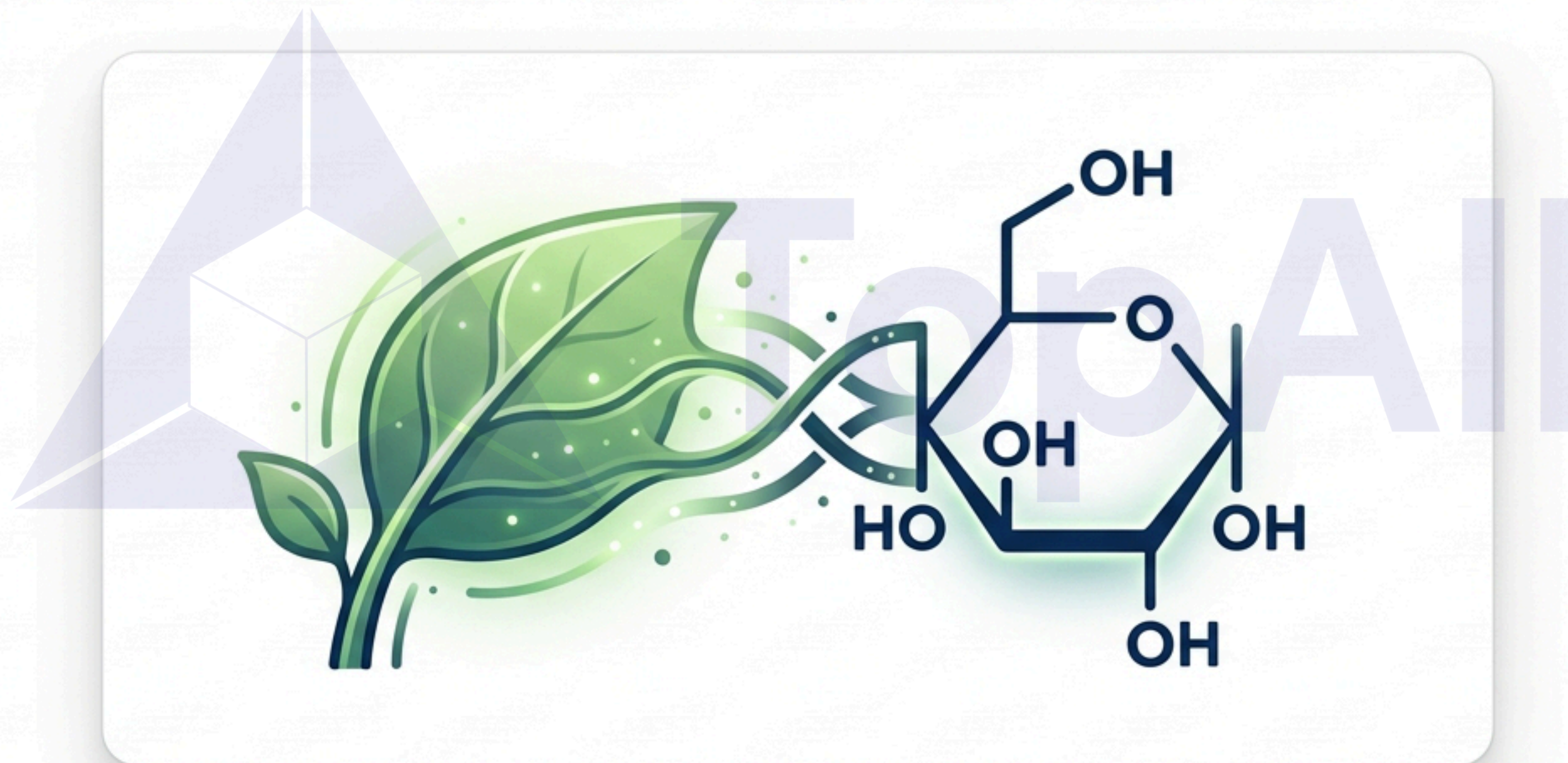


10.1 Carbohydrates

From plant production to the molecular logic of life processes.



[Exam Revision Guide]

[High-Yield Visuals]

[NCERT Aligned]

The fundamental molecules of life and energy

Primarily Produced by Plants



Form a massive group of naturally occurring organic compounds that sustain living systems.

The Saccharides

sakcharon → sugar

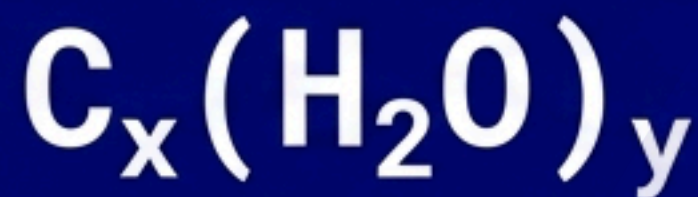
Carbohydrates that are sweet in taste are commonly known as sugars (e.g., sucrose in homes, lactose in milk).

Dietary Essentials



Interact with other biomolecules to constitute the molecular logic of life, serving as essential constituents of our food.

The Hydrates of Carbon historical fallacy



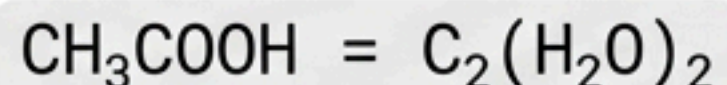
Early chemists believed these molecules were simply hydrates of carbon.

Glucose perfectly fits as $\text{C}_6(\text{H}_2\text{O})_6$ $\text{C}_6\text{H}_{12}\text{O}_6$ ✓

False Positive

[Fits formula, but NOT a carbohydrate]

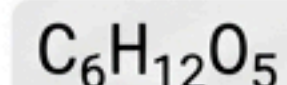
Acetic Acid



False Negative

[Doesn't fit formula, but IS a carbohydrate]

Rhamnose



A large number of reactions showed they contain specific functional groups, requiring a new definition.



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

$$E=mc^2$$



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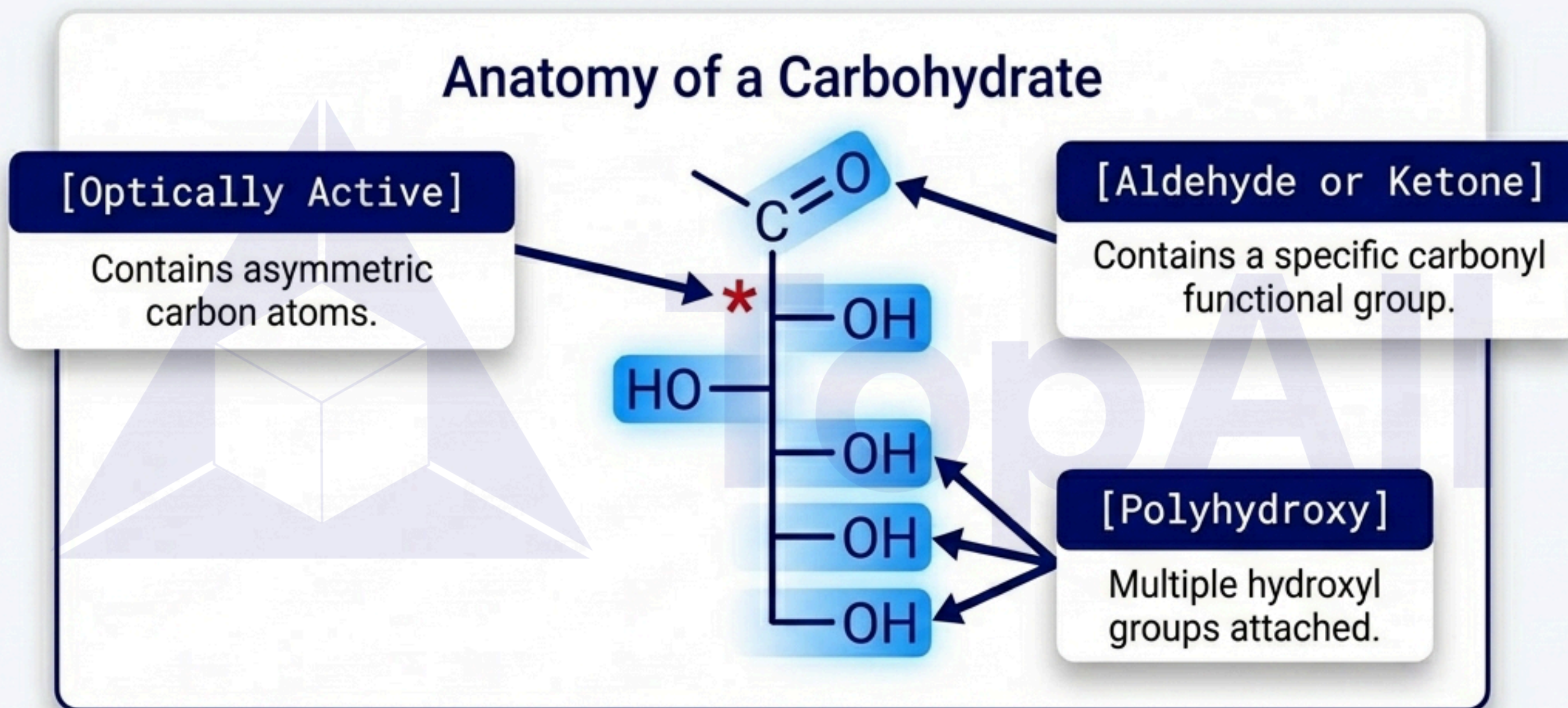
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Key Highlights

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The modern chemical definition, deconstructed



Optically active polyhydroxy aldehydes or ketones
(or compounds which produce such units on hydrolysis).

Classification based on hydrolysis behavior

Monosaccharides

Yields: 0 further units

Cannot be hydrolysed further into simpler polyhydroxy aldehydes/ketones. (~20 known in nature).

[Glucose]

[Fructose]

Oligosaccharides

Yields: 2-10 units

Yields two to ten monosaccharide units on hydrolysis. Disaccharides are the most common.

[Sucrose] → yields glucose + fructose

[Lactose] → milk sugar

Polysaccharides

Yields: >10 units

Yields a large number of monosaccharide units. Not sweet (also called non-sugars).

[Starch]

[Cellulose]

The ultimate purpose: Energy and Structure

The Structure-Function Loop

Carbohydrates as Energy



- **Storage:** [Starch] [Glycogen]
(Starch in plants, animal starch stored in liver/muscles).
- **Instant Fuel:** Honey, containing glucose/fructose, is used as an instant energy source (e.g., by Vaids in Ayurveda).

Carbohydrates as Structure



- **Cellular Framework:** [Cellulose]
Makes up the predominant constituent of plant and bacterial cell walls.
- **Industrial Utility:** Forms the basis of wood for furniture and cotton fiber for clothing.

From simple optically active aldehydes/ketones to the macro-structures that build and fuel the living world.



You've Learned the Theory.

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