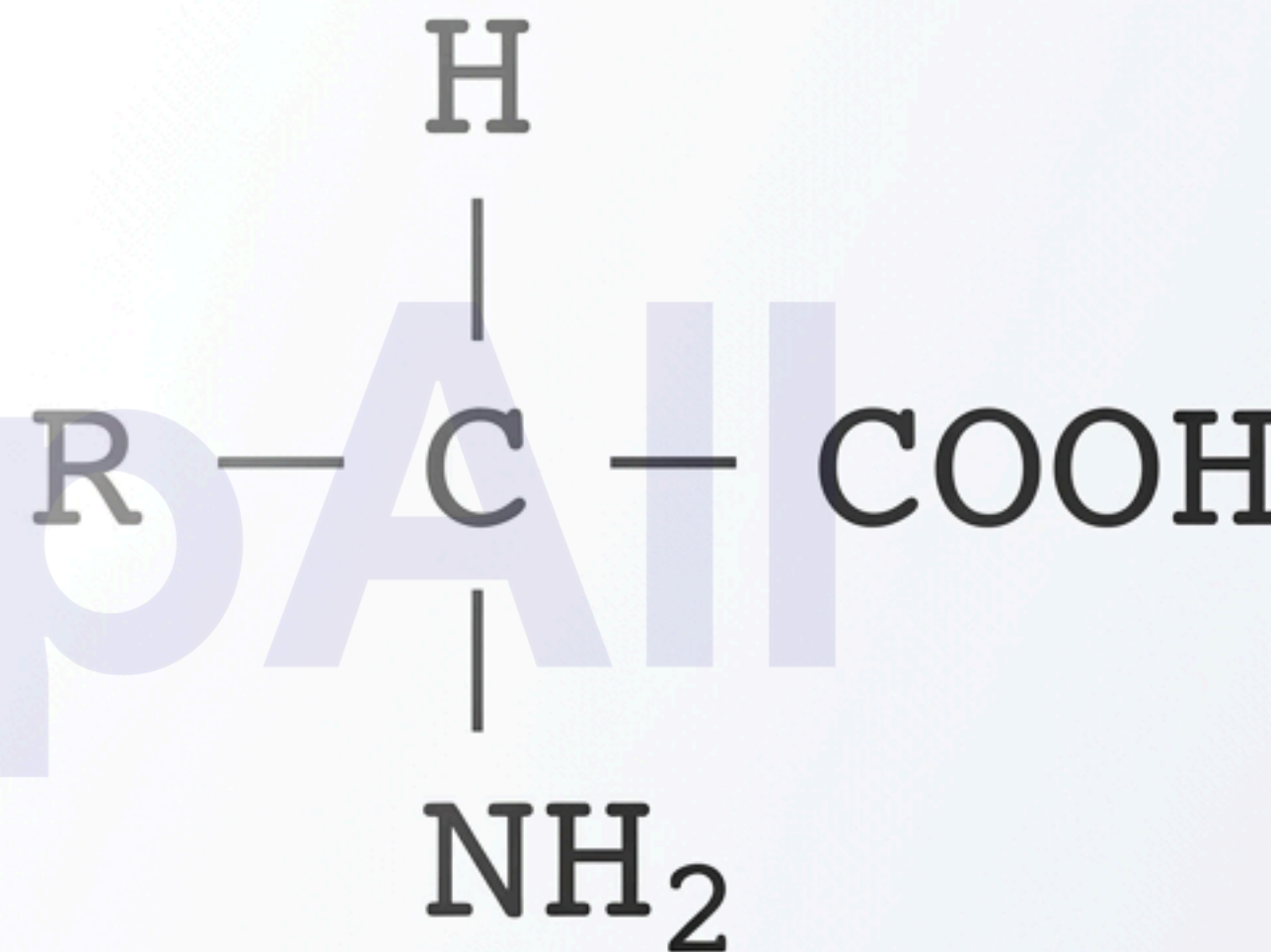


UNIT 10 • BIOMOLECULES

Classification of Amino Acids & Zwitterion Behaviour

The Proton Economics of α -Amino Acids in Aqueous Solutions.



Group Count

Amino acids are classified as Acidic, Basic, or Neutral strictly based on the relative count of amino ($-NH_2$) and carboxyl ($-COOH$) groups.

Zwitterion

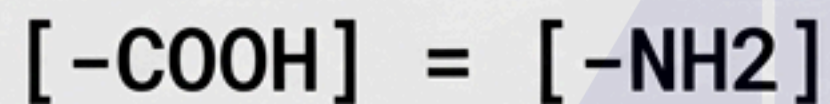
A neutral dipolar ion formed in aqueous solution containing both positive and negative charges due to internal proton transfer.

Amphoteric

Dual reactivity; the ability of the molecule to act as both an acid (donating protons) and a base (accepting protons).

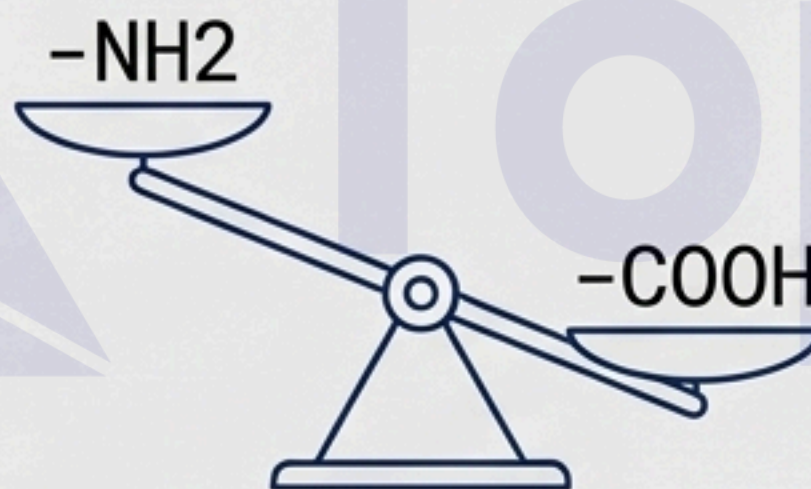
Classification by Proton Inventory

Neutral



Equal number of amino and carboxyl groups.

Acidic



More carboxyl groups compared to amino groups.

Basic



More amino groups compared to carboxyl groups.



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$$E=mc^2$$



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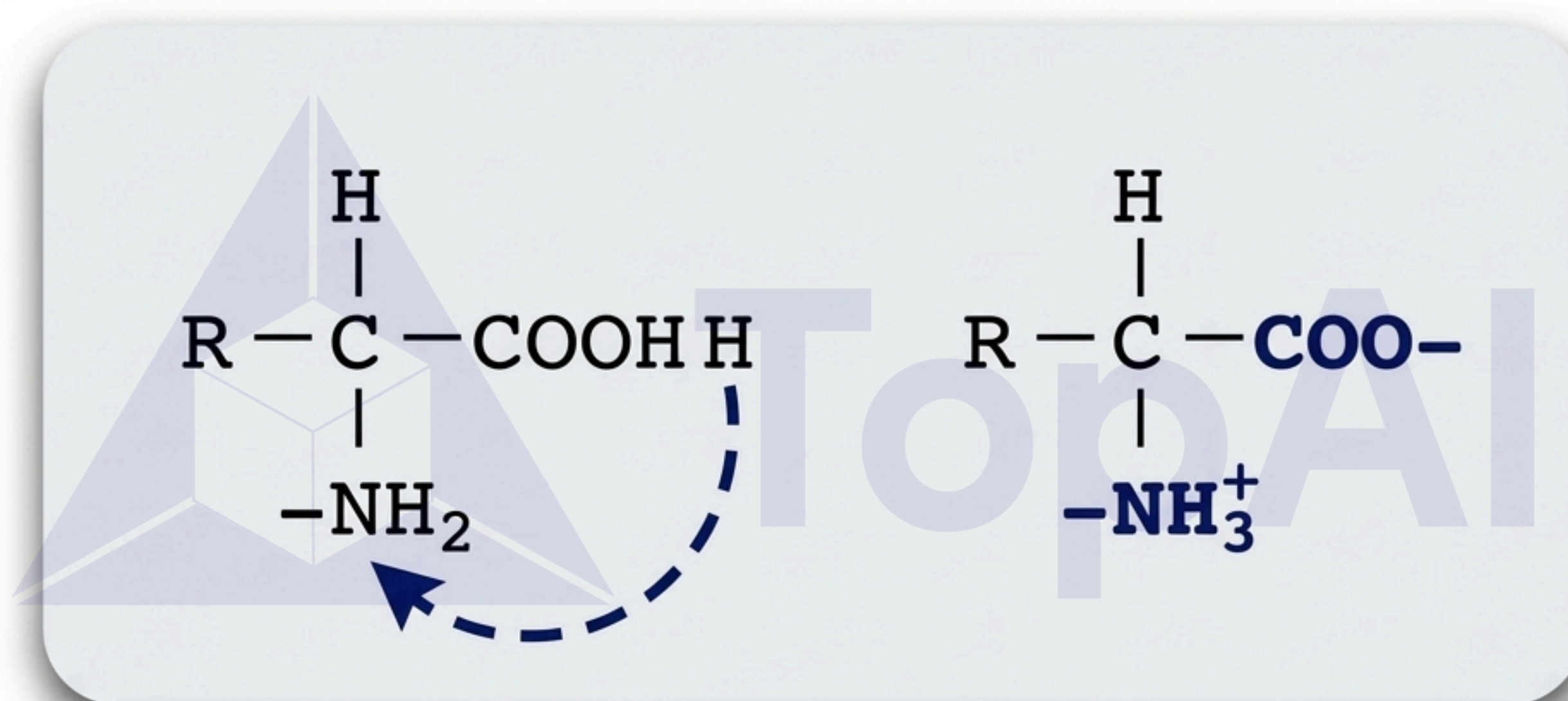
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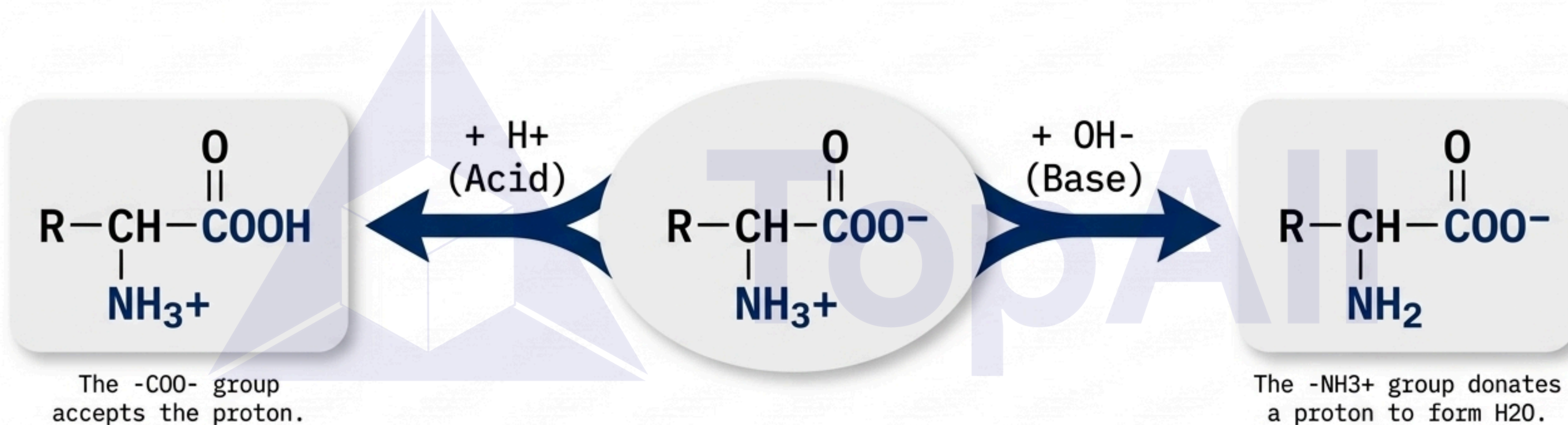


The Internal Proton Transaction



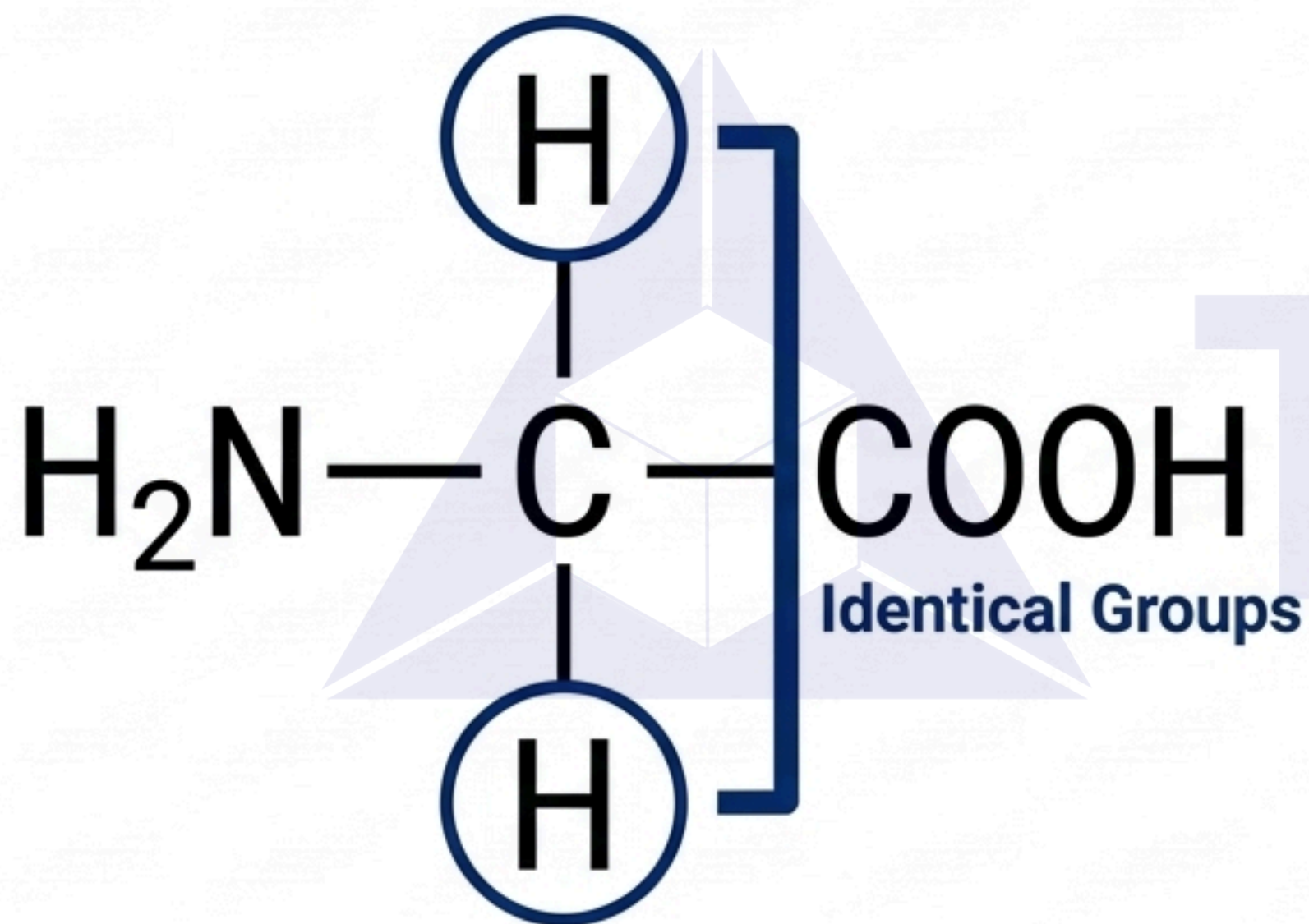
The resulting Dipolar Ion (Zwitterion) contains both positive and negative charges but remains electrically neutral overall.

Amphoteric Behaviour: Dual Reactivity



Because it reacts with both acids and bases, the zwitterion is functionally amphoteric.

The Glycine Exception



- Except for glycine, all naturally occurring α-amino acids are **optically active** because the **α-carbon** is asymmetric.
- Glycine has two identical hydrogen atoms on its α-carbon, meaning it is NOT asymmetric, making it the **only** optically inactive α-amino acid.

WATCH FOR THIS (Trap Alert)

Acidic/Basic/Neutral classification of an amino acid is determined **STRICTLY** by the internal structural count of -COOH vs -NH_2 groups, **NOT** by the pH of the solution it is dissolved in.

KEY TAKEAWAYS

- A Zwitterion is a neutral, dipolar ion formed in aqueous solution via an internal proton transfer from -COOH to -NH_2 .
- Amino acids exhibit amphoteric behaviour (reacting with both acids and bases) precisely because of this zwitterionic form.



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