Massachusetts Institute of Technology Organic Chemistry 5.512

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Introduction: Strategies for Stereocontrolled Synthesis

★ Thermodynamic Control

Relative energy of diastereomers determines outcome of reaction

- I. What determines the relative energy of stereoisomers?
 - **☆ De-stabilizing Non-bonded Repulsion**
 - **☆ Stabilizing Non-covalent Interactions**
 - **☆ Stereoelectronic Effects**
 - * Deviation from optimal geometry for orbital overlap (angle strain)
 - * Destabilizing torsional interactions
 - * Stabilizing secondary orbital interactions
 - * Dipole-dipole interactions
- II. Tactics for establishing thermodynamic control

Reading on Stereochemical Principles

Carey and Sundberg "Advanced Organic Chemistry" Part A (2000) Chapters 2 and 3

E. L. Eliel and S. H. Wilen "Stereochemistry of Organic Compounds" (1994)

Review of Key Reactions

Carey and Sundberg "Advanced Organic Chemistry" Part B (2000)

Chapter 1 (Alkylation reactions)

Chapter 2 (Aldol, Michael, Mannich reactions)

Chapter 4 (Hydroboration)

Chapter 9 (Organoboron, silicon, tin chemistry)

Chapter 12 (Epoxidation)