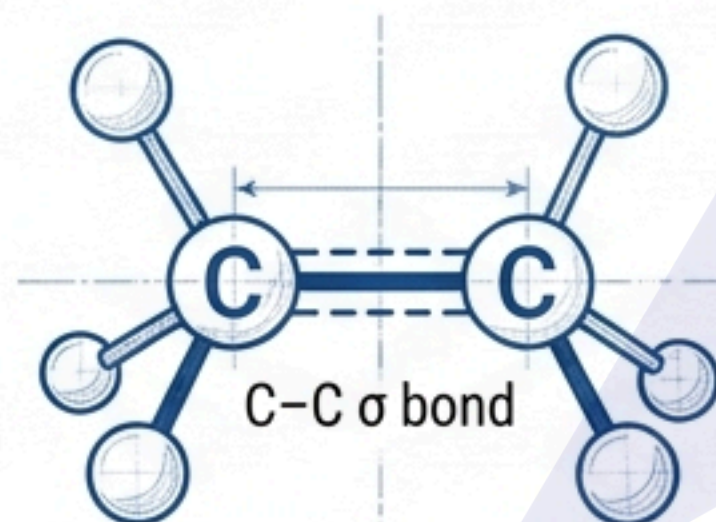


Conformations of Ethane | Newman & Sawhorse

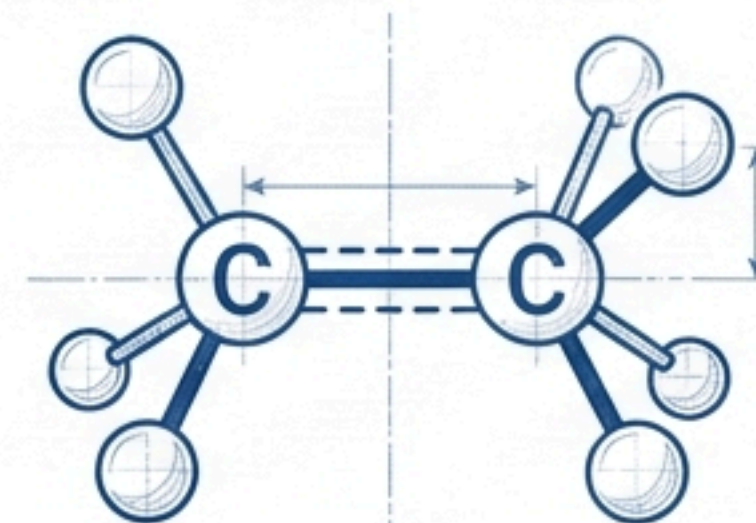
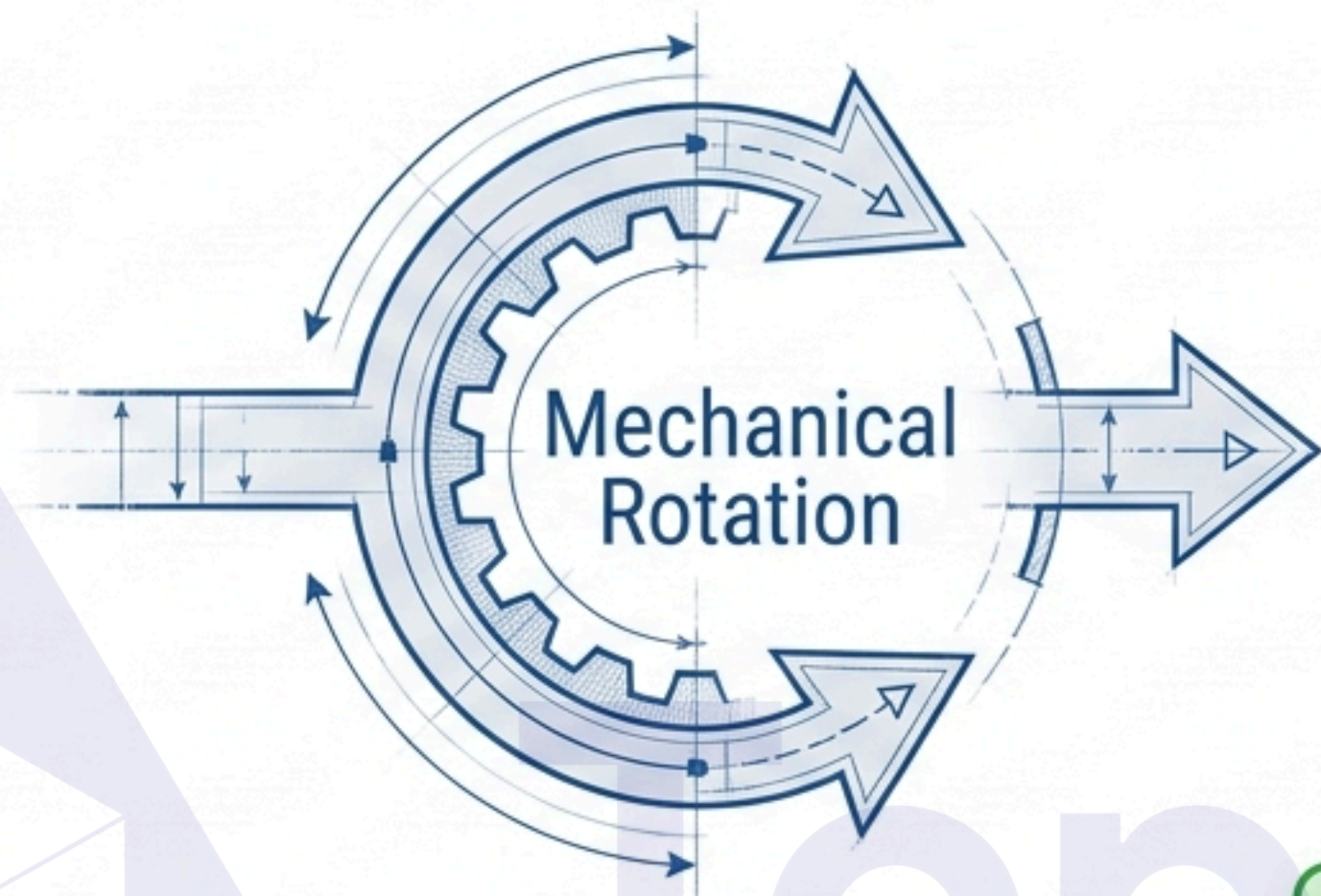


**ROTATE ONE C—C BOND
/ CHANGE THE ENERGY.**

What exactly is a Conformation?



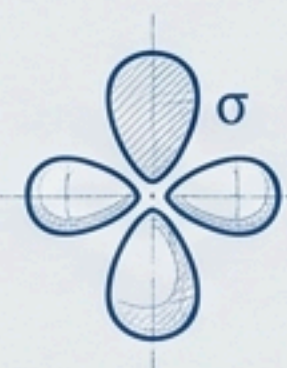
Molecule State A



Molecule State B

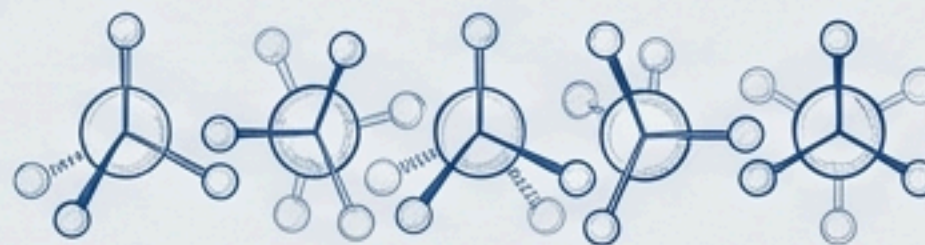
The Mechanism

- Formed by rotation about a C-C single (σ) bond.
- (Possible because σ molecular orbital electron distribution is symmetrical).



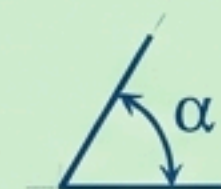
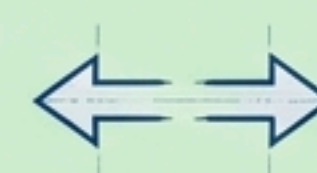
The Result

- Creates an infinite number of spatial arrangements (known as conformers or rotamers).



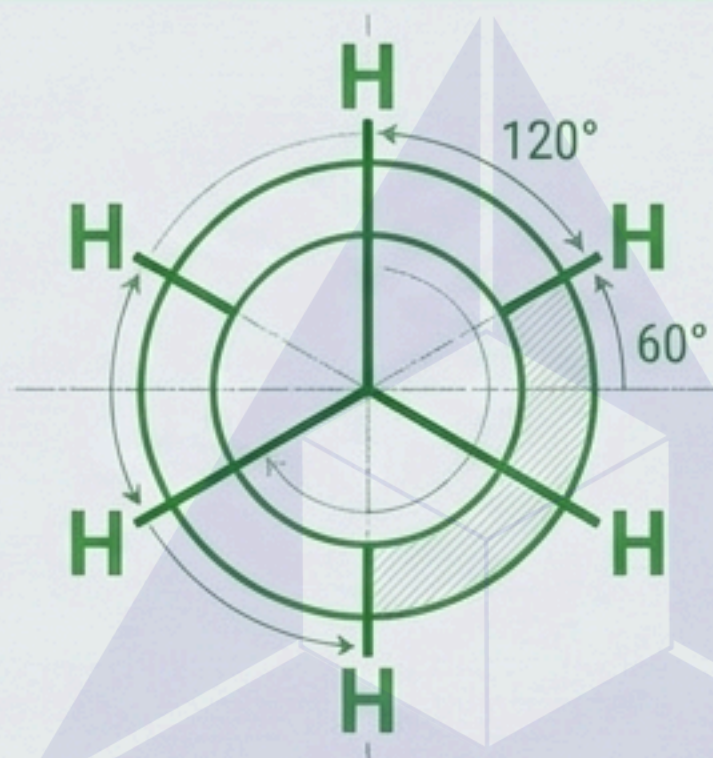
IMPORTANT: The High-Yield Rule

- No bonds are broken.
- Bond angles and bond lengths remain identical during this rotation.



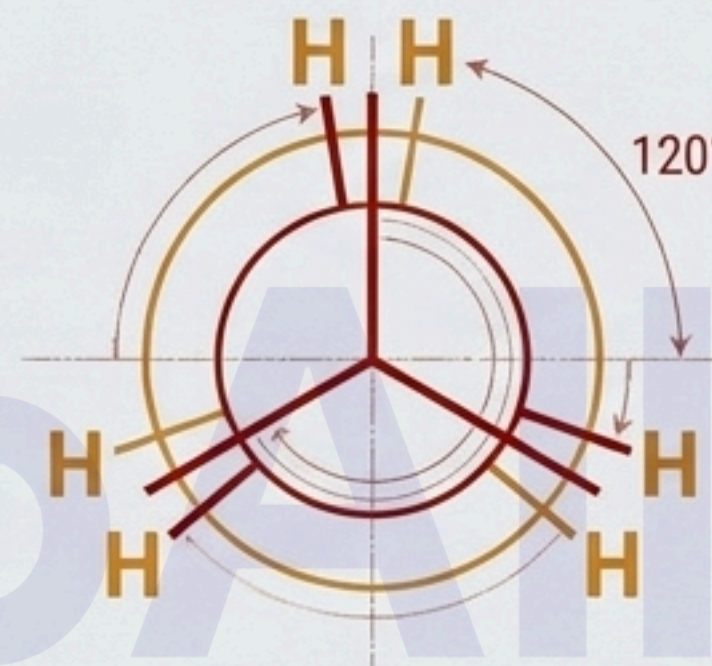
The Two Extremes: Staggered vs. Eclipsed

STAGGERED



- Hydrogens are as far apart as possible.
- Minimum torsional strain (electron cloud repulsion).
- Minimum Energy = **MAXIMUM STABILITY.**

ECLIPSED



- Hydrogens are aligned (closest together).
- Maximum torsional strain.
- Maximum Energy = **MINIMUM STABILITY.**

Note: Any intermediate spatial arrangement between these two extremes is called a Skew conformation.



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

$$E=mc^2$$



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Practice Now



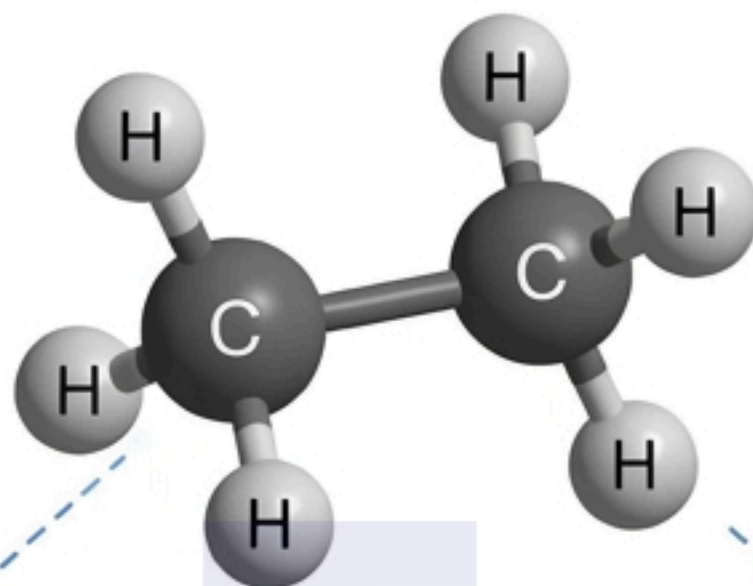
At prep.topall.app

Key Highlights

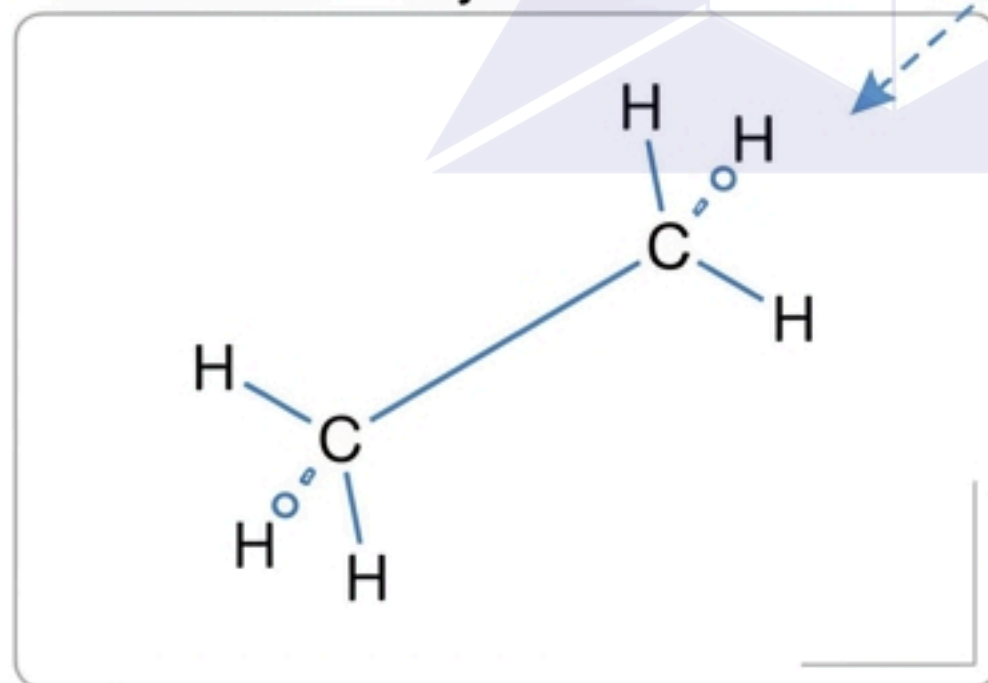
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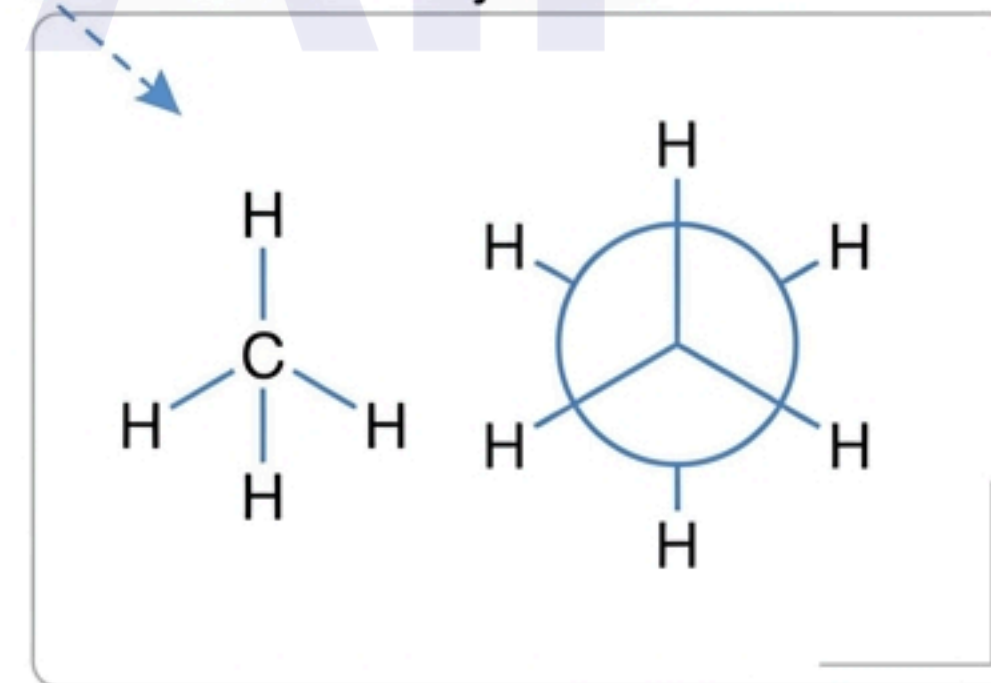
Visualizing 3D in 2D: The Act of Looking



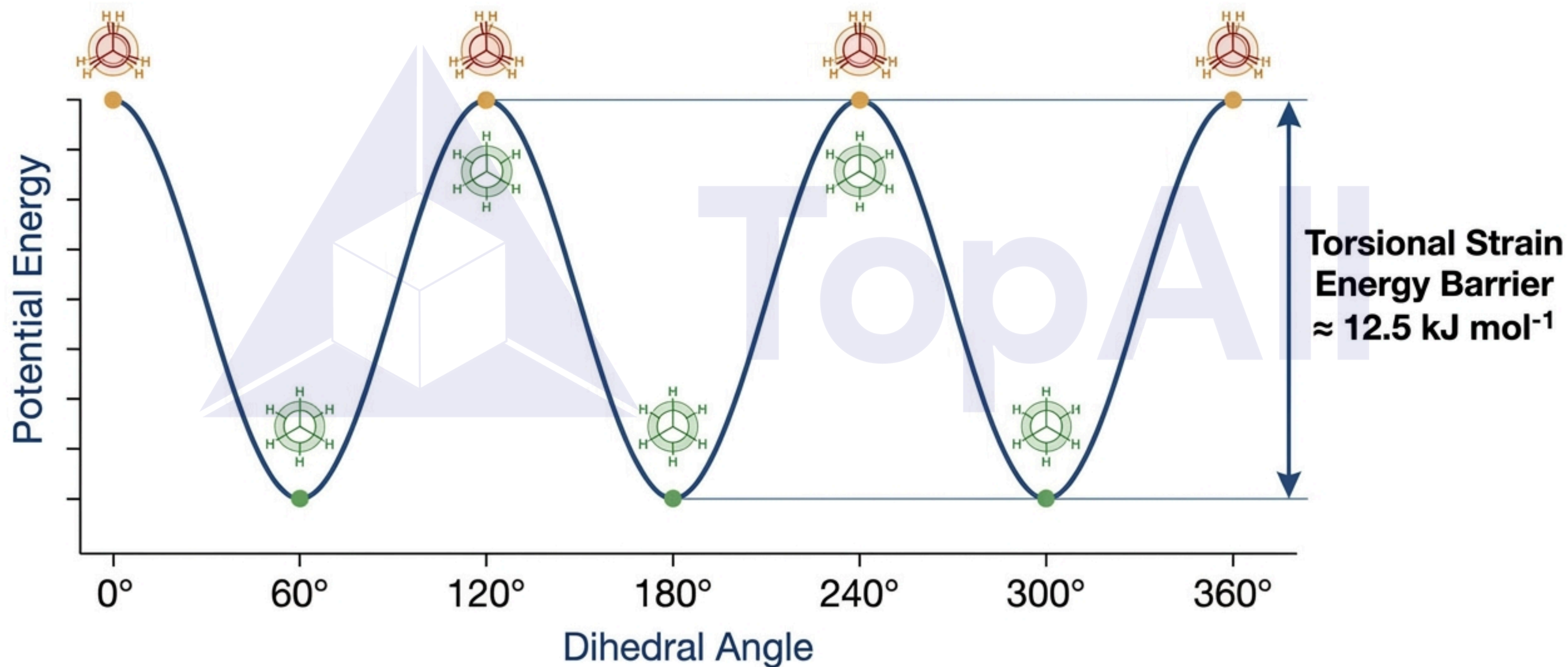
Sawhorse Projection



Newman Projection



The Thermodynamics: Energy Profile vs. Dihedral Angle



Exam Alert: Rotation is Almost Free, Not Completely Free

JEE Trap Alert

Misconception vs. Reality



Rotation around the C–C bond in ethane is completely free.



Rotation is almost free.

The energy barrier is small (12.5 kJ/mol). Even at ordinary room temperatures, the ethane molecule gains enough thermal/kinetic energy through intermolecular collisions to easily overcome this barrier.

Key Takeaway

STAGGERED → **MINIMUM
REPULSION** → **MINIMUM
ENERGY** → **MAXIMUM
STABILITY**



You've Learned the Theory.

Now Let's Test It.

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