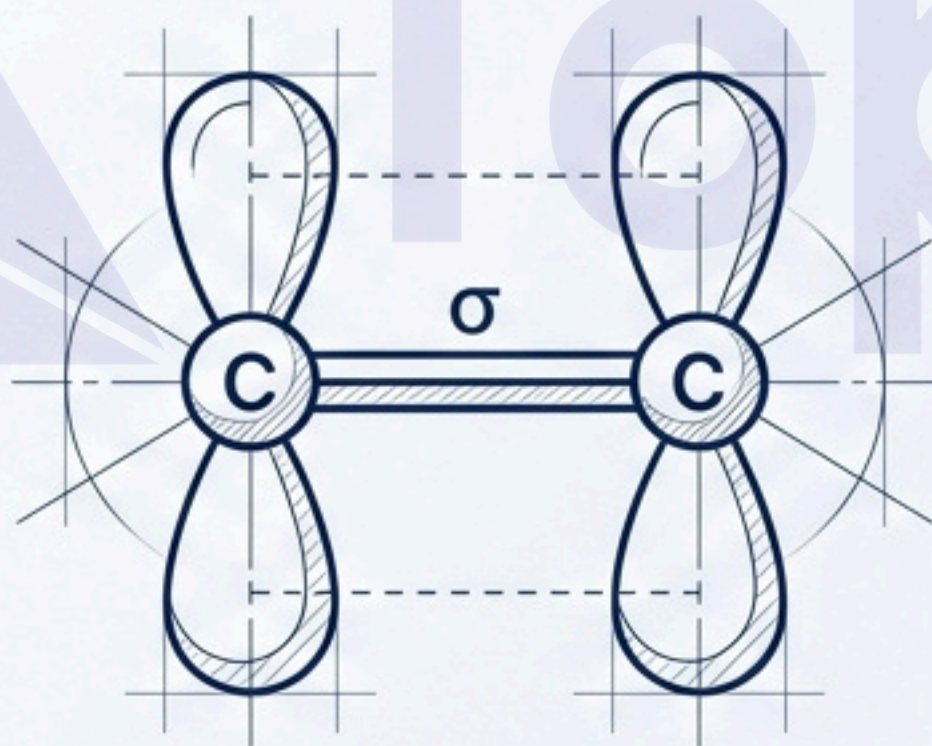


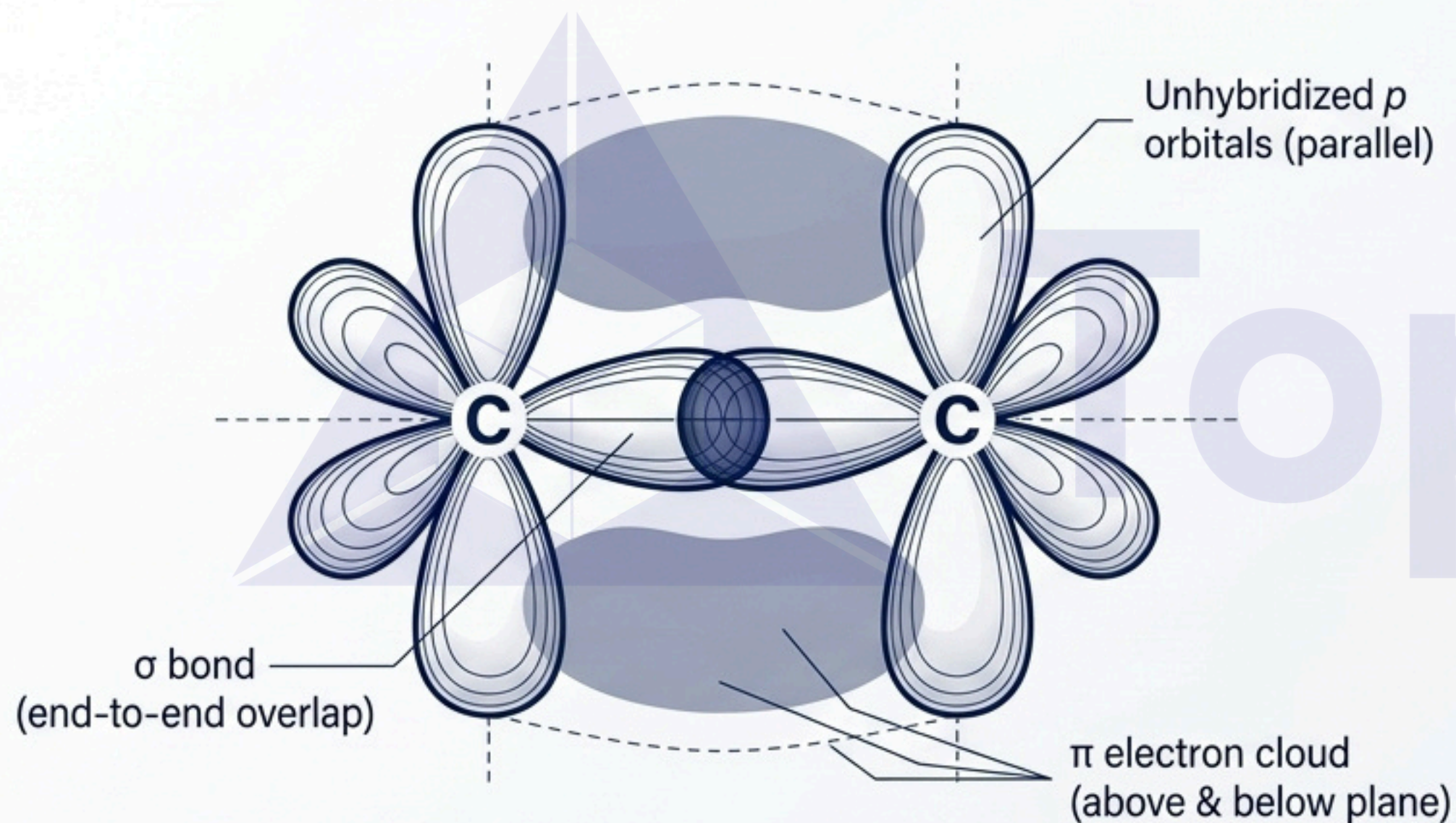
ORGANIC CHEMISTRY • SECTION 8.2.2

Characteristic Features of π Bonds

The 3D geometry that dictates molecular shape, locks rotation, and drives chemical reactivity.



The Micro-Anatomy: Sidewise Overlap



Parallel Alignment

p orbitals must align perfectly parallel to each other to interact.

Sidewise Overlap

The orbitals merge laterally, rather than head-on.

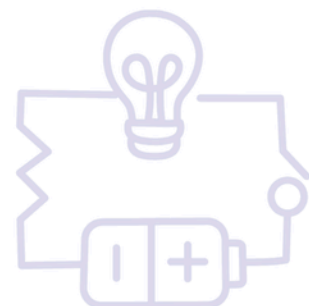
Exposed Clouds

The resulting π electron cloud sits entirely above and below the plane of the bonded atoms.



You've Learned the Theory. Let's Test Them Now.

$$E=mc^2$$



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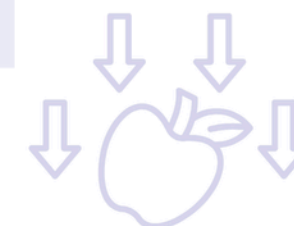
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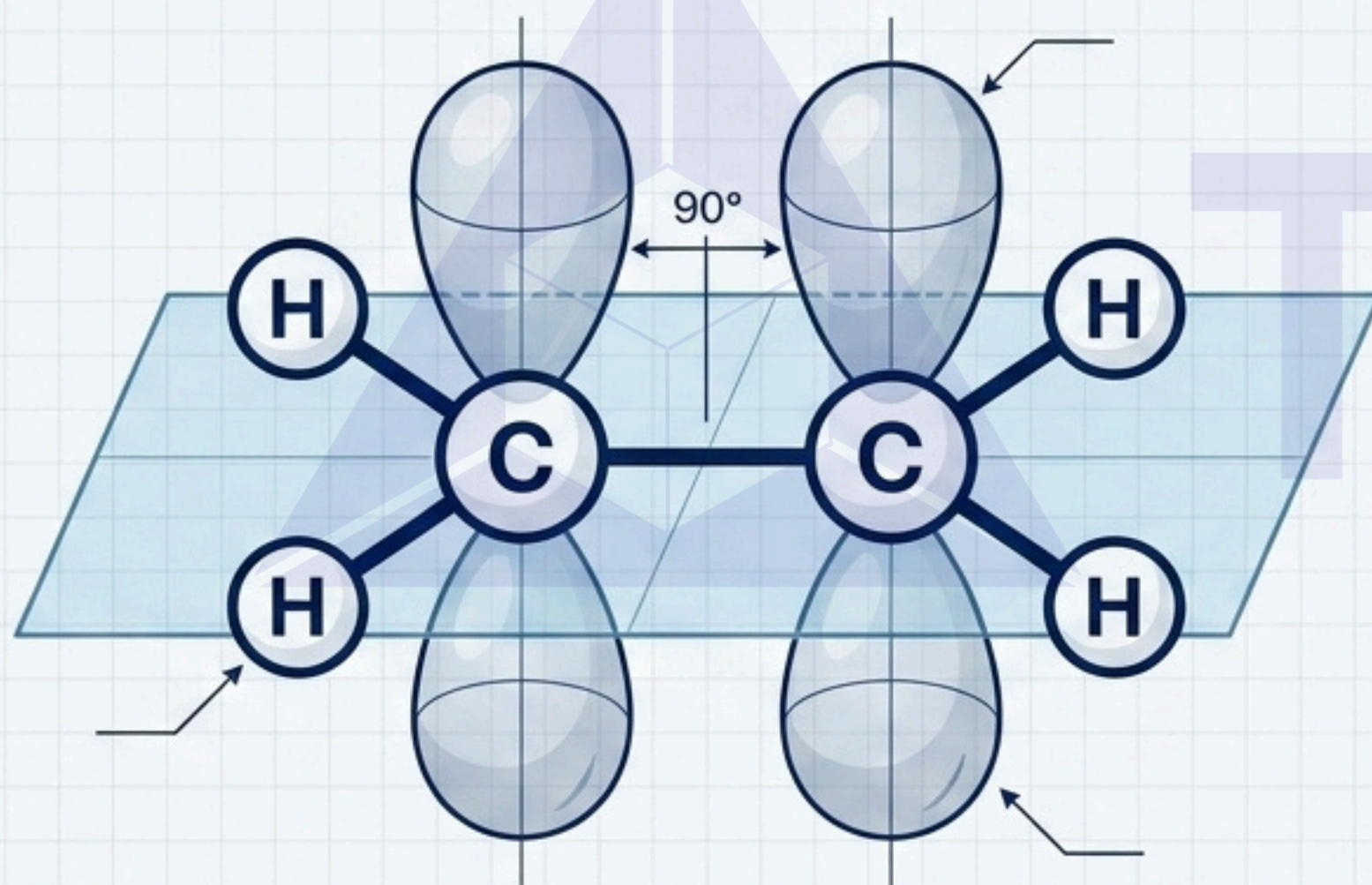
Key Highlights

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- » Get Clear Explanations, Not Just Marks
- » Track Your Performance Smarter



Geometric Constraint: The Planarity of Ethene

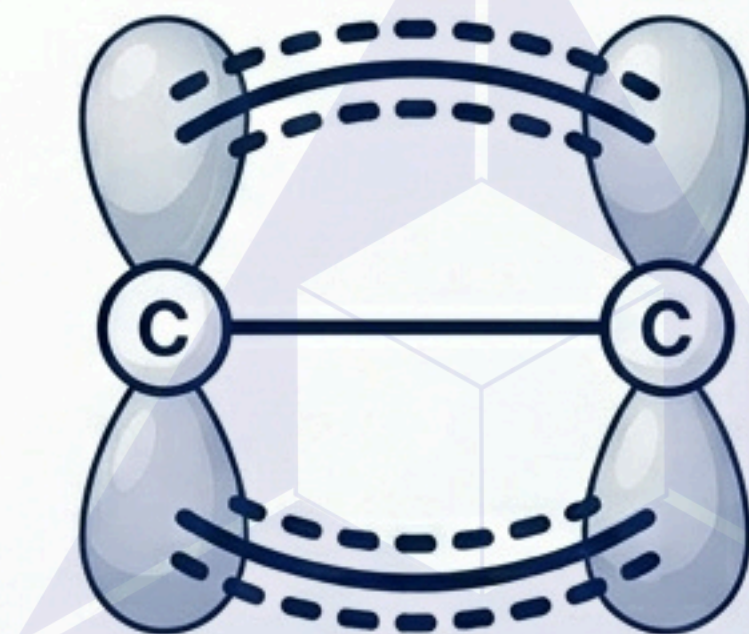
The Co-Planar Rule



- **The spatial absolute:** For the two p orbitals to achieve maximum sidewise overlap, they must be perfectly parallel.
- **The molecular consequence:** Because the p orbitals are perpendicular to the sp² hybrid orbitals, this parallel requirement forces all sp² bonds into a single, flat orientation.
- **The result:** All six atoms in ethene are permanently locked into the exact same 2D plane.

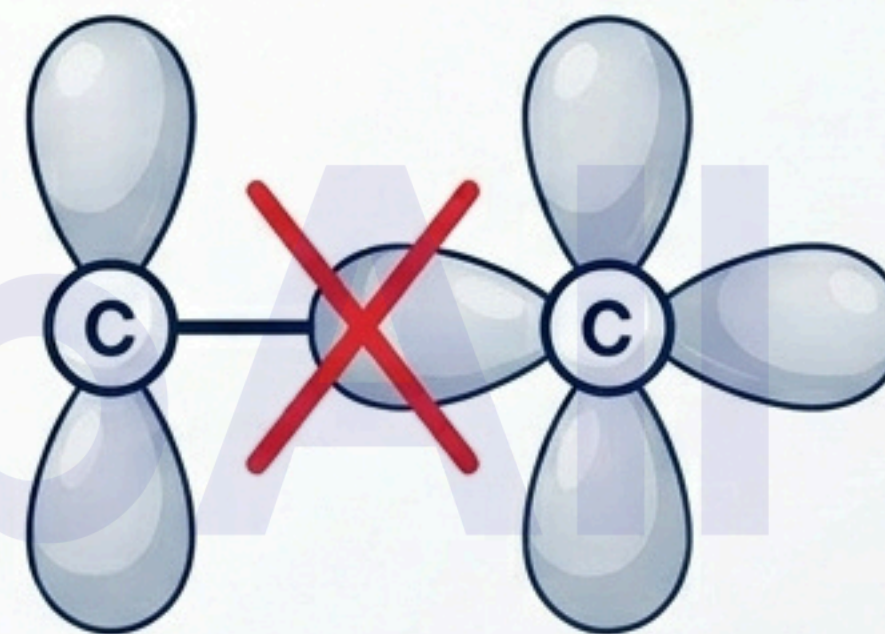
Kinematic Constraint: Restricted Rotation

Stable System (0° Rotation)



Maximum sidewise overlap is maintained.
The π bond is intact and structurally sound.

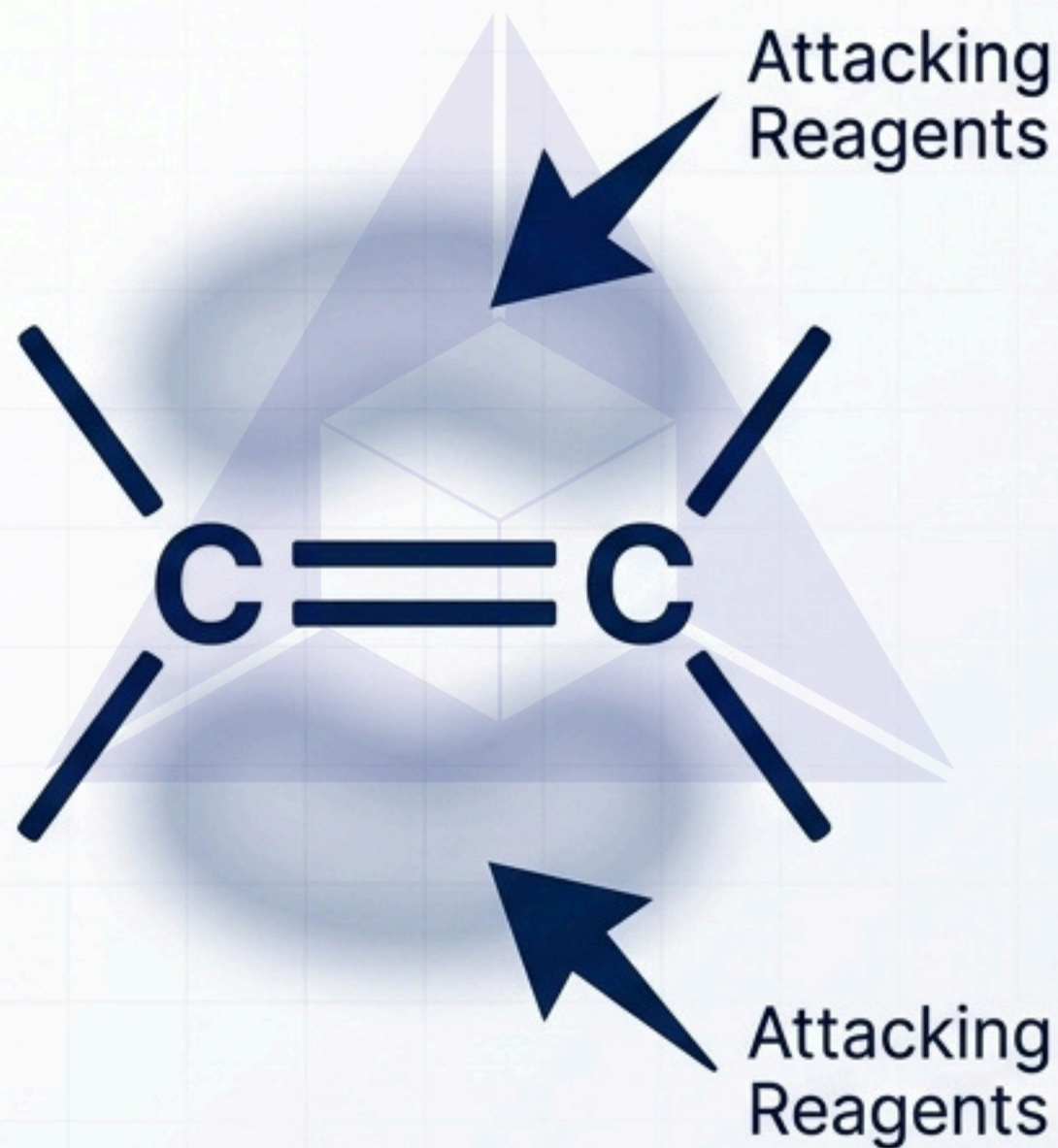
Broken System (90° Rotation)



Twisting the carbon-carbon bond misaligns the p orbitals. The sidewise overlap is completely destroyed.

Conclusion: Because rotation would destroy the orbital overlap, free rotation about a carbon-carbon double bond is strictly restricted.

Chemical Consequence: The Reactive Center



1

Loosely Held Electrons

Unlike the tightly bound electrons in the central σ bond, π electrons are held less securely.

2

Zero Shielding

The electron cloud is fully exposed above and below the carbon skeleton, acting as a chemical target.

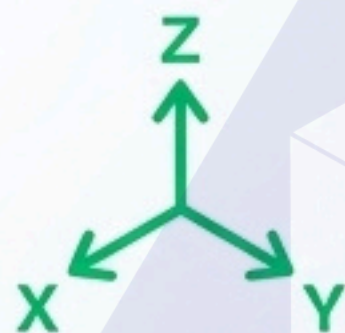
3

High Reactivity

Because these electrons are accessible and loosely bound, π bonds serve as highly active centers, readily supplying electrons to attacking electrophilic reagents.

Synthesis: The Profile of a π Bond

01. Form



Formed exclusively via the parallel, sidewise overlap of unhybridized p orbitals.

02. Function



Forces the attached atoms into a strict co-planar arrangement and absolutely restricts molecular rotation.

03. Fate



Creates an exposed, loosely-held electron cloud above/below the plane, forming a highly reactive center for reagents.

Mastery of π bond geometry is the foundation of organic reaction mechanisms.



You've Learned the Theory.

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