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Date:
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For Deg I Chemistry Hons Paper II &
Deg I Sub course

Activation energy and chemical rk

All the molecules cannot take part in the chemical reaction. It is only a certain number of molecules that may be active molecules which could take part in a chemical reaction.

The reactants do not directly Pass to the Products but must first acquire necessary energy to Pass over an energy barrier or Activated state or Transition state.

The amount of energy which the reactant molecules must absorb to Pass over the activated energy barrier is called activation energy.

The necessary energy of activation is acquired by the molecules as a result of interchanges occuring in

collision among molecules.

When two molecules, having the necessary energy of activation come together, they must first form an activated complex.

e.g- $A + BC = AB + C$

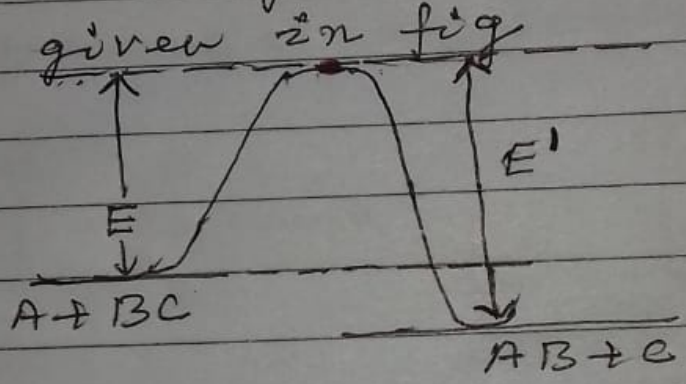
When A is relatively far from BC, the atoms of BC are vibrating about their mean position and thus the potential energy of the system is unaffected. As the distance of A is decreased towards BC, the nuclei of Atoms B and C of molecule BC are forced apart and this results an increase in the potential energy. This increase in potential energy is continued till a configuration A-B-C is attained. This A-B-C is known as the activated complex or transition complex and has the maximum potential energy. The activated complex A-B-C can decompose to yield the Products of reaction (AB&C) or vice versa.

or vice-versa.

$$A + BC \rightleftharpoons A-B-C \rightleftharpoons AB + C$$

Initial state — Activated complex — Final state

The change of Potential energy is given in fig



The energy of activation for the forward reaction $E = E_{A-B-C} - E_{A+BC}$

Where E_{A-B-C} is the Potential energy of the activated complex and E_{A+BC} is that of the reactants $(A+BC)$,

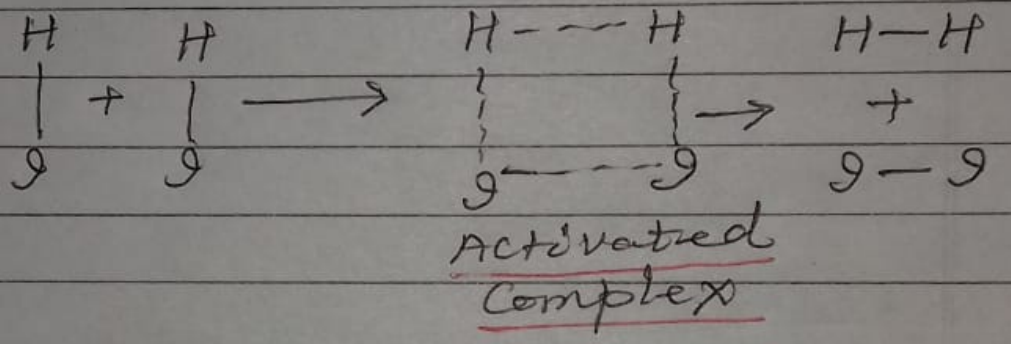
Similarly, the energy of activation for the backward or reverse reaction is given by $E' = E_{A+B+C} - E_{AB+C}$

Where E_{AB+C} is the Potential energy of products $(AB+C)$

Thus $\Delta E = E - E'$

where ΔE gives the heat of reaction at constant volume

The activated complex of the bimolecular decomposition of hydrogen iodide might be represented as follows –



Characteristics of activated Complex

(1) The formation of an activated complex is regarded as the characteristic of all chemical change.

(2) The activated complex has a transient existence only and breaks up at definite orate to form Products of reaction

(3) The Potential energy of activated complex is maximum this is why the activated complex is unstable.