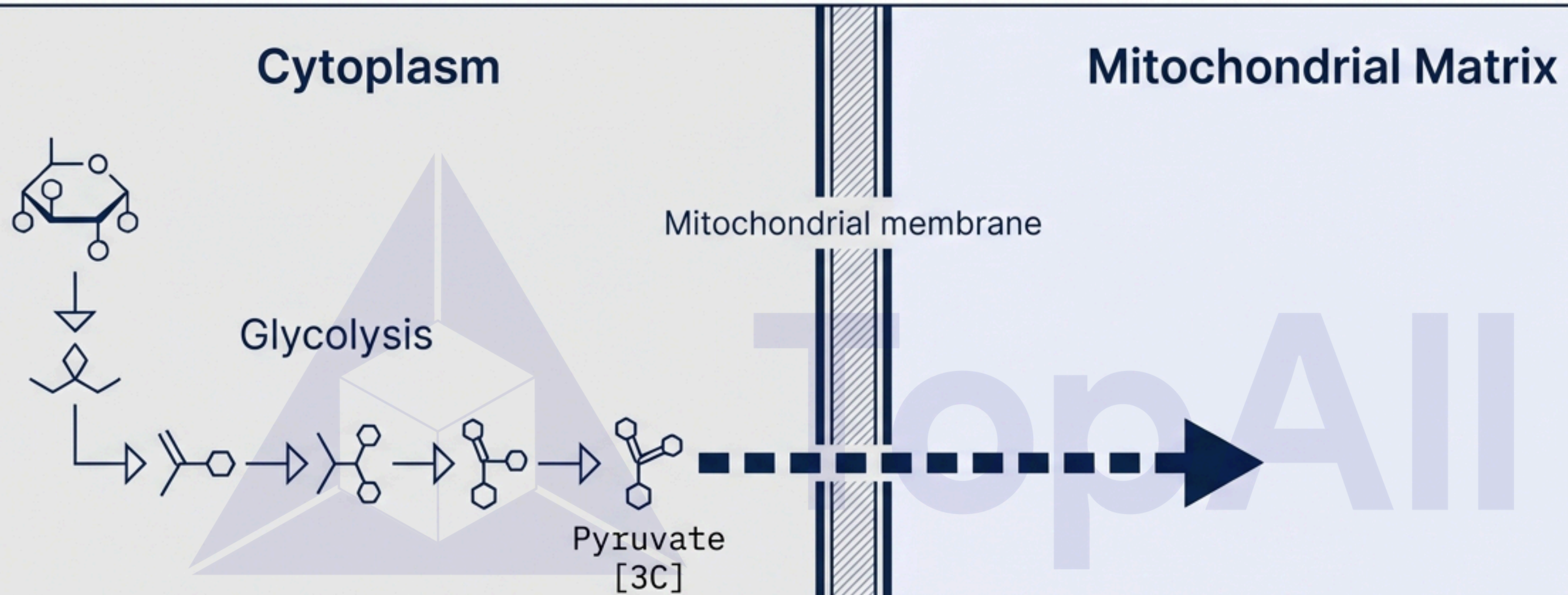


The Oxygen-Powered Pathway

Bridging Glycolysis and the Krebs Cycle



Pyruvate Enters the Mitochondria



Required Spatial Move:
Pyruvate must be transported from the cytosol into the mitochondrial matrix to initiate aerobic respiration.

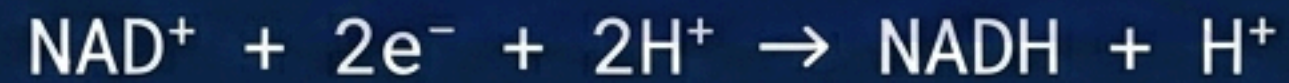


O₂ REQUIRED: Without oxygen, pyruvate undergoes anaerobic fermentation in the cytoplasm instead.

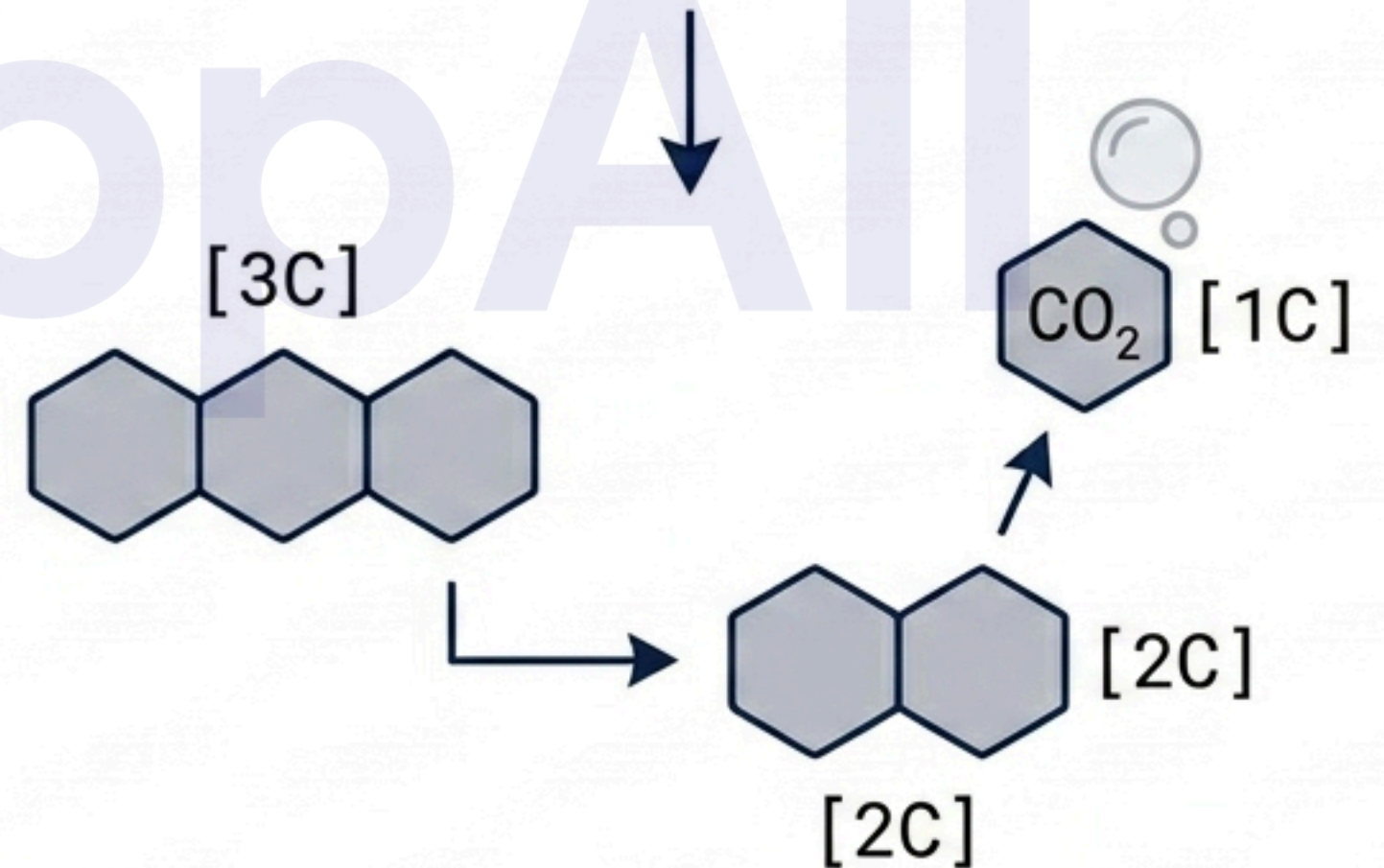
Deconstructing the Reaction

Pyruvate undergoes a complex set of reactions upon entering the matrix. Visually splitting the term reveals exactly what happens to the molecule: it loses electrons (oxidation) and it loses carbon (decarboxylation).

Oxidative



Decarboxylation





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$$E=mc^2$$



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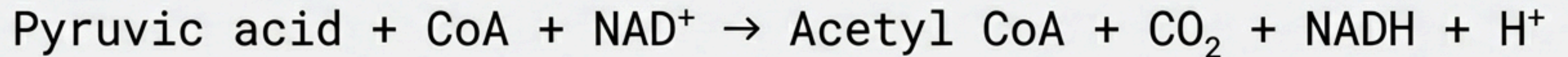
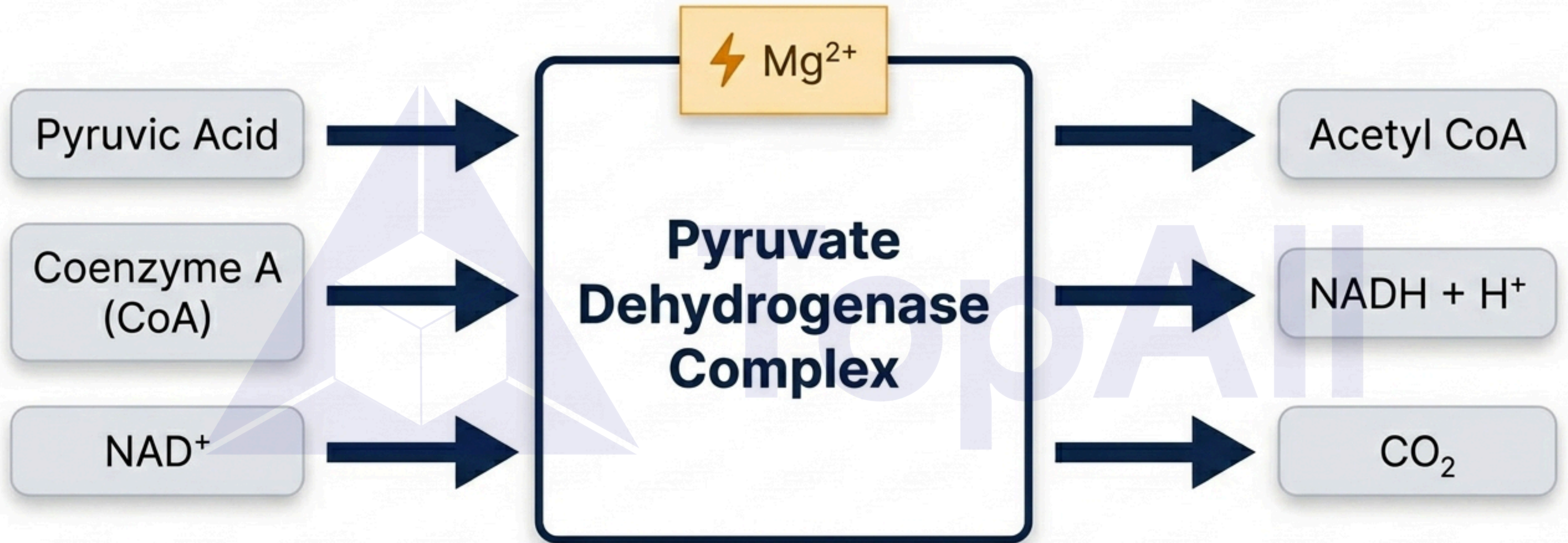
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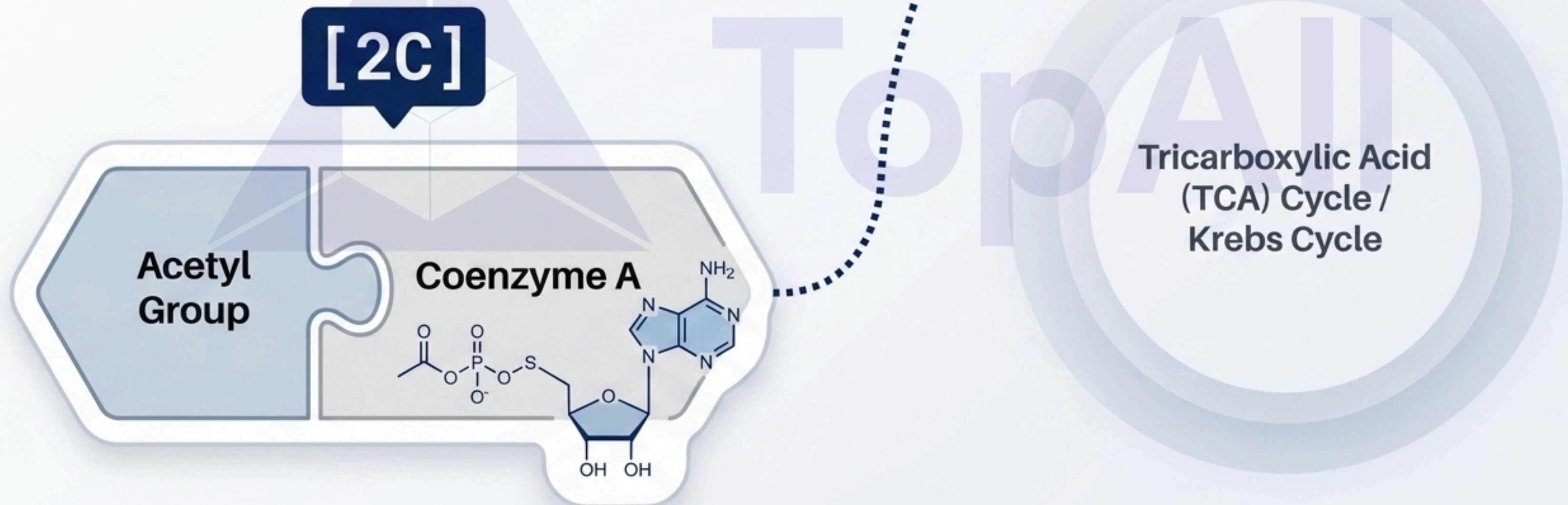


Pyruvate Dehydrogenase: The Cellular Checkpoint

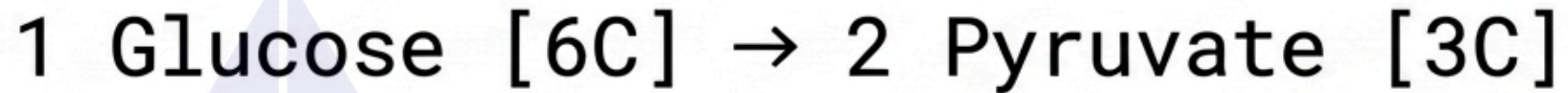


Acetyl CoA Formation

The acetyl group condenses with Coenzyme A, creating the vital 2-carbon intermediary. This newly formed Acetyl CoA acts as the primary substrate, primed and ready to enter the Krebs cycle by reacting with Oxaloacetic acid (OAA).



Stoichiometric Accounting: Tracking the Yield



x2



Waste product removed



Redox equivalents banked for the
Electron Transport System

Glycolysis breaks a single glucose into two pyruvates. Therefore, the Pyruvate Dehydrogenase complex runs twice per glucose molecule, doubling the output of the Link Reaction.

The Bridge is Complete



Key Takeaway: The oxidative decarboxylation of pyruvate acts as the vital biochemical bridge. It safely transitions cellular metabolism from the anaerobic cytosol into the high-yield, oxygen-dependent mitochondrial matrix, capturing high-energy electrons and priming carbon for complete oxidation in the Krebs Cycle.



You've Learned the Theory.

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