Isomers, conformers, rotamers

Newman projections
hyperconjugation
steric hindrance
rotamer energy diagrams

Isomers - molecules with the same chemical formula but different structures.

\[ \text{functional isomers} \]
\[ \text{structural isomers} \]

Stereoisomers (different 3D connectivity)

Conformation - specific geometric arrangement of atoms in a molecule

Conformers - identical molecules that differ in their conformation (and possibly energy)

Rotamers - identical molecules in which a single bond has been rotated (subset of conformers)

Dash-wedge convention

Wedge - pointed towards the observer
Dash - pointed away from the observer

Pointed opposite directions
Incorrectly drawn
Newman Projection

Dihedral angle - an angle made between two planes

Staggered conformation

rotate 60°

Eclipsed conformation

Steric hindrance - steric = shape/volume/site

When two clouds of π attempt to occupy the same space, they will repel, which in some cases causes a distortion in molecular structure, usually resulting in higher potential energy.

At RT, there is usually enough thermal energy to overcome the rotational energy barrier in a single bond, meaning the bond can rotate freely. At low enough temp, because the energy barrier, rotation would cease.
The diagram shows various conformational isomers of organic molecules, specifically cis and trans isomers. The terms 'cis' and 'trans' are used to describe the relative positions of atoms or groups of atoms in a molecule. In cis isomers, the substituents are on the same side of the molecule, while in trans isomers, they are on opposite sides.

The graph illustrates the energy profile (E) as a function of the dihedral angle. The dihedral angle is the angle between two planes that are perpendicular to the bond axis of a carbon-carbon single bond. The graph shows periodic peaks and troughs, indicating that the energy of the system varies with the dihedral angle, with certain angles being more stable (lower energy) than others.

Key terms and isomers:
- **Eclipsed (E)**: Syn
- **Staggered (S)**: Anti
- **Energy graph**
- **Dihedral angle** range from 0° to 360°