

# Splitting Glucose to Start Respiration

Deconstructing the EMP Pathway



# The Foundation of Cellular Respiration



## Discovery & Etymology

The term originates from the Greek *glycos* (sugar) and *lysis* (splitting).

### The EMP Pathway

(Named after its discoverers: Gustav Embden, Otto Meyerhof, and J. Parnas).

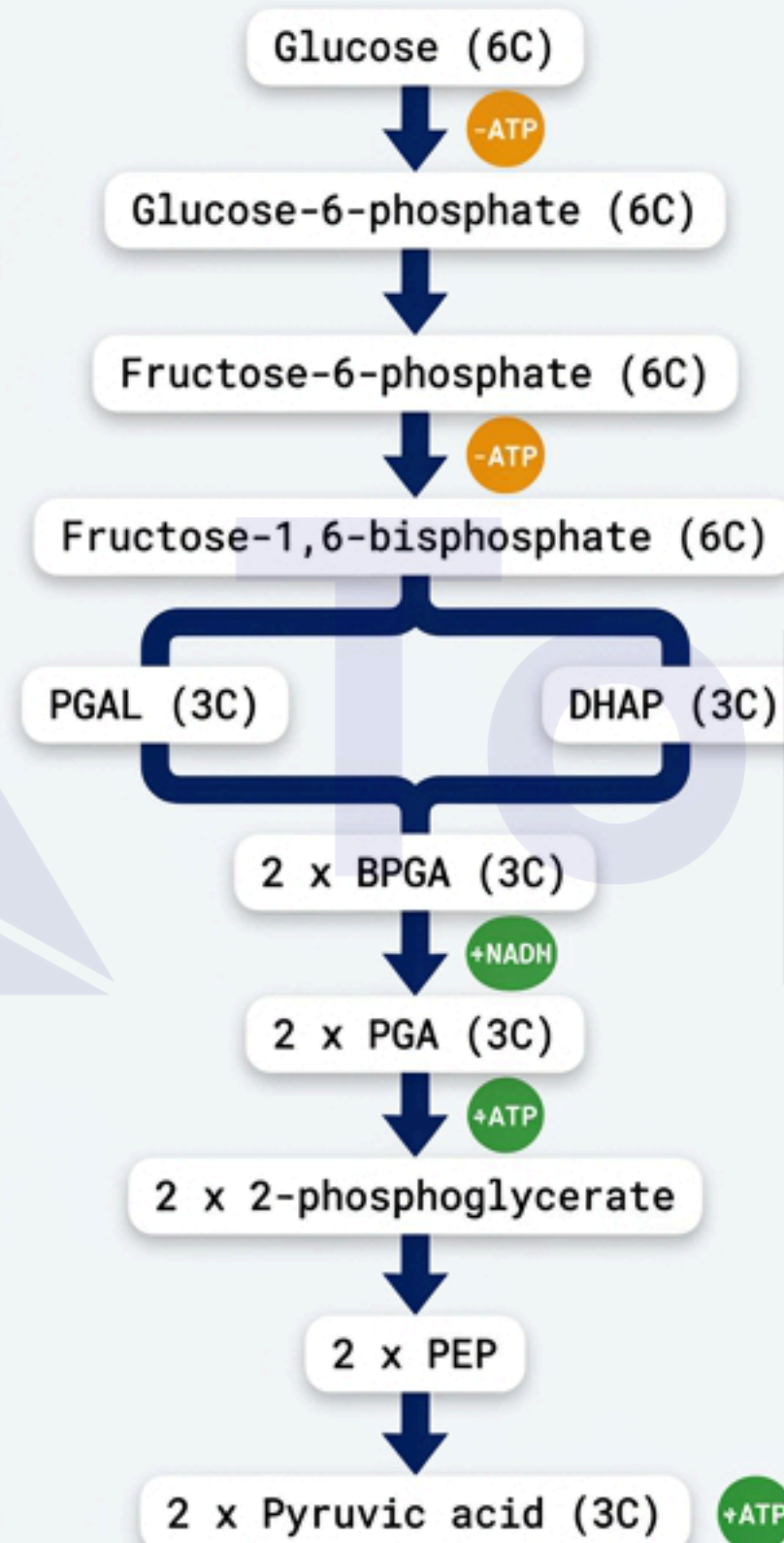


## Site of Operation

Glycolysis occurs strictly in the cytoplasm of the cell. It is present in all living organisms.

**In anaerobic organisms (lacking oxygen), this sequence of reactions is the ONLY process in respiration.**

# The Glycolysis Blueprint





**You've Learned the Theory.  
Let's Test Them Now.**

$$E=mc^2$$



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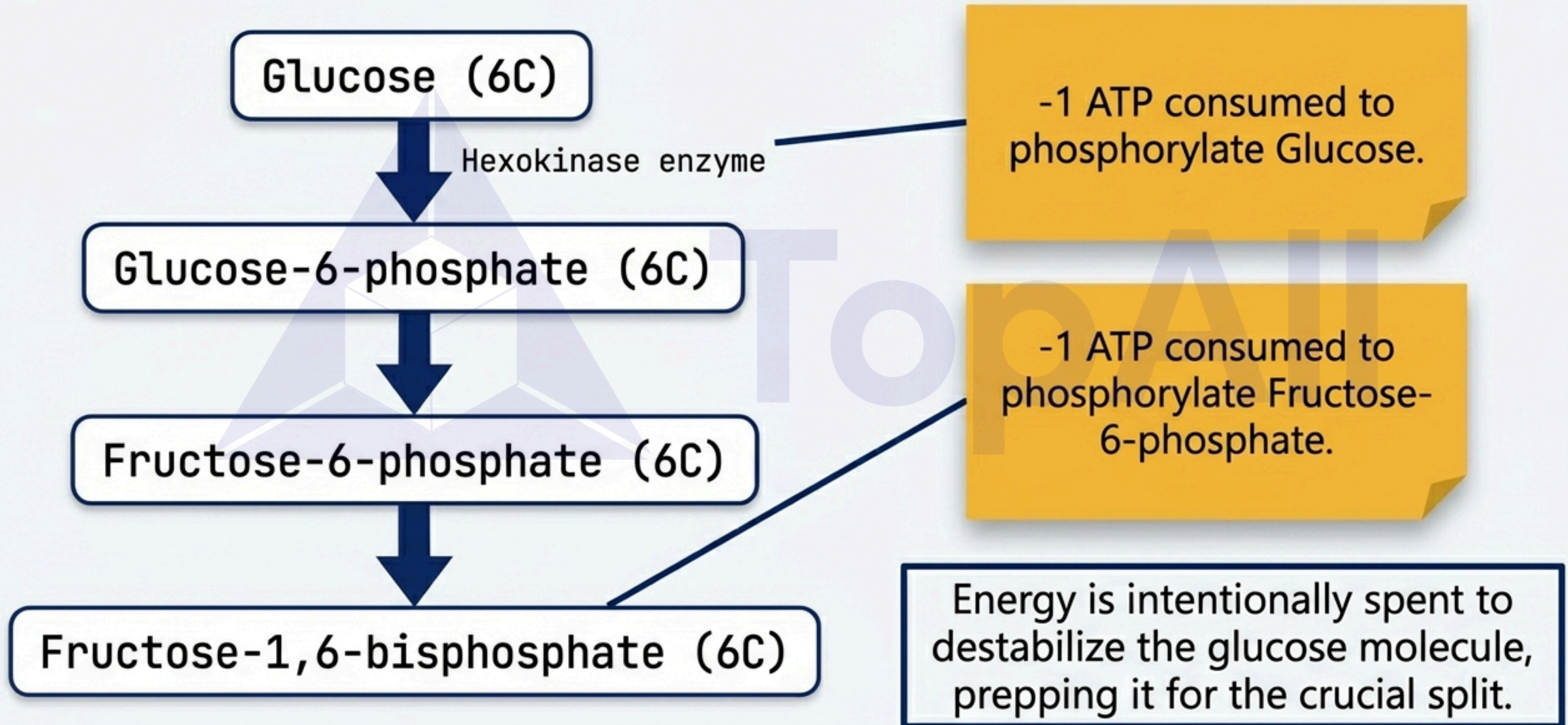
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### Key Highlights

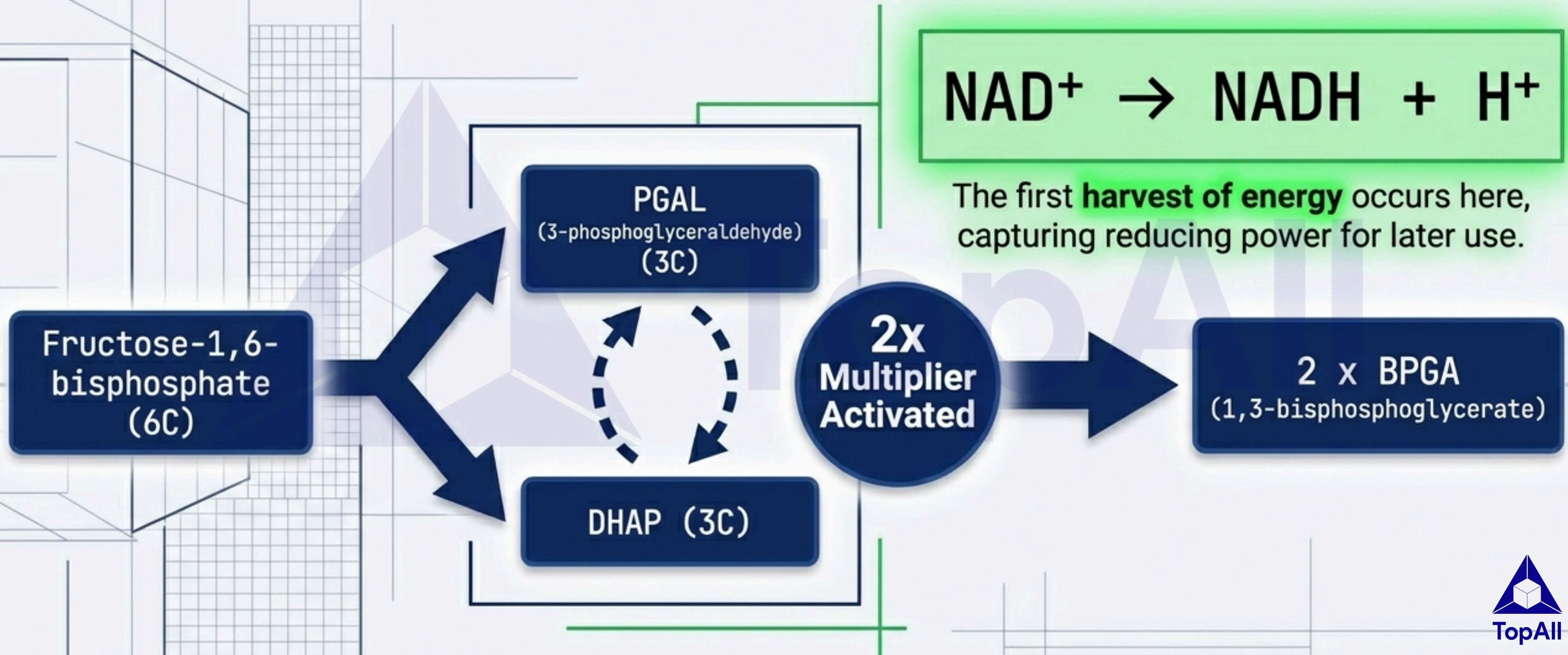
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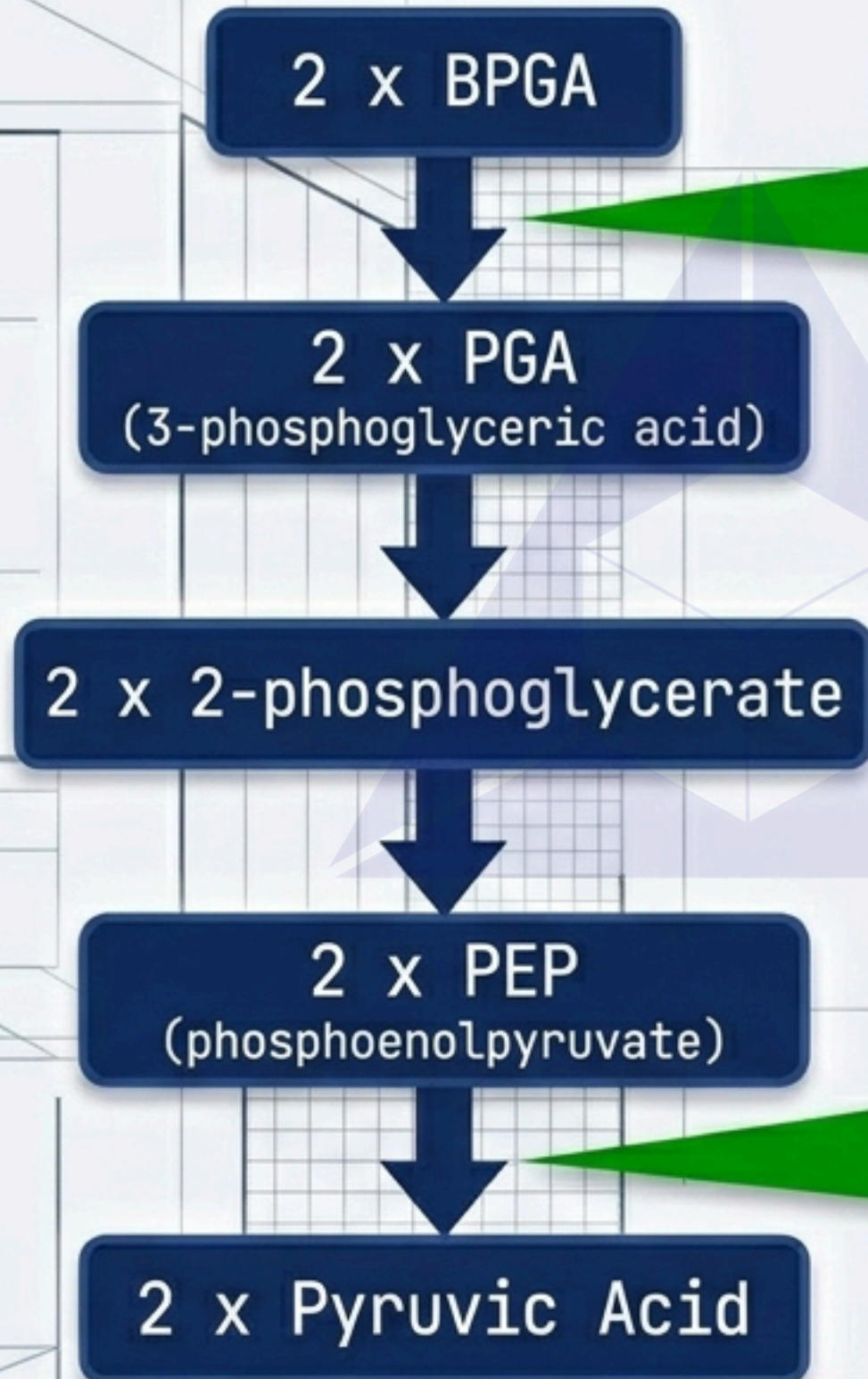
# Phase 1: The Energy Investment



# The Crucial Split & Oxidation



# Phase 2: The Energy Payoff



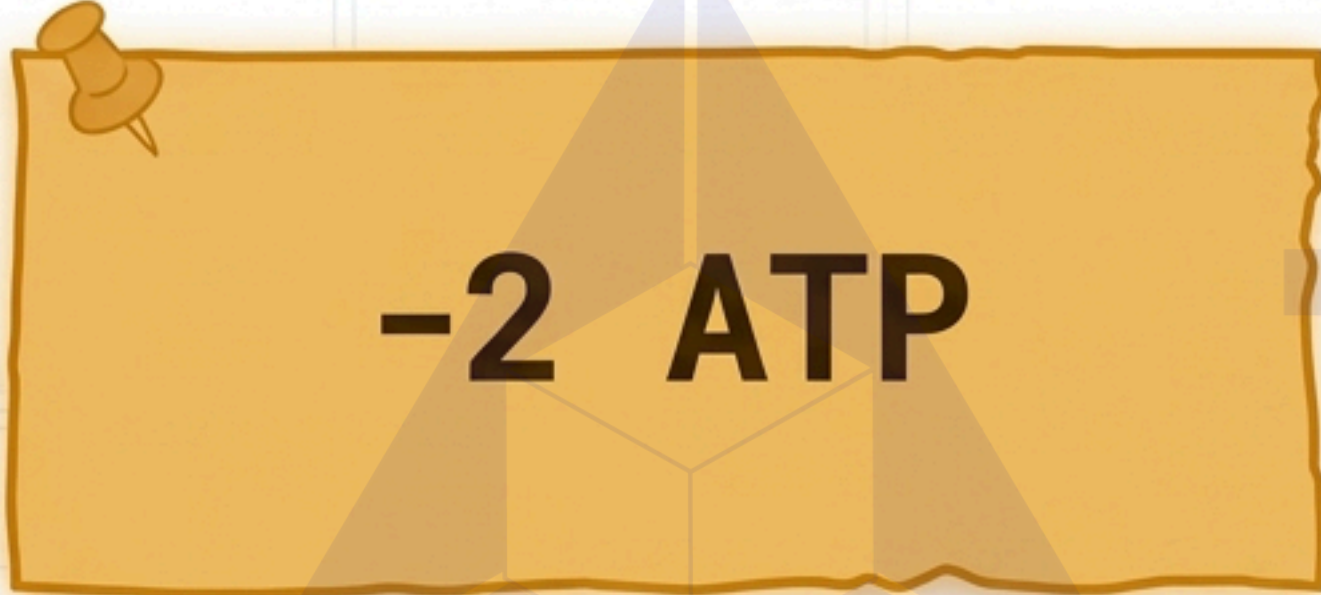
**+2 ATP**  
(Energy trapped by  
direct formation of ATP)

**+2 ATP**  
(Second direct  
synthesis of ATP)

Because the glucose molecule was split into two 3-carbon halves, the ATP yield in this phase is doubled.

# The Energy Balance Sheet

## Energy Spent



**-2 ATP**

Utilized during the conversion  
to Glucose-6-phosphate and  
Fructose-1,6-bisphosphate.

## Energy Harvested

**+4 ATP**  
(Direct synthesis)

**+2 NADH**  
(Reducing equivalents)

Bottom Line

**NET GAIN PER GLUCOSE = 2 ATP + 2 NADH**

# The Final Yield

**1 Glucose (6C)  $\rightarrow$  2 Pyruvic Acid (3C)**

*What is the metabolic fate of Pyruvic Acid?  
It depends on cellular needs and oxygen availability.*

## **Path A (No Oxygen)**

Anaerobic  $\rightarrow$  Lactic Acid or  
Alcoholic Fermentation  
(in cytoplasm).

## **Path B (Oxygen Present)**

Aerobic  $\rightarrow$  Transported to  
mitochondria for complete  
oxidation via the Krebs Cycle.



# You've Learned the Theory.

## Now Let's Test It.

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