

Unit 10 Biomolecules

10.1.4

Polysaccharides

The Architecture of Energy
and Structure in Nature



Beyond Simple Sugars



Chemical Nature

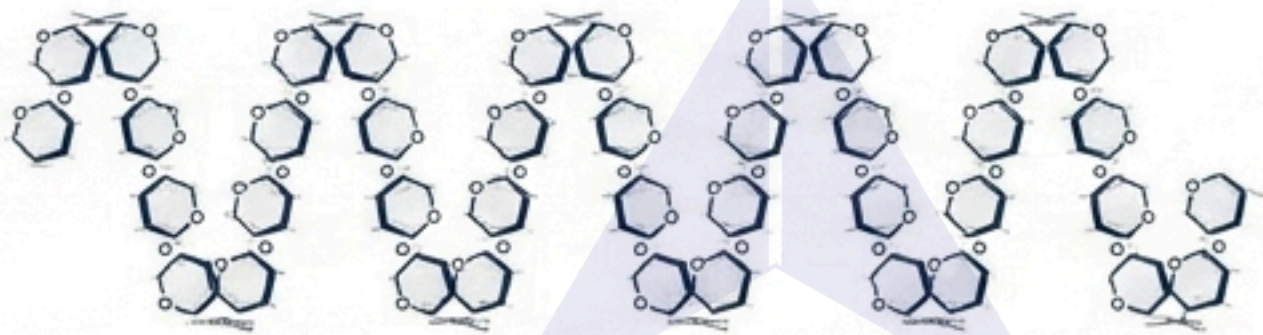
- Yields large numbers of monosaccharide units on hydrolysis.
- Joined by oxygen bridges.
- Specifically known as non-sugars because they are not sweet to the taste.

Primary Biological Roles

FOOD STORAGE

STRUCTURAL MATERIALS

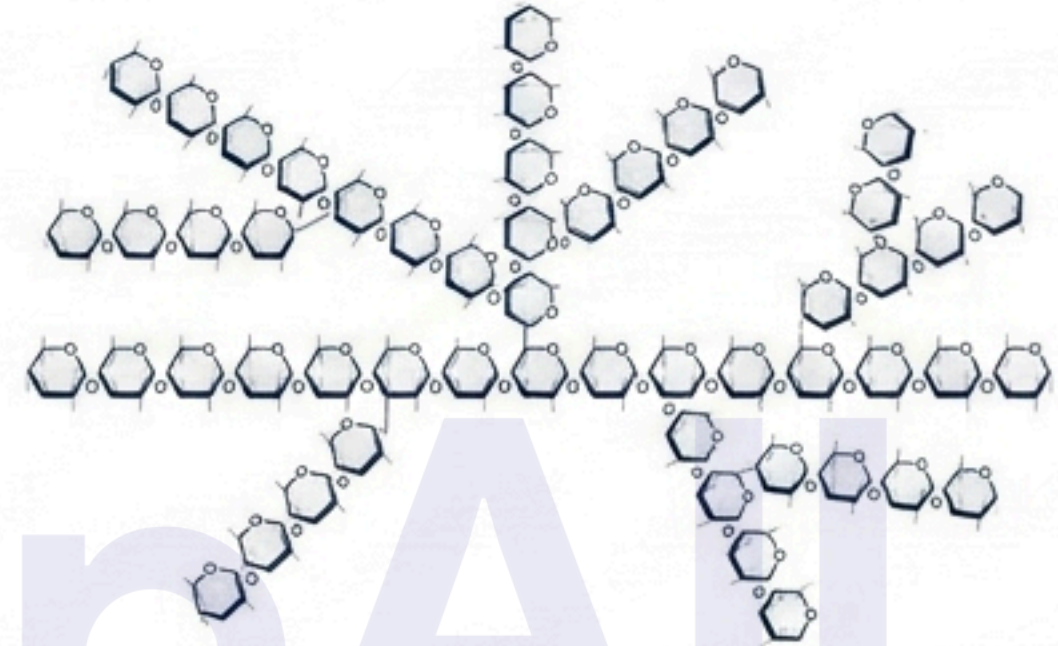
The Dual Components of Starch



Amylose

- Represents 15–20% of starch
- Water-soluble
- Long, unbranched chain polymer
- Composed of 200–1000 α -D-(+)-glucose units

Amylose: C1-C4 glycosidic linkage



Amylopectin

- Represents 80–85% of starch
- Insoluble in water
- Highly branched chain polymer

Amylopectin: C1-C4 chain, C1-C6 branching

The Botanical Backbone

Occurrence

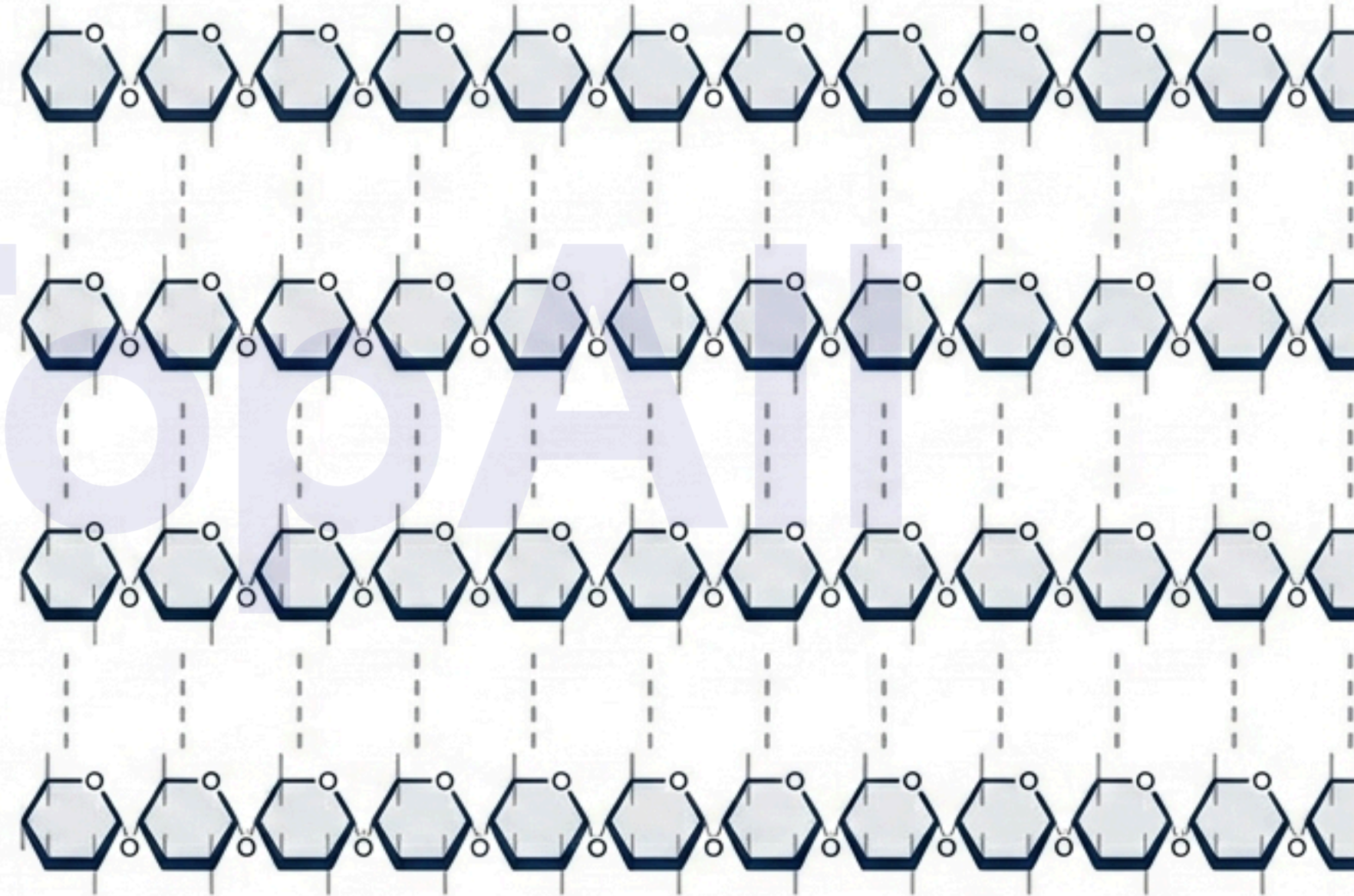
Found exclusively in plants.

The predominant constituent of plant cell walls.

The most abundant organic substance in the entire plant kingdom.

Structure

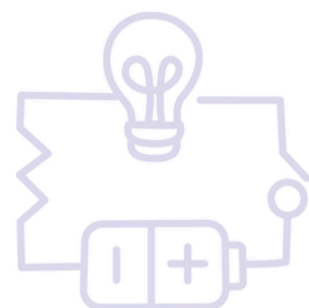
A strict, straight-chain polysaccharide.





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

$$E=mc^2$$



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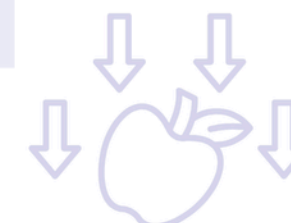
Practice Now



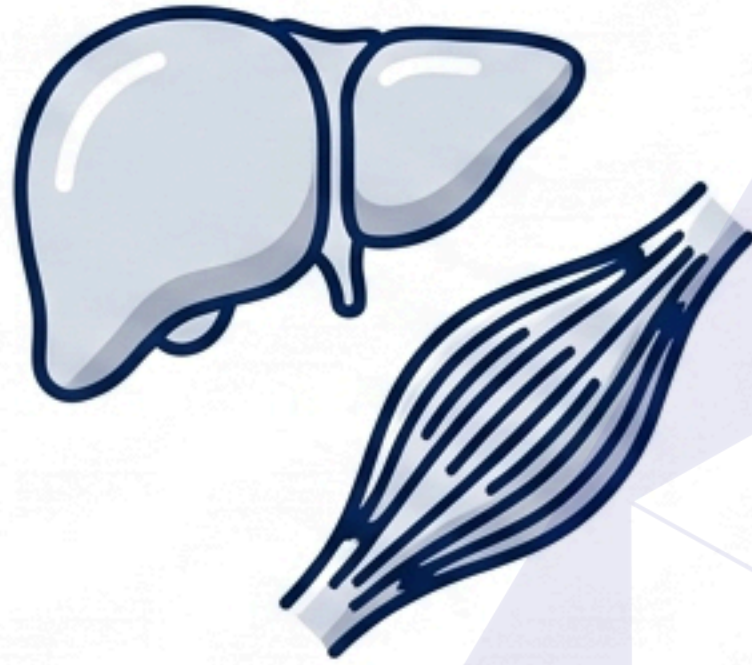
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Key Highlights

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- » Get Clear Explanations, Not Just Marks
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Animal Storage "Animal Starch"



Location

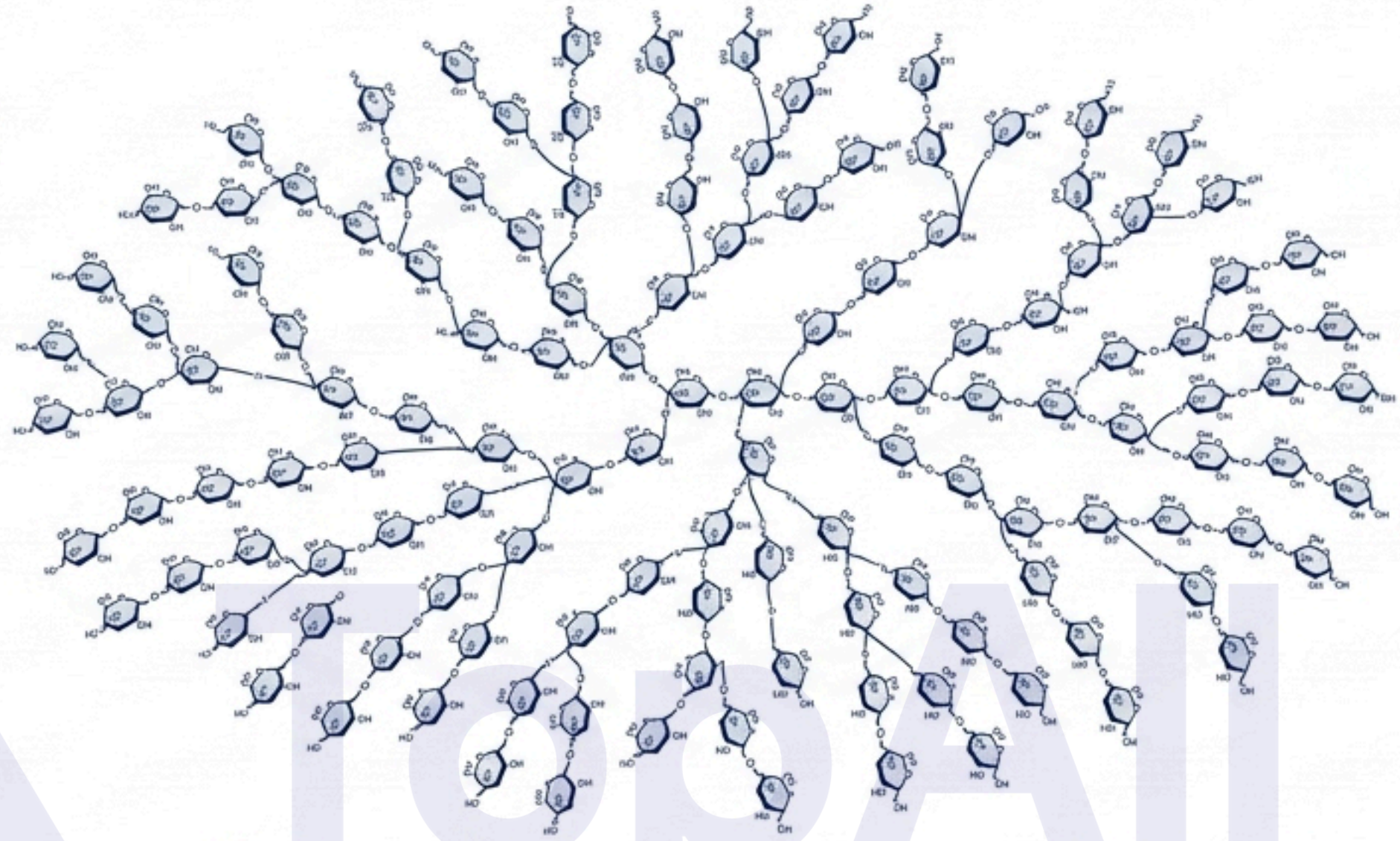
Stored primarily in the animal body (liver, muscles, and brain). Also naturally found in yeast and fungi.

Function

Rapid energy release. When the body needs energy, specific enzymes instantly break down glycogen into glucose for immediate use.

Structure

Chemically similar to amylopectin, but rather more highly branched.



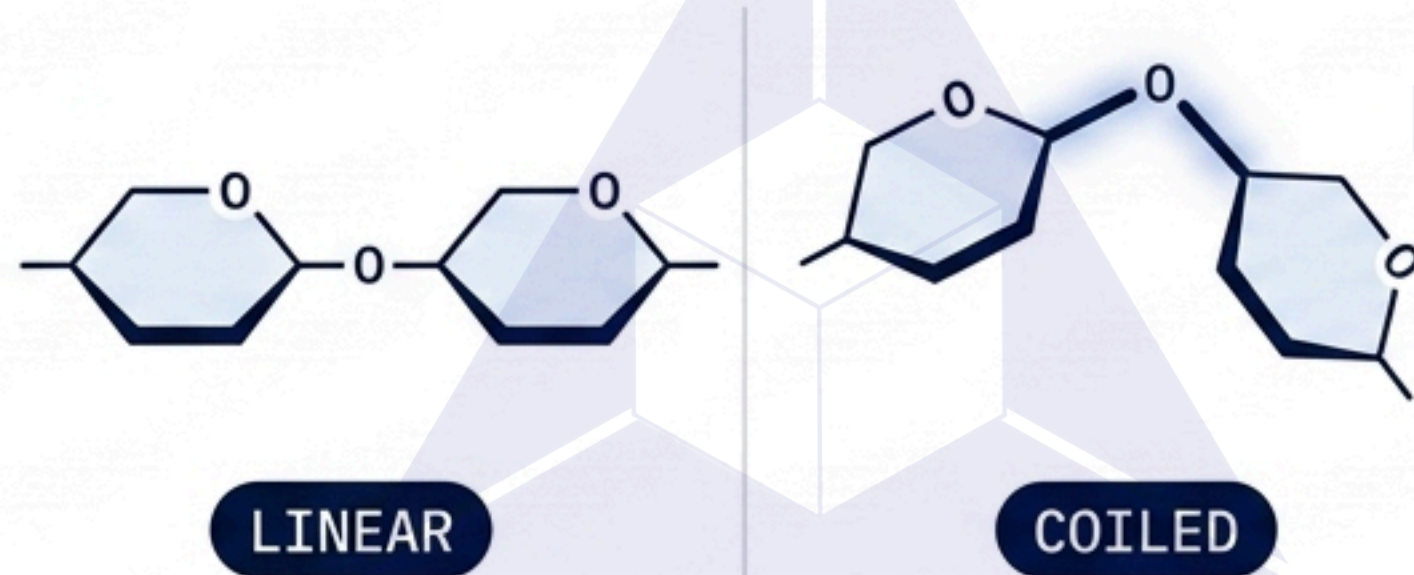
Key-Takeaway Panel

Glycogen serves as the direct animal equivalent to plant starch, optimized for rapid metabolic deployment.

Molecular Logic

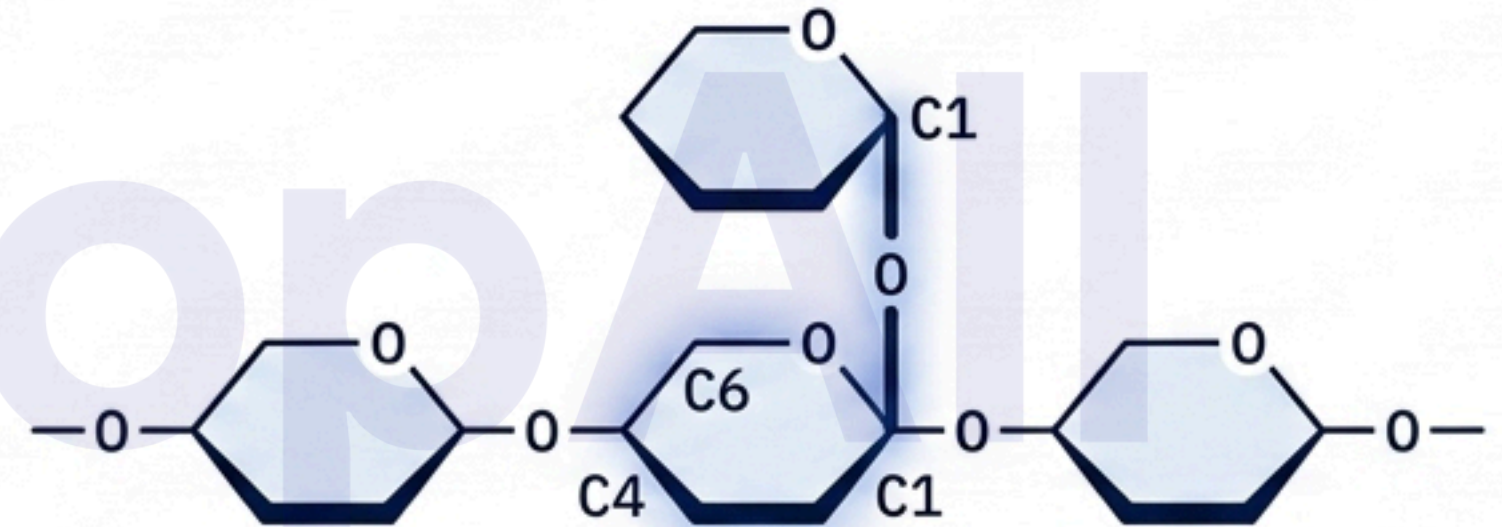
The Secret is in the Linkage

Straight vs. Coiled (C1-C4)



β -D-glucose (Cellulose) creates linear, stackable chains for absolute rigidity, while α -D-glucose (Starch) creates coiling structures optimized for dense packing.

The Power of Branching (C1-C6)



This specific C1-C6 linkage creates branches in Amylopectin and Glycogen. It generates multiple ends for enzymes to attack simultaneously, enabling explosive, rapid energy release.

The Polysaccharide Matrix

Molecule	Primary Function	Source	Monomer Unit	Linkage Type	Branching
Starch (Amylose)	Energy Storage	Plants	α -D-glucose	C1-C4	Unbranched
Starch (Amylopectin)	Energy Storage	Plants	α -D-glucose	C1-C4 & C1-C6	Branched
Glycogen	Energy Storage	Animals	α -D-glucose	C1-C4 & C1-C6	Highly Branched
Cellulose	Structural	Plants	β -D-glucose	C1-C4	Unbranched

EXAM FOCUS:
 α -glucose = Storage | β -glucose = Structure



You've Learned the Theory.

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