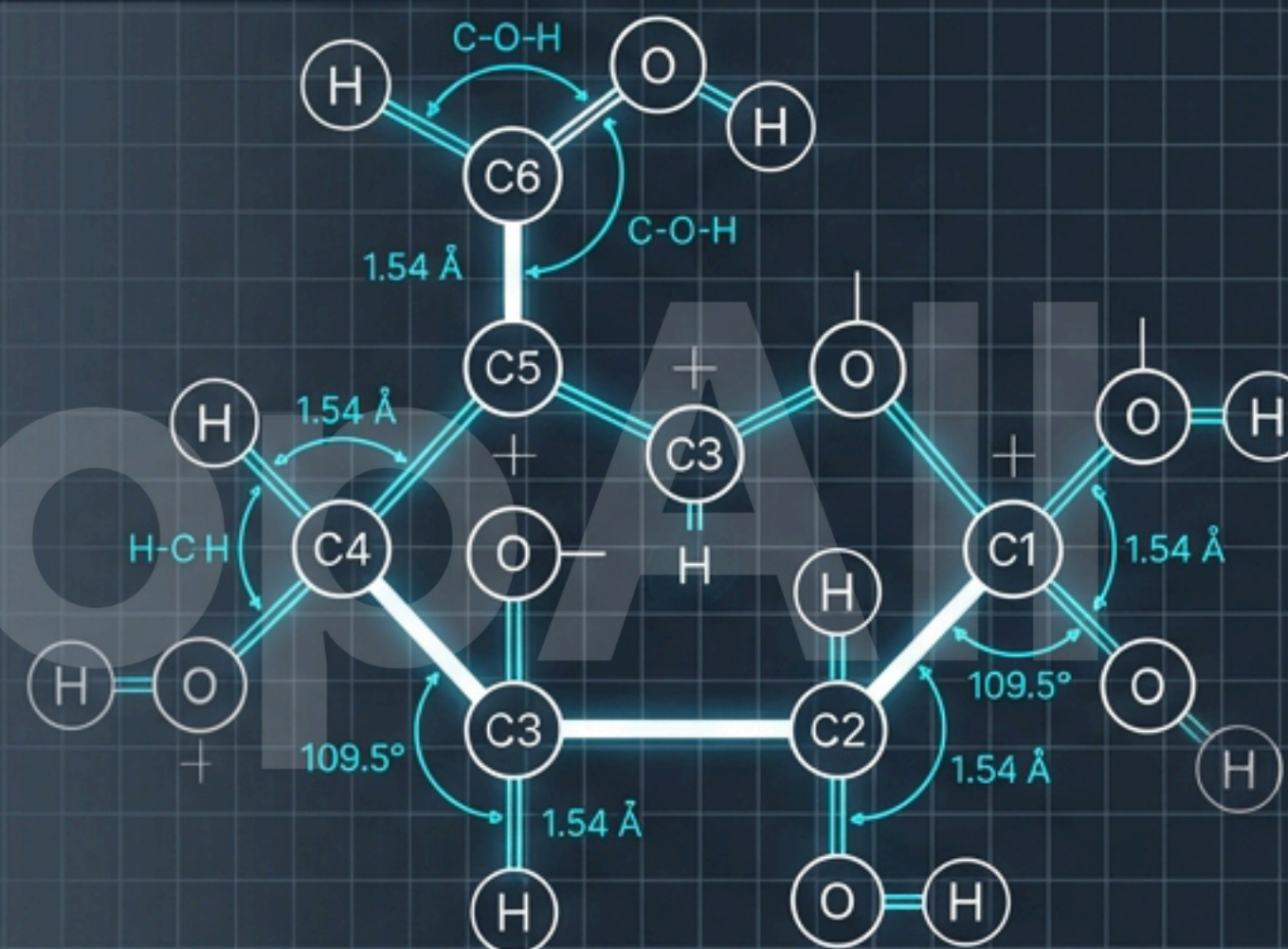
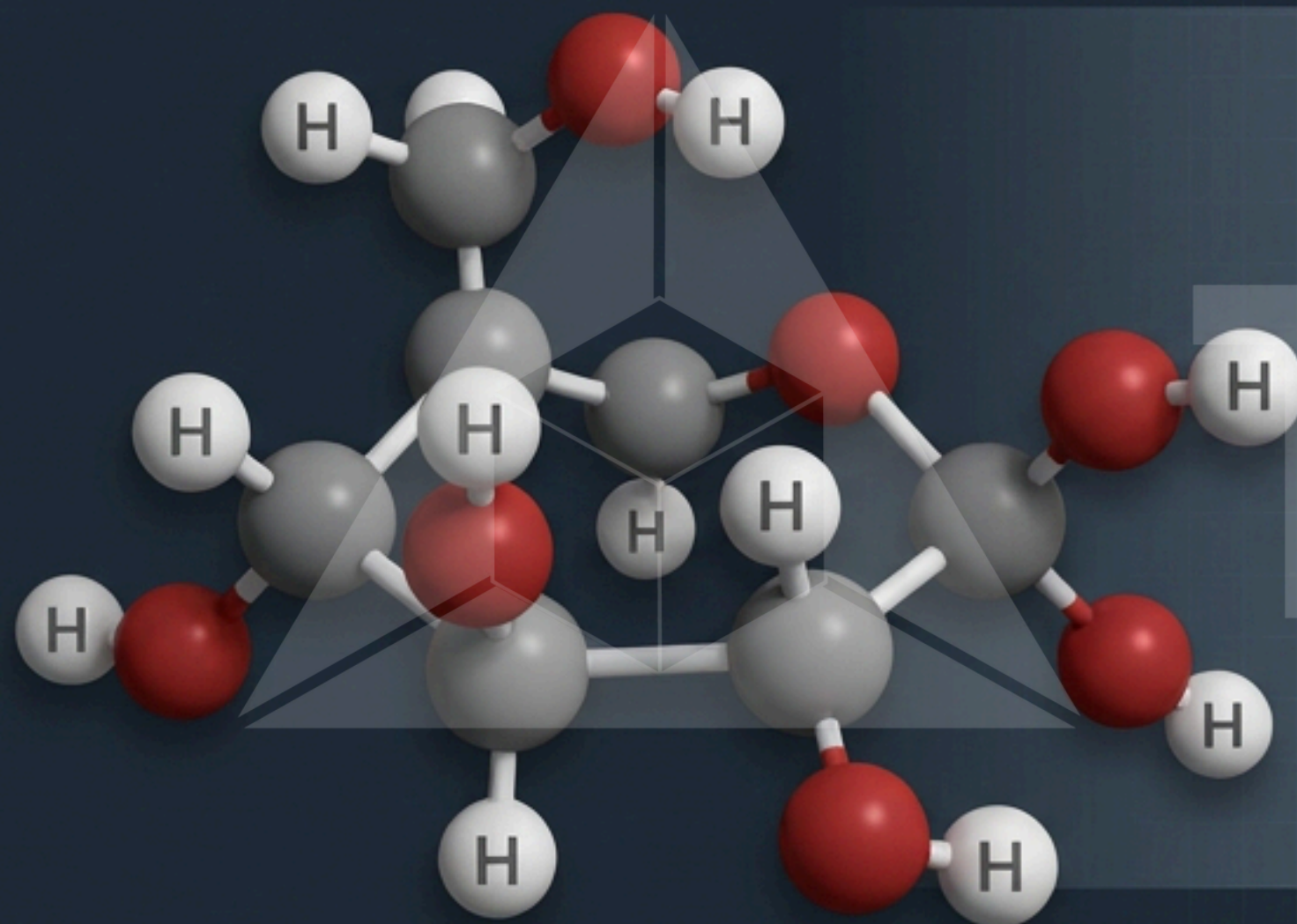


The Structure of Glucose

A Step-by-Step Elucidation of Nature's Primary Energy Molecule



2D Technical Schematic: Wireframe representation highlighting bond angles and atomic connectivity.

Step 1: Establishing the Carbon Backbone

The Formula

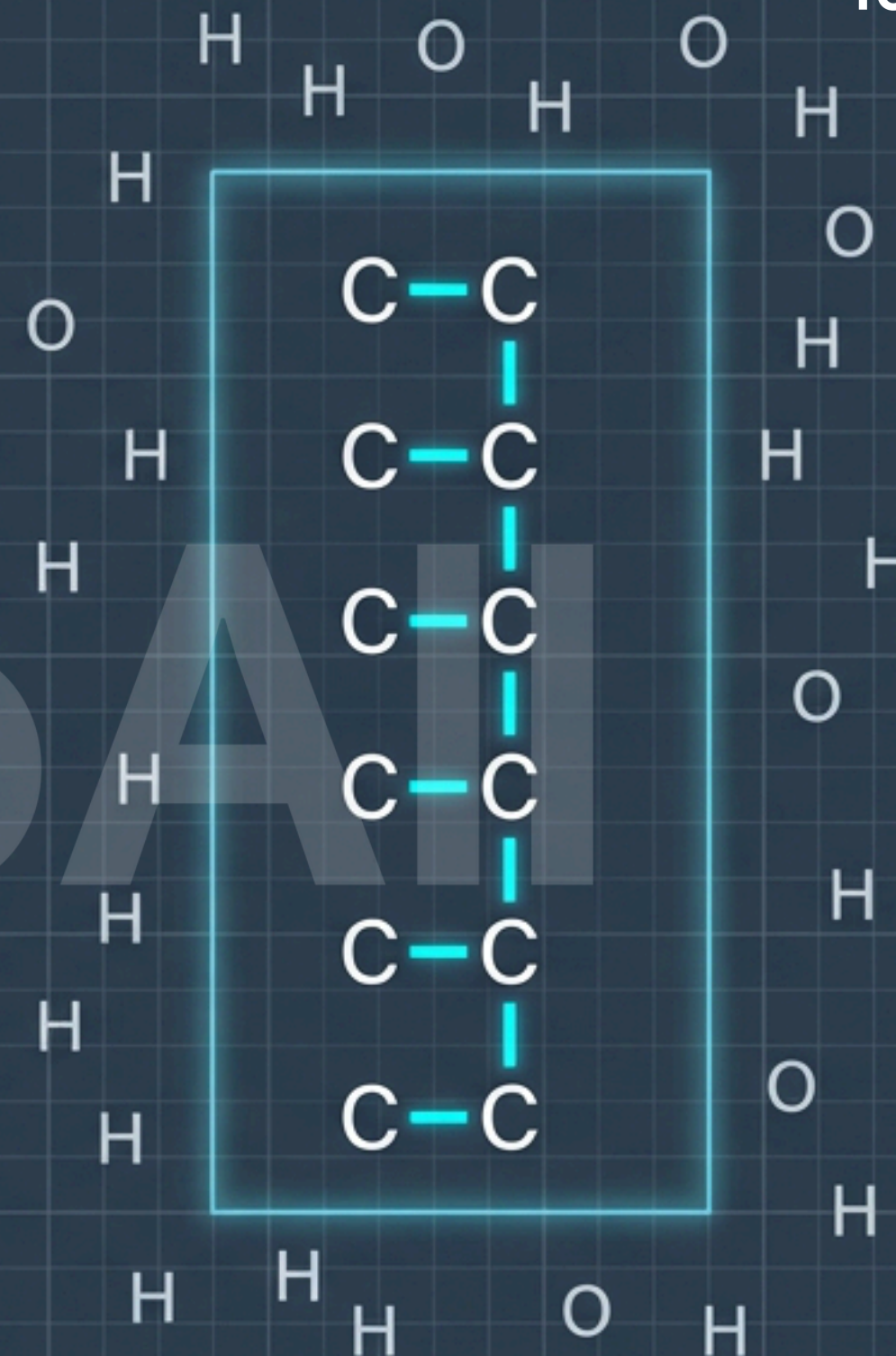
Elemental analysis reveals a baseline molecular formula of $C_6H_{12}O_6$.



The Deduction:

Yields a straight-chain alkane.

Conclusion: All six carbon atoms are linked in a continuous, unbranched straight chain.

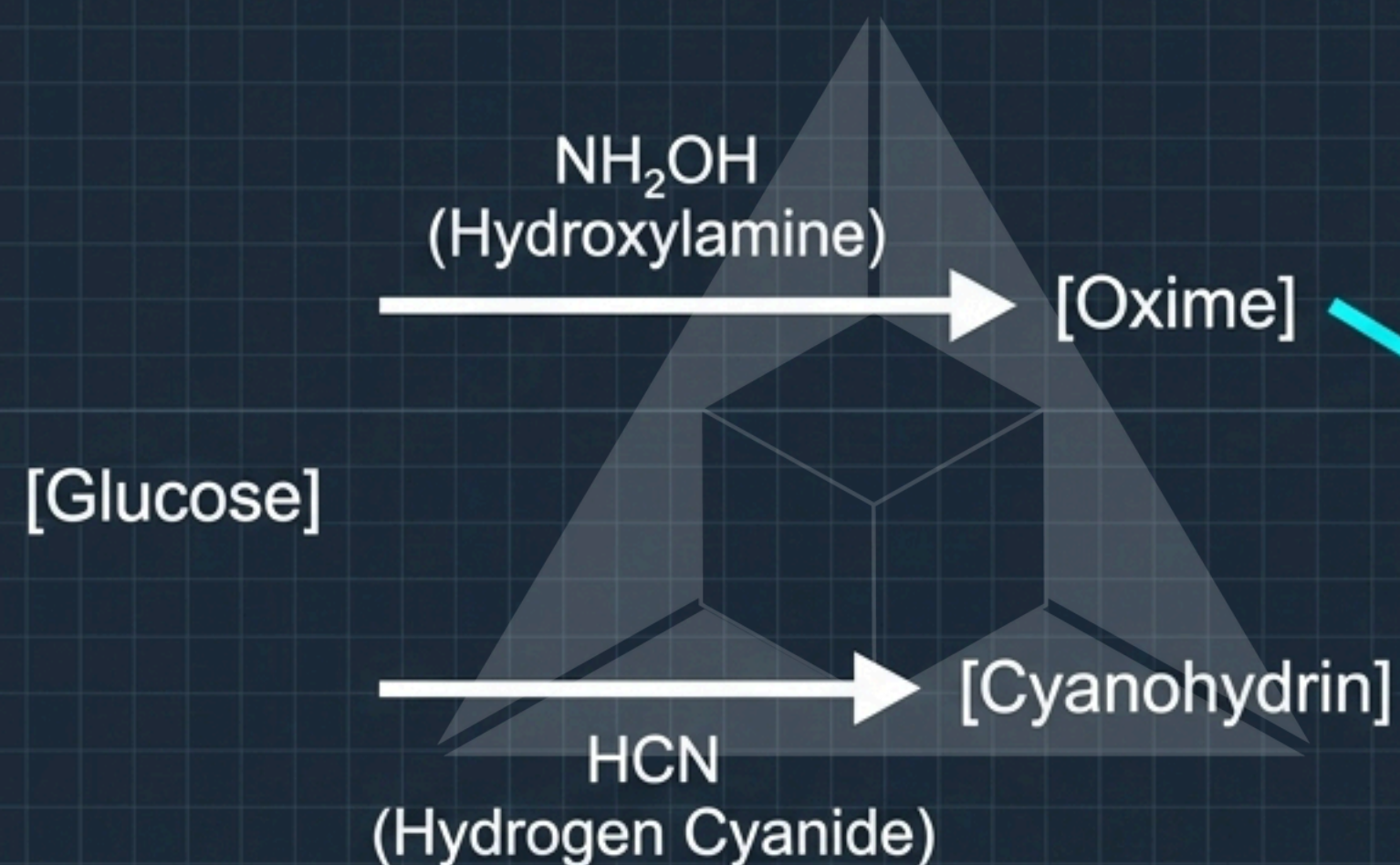


Step 2: Locating the Reactive Center



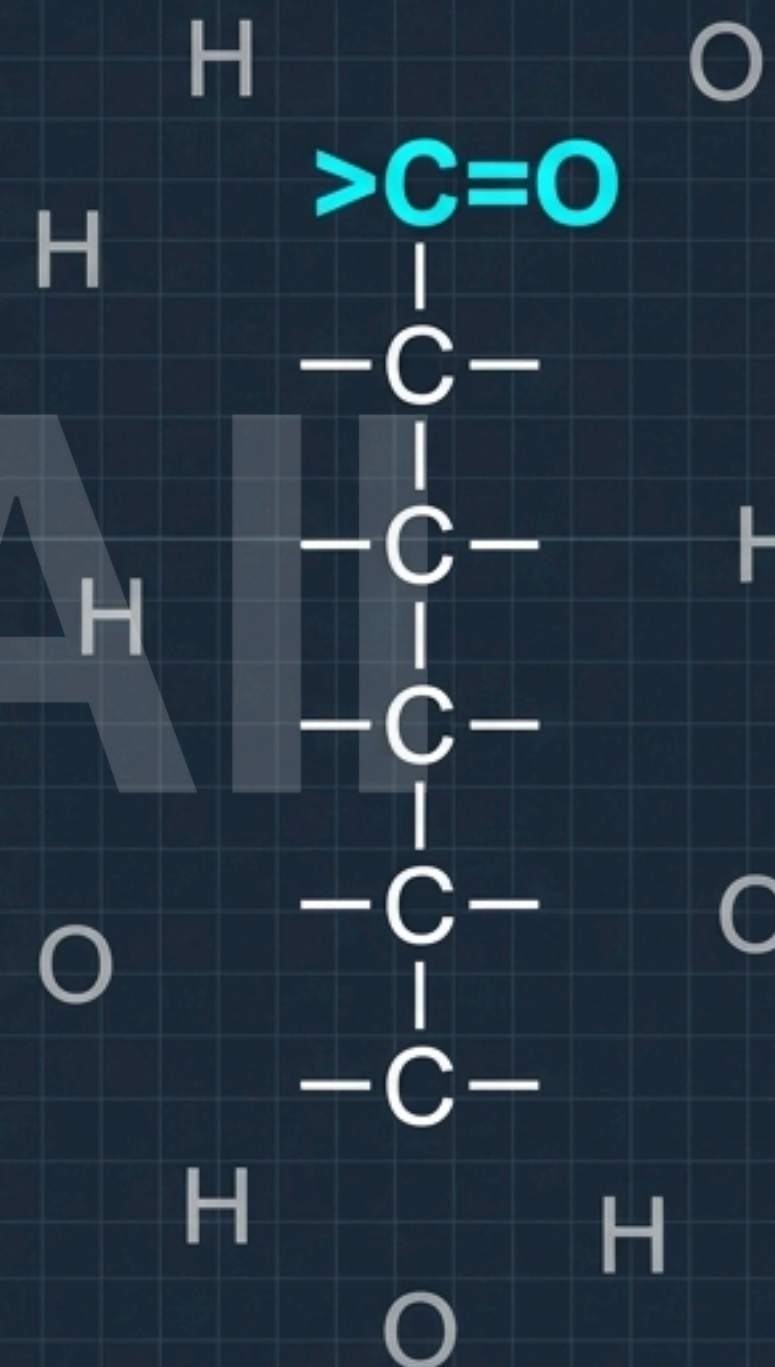
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Specific addition reactions confirm the presence of a **Carbonyl Group** ($>\text{C}=\text{O}$).

Blueprint Build





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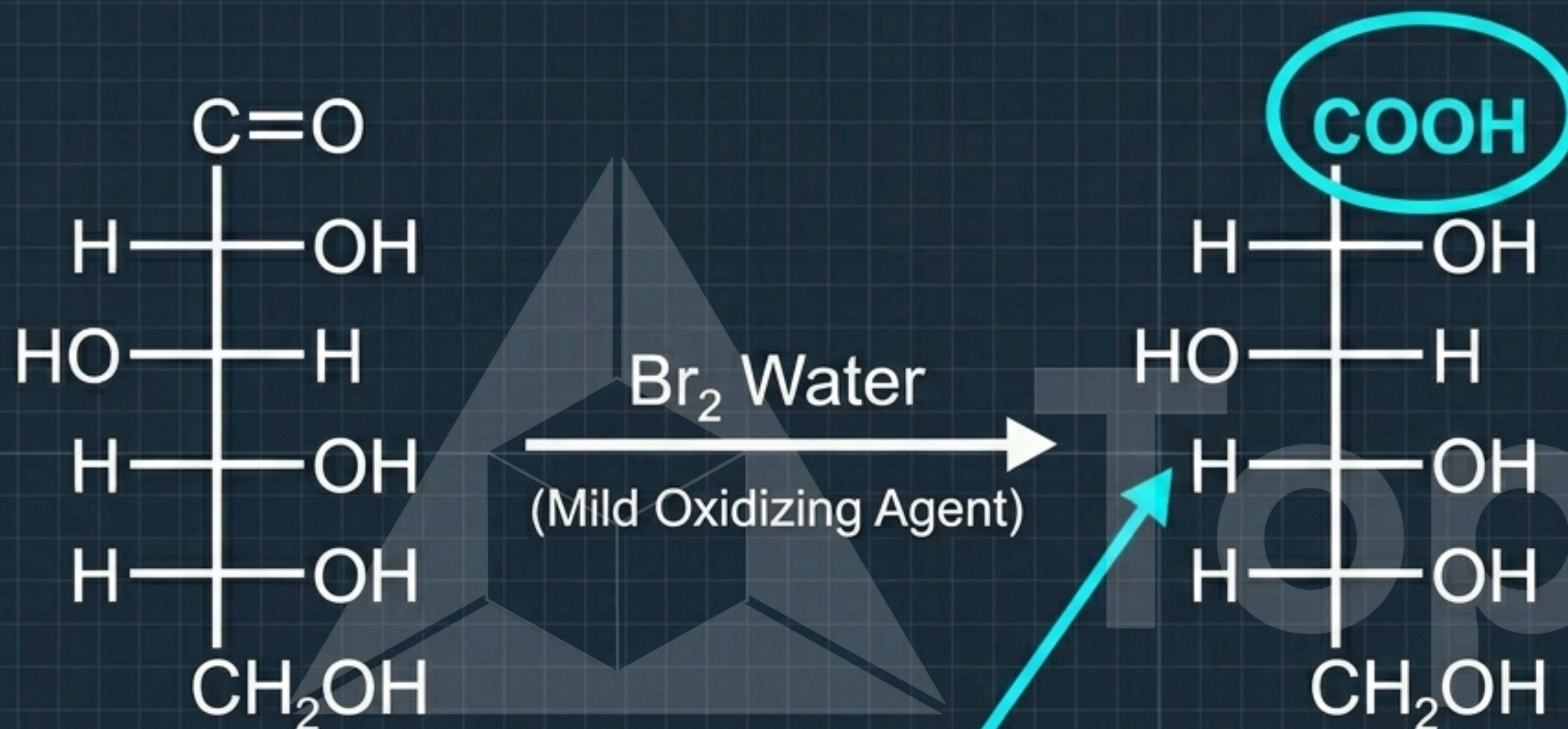


Step 3: Specifying the Carbonyl Type



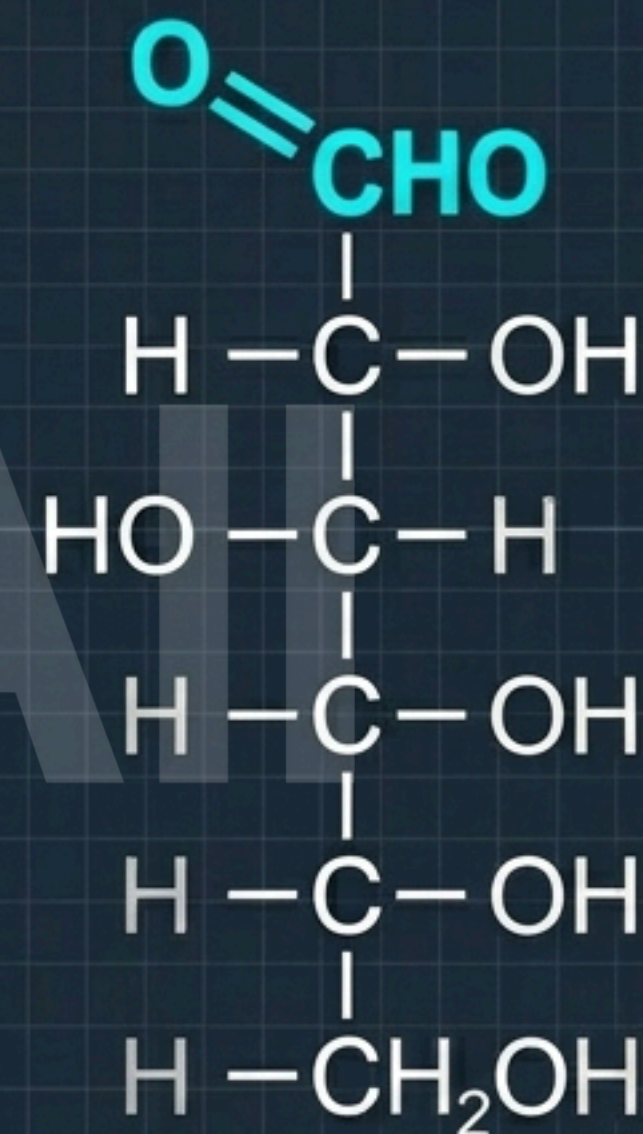
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Gluconic acid is a six-carbon carboxylic acid. Because the carbon chain remains unbroken during oxidation, the carbonyl group must be situated at the terminal end—making it an **Aldehyde (–CHO)**.

Blueprint Build

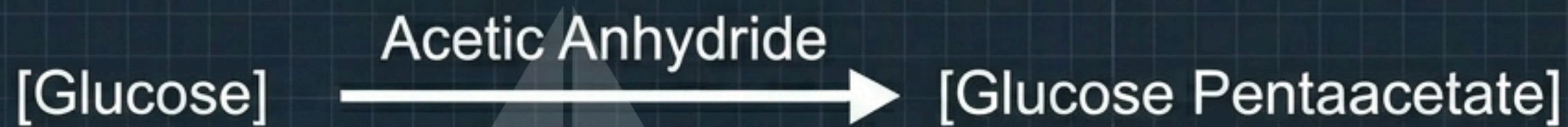


Step 4: Counting the Hydroxyls



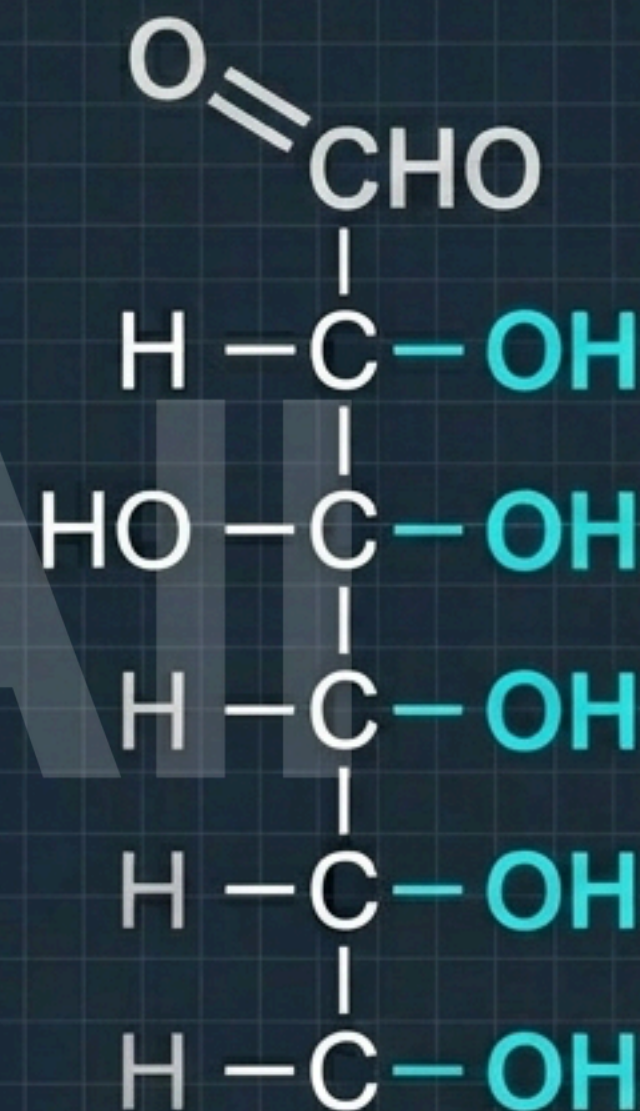
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The formation of a highly stable pentaacetate confirms exactly five -OH groups. Their stability implies they are attached to five different carbon atoms (multiple -OH on one carbon would be unstable).

Blueprint Build



Step 5: Identifying the Primary Alcohol



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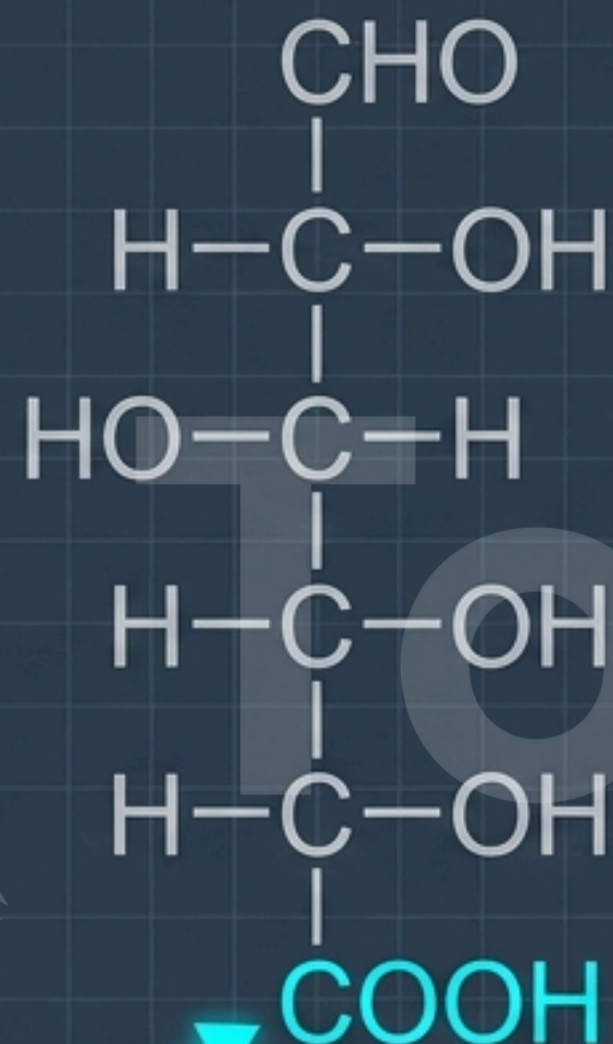
Glucose

HNO_3
(Vigorous Oxidation)

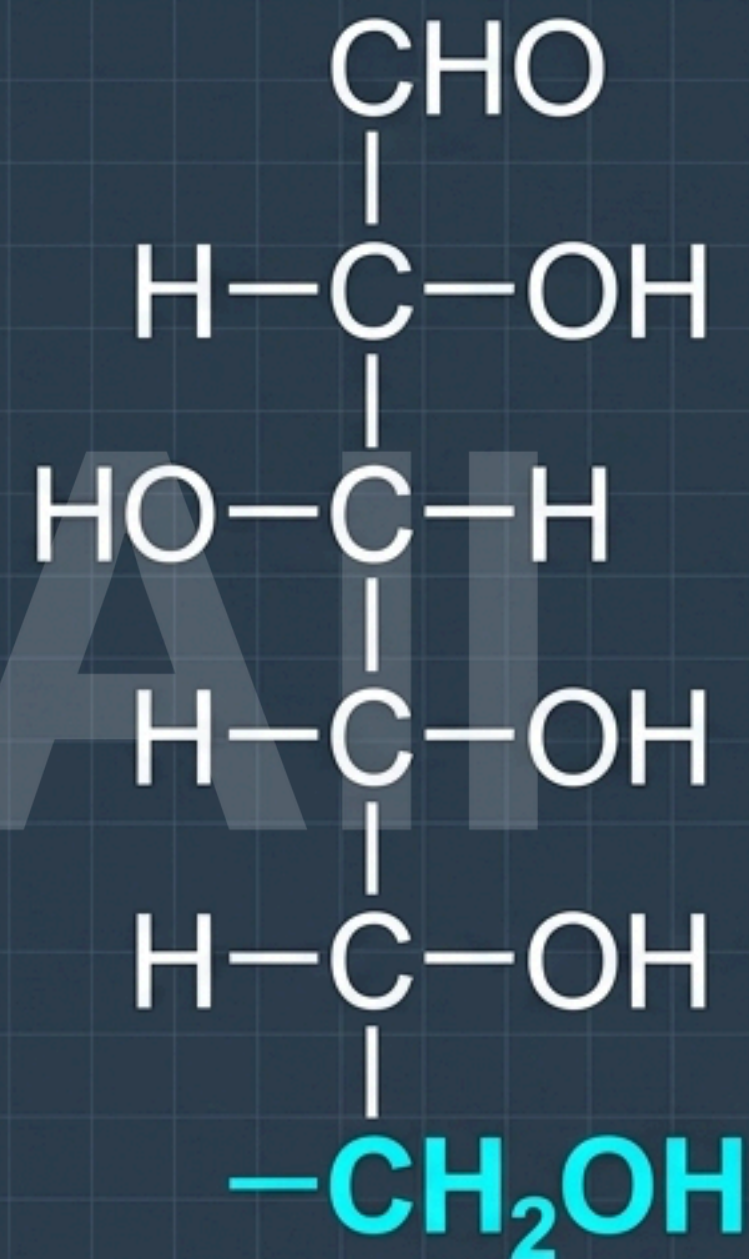
Gluconic Acid

HNO_3
(Vigorous Oxidation)

Yields a dicarboxylic acid (carboxylic groups at both ends). Since the top is already an aldehyde, the bottom end must be a primary alcohol ($-\text{CH}_2\text{OH}$) to allow oxidation without breaking the chain.



Blueprint Build



1D Connectivity
Complete

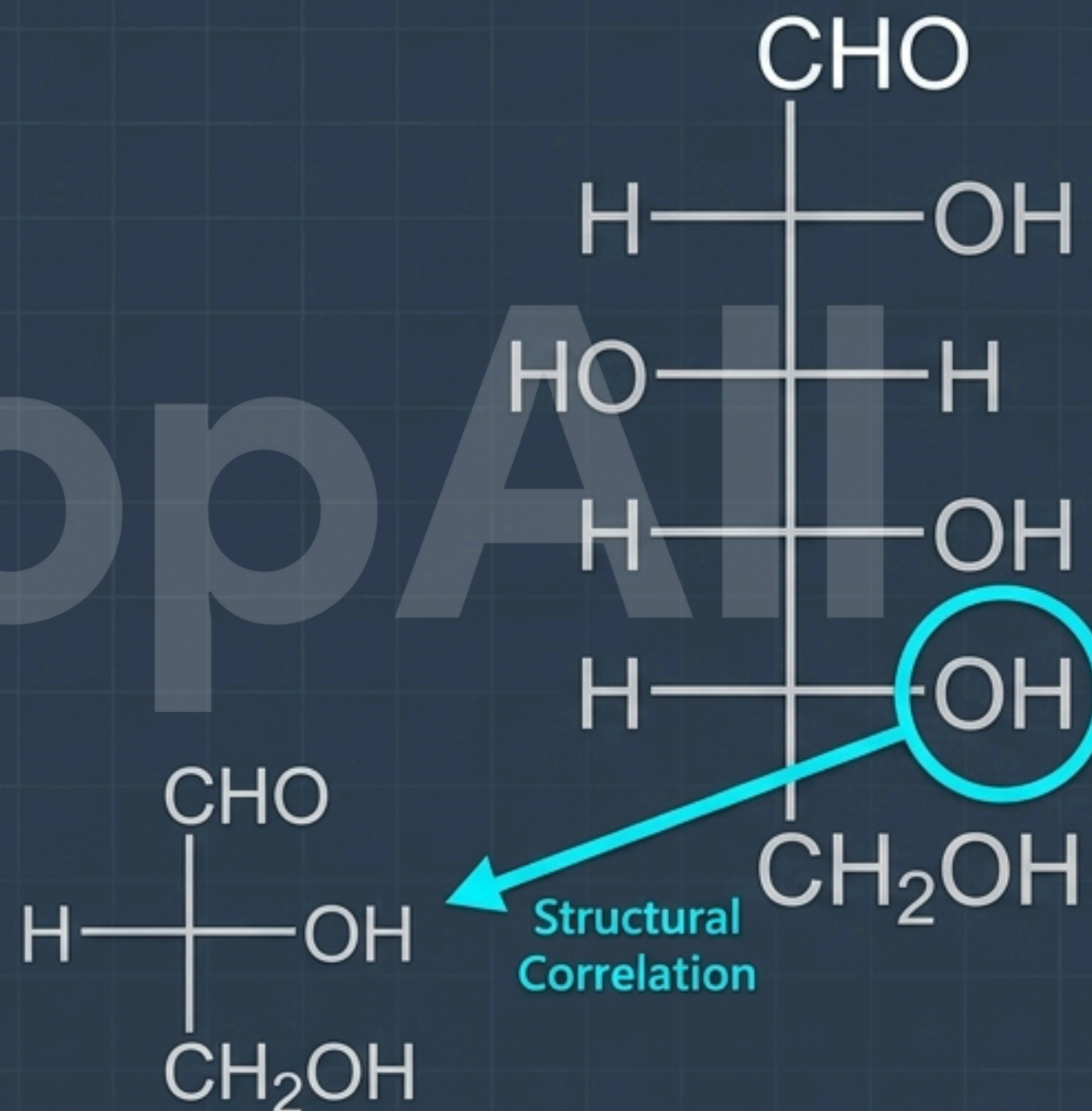
The Complete Blueprint: D-(+)-Glucose

Investigation Panel

Decoding the Name

1. **The Spatial Arrangement:** Emil Fischer deduced the exact left/right spatial orientation the -OH groups through chemical correlation.
2. **D Configuration:** The -OH group on the lowest asymmetric carbon (C5) is on the right, matching the reference structure of D-(+)-glyceraldehyde.
3. **(+) Rotation:** The molecule is dextrorotatory (rotates plane-polarized light to the right).

The Final Blueprint





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