**Anchimeric Assistance**

The anchimeric assistance may simply be defined as the increase in reaction-rate due to the presence of a neighboring group β- to the leaving group.

It is a well-known fact that many nucleophilic substitution reactions give rise to the same configuration (i.e., retention) instead of inversion or racemization due to neighboring group participation. Also, the rate of reaction for such reactions is very high because the group or atom at β-position to the leaving group is readily available for the nucleophilic attack in the first step (rate-determining step). The schematic representation of the whole process is shown below.

Since the first step is the rate-determining step, the reaction kinetics of the neighboring group mechanism is of the first order, which can be formulated as:

\[ \text{Rate} = k[RX] \]

Where \( k \) is the rate constant and symbol \([RX]\) represents the molar concentration of the substrate.

**Anchimeric Assistance by Heteroatom with Lone Pair**

The typical example of this type of anchimeric assistance that arises via neighboring group mechanisms is the reaction involving the acetylolation of trans-2-iodocyclohexyl brosylate in which the rate is \( 1.75 \times 10^6 \) times greater than what is in acetylolation of cis-isomer.

Also, it is obvious from the above route that the configuration would have changed if the reaction had taken place via the normal SN₂ route.
**Anchimeric Assistance by Alkene**

The typical example of this type of anchimeric assistance that arises via neighboring group mechanism is the reaction involving the solvolysis of unsaturated tosylate in which the rate is $10^{11}$ times greater than what is in solvolysis of saturated tosylate.

![Diagram of anchimeric assistance by alkene](image)

The carbocationic intermediate will be stabilized by resonance where the positive charge is spread over several atoms. In the diagram below this is shown.

![Diagram of resonance stabilization](image)

This effect is observed even if the alkene is more remote from the reacting center the alkene can still act in this way.

**Anchimeric Assistance by Aromatic Ring**

The typical example of this type of anchimeric assistance that arises via neighboring group mechanism is the reaction tosylate with acetic acid in solvolysis in which the rate is much greater than what is in solvolysis via aliphatic counterpart.

![Diagram of anchimeric assistance by aromatic ring](image)

It is obvious from the above routes that the configuration would have changed if the reaction had taken place via the normal SN$_2$ route. An aromatic ring assists in the formation of a carbocationic intermediate called a phenonium ion by delocalizing the positive charge.

![Diagram of phenonium ion formation](image)
Anchimeric Assistance by Cyclopropylmethyl System

The typical example of this type of anchimeric assistance that arises via neighboring group mechanism is the reaction of cyclopropylmethyl chloride with dilute ethyl alcohol in which the rate is much greater than what is expected in the normal SN$_2$ route. Similar results were obtained if we use cyclobutyl chloride or homoallyl chloride instead of cyclopropylmethyl chloride.

Anchimeric Assistance by Aliphatic Bonds

The typical example of this type of anchimeric assistance that arises via neighboring group mechanism is the reaction of the acetolysis of exo-$2$-norbonyl brosylate yielding an racemic mixture of exo-acetates in which the rate is much greater than what is for endo-$2$-norbonyl brosylate.

Therefore, we conclude that the enhanced rate can be due to the anchimeric assistance by the aliphatic carbon-carbon single bond.
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Table of Contents

CHAPTER 1 ................................................................................................................................................. 11

Nature of Bonding in Organic Molecules .......................................................................................................... 11
  ❖ Delocalized Chemical Bonding ........................................................................................................ 11
  ❖ Conjugation ............................................................................................................................................. 14
  ❖ Cross Conjugation .............................................................................................................................. 16
  ❖ Resonance ............................................................................................................................................... 18
  ❖ Hyperconjugation ............................................................................................................................... 27
  ❖ Tautomerism .......................................................................................................................................... 31
  ❖ Aromaticity in Benzenoid and Nonbenzenoid Compounds ................................................................. 33
  ❖ Alternant and Non-Alternant Hydrocarbons ...................................................................................... 35
  ❖ Huckel’s Rule: Energy Level of π-Molecular Orbitals ...................................................................... 37
  ❖ Conjugation .......................................................................................................................................... 46
  ❖ Annulenes ............................................................................................................................................. 48
  ❖ PMO Approach ..................................................................................................................................... 50
  ❖ Bonds Weaker Than Covalent ............................................................................................................. 58
  ❖ Addition Compounds: Crown Ether Complexes and Cryptands, Inclusion Compounds, Cycloextrins ................................................................................................................................. 65
  ❖ Catenanes and Rotaxanes ................................................................................................................... 75
  ❖ Problems ............................................................................................................................................. 79
  ❖ Bibliography ........................................................................................................................................ 80

CHAPTER 2 ................................................................................................................................................... 81

Stereochemistry .................................................................................................................................................. 81
  ❖ Chirality ................................................................................................................................................ 81
  ❖ Elements of Symmetry .......................................................................................................................... 86
  ❖ Molecules with More Than One Chiral Centre: Diastereomerism ......................................................... 90
  ❖ Determination of Relative and Absolute Configuration (Octant Rule Excluded) with Special Reference to Lactic Acid, Alanine & Mandelic Acid ........................................................................ 92
  ❖ Methods of Resolution .......................................................................................................................... 102
  ❖ Optical Purity ....................................................................................................................................... 104
  ❖ Prochirality .......................................................................................................................................... 105
  ❖ Enantiotopic and Diastereotopic Atoms, Groups and Faces .................................................................. 107
  ❖ Asymmetric Synthesis: Cram’s Rule and Its Modifications, Prelog’s Rule ........................................ 113
  ❖ Conformational Analysis of Cycloalkanes (Upto Six Membered Rings) ............................................... 116
  ❖ Decalins ............................................................................................................................................... 122
  ❖ Conformations of Sugars ..................................................................................................................... 126
  ❖ Optical Activity in Absence of Chiral Carbon (Biphenyls, Allenes and Spiranes) ................................. 132
  ❖ Chirality Due to Helical Shape ........................................................................................................... 137
  ❖ Geometrical Isomerism in Alkenes and Oximes .................................................................................. 140
  ❖ Methods of Determining the Configuration ....................................................................................... 146

Reference to Lactic Acid, Alanine & Mandelic Acid ........................................................................................ 92
CHAPTER 3 ............................................................................................................................................... 153

Reaction Mechanism: Structure and Reactivity .................................................................................. 153

Types of Mechanisms ....................................................................................................................... 153

Types of Reactions ............................................................................................................................ 156

Thermodynamic and Kinetic Requirements ...................................................................................... 159

Kinetic and Thermodynamic Control ............................................................................................... 161

Hammond’s Postulate ....................................................................................................................... 163

Curtin-Hammett Principle ................................................................................................................ 164

Potential Energy Diagrams: Transition States and Intermediates ..................................................... 166

Methods of Determining Mechanisms .............................................................................................. 168

Isotope Effects ................................................................................................................................ 172

Hard and Soft Acids and Bases ......................................................................................................... 174

Generation, Structure, Stability and Reactivity of Carbocations, Carbanions, Free Radicals, Carbenes
and Nitrenes .................................................................................................................................... 176

Effect of Structure on Reactivity .................................................................................................... 200

The Hammett Equation and Linear Free Energy Relationship ........................................................ 203

Substituent and Reaction Constants ............................................................................................... 209

Taft Equation .................................................................................................................................. 215

Problems ....................................................................................................................................... 219

Bibliography .................................................................................................................................. 220

CHAPTER 4 ............................................................................................................................................... 221

Carbohydrates .................................................................................................................................... 221

Types of Naturally Occurring Sugars ............................................................................................... 221

Deoxy Sugars .................................................................................................................................. 227

Amino Sugars .................................................................................................................................. 229

Branch Chain Sugars ....................................................................................................................... 230

General Methods of Determination of Structure and Ring Size of Sugars with Particular Reference
to Maltose, Lactose, Sucrose, Starch and Cellulose ........................................................................ 231

Problems ....................................................................................................................................... 239

Bibliography .................................................................................................................................. 240

CHAPTER 5 ............................................................................................................................................... 241

Natural and Synthetic Dyes ............................................................................................................... 241

Various Classes of Synthetic Dyes Including Heterocyclic Dyes ..................................................... 241

Interaction Between Dyes and Fibers ............................................................................................. 245

Structure Elucidation of Indigo and Alizarin ..................................................................................... 247

Problems ....................................................................................................................................... 252

Bibliography .................................................................................................................................. 253

CHAPTER 6 ............................................................................................................................................... 254

Aliphatic Nucleophilic Substitution ................................................................................................... 254

The SN₂, SN₁, Mixed SN₁ and SN₂, SNᵢ, SNᵢ’, SNᵢ’, and SET Mechanisms .................................... 254
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