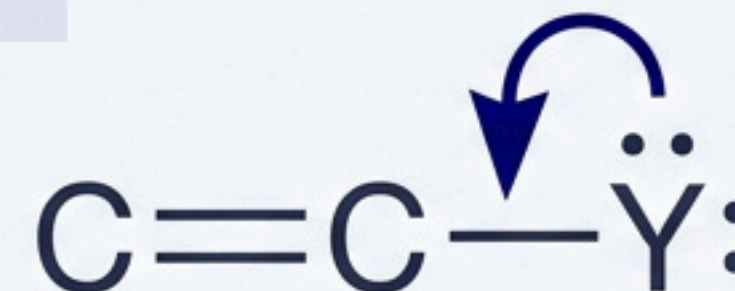


Defining the Resonance Effect

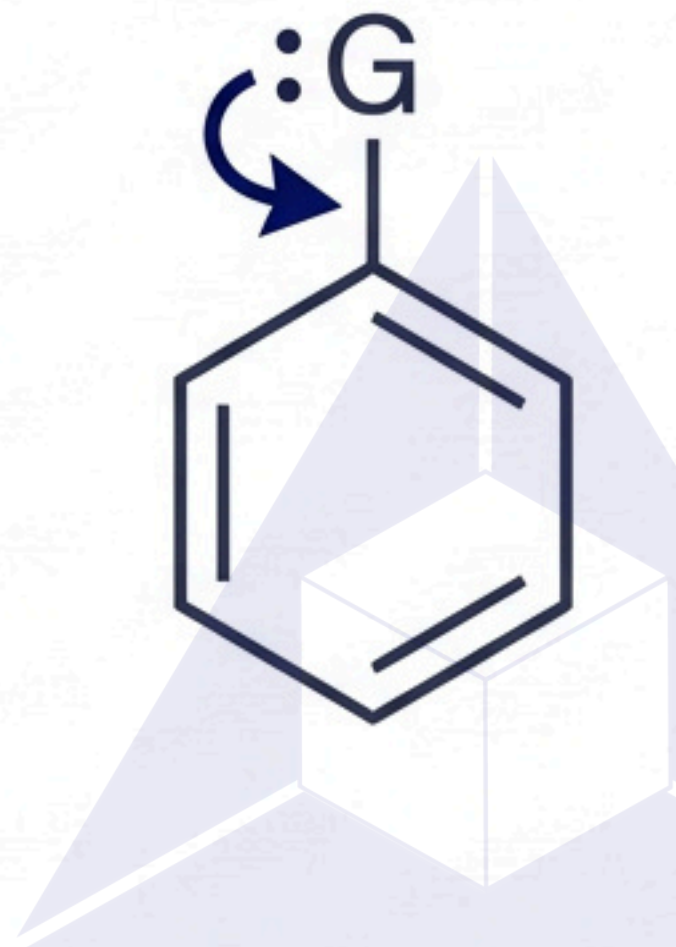
The Generation of Polarity

A permanent effect where polarity is produced in a molecule by the interaction of two π -bonds or a π -bond and a lone pair on an adjacent atom. This effect is transmitted through a conjugated chain.

Key Condition: Conjugation



The Positive Resonance (+R) Effect



Transfer of electrons is **away** from the atom or substituent group and into the conjugated system.

The Group Roster

+R Substituents (Electron Donors)

[–OH]

[–OR]

[–OCOR]

[–NH₂]

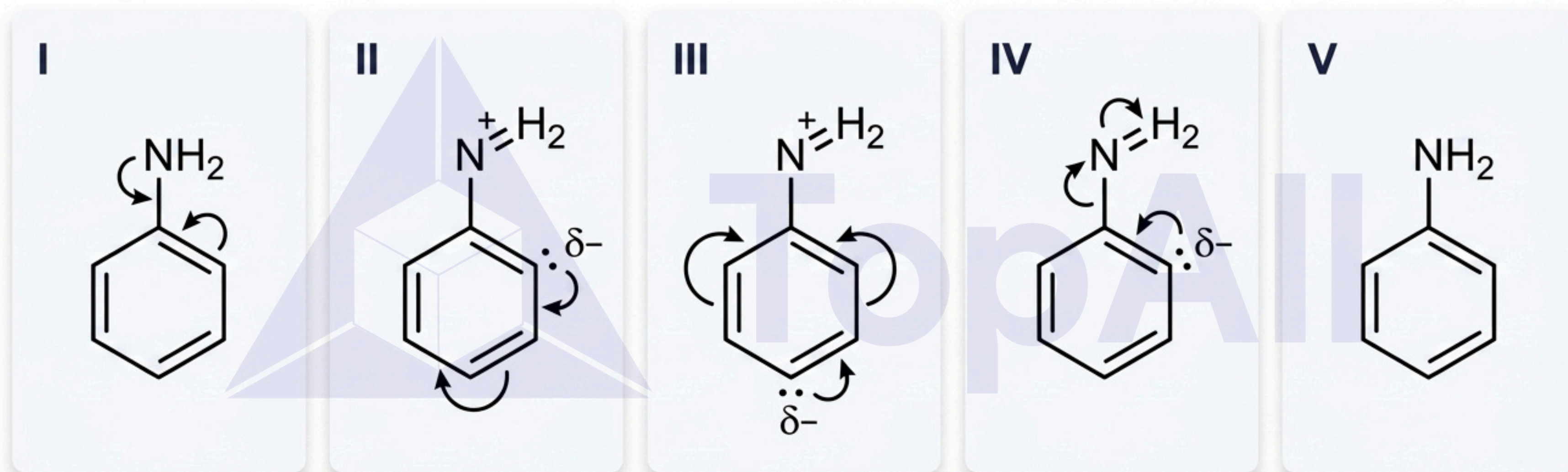
[–NHR]

[–NR₂]

[–NHCOR]

[–Halogen (Cl, Br, etc.)]

Application of +R: The Aniline System



The +R effect pushes electron density into the ring, specifically creating centers of high electron density at the ortho and para positions.



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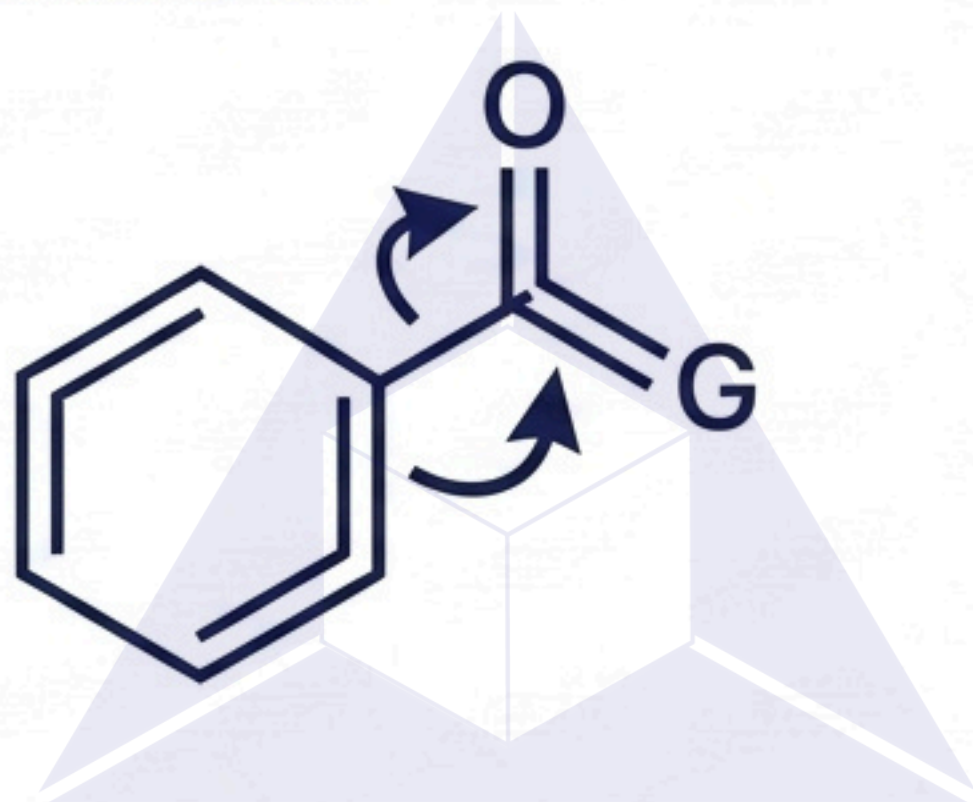
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The Negative Resonance (–R) Effect

The Mechanic



Transfer of electrons is towards the atom or substituent group, pulling away from the conjugated system.

The Group Roster

–R Substituents (Electron Acceptors)

[–COOH]

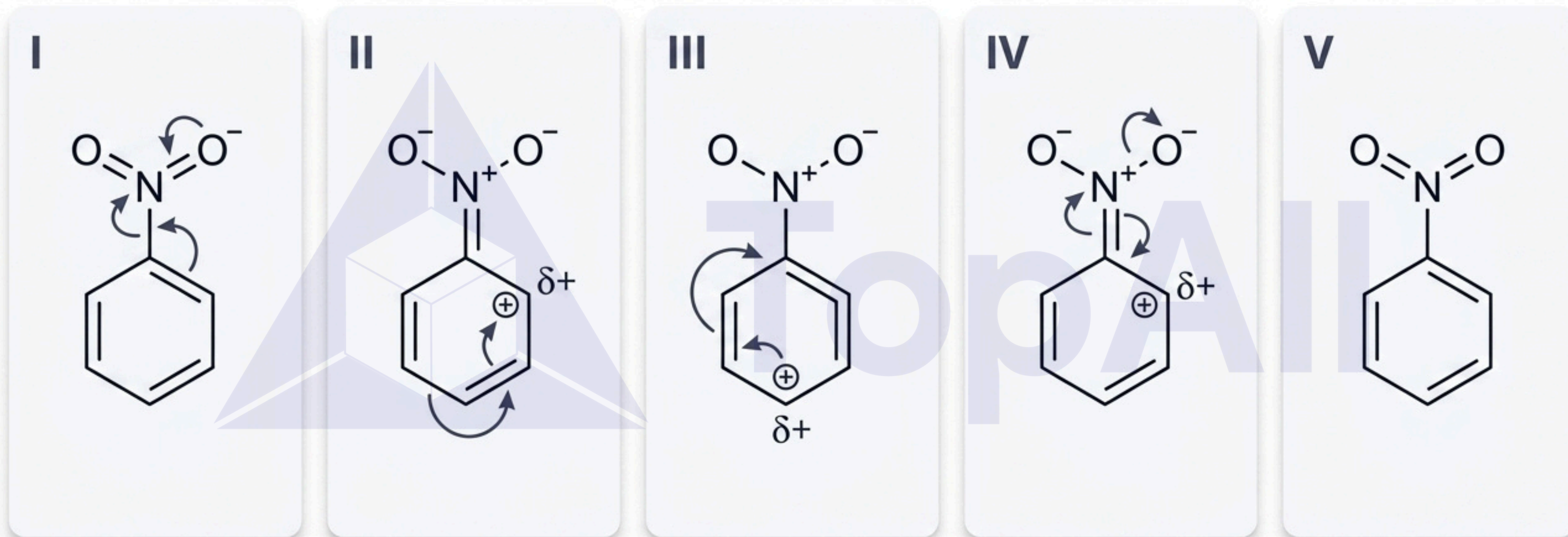
[–CHO]

[>C=O]

[–CN]

[–NO₂]

Application of -R: The Nitrobenzene System



The -R effect withdraws π -electrons from the ring, creating centers of electron deficiency (partial positive charges) at the ortho and para positions.

Revision Frame: Synthesizing the Resonance Effect



Screenshot Friendly

Dimension	+R Effect	−R Effect
Direction of Electron Flow	Away from substituent, into the conjugated system.	Towards substituent, out of the conjugated system.
Key Structural Requirement	Substituent possesses a lone pair of electrons (or anion).	Substituent possesses a multiple bond to a more electronegative atom.
Impact on Ring Electron Density	Increases overall density (Activator).	Decreases overall density (Deactivator).
Charge at Ortho/Para Positions	Negative (δ^-) — Electron Rich.	Positive (δ^+) — Electron Deficient.
High-Yield Examples	$-\text{OH}$, $-\text{OR}$, $-\text{NH}_2$, $-\text{Cl}$	$-\text{NO}_2$, $-\text{CN}$, $-\text{CHO}$, $-\text{COOH}$



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