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Organic Chemistry

Class- T.Y.B.Sc.

Nucleophilic Substitution Reactions : The S_N1 and S_N2
Mechanisms

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S_N2 Reaction: Leaving Groups

- Best leaving groups leave to form *weak* Lewis bases.
- Good leaving groups:
 - Br, I, Cl, OTs, OH₂⁺
- “Lousy” leaving groups:
 - OH, OR, NH₂, F

S_N2 Reaction: solvents

S_N2 reactions are *accelerated* in polar, aprotic solvents. Consider Na⁺ ⁻OEt as an example of a nucleophile.

Why are reactions accelerated? The Na⁺ cation is complexed by the negative part of the aprotic solvent molecule pulling it away from ⁻OEt.

Now that the sodium ion is complexed, the oxygen in the nucleophile ⁻OEt is more available for attack.

S_N1 Mechanism

- reaction and mechanism
- kinetics
- stereochemistry
- substrate structure
- nucleophiles
- leaving groups
- solvents

S_N1 Reaction: kinetics

- The reaction follows first order (unimolecular) kinetics
- Rate = $k [R-Br]^1$

S_N1 Reaction: stereochemistry

With chiral R-X compounds, the product will be racemic (50% of each enantiomer).

S_N1 Reaction: substrate structure

tertiary > secondary > primary > methyl

Primary and methyl halides are very unreactive! They don't go by S_N1 reactions.