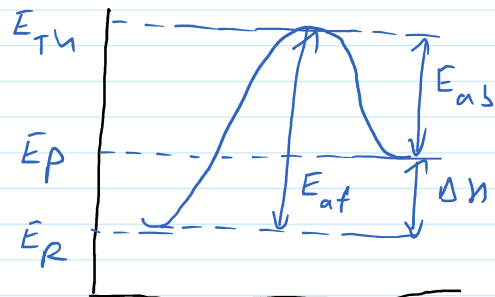
Energy to be supplied to reactant molecules so that their energy becomes equal to threshold energy is called activation energy (E_a) of the reaction.

$$E_{\text{activation}} = E_{\text{Threshold}} - E_{\text{reactant}}$$



Exothermic reaction

$$\Delta H = E_{af} - E_{ab}$$



Endothermic reaction

$$\Delta H = E_P - E_R > 0$$

$$\Delta H = E_{af} - E_{ab}$$