

Activated Complex Encyclopedia Article

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Activated Complex

A crucial conceptual element of the transition state theory, activated complex is an unstable, high-energy grouping of atoms. According to transition state theory, there is an intermediate point, in a chemical reaction, when the bonds of the reactants have not been quite broken, and the reaction product's new bonds have not yet been formed. The entity reflecting that point is the activated complex. For example, in a $\text{HI} + \text{Cl}$ reaction, which yields $\text{HCl} + \text{I}$, the I-H-Cl group of atoms appears during the reaction: this is an activated complex. Since, as transition state theory posits, a chemical reaction requires a specific level of energy, known as the activation energy, every initiated reaction is not automatically completed. If a reaction is successful, the activated complex will yield the product; if the reaction process cannot be completed due to insufficient energy, the activated complex will revert to the original reactants. In our example, the I-H-Cl group would become HI and Cl . Michael Polanyi (1891-1976) and Henry Eyring (1901-1981), who developed the transition state theory in the 1920s and 1930s, postulated that every chemical reaction goes through the activated complex phase.