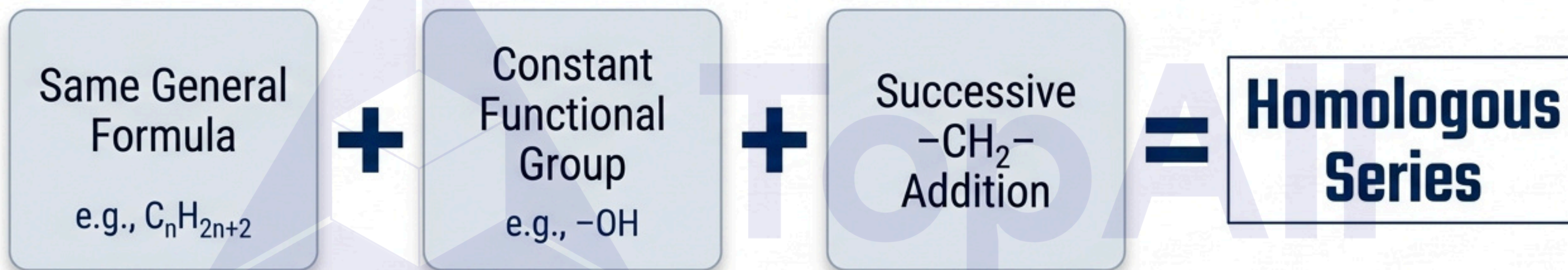


THE BLUEPRINT OF ORGANIC FAMILIES

Members of this series are called **homologues**.

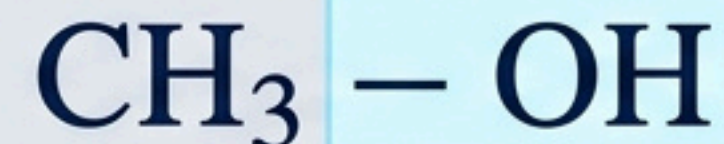


A homologous series is a family of organic compounds where the chemical identity remains fixed, but the carbon skeleton grows in predictable, uniform steps.

The Chemical Anchor: Constant Functional Groups

The varying carbon chain attached to the constant functional group is called the **alkyl group** (e.g., Methyl, Ethyl, Propyl).

Methanol:



Ethanol:



Propanol: $\text{CH}_3\text{CH}_2\text{CH}_2 - \text{OH}$

Key Principle: Because the functional group (the active site) is identical, all homologues in a series exhibit similar chemical properties.



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$$E=mc^2$$



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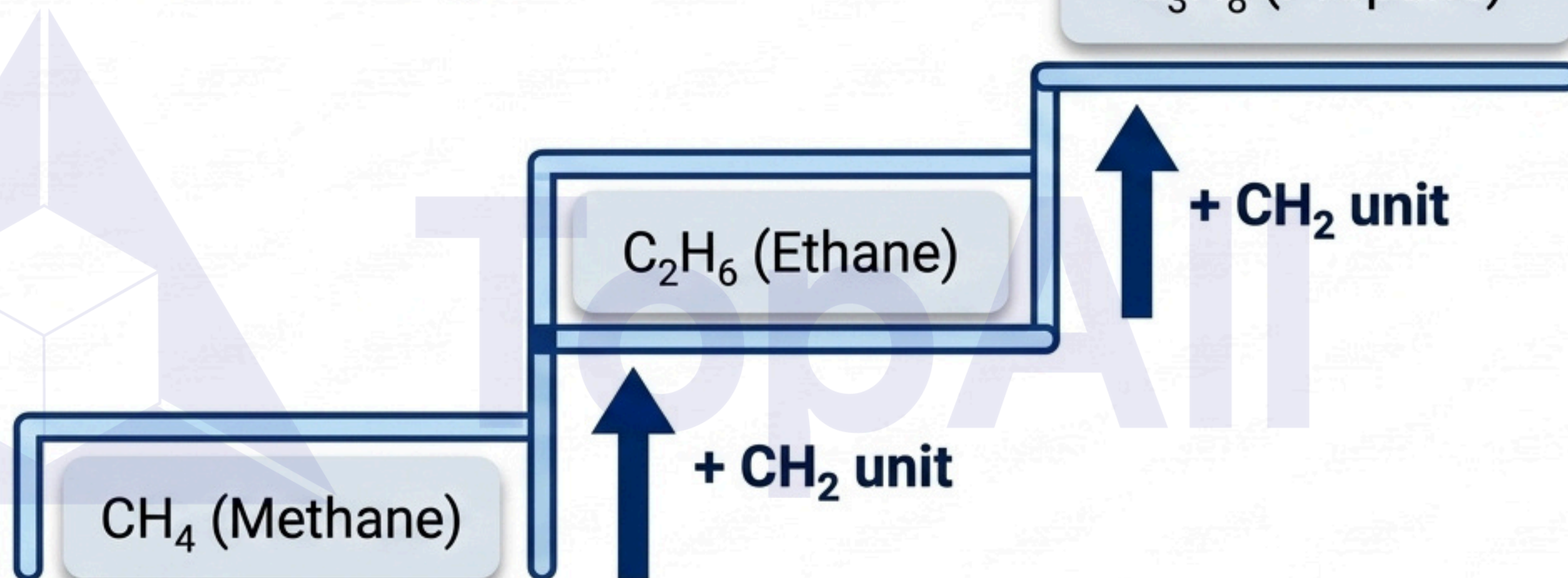
The Escalating Chain: The $-\text{CH}_2-$ Step



The Mass Rule

Each $-\text{CH}_2-$ addition adds exactly 1 Carbon and 2 Hydrogens, corresponding to a uniform mass increase of $+14\text{u}$ per successive member.

Staircase Diagram



The Physical Impact

While chemical properties remain similar, this predictable increase in molecular mass causes a regular gradation in physical properties (such as boiling point, melting point, and density) as you move up the series.

Universal Application Across Organic Families



Alkanes

General Formula: C_nH_{2n+2}

CH_4 (Methane)



C_2H_6 (Ethane)

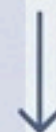


C_3H_8 (Propane)

Alcohols

General Formula: $C_nH_{2n+1}OH$

CH_3OH (Methanol)



C_2H_5OH (Ethanol)



C_3H_7OH (Propanol)

Carboxylic Acids

General Formula: $C_nH_{2n+1}COOH$

$HCOOH$ (Methanoic acid)



CH_3COOH (Ethanoic acid)



C_2H_5COOH (Propanoic acid)

Regardless of the functional group family, the fundamental rule applies: adjacent members always differ by exactly one $-CH_2-$ structural unit.

Revision Frame: Homologous Series

Core Identity

Definition: A series of organic compounds with the same characteristic functional group and general molecular formula. Members are homologues.

The Successive Rule

The Progression: Successive members differ by exactly one $-\text{CH}_2-$ unit.

Molecular mass increases by exactly $+14\text{u}$ per step.

Properties

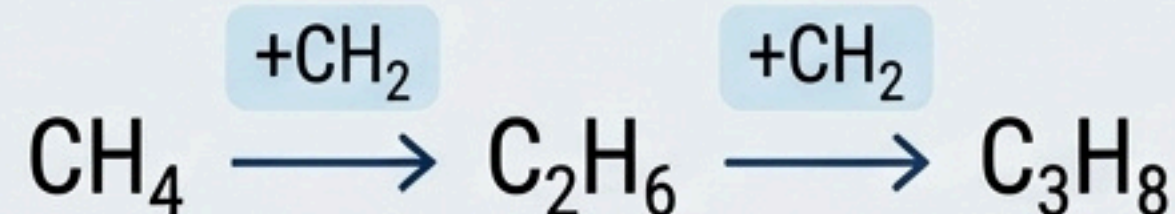
Behavioral Rules:

- Chemical Properties: Similar (dictated by the constant functional group).
- Physical Properties: Gradation (dictated by increasing molecular mass).

Example Anchor

Alkane Series

General Formula: $\text{C}_n\text{H}_{2n+2}$





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