

UNIT 6 • HALOALKANES AND HALOARENES

Nucleophilic Substitution: S_N2 & S_N1

Mastering Bimolecular and Unimolecular reaction mechanisms and reactivity ladders.

Nucleophile

The electron-rich attacker seeking a positive center.

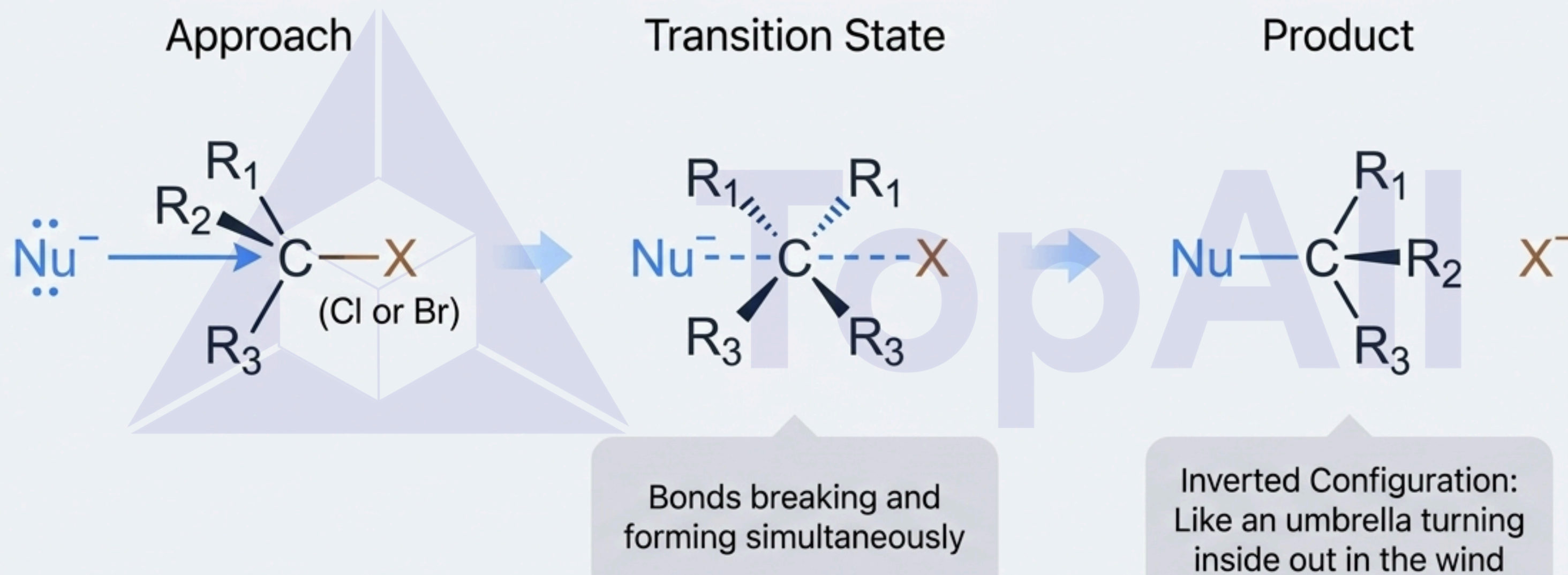
Ambident Nucleophile

A versatile attacker with two different binding sites (e.g., C or N).

Carbocation

The crucial, positively-charged intermediate step in the SN1 pathway.

1-Step Process (Bimolecular)



2-Step Process (Unimolecular)

Step I (Slow): Cleavage of C–Br bond



Carbocation intermediate forms here. (Rate-determining step)

Step II (Fast): Nucleophile attack on the intermediate.





You've Learned the Theory. Let's Test Them Now.

$$E=mc^2$$



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Key Highlights

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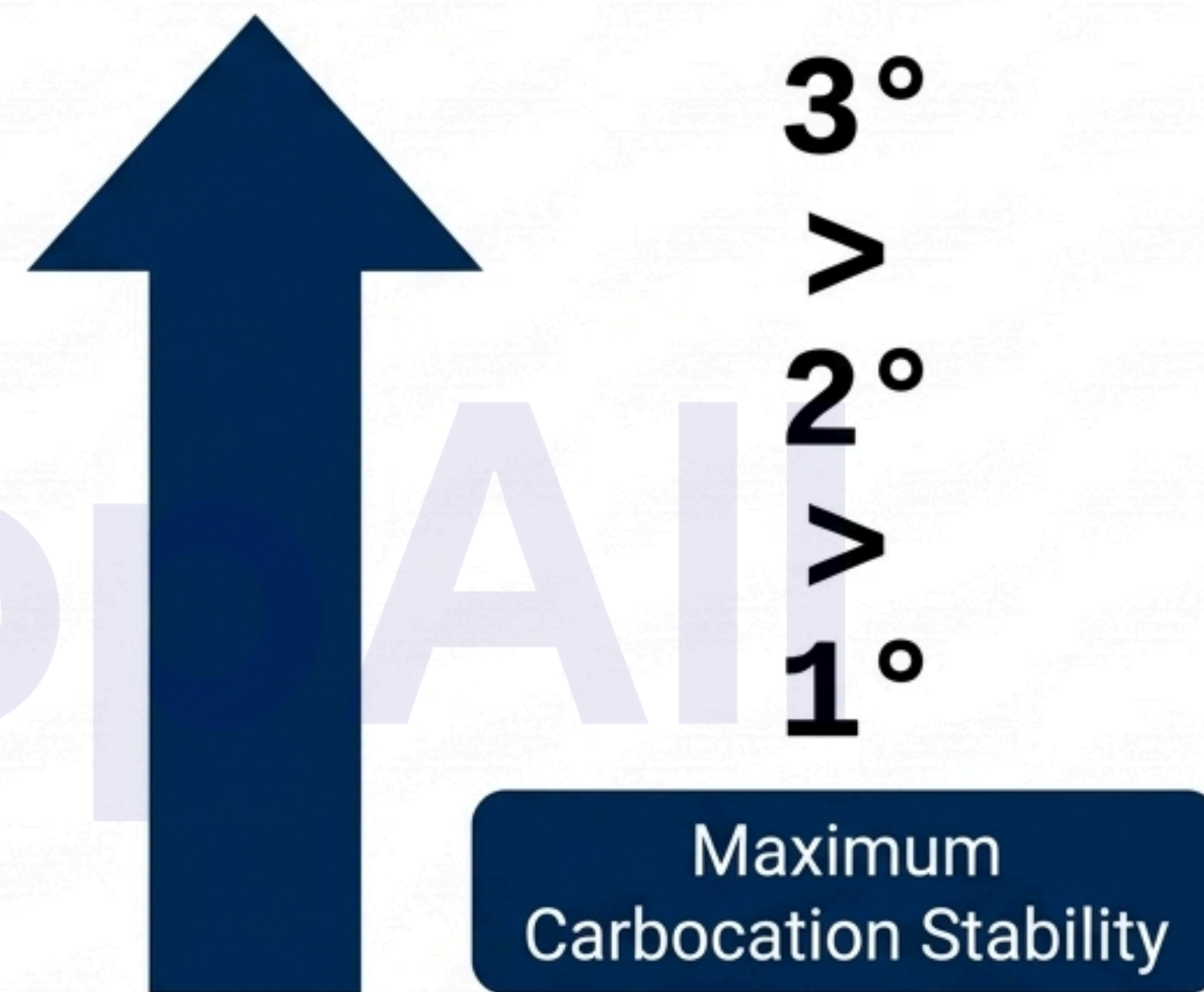


Comparing S_N2 vs. S_N1 Reactivity

S_N2 Pathway



S_N1 Pathway



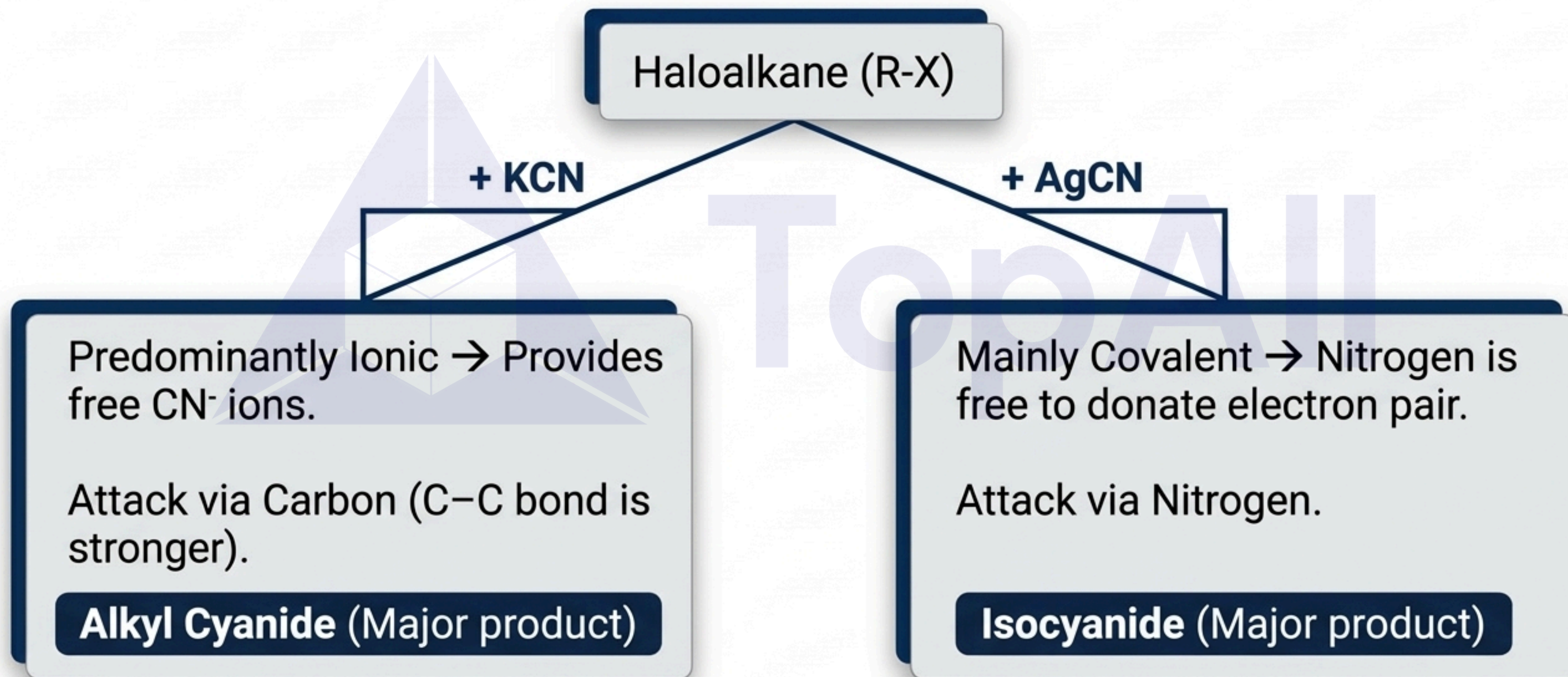
Leaving group efficiency remains identical for both mechanisms:



Common Nucleophile Conversions

REAGENT	ACTIVE NUCLEOPHILE	FINAL PRODUCT CLASS
NaOH / KOH	OH⁻	Alcohol
NaI	I⁻	Alkyl Iodide
NH ₃	NH₃	Primary Amine

Ambident Nucleophile Spotlight: Carbon vs. Nitrogen





WATCH FOR THIS: The Reactivity Reversal

Examiners will test your muscle memory. The SN1 and SN2 reactivity orders are exact opposites.

The Trap

Do not confuse steric hindrance (which blocks SN2 in 3° carbons) with inductive stability (which enables SN1 in 3° carbons).

Remember: SN1 wants stability (3°). SN2 wants space (1°).

Key Takeaways

- S_N2 is a continuous 1-step direct backside attack resulting in configuration inversion. It strongly favors uncrowded 1° halides.
- S_N1 is a 2-step checkpoint process reliant on forming a stable carbocation intermediate. It strongly favors stable 3° halides.



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