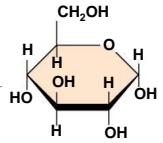
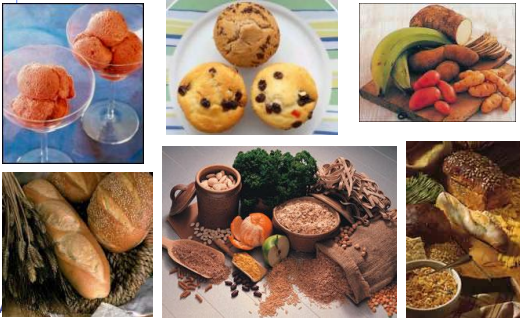


Carbohydrates



Carbohydrates

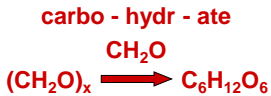
energy molecules



2006-2007

Carbohydrates

Carbohydrates are composed of C, H, O



Function:

- energy
- raw materials
- energy storage
- structural materials

Monomer: sugars



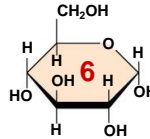
AP Biology

Sugars

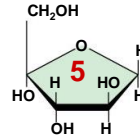
Most names for sugars end in **-ose**

Classified by number of carbons

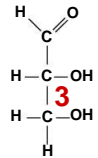
- 6C = hexose (glucose)
- 5C = pentose (ribose)
- 3C = triose (glyceraldehyde)



Glucose



Ribose



Glyceraldehyde

AP Biology

Functional groups determine function

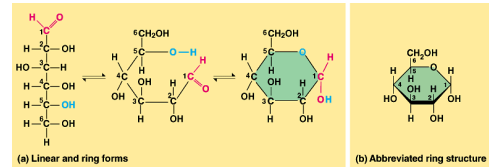
carbonyl
aldehyde

	Triose sugars (C ₃ H ₆ O ₃)	Pentose sugars (C ₅ H ₁₀ O ₅)	Hexose sugars (C ₆ H ₁₂ O ₆)
Aldehydes	<chem>OCC(O)C(O)O</chem> Glyceraldehyde	<chem>OCC(O)C(O)C(O)O</chem> Ribose	<chem>OCC(O)C(O)C(O)C(O)O</chem> Glucose <chem>OCC(O)C(O)C(O)C(O)O</chem> Galactose
Ketones	<chem>OCC(O)C(=O)O</chem> Dihydroxyacetone	<chem>OCC(O)C(=O)C(O)O</chem> Ribulose	<chem>OCC(O)C(=O)C(O)C(O)O</chem> Fructose

AP Biology

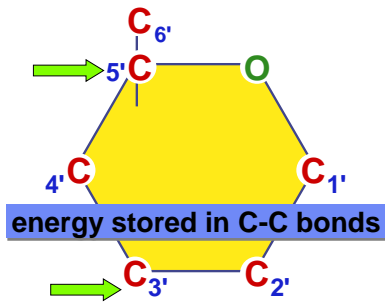
Sugar structure

5C & 6C sugars form rings in solution



Carbons are numbered

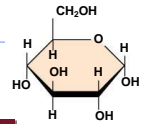
Numbered carbons



AP Biology

Simple & complex sugars

- **Monosaccharides**
 - ◆ simple 1 monomer sugars
 - ◆ glucose
- **Disaccharides**
 - ◆ 2 monomers
 - ◆ sucrose
- **Polysaccharides**
 - ◆ large polymers
 - ◆ starch



Glucose

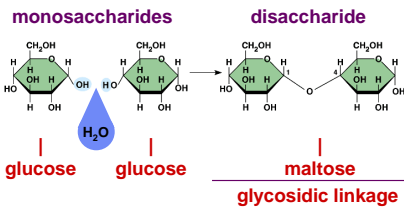


QuickTape™ and a TFF (Advanced) Microcassette are needed to see this picture.

AP Biology

Building sugars

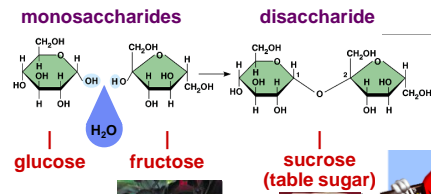
- Dehydration synthesis



AP Biology

Building sugars

- Dehydration synthesis



Let's go to the videotape!



QuickTape™ and a TFF (Advanced) Microcassette are needed to see this picture.

Polysaccharides

- Polymers of sugars
 - ◆ costs little energy to build
 - ◆ easily reversible = release energy
- Function:
 - ◆ **energy storage**
 - starch (plants)
 - glycogen (animals)
 - ◆ in liver & muscles
 - ◆ **structure**
 - cellulose (plants)
 - chitin (arthropods & fungi)



Linear vs. branched polysaccharides

slow release

starch (plant)

energy storage

glycogen (animal)

fast release

Chloroplast Starch

Amylose Amylopectin

(a) Starch

Mitochondrion Glycogen granules

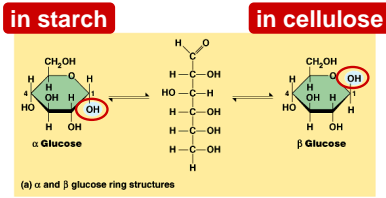
Glycogen

What does branching do?

Let's go to the videotape!

Polysaccharide diversity

- Molecular structure determines function

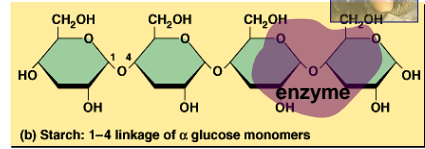


- ◆ isomers of glucose
- ◆ structure determines function...

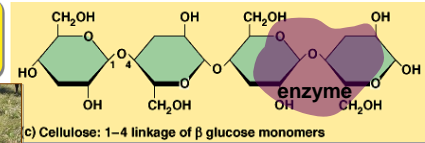
AP Biology

Digesting starch vs. cellulose

starch
easy to digest

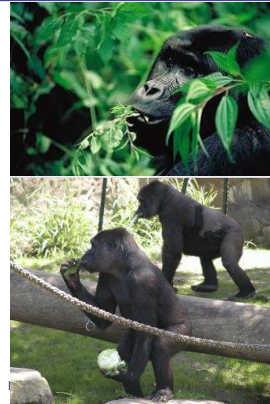
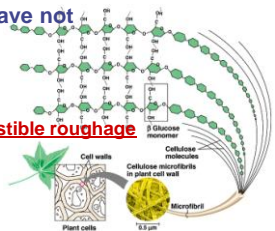


cellulose
hard to digest



Cellulose

- Most abundant organic compound on Earth
- ◆ herbivores have evolved a mechanism to digest cellulose
- ◆ most carnivores have not
 - that's why they **eat meat** to get their energy & nutrients
 - **cellulose = undigestible roughage**



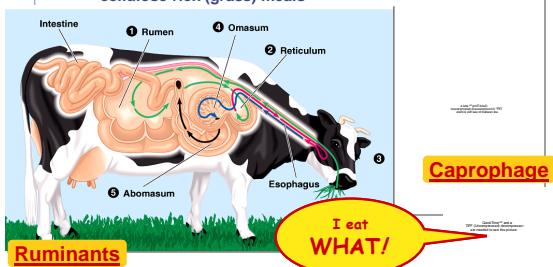
Cow
can digest cellulose well;
no need to eat other sugars

Gorilla
can't digest cellulose well;
must add another sugar source, like fruit to diet



Helpful bacteria

- How can herbivores digest cellulose so well?
 - ◆ **BACTERIA** live in their digestive systems & help digest cellulose-rich (grass) meals



EAT
Let's bu~~X~~ild some
Carbohydrates!

