

UNIT 10 • BIOMOLECULES

Polysaccharides

Nature's Polymers: How branching and linkages dictate biological function.

The Building Blocks



Amylose

Unbranched,
water-soluble
starch component.



Amylopectin

Branched,
water-insoluble
starch component.



Glycosidic Linkage

The oxide bond
connecting
monosaccharides.

Anatomy of Starch

Amylose

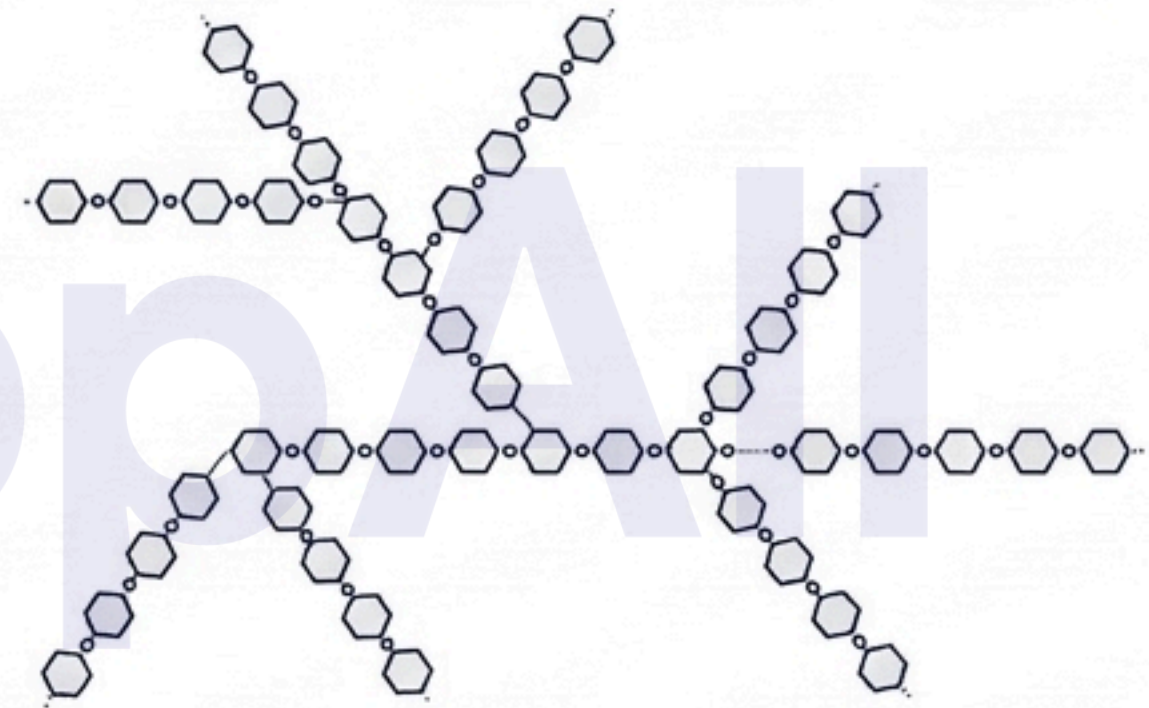
15–20% of starch.



Linkage:
C1–C4 α -glycosidic

Amylopectin

80–85% of starch.



Linkages:
C1–C4 α (chain) and C1–C6 α (branching)



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

$$E=mc^2$$



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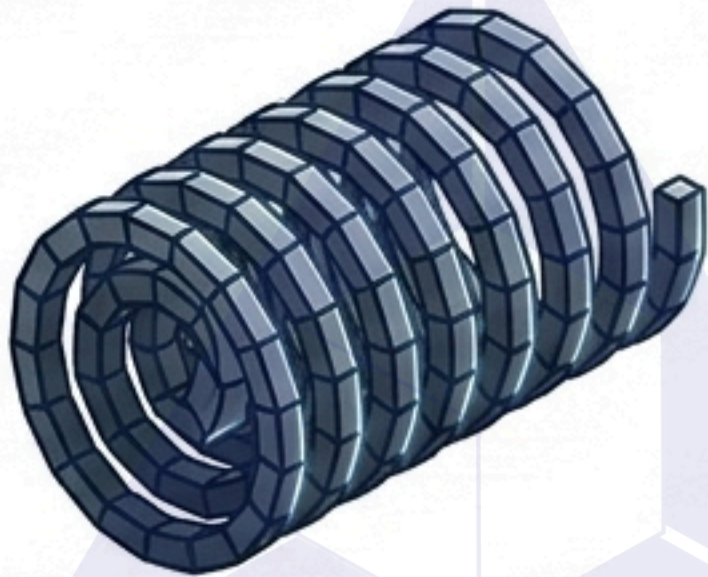
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Storage vs. Structure

Amylose (Starch)

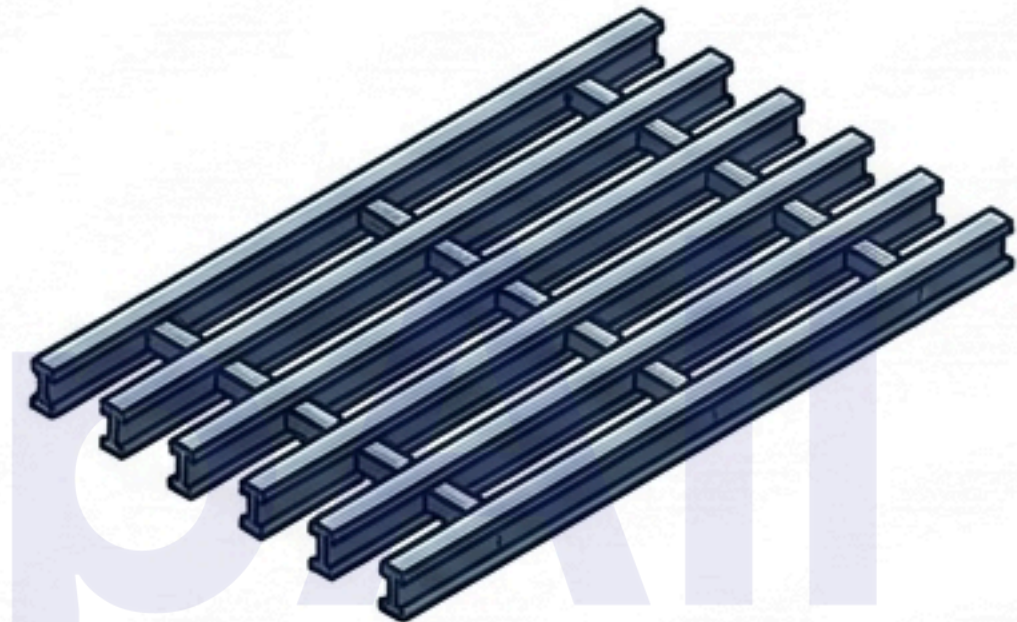


Role: Plant food storage.

Monomer: α -D-glucose

Linkage: C1-C4

Cellulose



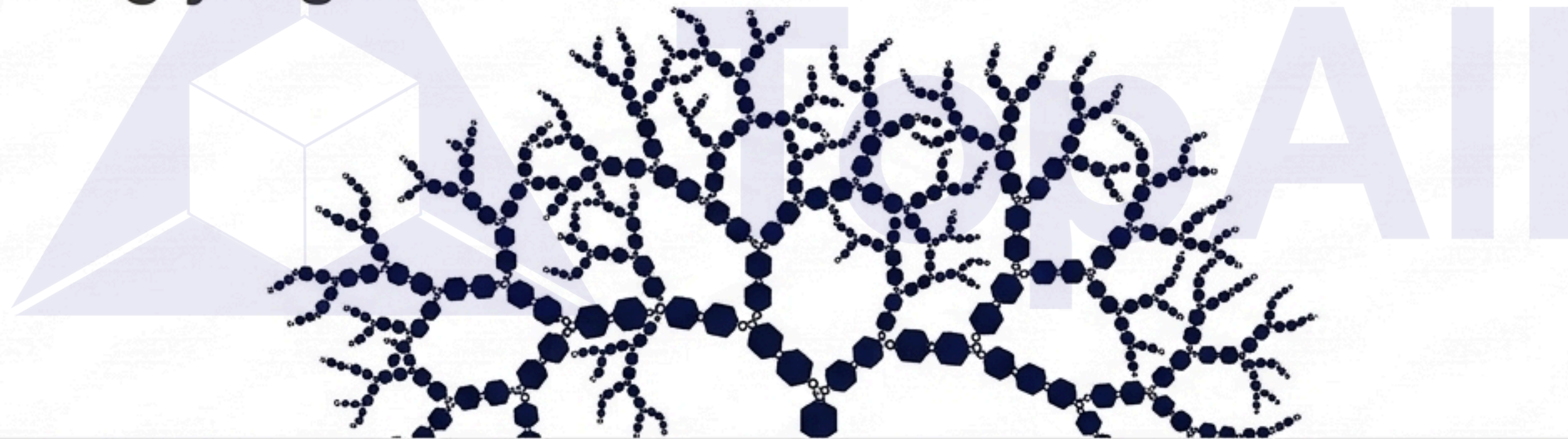
Role: Plant cell walls (most abundant organic substance in the plant kingdom).

Monomer: β -D-glucose

Linkage: C1-C4

Glycogen: Animal Starch

Carbohydrates are stored in the animal body (liver, muscles, brain) as **glycogen**.



Structurally similar to Amylopectin, but **rather more highly branched**. Breaks down rapidly into glucose when the body requires instant energy.

The Digestibility Difference

Why can we eat potatoes (starch) but not wood (cellulose)? It all comes down to the **linkage**.



Humans possess enzymes to break down α -linkages (Starch/Glycogen).



Humans lack the enzymes to break down β -linkages (Cellulose).

The α vs β orientation is the sole difference between nutrition and roughage!

Key Takeaways

Monomer + Linkage = Identity.

All major polysaccharides are polymers of glucose, but variations in α/β orientation and C1-C4/C1-C6 branching dictate their properties.

Plant vs. Animal.

Plants use **Starch** (α , moderately branched) for storage and **Cellulose** (β , unbranched) for structure. Animals use **Glycogen** (α , highly branched) for rapid-access storage.



You've Learned the Theory.

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