

The Organic Reaction Blueprint



Substrate

The foundational anchor. The molecule whose carbon is involved in new bond formation.

Rule of Thumb: If both reactants supply carbon to the new bond, the molecule of primary interest is designated the substrate.

Attacking Reagent

The reactive species that initiates the chemical change and active motion.

Note: The reagent dictates the classification of the reaction (e.g., nucleophilic vs. electrophilic attack).



The Nucleophile: The Nucleus Seeker



The Concept



Literal Meaning: Nucleus Seeking

Core Definition: A reagent that brings an electron pair to the reactive site.

The Mechanism



Takeaway: Nucleophilic reactions occur when a reagent supplies an electron pair to a positively polarized center.

The Electrophile: The Electron Seeker

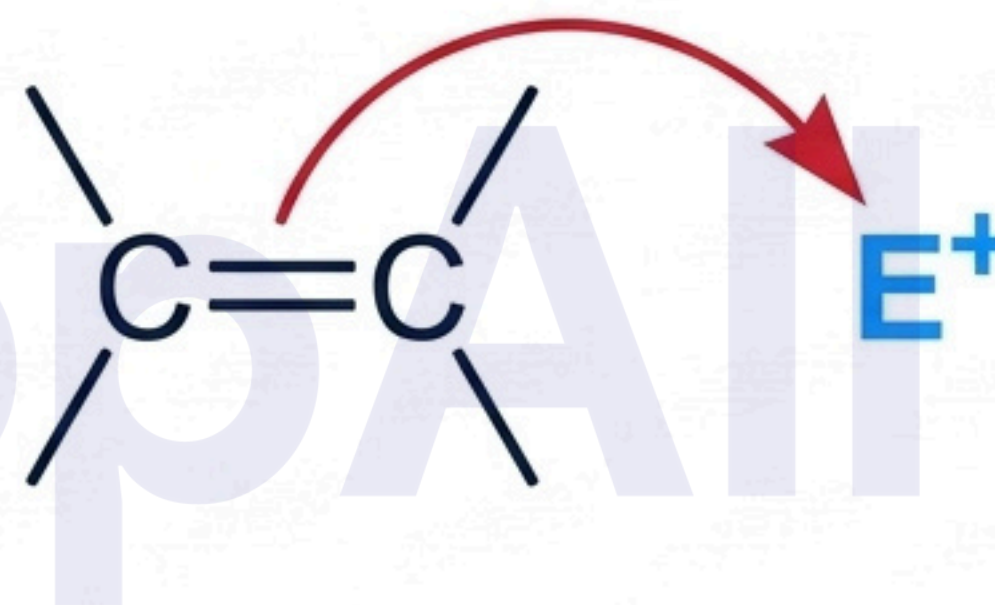
The Concept



Literal Meaning: Electron Seeking

Core Definition: A reagent that **takes away an electron pair** from the reactive site.

The Mechanism



Takeaway: Electrophilic reactions occur when a reagent accepts an electron pair from an electron-rich site.



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$$E=mc^2$$



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Identifying Nucleophiles in the Wild



Negatively Charged (Anions)

Carries a formal negative charge. Highly reactive.

Hydroxide ion: HO^-

Cyanide ion: NC^-

Carbanions: R_3C^-

Neutral Species

No formal charge, but possesses unshared electron pairs.

Water: $\text{H}_2\ddot{\text{O}}$

Ammonia: $\text{N}\ddot{\text{H}}_3$

Primary Amines: $\text{R}\ddot{\text{N}}\text{H}_2$

Note: Neutral nucleophiles typically attack electron-deficient centers, utilizing their lone pairs to form new bonds.

Identifying Electrophiles in the Wild



Positively Charged (Cations)

Carries a formal positive charge. Contains empty orbitals.



Neutral Polarized Molecules

No formal charge, but contains an electron-deficient center due to polarity.



The highly electronegative oxygen pulls electron density away from the carbon.



The halogen X acts as an electron-withdrawing group.

Note: A neutral electrophilic center is created by an attached electronegative atom polarizing the bond.

Core Participants: The Revision Frame



Feature	Nucleophile (Nu:)	Electrophile (E ⁺)
Meaning	Nucleus Seeker	Electron Seeker
Role	Brings an electron pair (Donor)	Takes an electron pair (Acceptor)
Acid/Base Nature	Lewis Base	Lewis Acid
Identifying Feature	Lone pair or Negative Charge (-) Nu:^-	Empty orbital or Positive/ δ^+ Charge $\otimes^{\delta^+} \text{E}^+$
Primary Target	Attacks electron-deficient sites (δ^+)	Attacks electron-rich sites (δ^- or π bonds)

Mastery of these two species is the foundational blueprint for predicting organic reaction mechanisms.



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