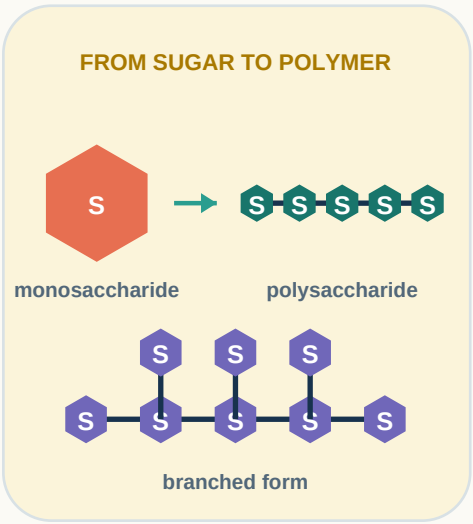
AP BIOLOGY | UNIT 1

TOPIC 1.4

Carbohydrates

Simple sugar monomers can be linked into linear or branched polymers that store energy or provide structural support.



THE CORE CAUSAL CHAIN

SUGAR
monosaccharide

→

COVALENT BONDS
units connected

→

POLYSACCHARIDE
linear or branched

→

FUNCTION
energy or support

BY THE END, YOU SHOULD BE ABLE TO...

1. Identify monosaccharides as carbohydrate monomers.
2. Distinguish linear and branched polysaccharides.
3. Link starch, glycogen, and cellulose to biological functions.

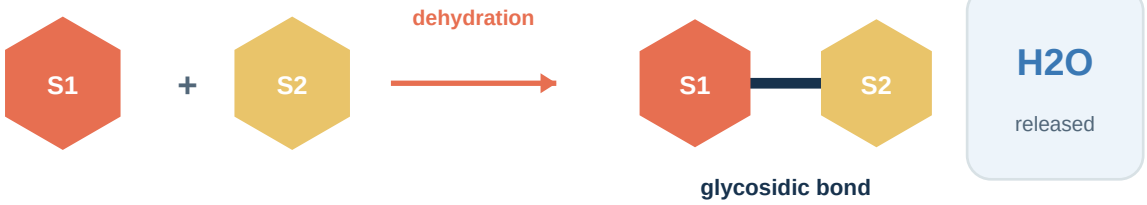
BIG IDEA

Carbohydrate function depends on how sugar monomers are connected and arranged. The same kind of monomer can support storage or structure in different polymers.

1 From monosaccharide to polysaccharide

Dehydration synthesis forms covalent glycosidic bonds; hydrolysis can split those bonds again.

BUILDING A CARBOHYDRATE



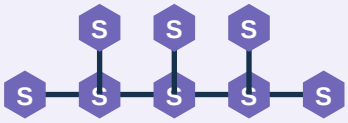
TWO POLYMER FORMS

LINEAR



Sugar units form an unbranched chain. Parallel chains may align into strong fibers.

BRANCHED



Branches create many chain ends, providing multiple access points for enzymes.

STRUCTURE SUPPORTS FUNCTION

MONOMER

A monosaccharide is one simple sugar unit.

BOND

A covalent glycosidic bond links sugar units.

POLYMER

A polysaccharide contains many linked sugars.

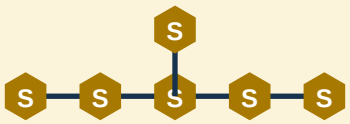
AP SCOPE NOTE

Know the monomer-to-polymer relationship and linear-versus-branched forms. Exact molecular structures of specific carbohydrate polymers are not required.

2 Three polysaccharides, three roles

Starch and glycogen store chemical energy; cellulose provides structural support in plant cell walls.

STARCH — PLANTS



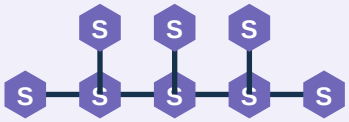
SCHEMATIC FORM

Coiled or moderately branched glucose polymer.

MAIN FUNCTION

Stores glucose for later energy use.

GLYCOGEN — ANIMALS



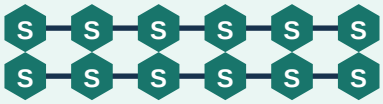
SCHEMATIC FORM

Highly branched glucose polymer.

MAIN FUNCTION

Compact, rapidly accessible energy storage.

CELLULOSE — PLANTS



SCHEMATIC FORM

Straight chains align into strong fibers.

MAIN FUNCTION

Provides tensile strength in cell walls.

QUICK COMPARISON

STARCH	GLYCOGEN	CELLULOSE
plant storage	animal storage	plant structure

COMMON ERROR

Carbohydrates are not only immediate energy sources. Different polysaccharide structures support energy storage or structural strength.