

Substitution-Elimination Decision Map

When deciding whether a given reaction between a haloalkane and nucleophile/base will occur through an elimination or substitution mechanism you need to classify the haloalkane (methyl, primary, secondary, or tertiary) and the relative nucleophile/base strengths of the nucleophile/base (strong nucleophile, medium nucleophile, weak nucleophile, strong base, very weak base, etc.) as listed in the Table (below left). Once these parameters have been identified, the expected reaction can be predicted from the decision tree (below right).

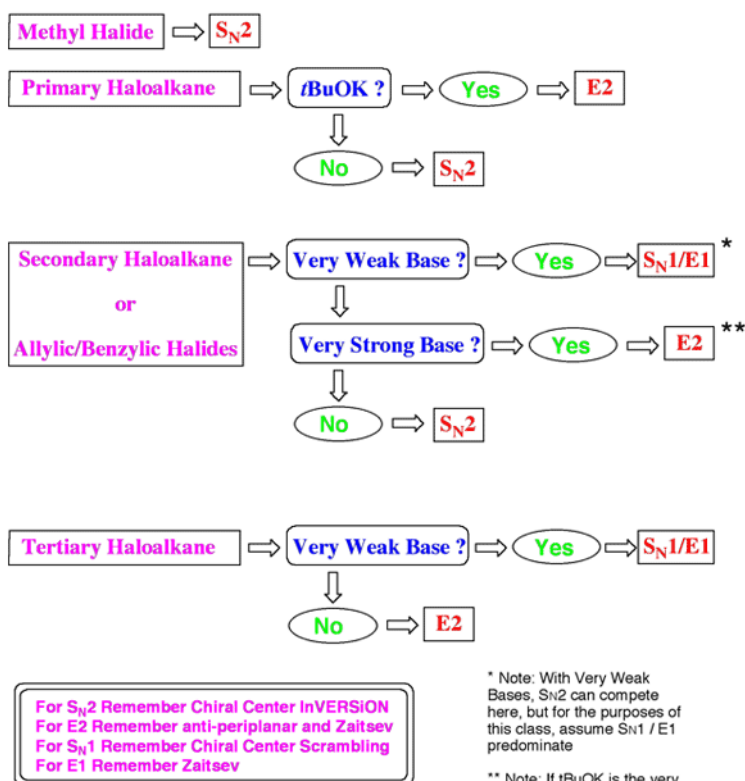
Table of Nucleophiles

<p>Strong Nucleophiles Br^-, I^-, R-S^-, H-S^-, $\text{N}\equiv\text{C}^-$, N_3^-</p>
<p>$\text{R-C}\equiv\text{C}^-$, R-O^-, H-O^- Strong Bases</p>
<p>Medium Nucleophiles R-CO_2^-, R-S-H, R_2S, NH_3, RNH_2, R_2NH, NR_3</p>
<p>Weak Nucleophiles $\text{R-CO}_2\text{H}$, R-O-H, H_2O Very Weak Bases</p>

Special Case

Tert-Butoxide (tBuO^-) is a strong base, but is not a nucleophile due to non-bonded interaction strain.

Substitution/Elimination Decision Map



* Note: With Very Weak Bases, $\text{S}_{\text{N}}2$ can compete here, but for the purposes of this class, assume $\text{S}_{\text{N}}1$ / $\text{E}1$ predominate

** Note: If tBuOK is the very strong base, an appreciable amount of a non-Zaitsev product can be formed because the bulky tBuOK will tend to react with the most accessible H atom.