

8.1: A. Methods of Catalysis

Learning Objectives

- define and give examples of general acid/base, electrostatic, nucleophilic (covalent), and intramolecular methods of catalysis of chemical reactions in the absence of enzymes;
- draw mechanisms showing transition states and intermediates in general acid/base and nucleophilic catalysis;
- explain the role of transition state stabilization and preferential binding of the transition state compared to the substrate for macromolecule-catalyzed chemical reactions

Catalysts, including enzymes, can employ at least five different ways to stabilize transition states. Reactions in solution that are not catalyzed are slow since charge development and separation occurs in the transition state. When bonds are made or broken, charged intermediates are often formed which are higher in energy than the reactants. Since the intermediate is higher in energy than the reactants, the transition state would be even higher in energy, and hence more closely resemble the charged intermediate. Anything that can stabilize the charges on the intermediate and hence the developing charges in the transition states will lower the energy of the transition state and catalyze the reaction.

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Contributors and Attributions

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