• Cis (Z) = same side
• Trans (E) = opposite side
  ○ i.e:

  Cis (Z)  
  Trans (E)

Molecular Geometry and Hybridization

<table>
<thead>
<tr>
<th>Name</th>
<th>Molecular Geometry</th>
<th>Hybridization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linear</td>
<td>![Linear Diagram]</td>
<td>sp</td>
</tr>
<tr>
<td>Trigonal planar</td>
<td>![Trigonal Planar]</td>
<td>sp²</td>
</tr>
<tr>
<td>Tetrahedral</td>
<td>![Tetrahedral]</td>
<td>sp</td>
</tr>
<tr>
<td>Trigonal bipyramidal</td>
<td>![Trigonal Bipyramidal]</td>
<td>sp³d</td>
</tr>
<tr>
<td>Octahedral</td>
<td>![Octahedral]</td>
<td>sp³d²</td>
</tr>
</tbody>
</table>

Functional Groups

• Reactivity of a compound is determined by the number and type of functional group
• Alcohols: $1^\circ > 2^\circ > 3^\circ$

• Ether 

  ![Ether Diagram]
Sn2 Reaction

- Substitution, favors cold, 2 things theoretically happening at once

\[ \text{HO}^- + \text{H}_3\text{C}-\text{Br} \rightarrow \text{HO}^-\text{H}_3\text{C}+\text{Br} \rightarrow \text{HO}\text{H}_3\text{C} \]

*HO\(^-\) (nucleophile) come in and Br leaves on its own

*transition state \(\ddagger\)

*configuration of C is inverted

E1 Reaction

- Elimination, favors heat

\[ \text{H}_3\text{C} - \text{C} - \text{Cl} \rightarrow \text{H}_3\text{C} - \text{C} \leftrightarrow \text{H}_3\text{C} + \text{Cl} \]

*Cl leaves on its own and water in excess comes in

*OH\(^-\) leaves, resonance occurs

*final product is the elimination of a halogen

E2 Reaction

- Elimination, favors heat

\[ \text{EtO}^- + \text{H} \rightarrow \text{Et} + \text{EtOH} + \text{Br}^- \]

*EtO\(^-\) takes H, resonance occurs, Br
Stability of Carbocations

- More resonance opportunity = more stability

\[ 3^\circ > 2^\circ > 1^\circ > \text{methyl} \]

\[ \begin{array}{c}
\text{\raisebox{-0.5cm}{3}} \quad \text{\raisebox{-0.5cm}{2}} \\
\text{\raisebox{-0.5cm}{1}} \quad \text{\raisebox{-0.5cm}{0}} \\
\end{array} \]

IUPAC Naming

- Prefixes
  - Meth- 1 carbon
  - Eth- 2 carbons
  - Prop- 3 carbons
  - But- 4 carbons
  - Pent- 5 carbons
  - Hex- 6 carbons
  - Hept- 7 carbons
  - Oct- 8 carbons
  - Non- 9 carbons
  - Dec- 10 carbons

Rules

1. Parent name of hydrocarbon is the longest continuous chain of carbons.

\[ \text{2-methylbutane} \quad \text{NOT:} \quad \text{2-ethylpropane} \]

2. A chain branching off the parent chain is an alkyl group.

\[ \text{2-methyl-3-ethylpentane} \]

3. The alkyl groups are organized by the smallest number first when naming.

\[ \text{2-methylpentane} \quad \text{NOT:} \quad \text{4-methylpentane} \]
Halogenation of Higher Alkanes

1. Chain Initiation
\[ \text{RO-OR} \rightarrow 2 \text{RO}^\cdot \quad \text{&} \quad \text{RO}^\cdot + \text{H-Br} \rightarrow \text{ROH} + \cdot \text{Br}^\cdot \]

2. Chain Propogation

3. Chain Termination

Alcohol Structure and Nomenclature

- Ethanol

- 2-propanol (isopropyl alcohol)

- 2-methyl-2-propanol (tert-butyl alcohol)

- 2-propenol (allyl alcohol)

- 2-propynol (propargyl alcohol)

- Benzyl alcohol

- Phenol