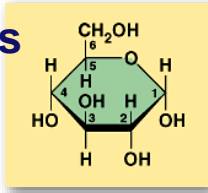


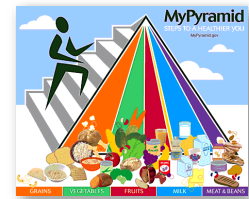
Chapter 3.3 Carbohydrates



Americans consume an average of **140 pounds of sugar** per person per year.

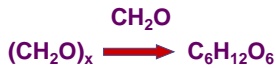
So what was all this talk about carbs?

Atkin's diet & South Beach diet reduces carbohydrate intake.



Carbohydrates

- Carbohydrates are composed of C, H, O
carbo - hydr - ate



- Function:
 - energy
 - raw materials
 - energy storage
 - structural materials
- Monomer: sugars
- ex: sugars & starches

Sugars

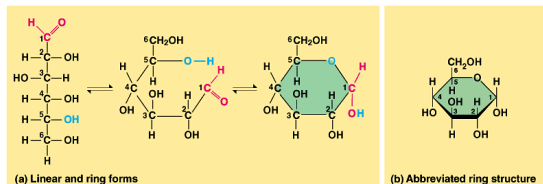
- Most names for sugars end in **-ose**
- Classified by number of carbons
 - hexose (glucose)
 - pentose (fructose, ribose)
 - triose (glyceraldehyde)

What functional groups?

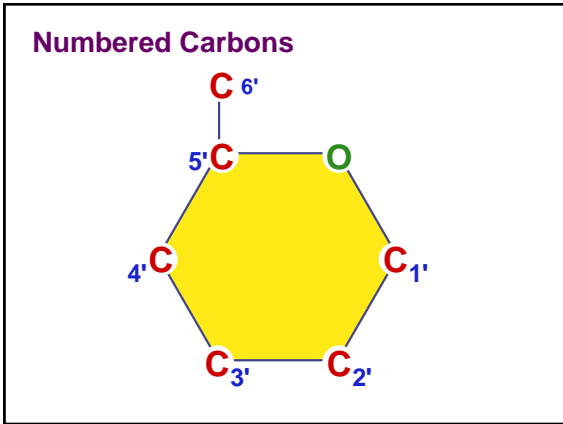
| | Triose sugars (C ₃ H ₆ O ₃) | Pentose sugars (C ₅ H ₁₀ O ₅) | Hexose sugars (C ₆ H ₁₂ O ₆) |
|----------|---|---|--|
| carbonyl | Aldehydes Glyceraldehyde | Aldehydes Ribose | Aldehydes Glucose Galactose |
| | ketone | | |
| hydroxyl | Ketoses Dihydroxyacetone | Ketoses Ribulose | Ketoses Fructose |

Sugar Structure

- 5C & 6C sugars form rings in aqueous solutions
 - in cells!

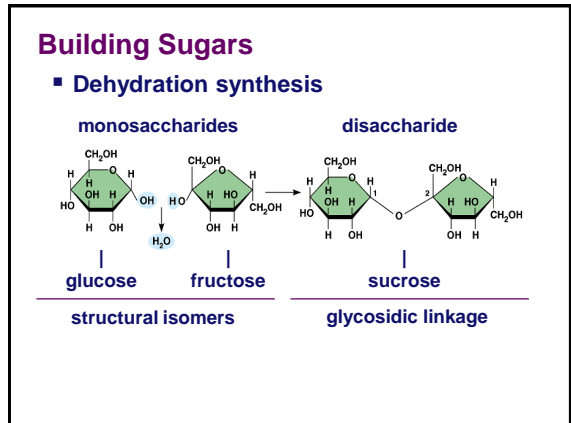
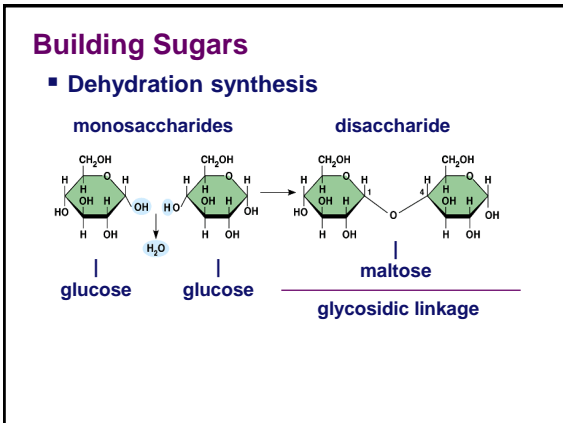


Carbons are numbered!



Simple & Complex Sugars

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



Polysaccharides

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

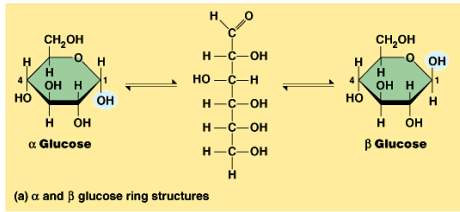
Branched vs. Linear Polysaccharides

(a) Starch

(b) Glycogen

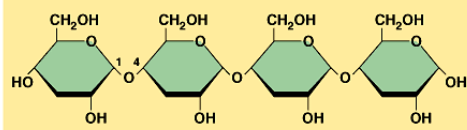
Polysaccharide Diversity

- Molecular structure determines function

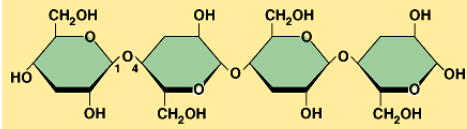


- ◆ Isomers of glucose
- ◆ How does structure influence function...

Digesting Starch vs. Cellulose



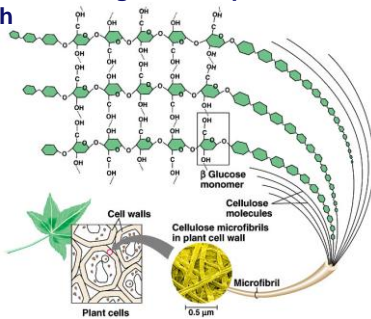
(b) Starch: 1-4 linkage of α glucose monomers



(c) Cellulose: 1-4 linkage of β glucose monomers

Cellulose

- Most abundant organic compound on Earth



Glycemic Index

- Ranking of carbohydrates based on their immediate effect on blood glucose (blood sugar) levels
- Carbohydrate foods that breakdown quickly during digestion have the highest glycemic indices. Their blood sugar response is fast & high.



Glycemic Index

- Which food will get into your blood more quickly?
 - ◆ apple
 - ◆ rice cakes
 - ◆ corn flakes
 - ◆ bagel
 - ◆ peanut M&M

