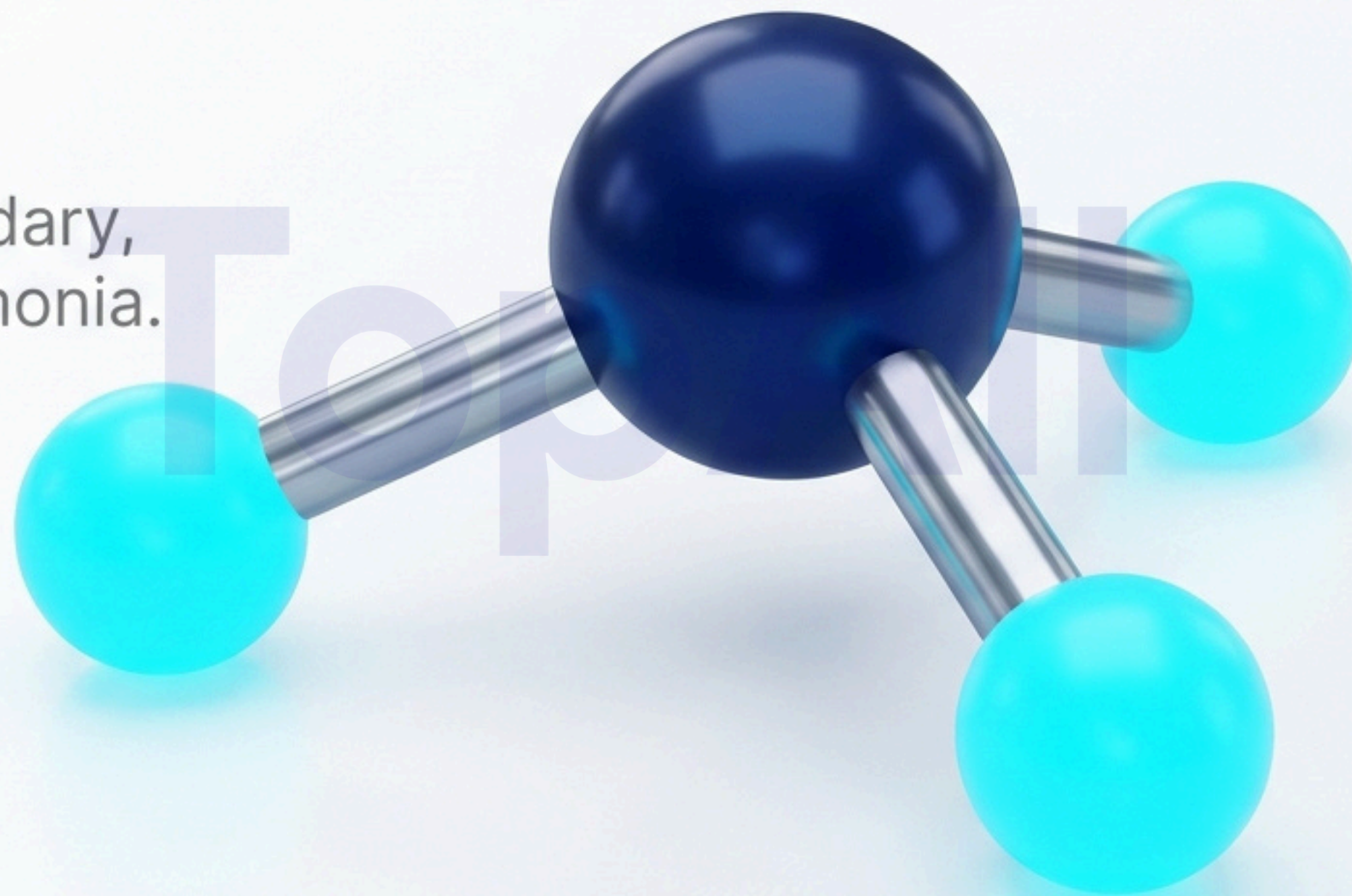


9.2 Classification of Amines

Understanding primary, secondary, and tertiary derivatives of ammonia.

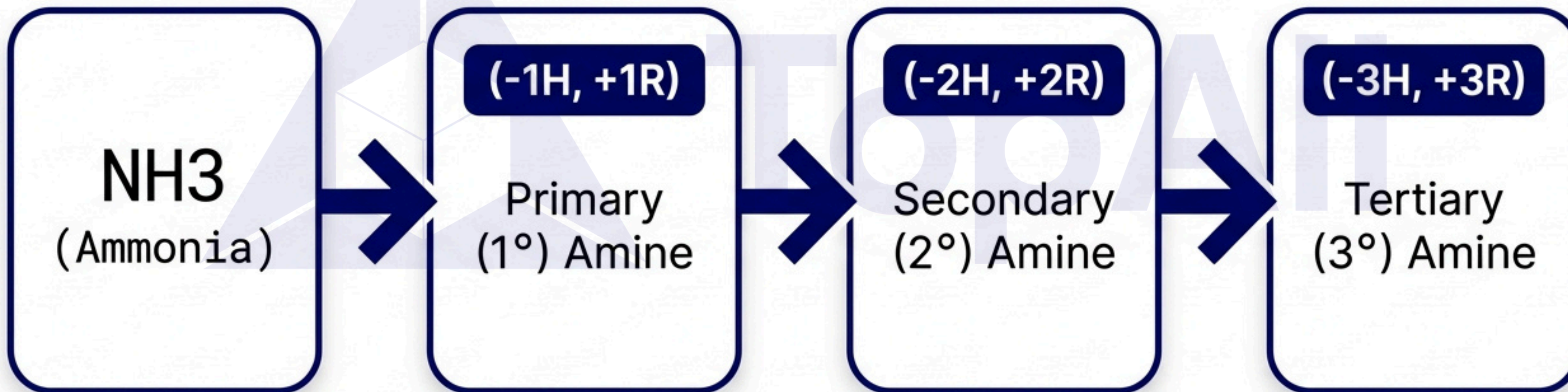


THE CORE CONCEPT

The Replacement Logic



Amines are chemical derivatives of ammonia. Their classification depends entirely on how many hydrogen atoms are replaced by alkyl (R) or aryl (Ar) groups.



Crucial Structural Rule: Across all classifications, the nitrogen atom remains trivalent and retains its unshared lone pair of electrons. The geometry remains pyramidal.

DEGREE OF SUBSTITUTION: 1

Primary (1°) Amines



Definition

Formed when exactly **one** hydrogen atom of ammonia is replaced by an alkyl or aryl group.

Aliphatic Example

Ethanamine



Aromatic Example

Aniline (Benzenamine)





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$$E=mc^2$$



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Secondary (2°) Amines

Definition

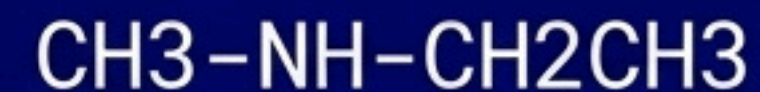
Formed when **two** hydrogen atoms of ammonia (or one of a primary amine) are replaced by alkyl/aryl groups.

Structure

The nitrogen atom is directly bonded to two carbon atoms. Only one remaining hydrogen is attached to the nitrogen.

Example

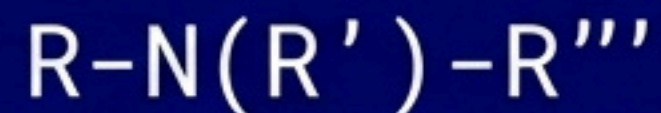
N-Methylethanamine



The R and R' groups can be identical or entirely different.

DEGREE OF SUBSTITUTION: 3

Tertiary (3°) Amines



Definition

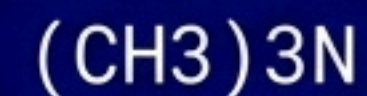
Formed when **all three** hydrogen atoms of ammonia are replaced by alkyl or aryl groups.

Structure

The nitrogen atom is completely surrounded by carbon atoms. Zero N-H bonds remain.

Example

N,N-Dimethylmethanamine
(Trimethylamine)



Physical Consequence: Tertiary amines cannot form intermolecular hydrogen bonds with each other due to the complete absence of an N-H bond.

Simple vs. Mixed Amines

Same Groups = Simple

All attached alkyl or aryl groups are identical.

Example:
Diethylamine



↑ Identical Groups ↑

Different Groups = Mixed

At least one attached alkyl or aryl group is different from the others.

Example:
Ethylmethanamine



↑ Different Groups ↑

Note: Primary amines cannot be classified as simple or mixed, as they possess only a single substituted group.



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