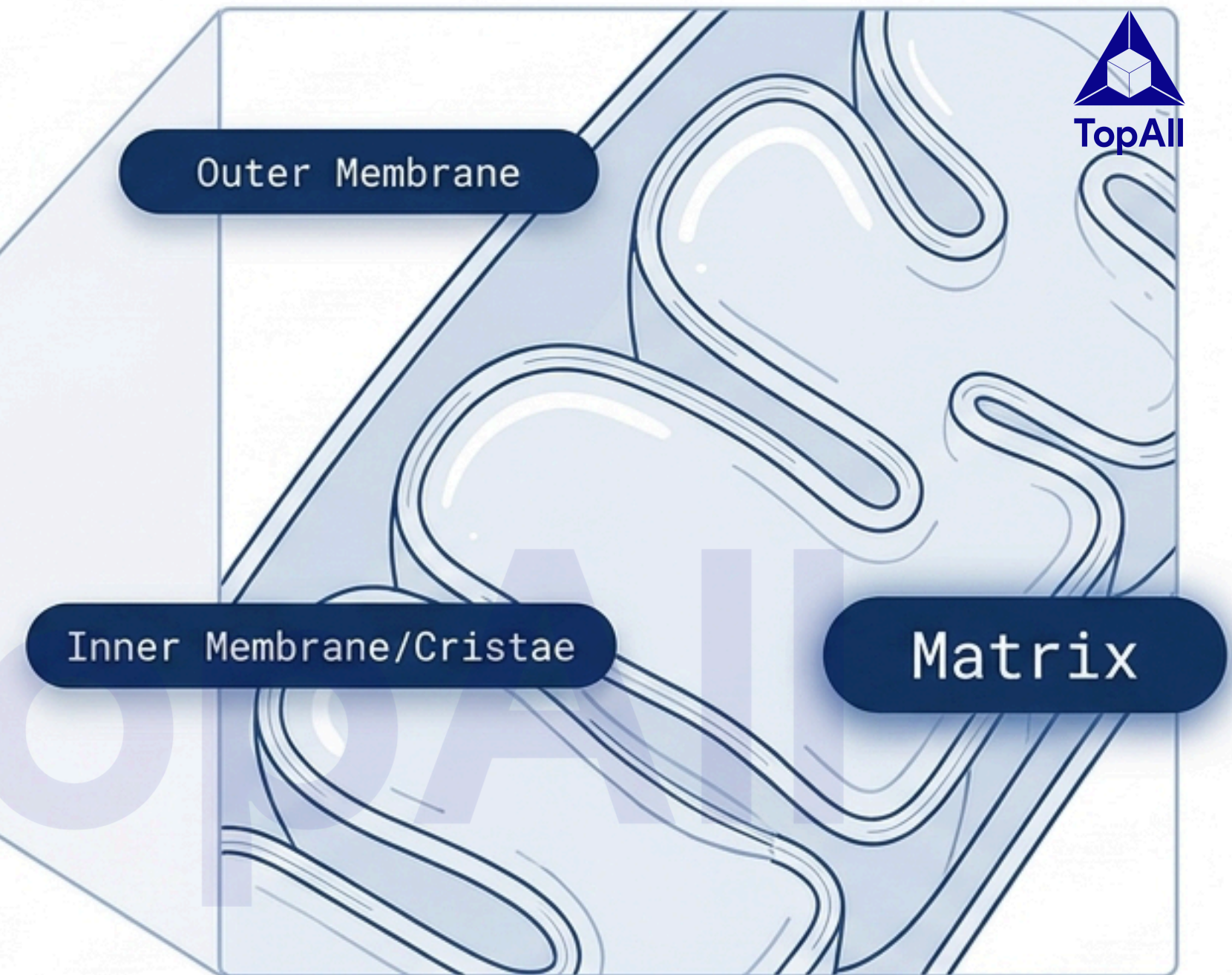
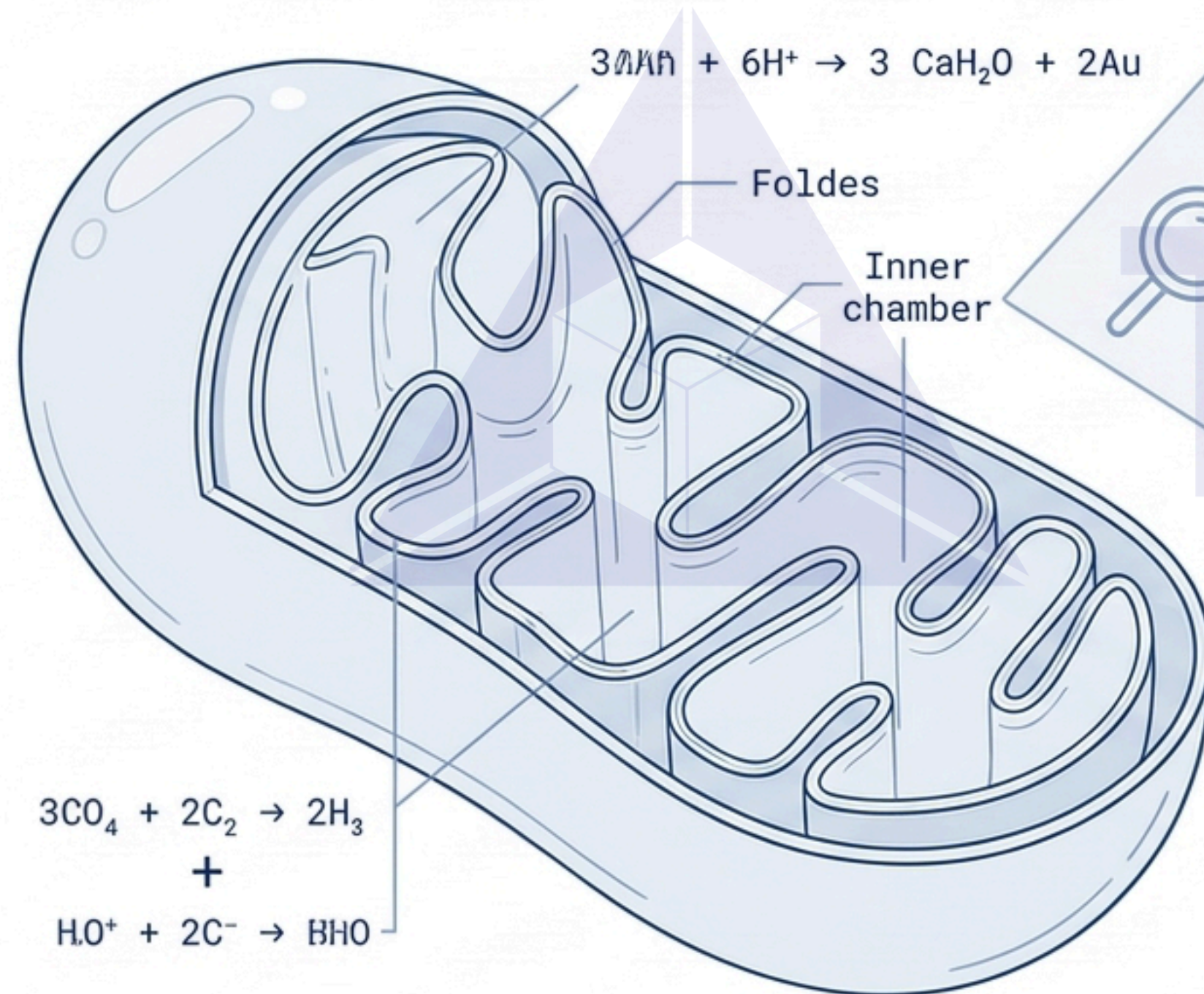




The Mitochondrial Energy Wheel

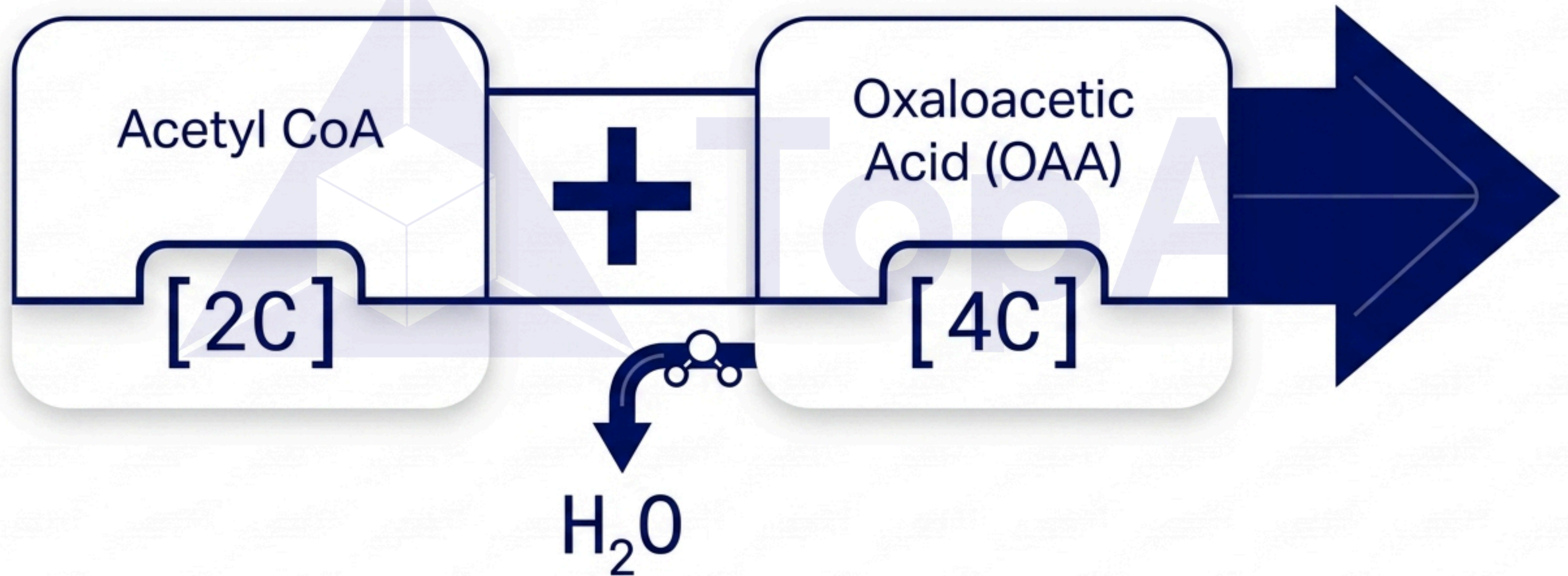
Deconstructing the TCA Cycle: The central hub of cellular respiration.

The Engine Room: The Mitochondrial Matrix



While glycolysis occurs in the cytoplasm, the Energy Wheel requires the specialized, enzyme-rich environment of the mitochondrial matrix.

Priming the System: The Carbon Merge





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$$E=mc^2$$



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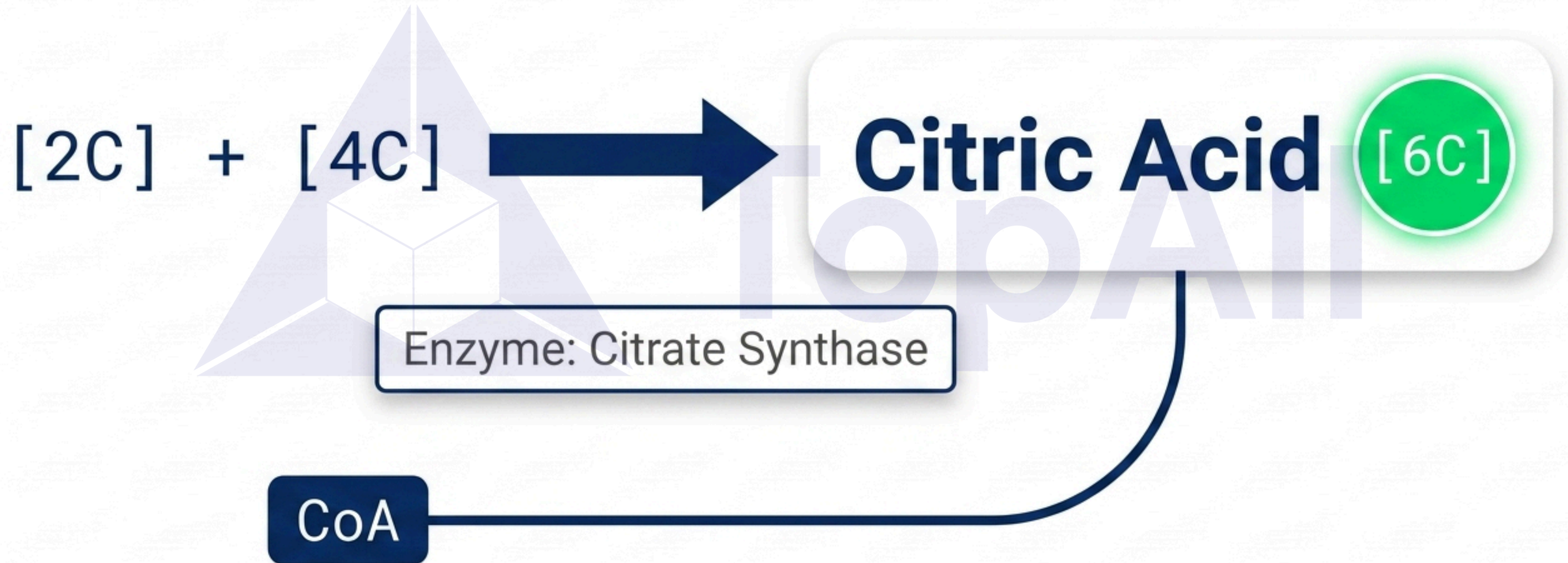
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Key Highlights

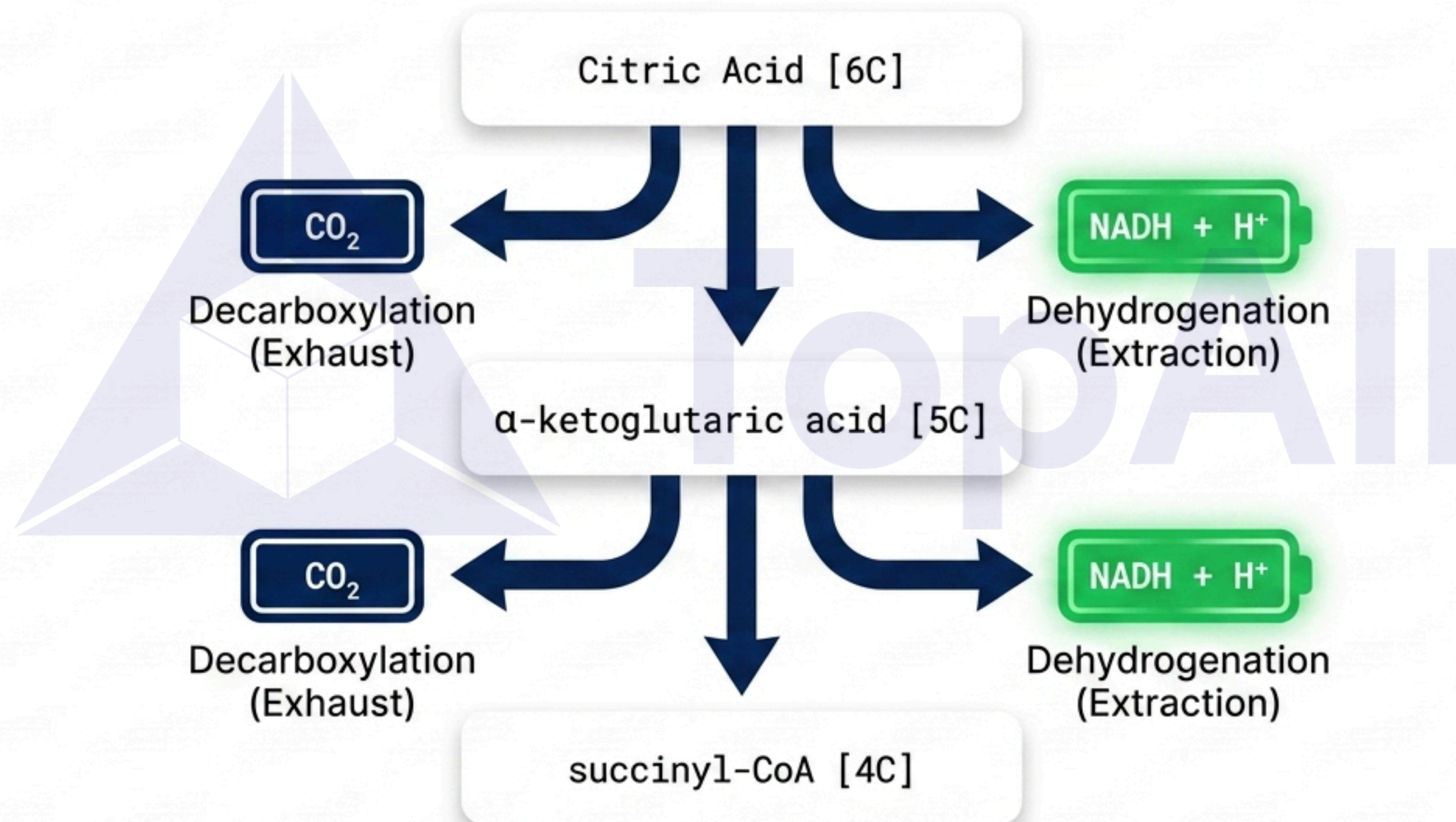
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Citric Acid Formation



Decarboxylation and Dehydrogenation



The Output Ledger: Energy Formation

Primary Carrier



Primary electron carriers
bound for the ETS.

Secondary Carrier



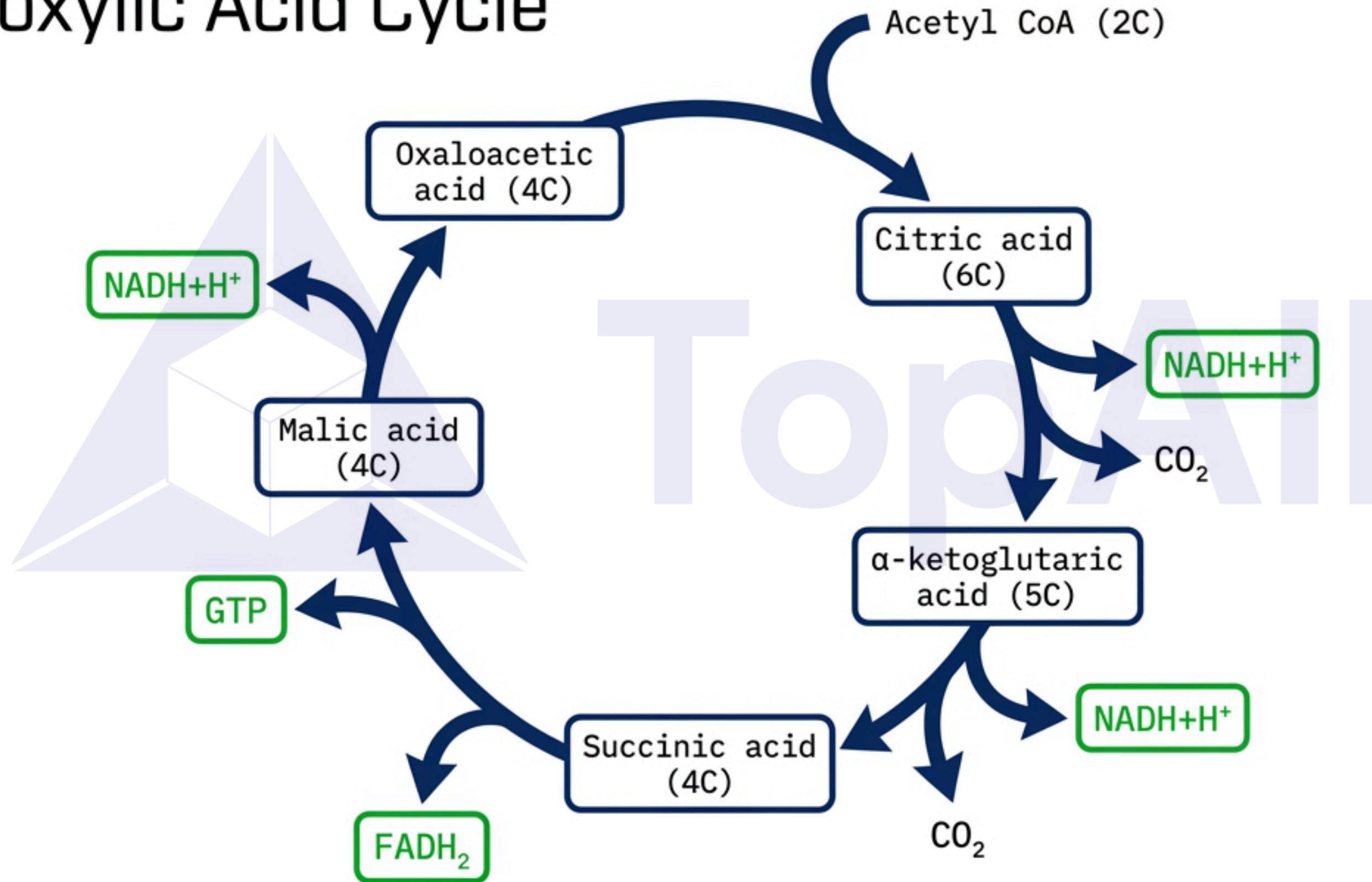
Secondary electron carrier
generated during oxidation
of succinic acid.

Direct Energy



Substrate-level
phosphorylation. Direct,
immediate cellular energy.

The Complete Blueprint: Tricarboxylic Acid Cycle



The True Purpose of the Wheel



The Krebs Cycle is an electron-harvesting machine.

While it **produces minimal direct ATP**, its primary biological function is to generate massive quantities of reducing equivalents (NADH and FADH_2) to power the **Electron Transport System (ETS)**.



System Requirement: The wheel requires continuous replenishment of Oxaloacetic Acid (OAA) and regeneration of $\text{NAD}^+/\text{FAD}^+$ to keep spinning.



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