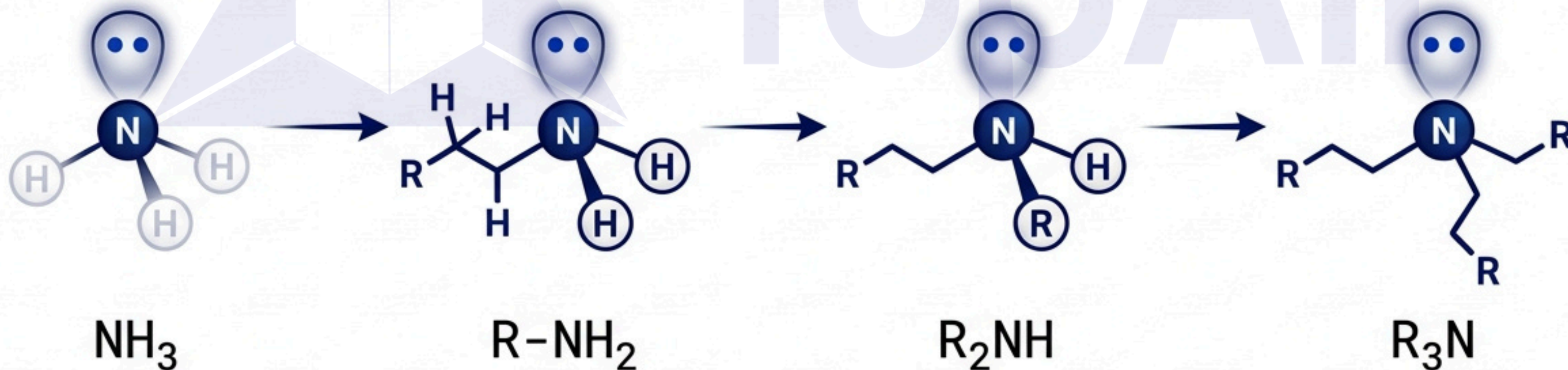


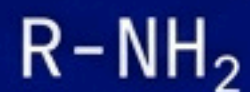
9.1 Structure of Amines

Ammonia derivatives with a lone pair and pyramidal shape.

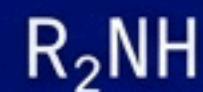
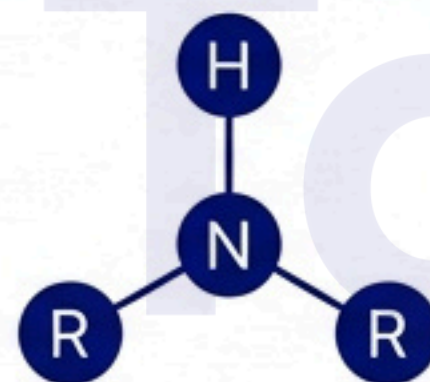


Amines as Derivatives of Ammonia

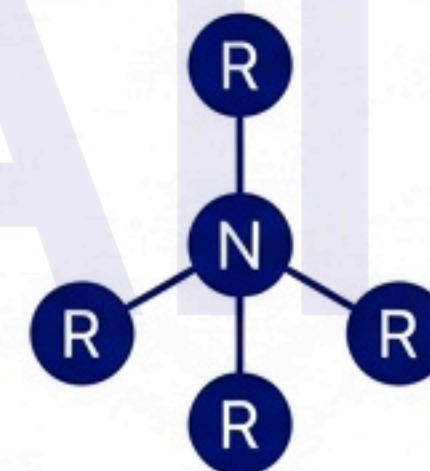
Amines are formed by replacing one, two, or all three hydrogen atoms of an ammonia molecule with alkyl (R) or aryl (Ar) groups.



Primary (1°) Amine.
One hydrogen replaced.

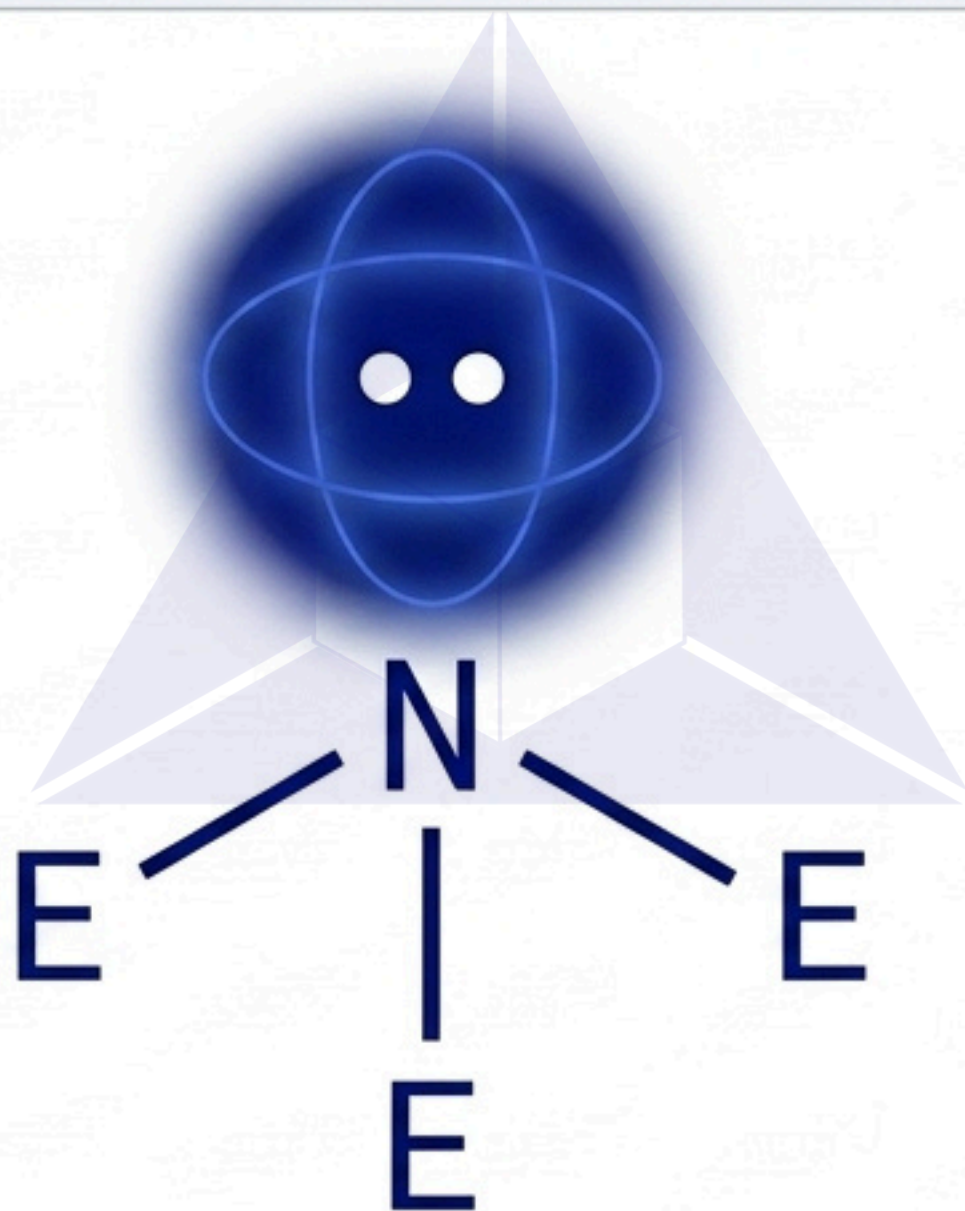


Secondary (2°) Amine.
Two hydrogens replaced.



Tertiary (3°) Amine.
All three hydrogens replaced.

Nitrogen in Amines



Trivalent Nature

Like ammonia, the nitrogen atom forms exactly three covalent bonds.

Unshared Electron Pair

Nitrogen carries one lone pair of electrons that does not participate in bonding.

Nucleophilic Center

This unshared pair dictates chemical reactivity, making amines act as Lewis bases and nucleophiles.



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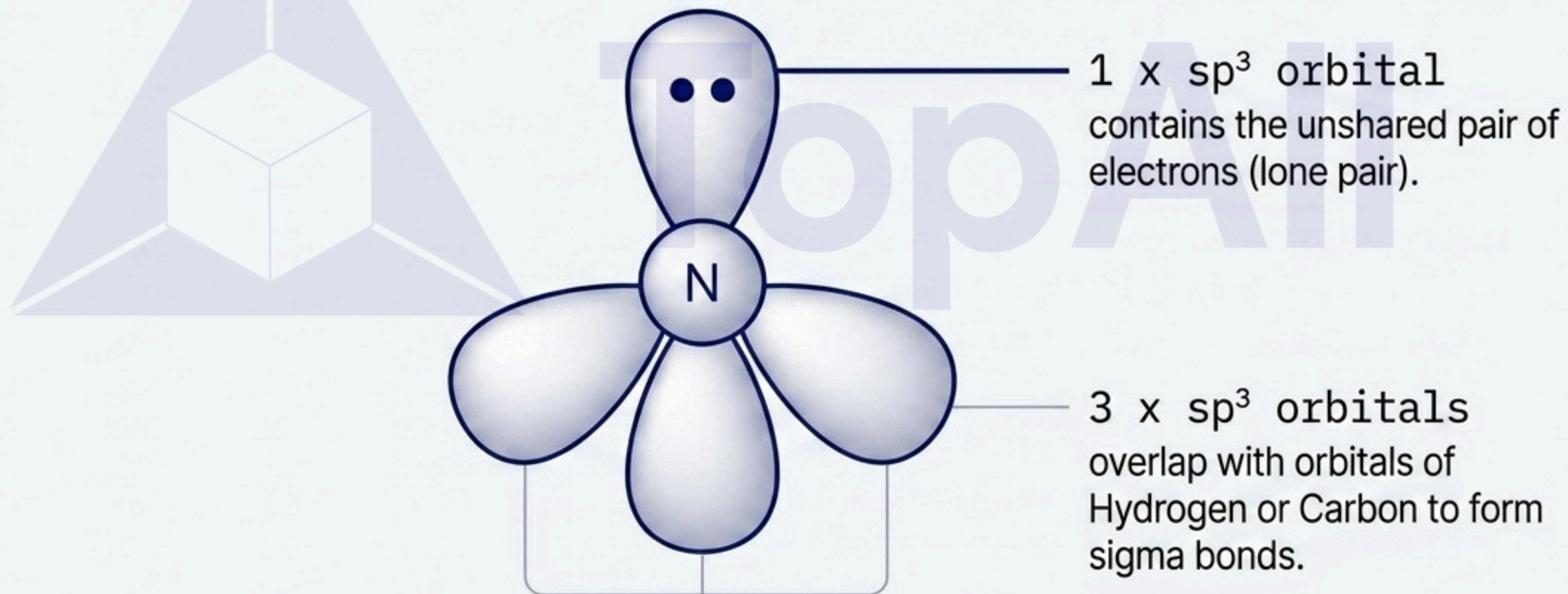
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sp^3 Hybridisation of Nitrogen

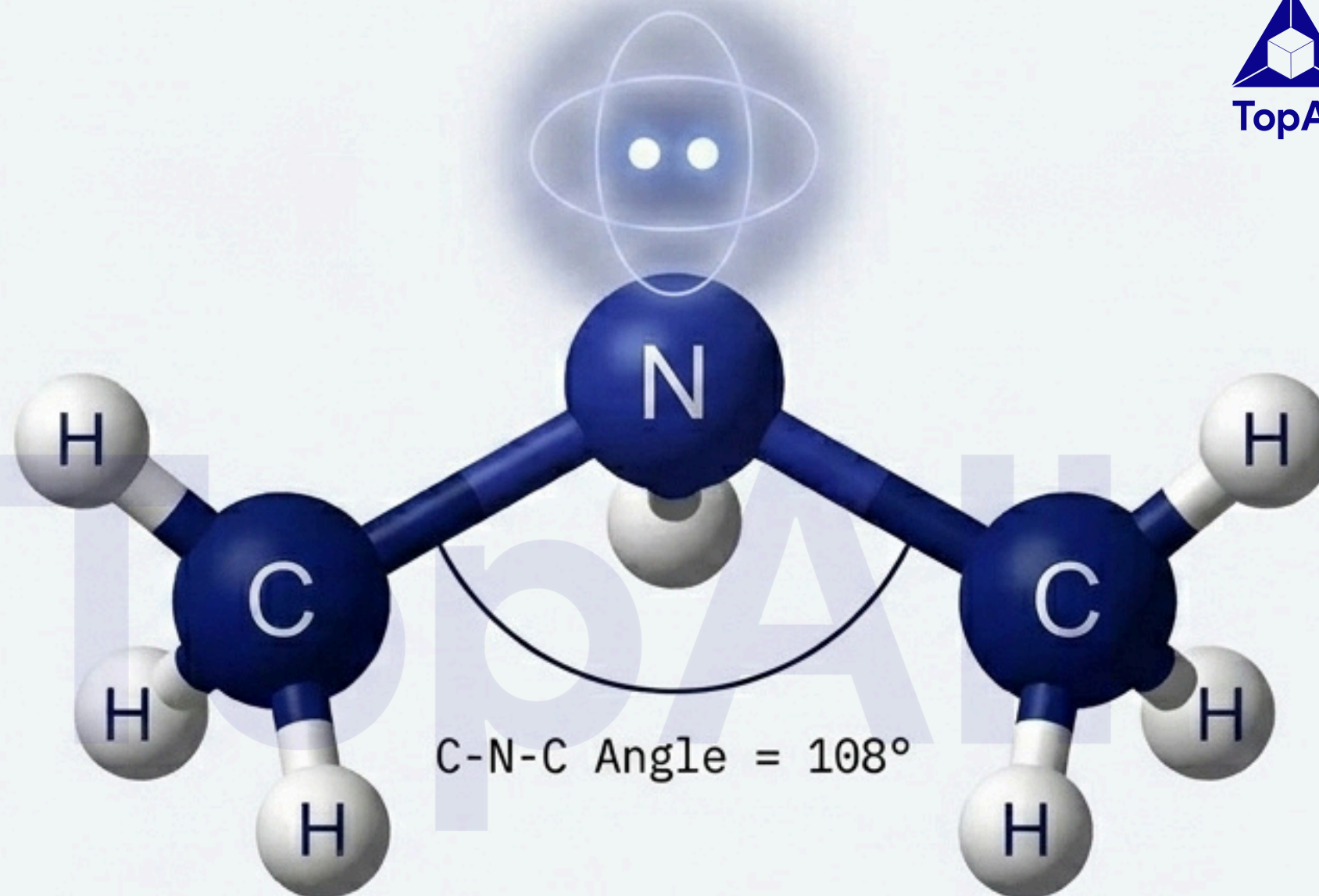
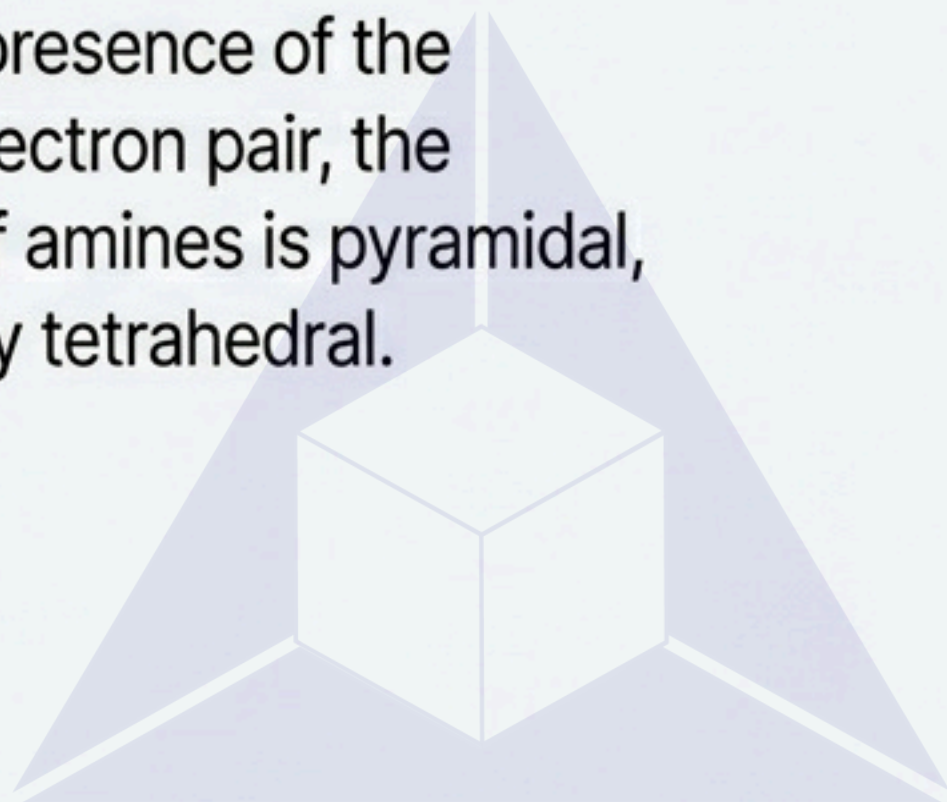
The nitrogen orbitals in amines are sp^3 hybridised, creating four equivalent orbitals directed toward the corners of a tetrahedron.



MOLECULAR SHAPE

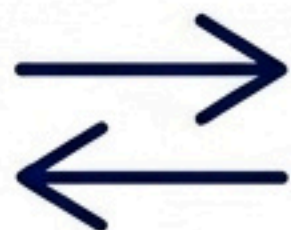
Pyramidal Geometry

Due to the presence of the unshared electron pair, the geometry of amines is pyramidal, not perfectly tetrahedral.



Lone Pair Repulsion: Lone pair-bond pair repulsion pushes the bonded groups closer together, compressing the expected tetrahedral angle from the standard 109.5° down to 108° (as seen in trimethylamine).

Key Takeaways



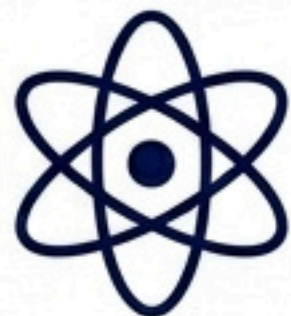
Ammonia Derivatives:

Amines are formed by replacing 1, 2, or 3 hydrogens of NH_3 with alkyl or aryl groups.



Lone Pair:

The nitrogen atom is trivalent but constantly carries one unshared pair of electrons.



sp^3 Hybridised:

The nitrogen atom utilizes four sp^3 orbitals (3 bonding, 1 non-bonding).



Pyramidal Geometry:

Lone pair repulsion compresses the C-N-E bond angle to less than 109.5° (e.g., 108°).



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