

# Biochemistry



Day 1  
Carbohydrates

# Organic molecules

= all molecules made by/used by biotic organisms that contain carbon (except for CO<sub>2</sub>)

Basic atoms of organic molecules=

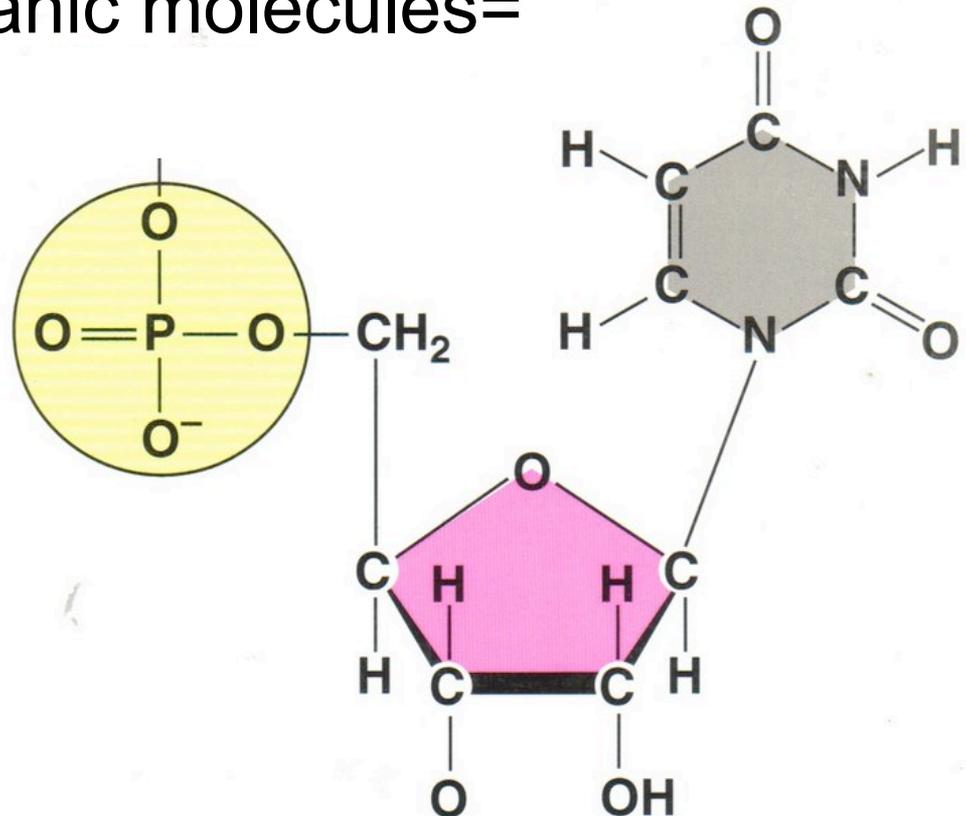
**C**arbon

**H**ydrogen

**O**xygen

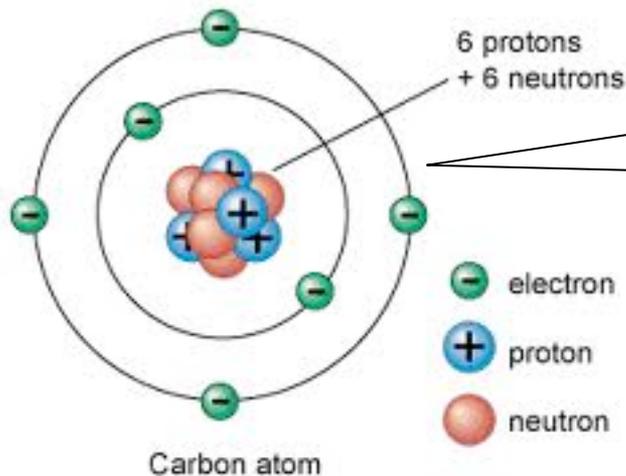
**N**itrogen

**P**hosphorus

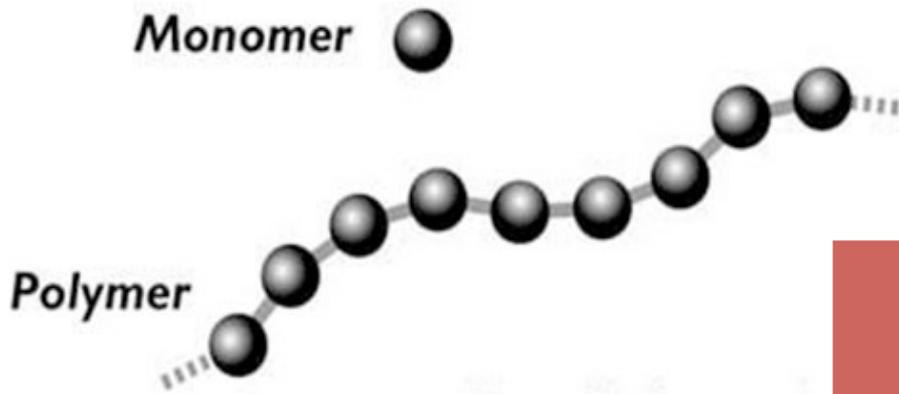


# Why is carbon required?

- Carbon has a valence of 4 and makes 4 bonds (most # possible)
- 4 bonds allows carbon to make long complex chain organic molecules (DNA etc)
- Molecules of life are carbon based!



Valence of 4  
(room for 4 more e<sup>-</sup>)  
Makes 4 covalent  
bonds



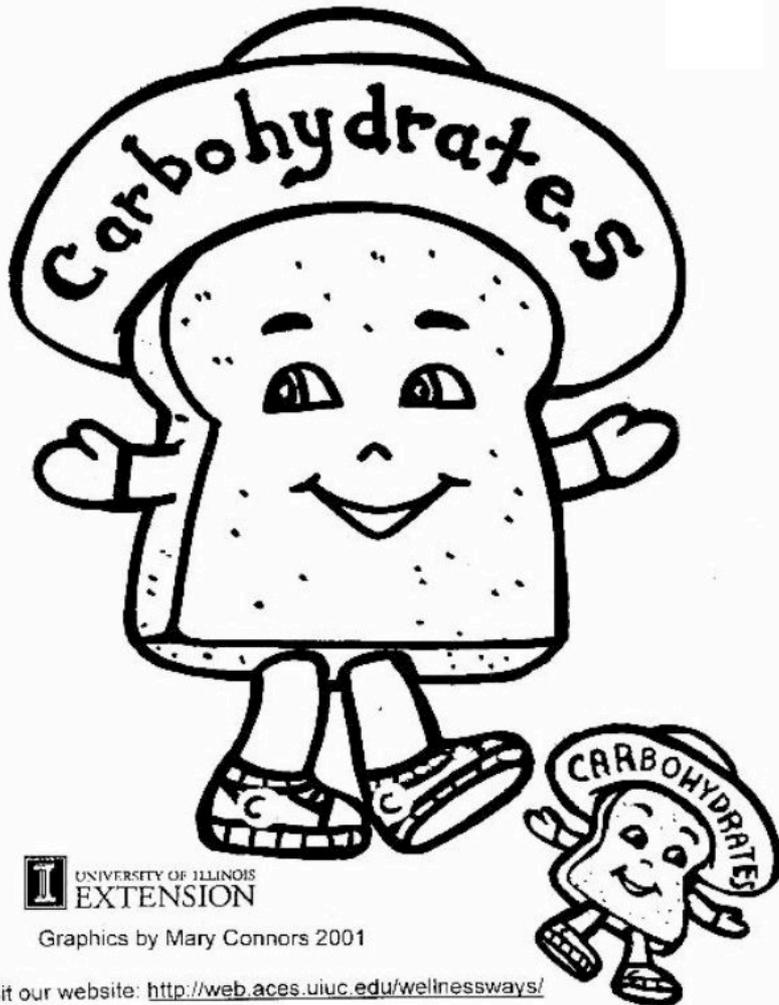
# 4 Types of Organic Polymers

**Mono** = One  
**Poly** = Many

**Monomer** = building block molecule

**Polymer** = long chain molecule made of linked monomers

Monomer Building block	Polymer Organic Chain
Sugar Monosaccharide	Carbohydrates / Polysaccharide
Amino Acid	Protein
Glycerol & Fatty Acids	Lipids (fats)
Nucleotides	Nucleic Acids (DNA & RNA)



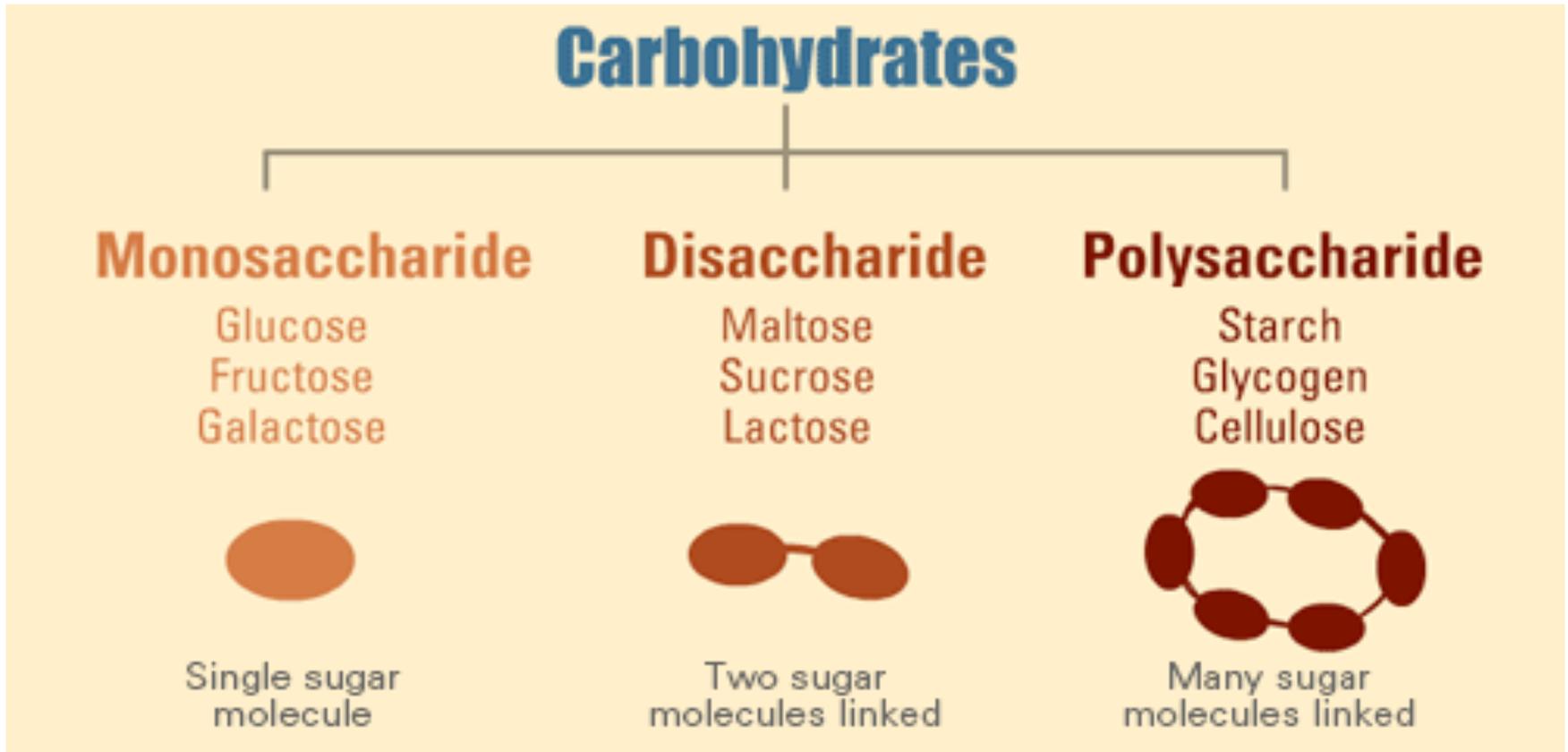
## Why eat Carbohydrates?

**Monosaccharides** (simple sugars) give cells energy to burn during cellular respiration

**Polysaccharides** polymer chains of sugar store energy short term. (often called complex carbs) & build cell walls in plants & build exoskeletons for insects.

Made of only C, H, O atoms

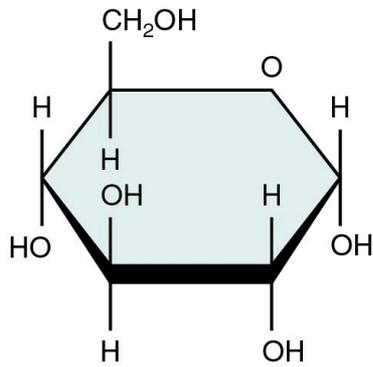
# Three types of Carbohydrates:



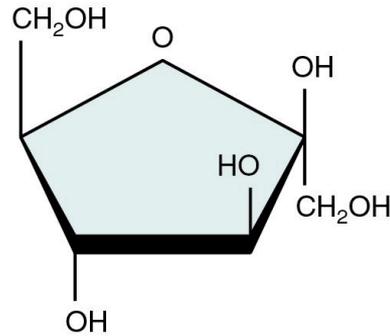
# Mono-saccharides

## Single Sugars

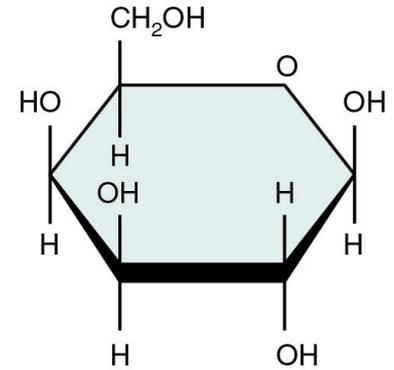
give immediate energy



Glucose

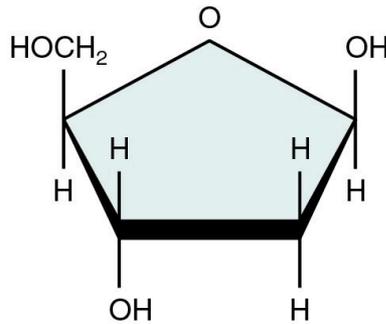


Fructose

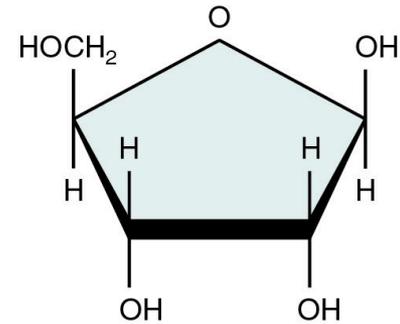


Galactose

...



Deoxyribose



Ribose

Glucose most common; burned in cellular respiration

# Di-saccharides

Double Sugars  
(link two Monosaccharides)

## Sucrose

(Glucose-fructose)

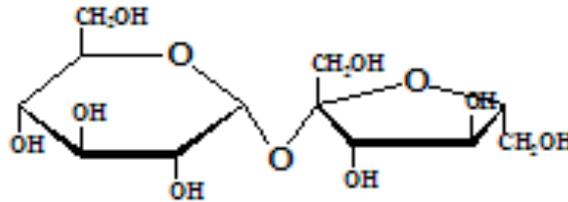
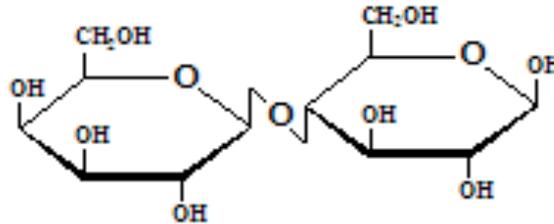


Table  
Sugar

## Lactose

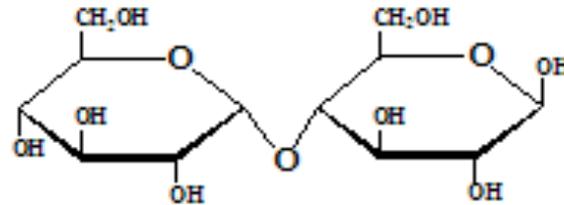
(Galactose-glucose)



Milk  
Sugar

## Maltose

(Glucose-glucose)

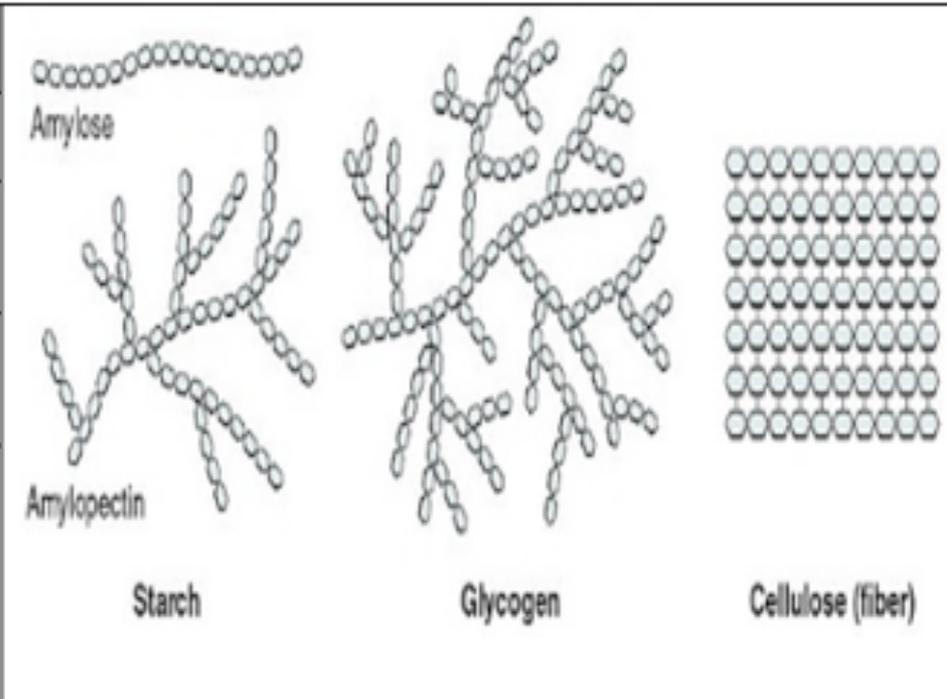


Malt  
Sugar

# Poly-saccharides

Many Sugars linked into chains

Used for energy storage in plants (starch), energy storage in the liver of animals (glycogen), cell walls in plants (cellulose) and exoskeletons in insects (chitin)

Name of Polysaccharide	Function	
Starch	Stores glucose in plants.	 <p>Amylose</p> <p>Amylopectin</p> <p>Glycogen</p> <p>Cellulose (fiber)</p> <p>Starch</p> <p>Glycogen</p> <p>Cellulose (fiber)</p>
Cellulose	Makes up the cell walls in plants.	
Glycogen	Stores glucose for animal cells; found in muscles and liver.	
Chitin	Structural component of exoskeletons in insects, arachnids and crustaceans. Also a component of cell walls of fungi.	

Found in : grains & cereals (rice, oat, wheat, corn),  
veggies (potato, squash, corn, beans)

Energy = 4 Calories/gram



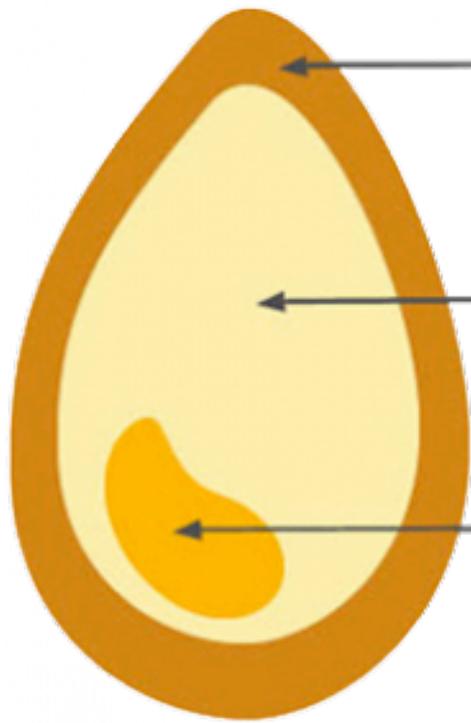
# Grains are seeds!

Whole grains contain all layers of the seed & more nutrition/vitamins.

**Whole Grain**

**vs.**

**“White” Grain**



**Bran**

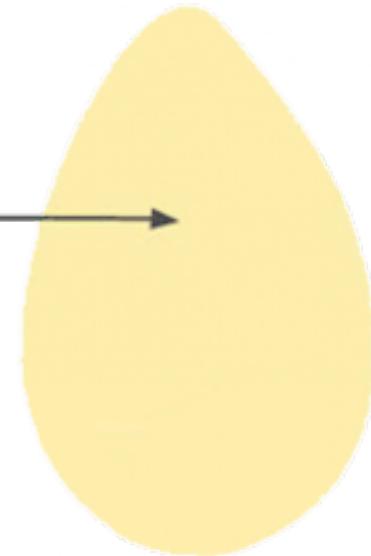
The fiber-rich outer layer that protects the seed and contains B vitamins and trace minerals.

**Endosperm**

The middle layer that contains carbohydrates along with proteins.

**Germ**

The small nutrient-rich core that contains antioxidants, including vitamin E, B vitamins and healthy fats.



“Brown” flour

“White” flour