

ORGANIC CHEMISTRY • CHAPTER 8

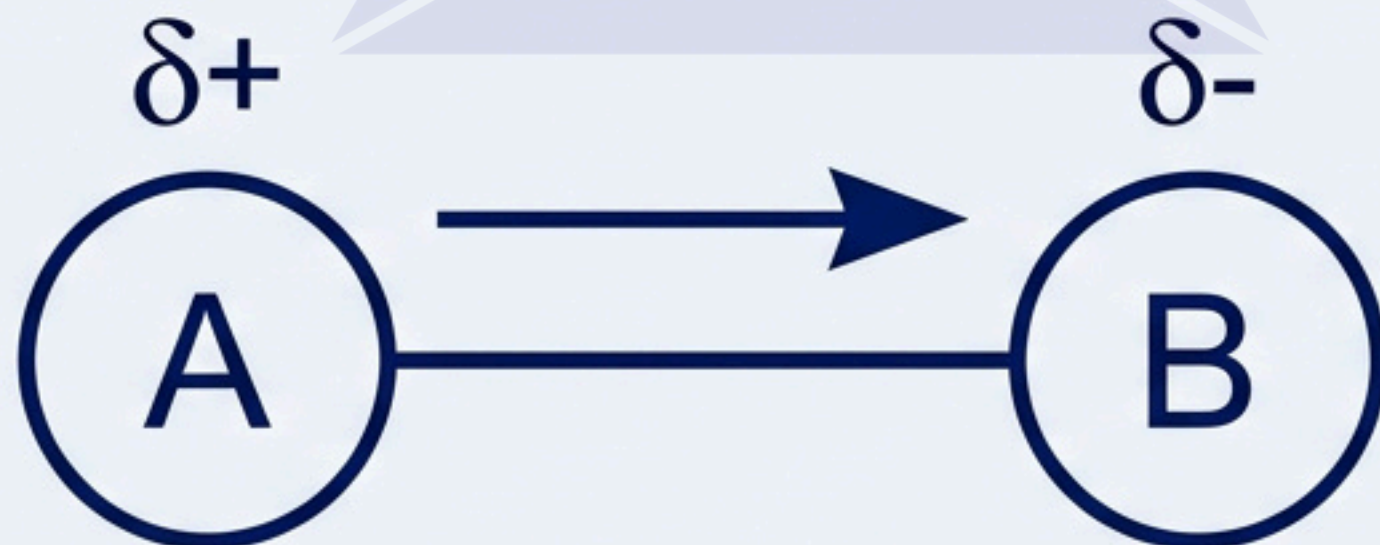
Electron Displacement in Covalent Bonds

The structural framework of permanent and temporary electron shifts in organic molecules.

8.7.4 • FUNDAMENTAL CONCEPTS

The Engine of Organic Reactivity

Electron displacement is the shifting of shared electron pairs within a covalent bond. This shifting creates polarity, establishing centers of high and low electron density that ultimately dictate how and where a molecule will react.



⚡ Reactivity Trigger

Why It Matters

Whether intrinsic to the molecule's ground state or triggered by an outside force, these electron shifts are the fundamental prerequisite for organic reaction mechanisms.

Two Modes of Electron Shifting

PERMANENT EFFECTS

Intrinsic Polarization

Operates continuously in the ground state of the molecule. Influences both physical properties (like dipole moment) and intrinsic chemical reactivity.

Requires NO external reagent.

TEMPORARY EFFECTS

Induced Polarization

Operates only in the excited state. The electron shift is a direct, reversible response to the approach of a reactive chemical species.

REQUIRES an attacking reagent.



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$$E=mc^2$$



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The Ground-State Mechanisms

Inductive Effect (I)

Sigma (σ) Bonds

Polarization of a σ -bond caused by the polarization of an adjacent σ -bond due to electronegativity differences.



Resonance Effect (R)

Pi (π) Bonds / Lone Pairs

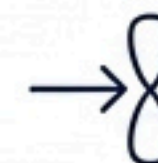
Delocalization of π -electrons or lone pairs across a conjugated system of parallel p-orbitals.



Hyperconjugation

σ - π Interaction

Delocalization of σ -electrons (typically C-H) into an adjacent empty or partially filled p-orbital or π -system.



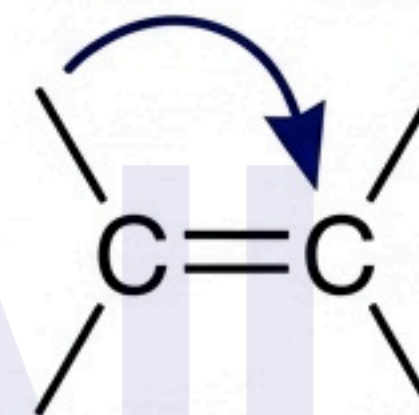
TEMPORARY DISPLACEMENT

The Reagent-Driven Mechanism

Electromeric Effect (E Effect)

Multiple Bonds Only

The complete transfer of a shared pair of π -electrons to **one** of the atoms joined by a multiple bond.



The Reagent Rule: This effect is only brought into play by the demand of an attacking reagent. If the reagent is removed, the molecule instantly reverts to its original ground-state electronic condition.

Exam-Focused Takeaways

Core Driver

Electron displacement generates the polarity required for organic reactions to occur.

Permanent

Inductive, Resonance, and Hyperconjugation are intrinsic to the molecule and alter ground-state properties.

Temporary

The Electromeric effect is purely conditional, vanishing the moment the attacking reagent is removed.

Next Steps

Understanding these four distinct classes is the absolute foundation for predicting reaction pathways and molecular stability.



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