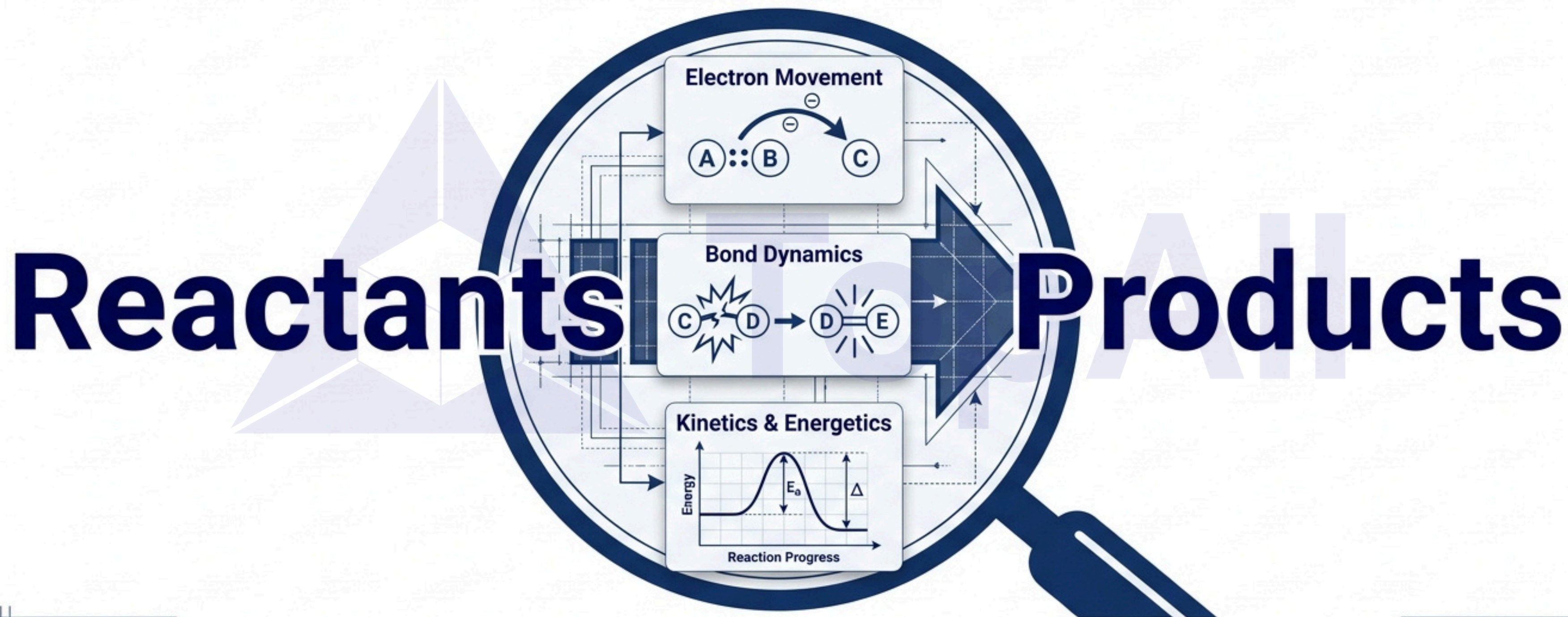


Demystifying the Reaction Arrow

An equation is just the starting line and finish line. The arrow hides the actual microscopic journey.



This sequential account of electron movement, energetics, and rates of transformation is called the Reaction Mechanism.

The Substrate: The Carbon Foundation

The primary reactant that provides the carbon framework for the newly formed bond.

The Primary Target

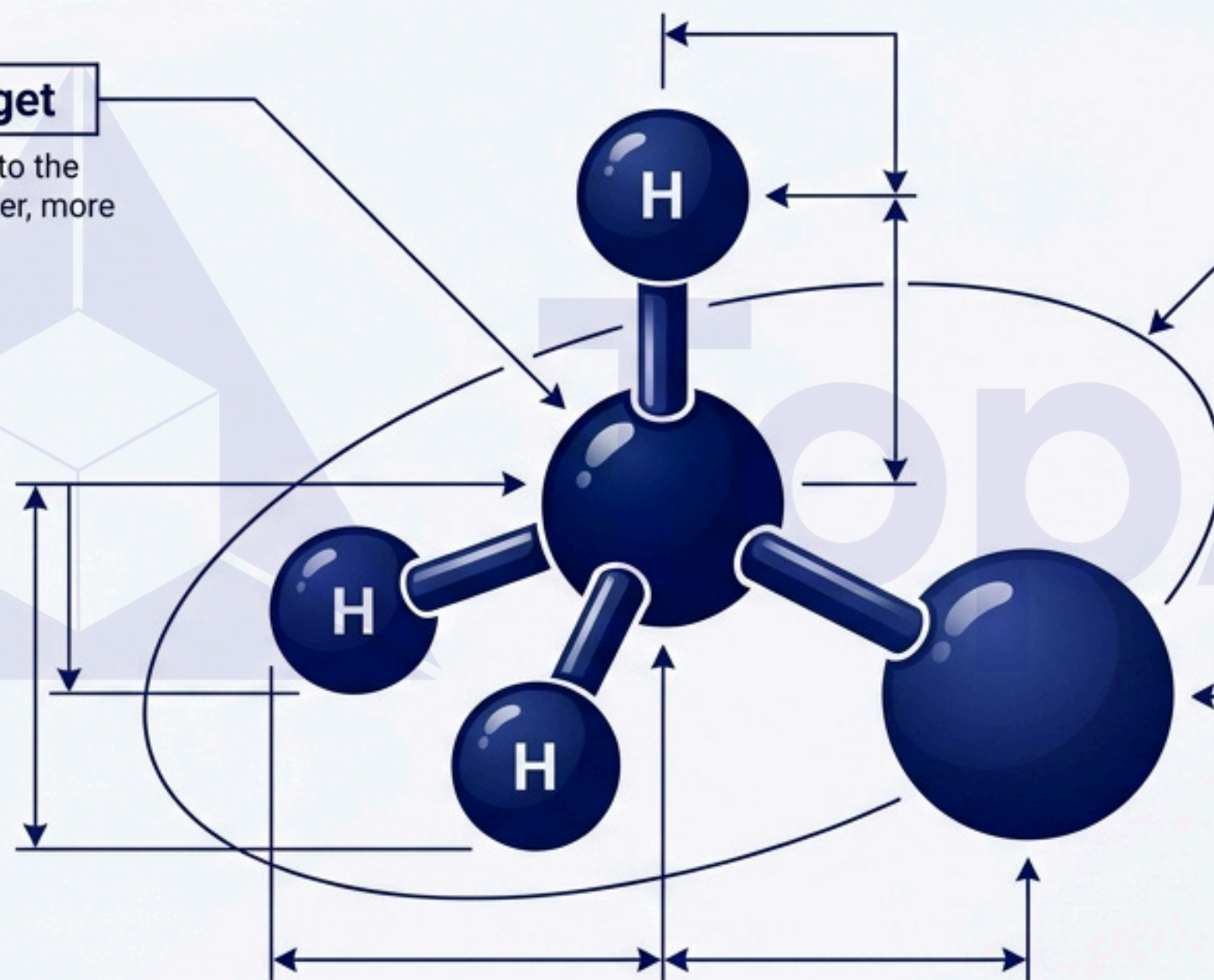
Supplies the carbon atom to the new bond. Usually the larger, more complex reactant.

The 'Passive' Victim

The molecule that undergoes the transformation.

The Leaving Group

A functional group that defines the molecule's chemical reactivity and dictates where the attack will happen.



The Reagent: The Attacker

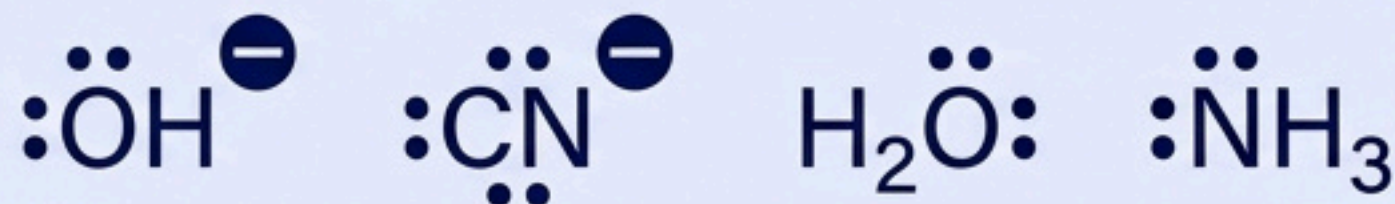
The reactive species that initiates the clash. Broadly classified by their electrical cravings.



Nucleophiles (Nu^-)

Nucleus-seeking (Electron-rich).

Donates an electron pair. Attacks regions of **low electron density** (positive centers) on the substrate.



Electrophiles (E^+)

Electron-seeking (Electron-deficient).

Accepts an electron pair. Attacks regions of **high electron density** (negative centers or π bonds).





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$$E=mc^2$$



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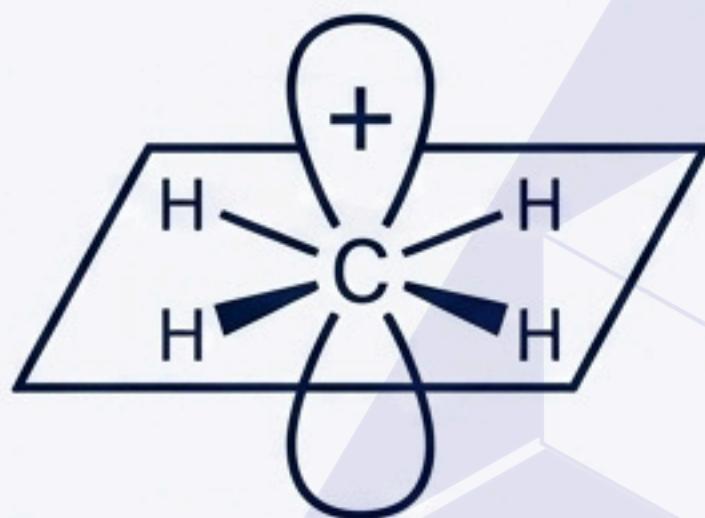


Reaction Intermediates: The Transient State



Short-lived, highly reactive species born from bond cleavage before the final product stabilizes.

Carbocation



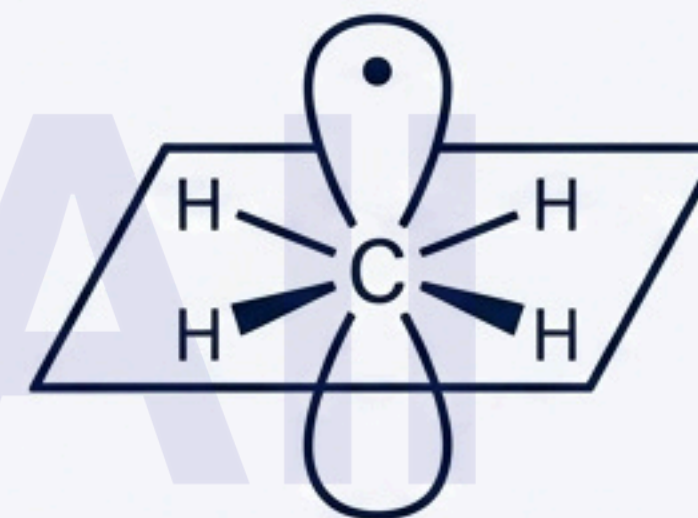
- Formed by heterolytic cleavage.
- Carbon carries a positive charge.
- sp^2 hybridized. Sextet of electrons.

Carbanion



- Formed by heterolytic cleavage.
- Carbon carries a negative charge.
- sp^3 hybridized. Octet of electrons.

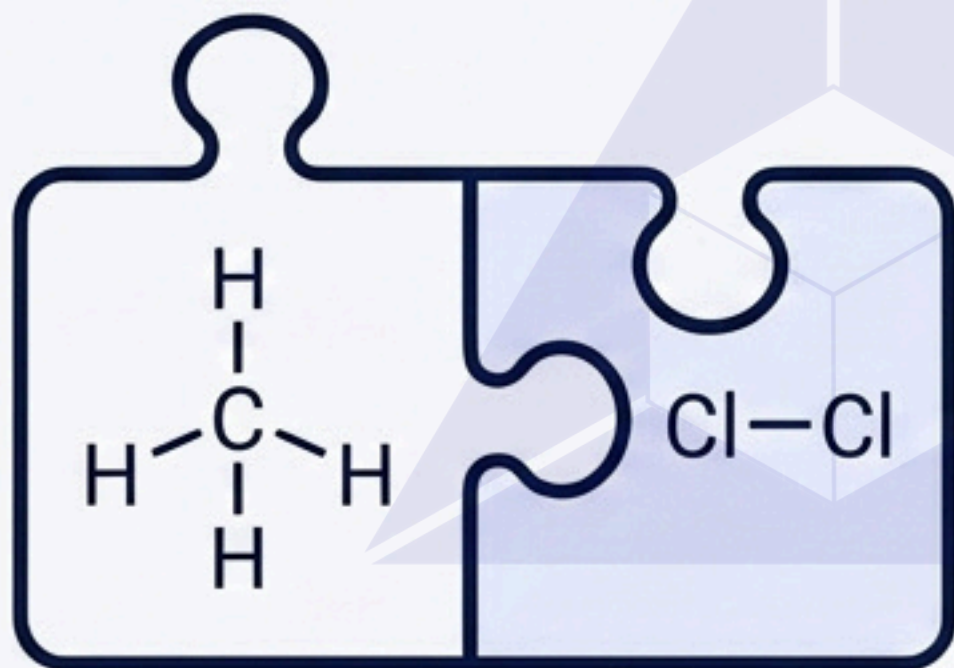
Free Radical



- Formed by homolytic cleavage (symmetrical splitting).
- Electrically neutral.
- Possesses a highly reactive unpaired electron.

Products & Byproducts: The Resolution

The final stable molecules formed after the transient intermediate state resolves.



CH₄
(Substrate)

Cl₂
(Reagent)

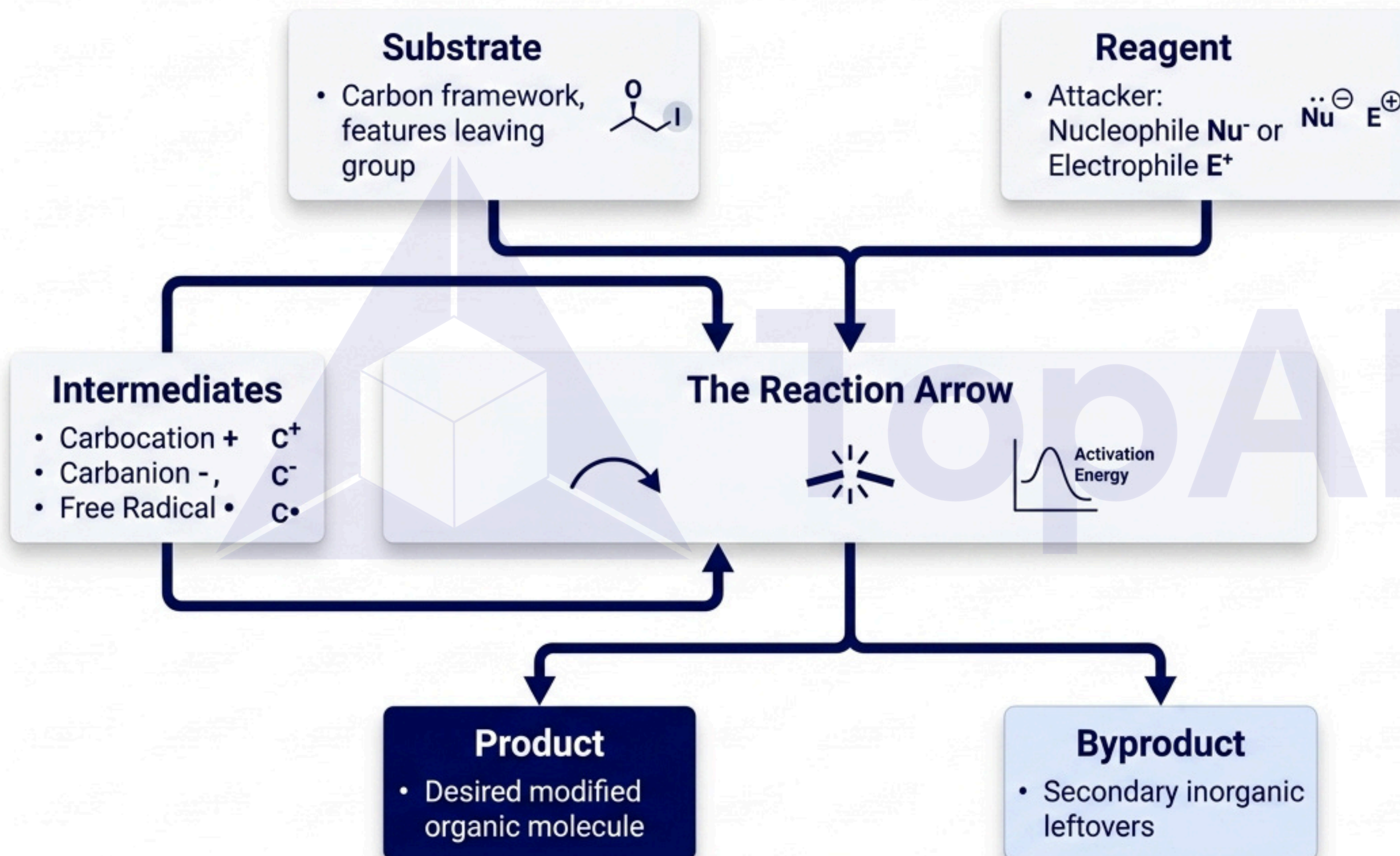
CH₃Cl (Chloromethane)

The Product. The primary target of the synthesis. Contains the newly modified carbon skeleton derived from the substrate.

HCl (Hydrogen Chloride)

The Byproduct. The secondary, often inorganic molecule formed from the "leftovers" of the reagent and leaving group.

Revision Frame: Reaction Mechanism Anatomy





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