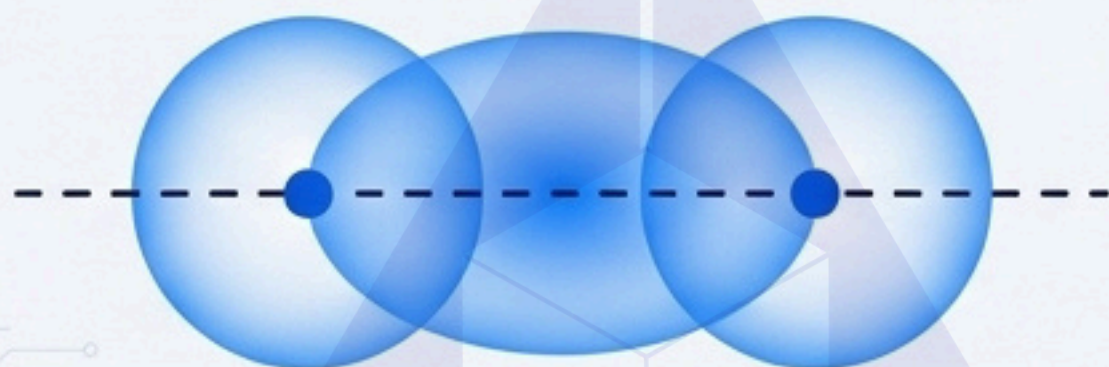


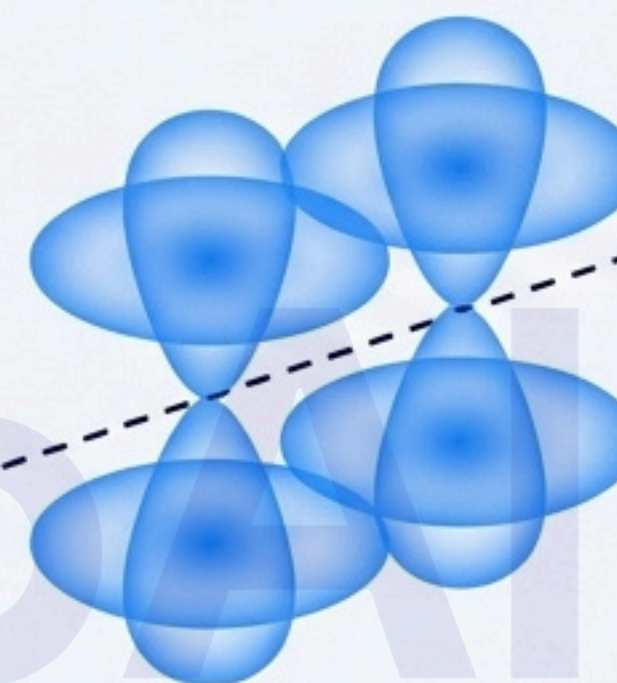
Two Fundamental Classes of Molecular Orbitals

Sigma (σ) Orbitals



- **Symmetry:** Symmetrical around the bond axis.
- **Overlap Type:** Head-on / Axial.
- **Electron Density:** Concentrated directly between the nuclei.
- **Strength:** Stronger bond due to maximum extent of overlap.

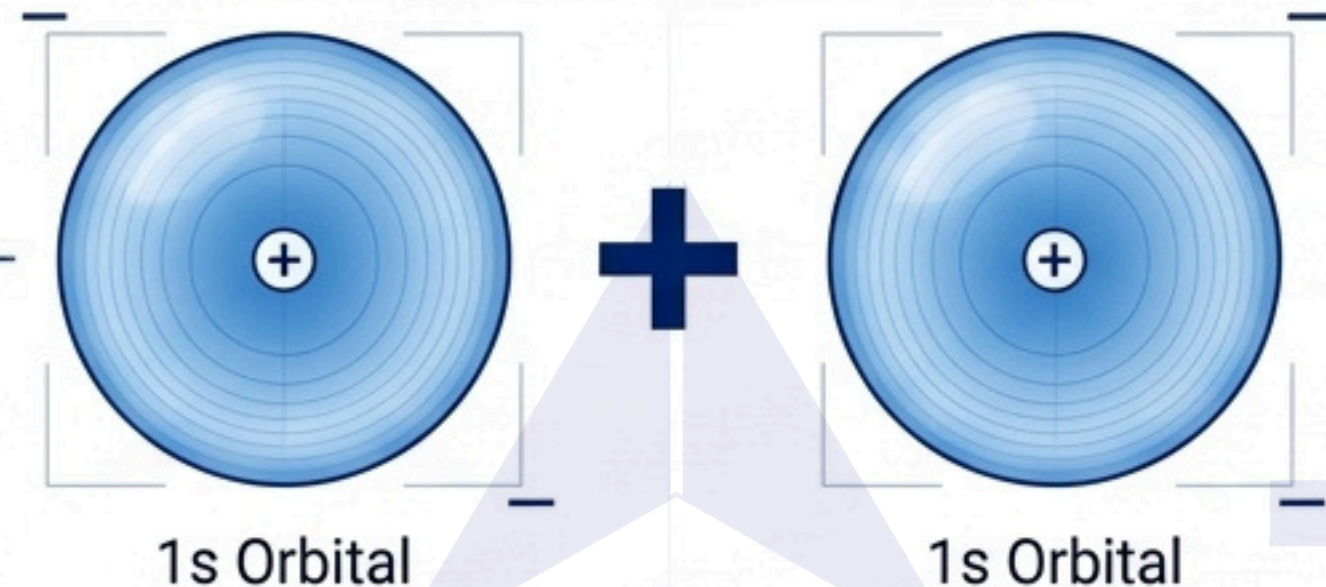
Pi (π) Orbitals



- **Symmetry:** Not symmetrical around the bond axis.
- **Overlap Type:** Sideways / Parallel.
- **Electron Density:** Saucer-type clouds located above and below the nuclear plane.
- **Strength:** Weaker bond due to smaller extent of sideways overlap.

The Foundation: Combining 1s Orbitals

Constructive Interference

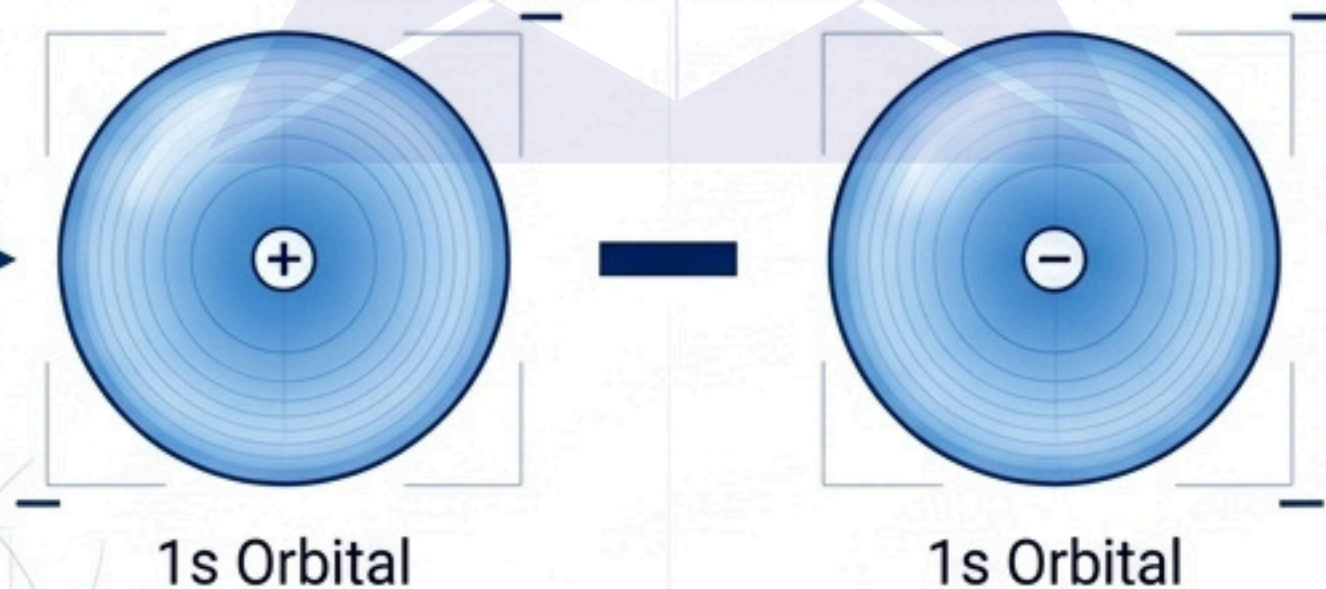


σ_{1s}

Continuous electron density between nuclei (stable, lower energy).

Addition ($\psi_A + \psi_B$) creates the σ_{1s} Bonding Orbital.

Destructive Interference



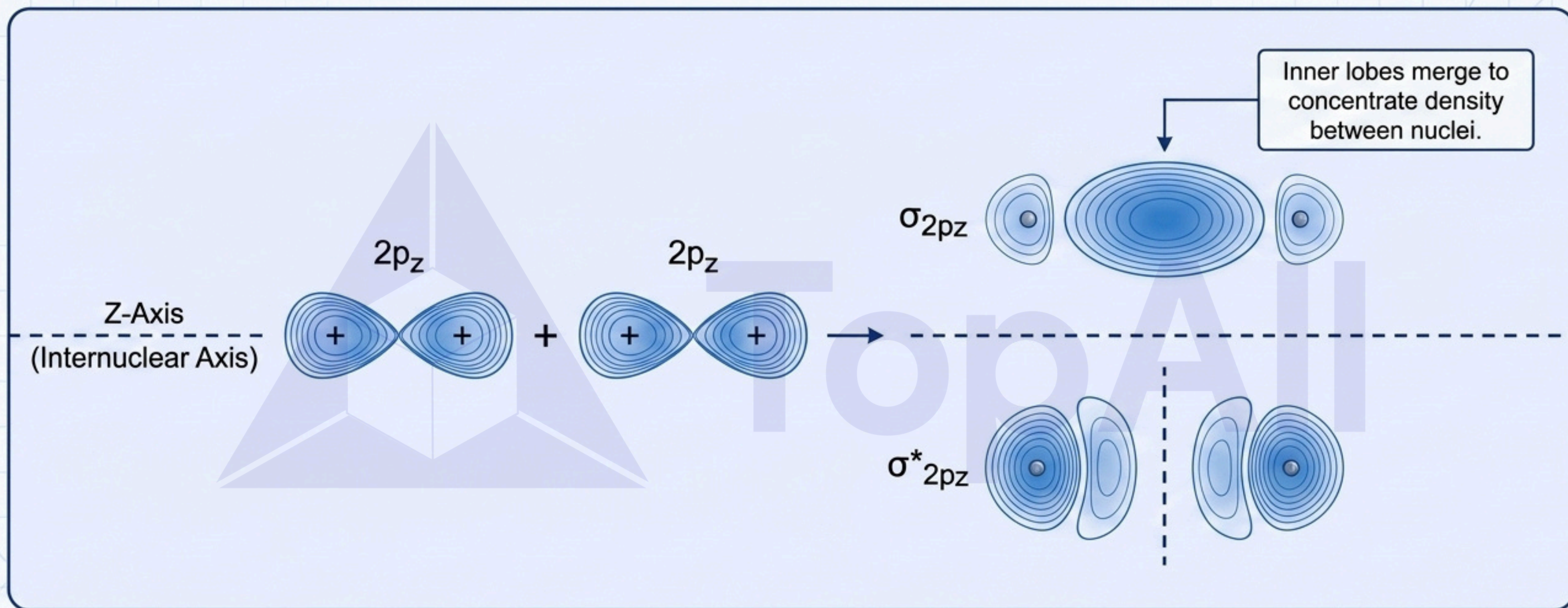
Node: Region of zero electron density (destabilized, higher energy).

Subtraction ($\psi_A - \psi_B$) creates the σ_{1s}^* Antibonding Orbital.



TopAll

Axial Alignment: p-Orbitals as Sigma Bonds



Despite originating from p-orbitals, these remain perfectly symmetrical around the z-axis, classifying them strictly as σ -type molecular orbitals.



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

$$E=mc^2$$



Turn theory into marks with **unlimited MCQs, smart analysis, and focused revision.**

Practice Now



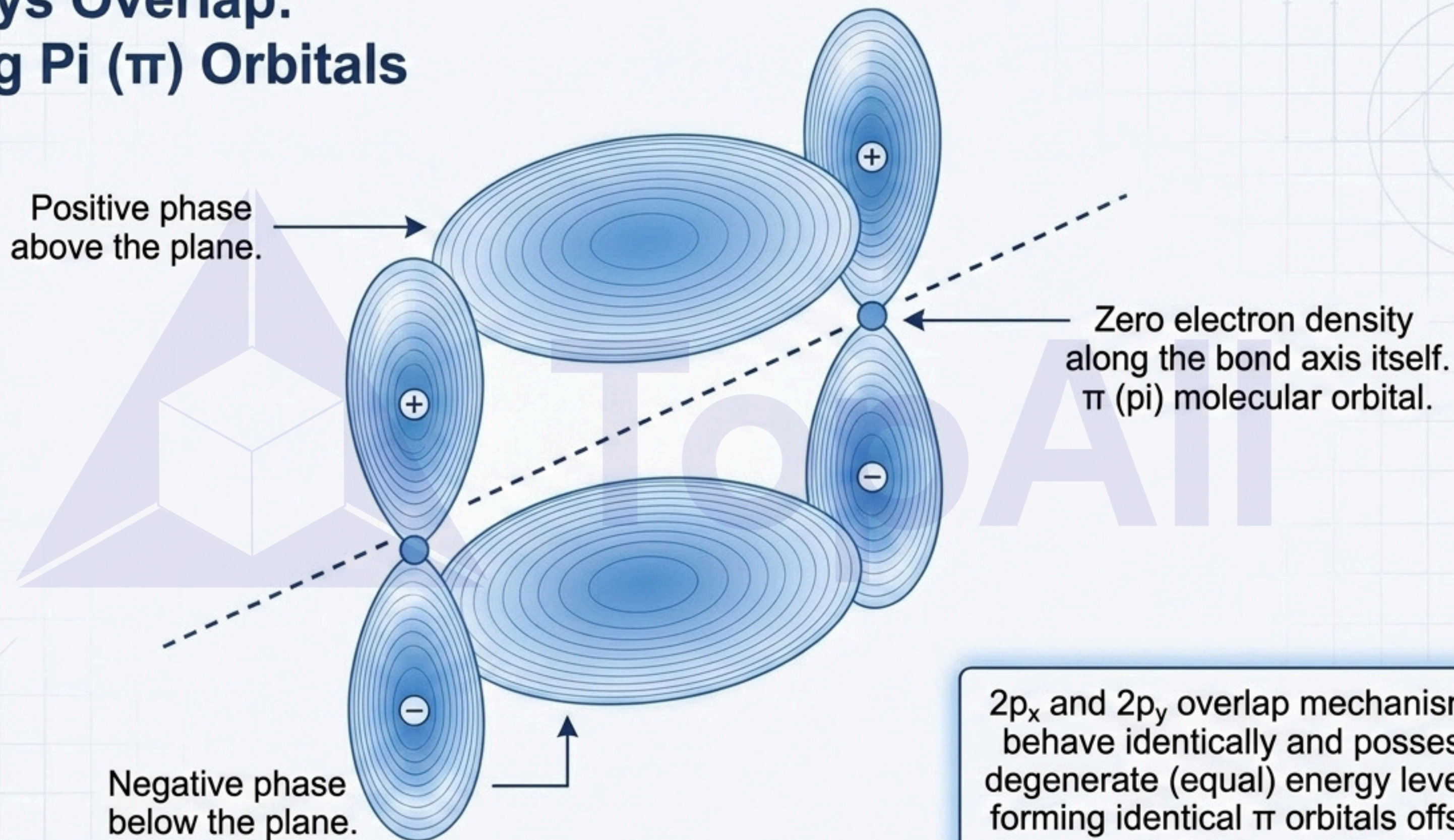
At prep.topall.app

Key Highlights

- » Free Study Material, Videos & Infographics
- » Push Your Limits with Level-Based Challenges
- » Climb the Leaderboard Among Fellow Aspirants
- » Practice Unlimited MCQs for NEET & JEE
- » Get Clear Explanations, Not Just Marks
- » Track Your Performance Smarter

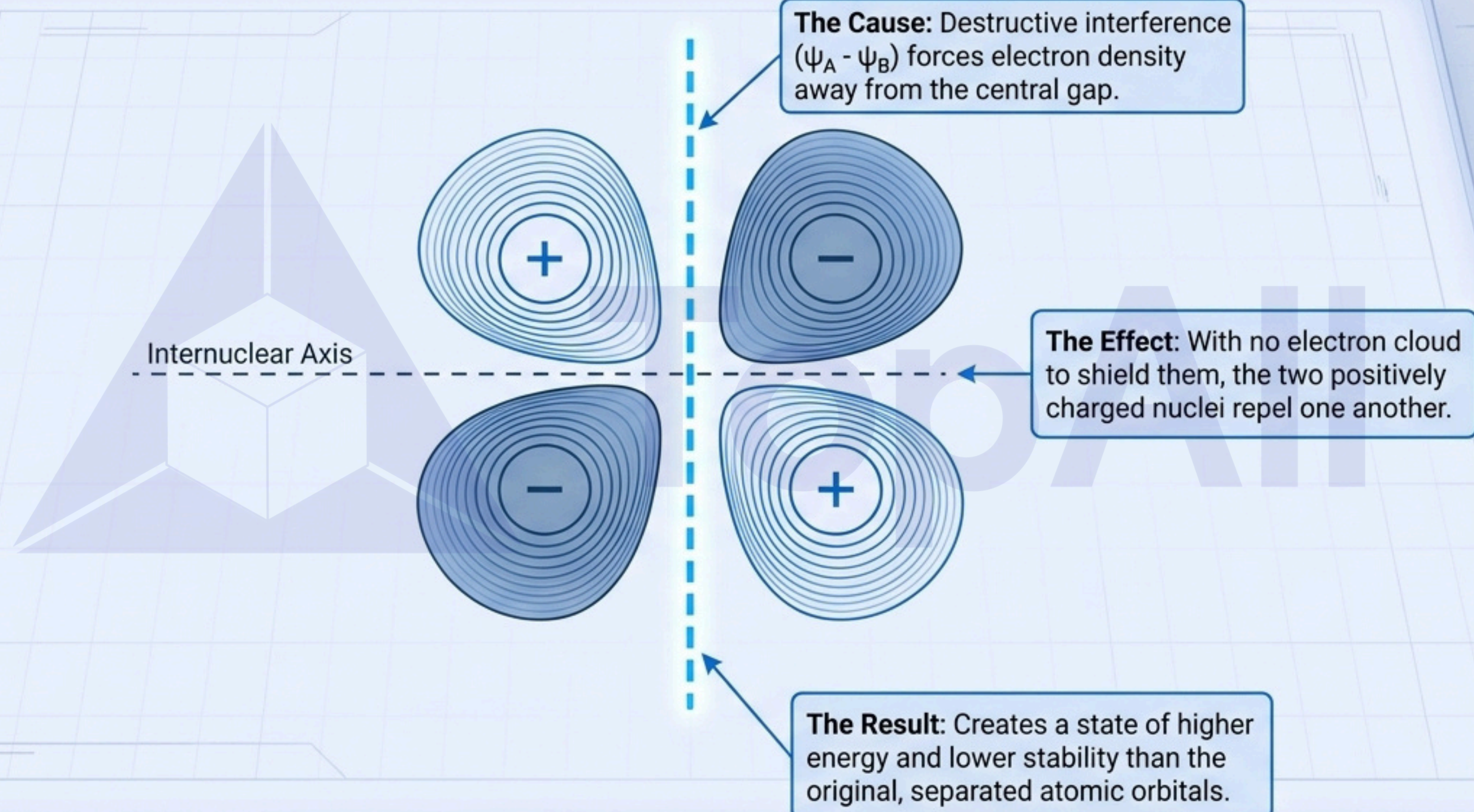


Sideways Overlap: Forming Pi (π) Orbitals



$2p_x$ and $2p_y$ overlap mechanisms behave identically and possess degenerate (equal) energy levels, forming identical π orbitals offset by 90 degrees.

Anatomical Deep Dive: The π^* Node



The Quantum Blueprint: MO Reference Matrix

MO Type	Parent Atomic Orbitals	Symmetry	Node Location	Energy Impact
σ (Bonding)	1s, 2s, 2pz	Axial (Symmetrical)	None between nuclei	Stabilizes molecule
σ^* (Antibonding)	1s, 2s, 2pz	Axial (Symmetrical)	Perpendicular between nuclei	Destabilizes molecule
π (Bonding)	2px, 2py	Planar (Not symmetrical)	Along the internuclear axis	Stabilizes molecule
π^* (Antibonding)	2px, 2py	Planar (Not symmetrical)	Intersecting planes (between nuclei + along axis)	Destabilizes molecule

Orbitals fill in accordance with the Aufbau principle, obeying Pauli's exclusion principle and Hund's rule, determining the final magnetic and structural properties of the molecule.



You've Learned the Theory.

Now Let's Test It.

Reading notes gets you knowledge.

Practicing MCQs gets you marks.

That's exactly what TopAll Pro is built for.

Try TopAll Pro Now

What TopAll Pro Does Differently

-  **Stuck? Snap it. Solve it. — Doubts AI**
Photo → step-by-step solution in seconds, 24/7
-  **Your AI Coach finds your blind spots**
Concept-level weakness detection — not just chapter-level
-  **4.5 Lakh+ questions. Never run out.**
13× more content than any other prep app in India
-  **Build your own test in 60 seconds**
Pick a chapter, set difficulty — AI does the rest instantly.
-  **AI Recommendation that helps you improve**
AI Recommendation Analysis your Tests and tell you where you need to improve.



Practice the moment you finish studying
Jump in while the concept is still fresh in your head

4.5L+
MCQs

1.5L+
Students

AI Powered
In-Depth Analysis