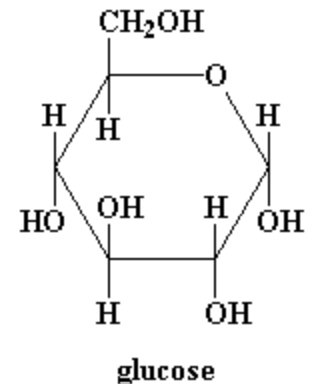
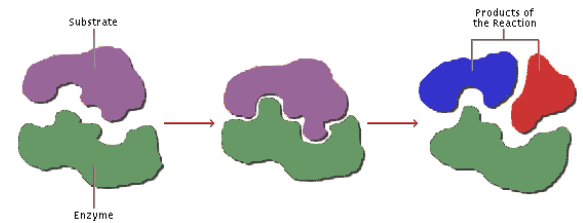


# Characteristic #1

All living things are complex chemical systems

- Living things are made of molecules that interact
- Metabolism is the collective set of chemical processes & reactions in an organism
  - Molecules breaking apart (releasing energy)
  - Molecules forming (to store energy)
- Enzymes – molecules that help reactions occur

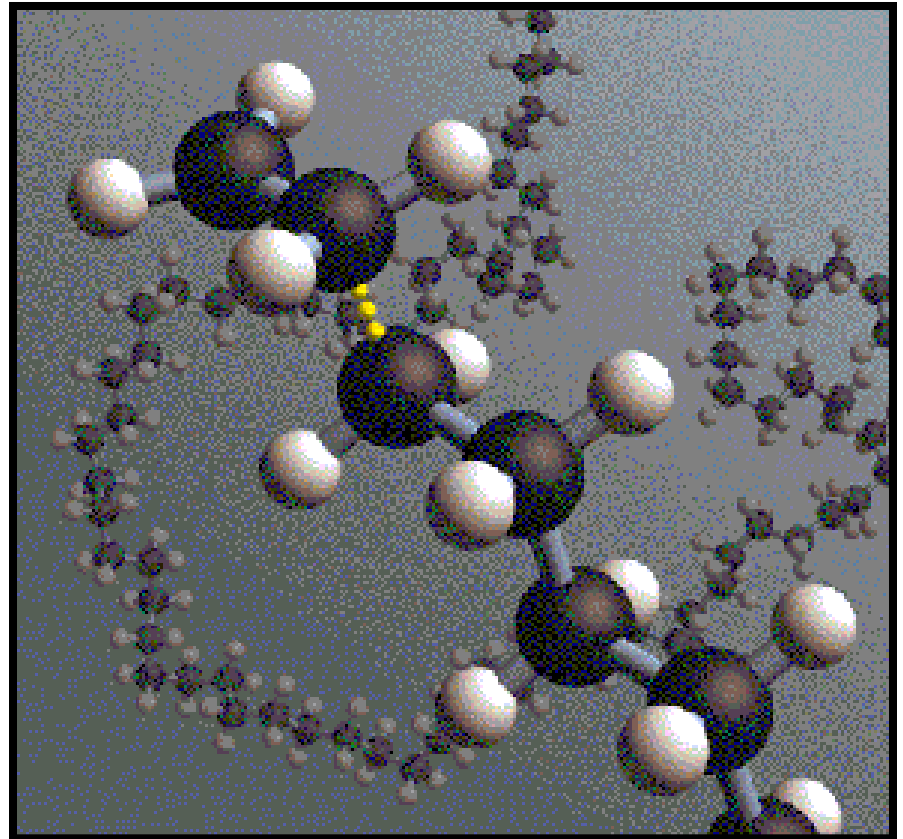
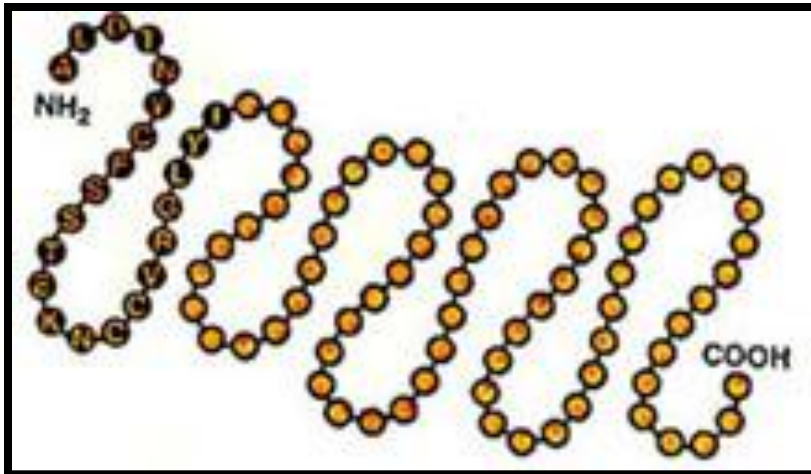


# Organic

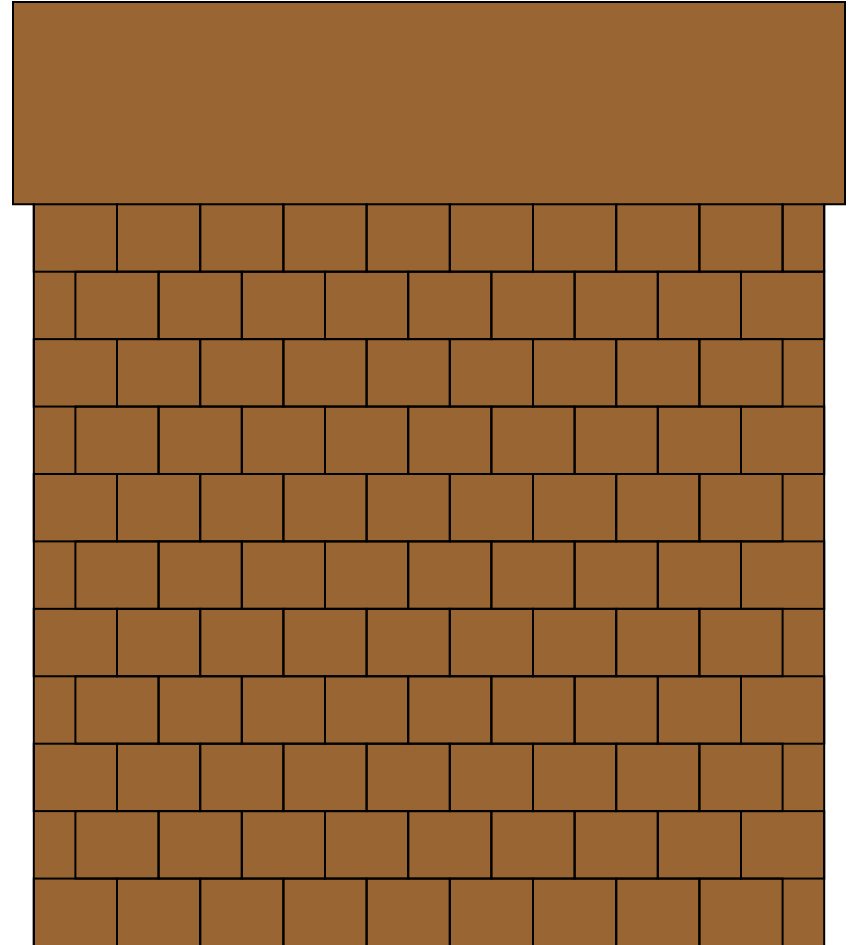
- The word **Organic** means “containing carbon”
  - **Organic** molecule: a molecule with carbon
  - **Organic** chemistry: the chemistry of carbon
  - **Organism**: a carbon-based life form

# Polymer

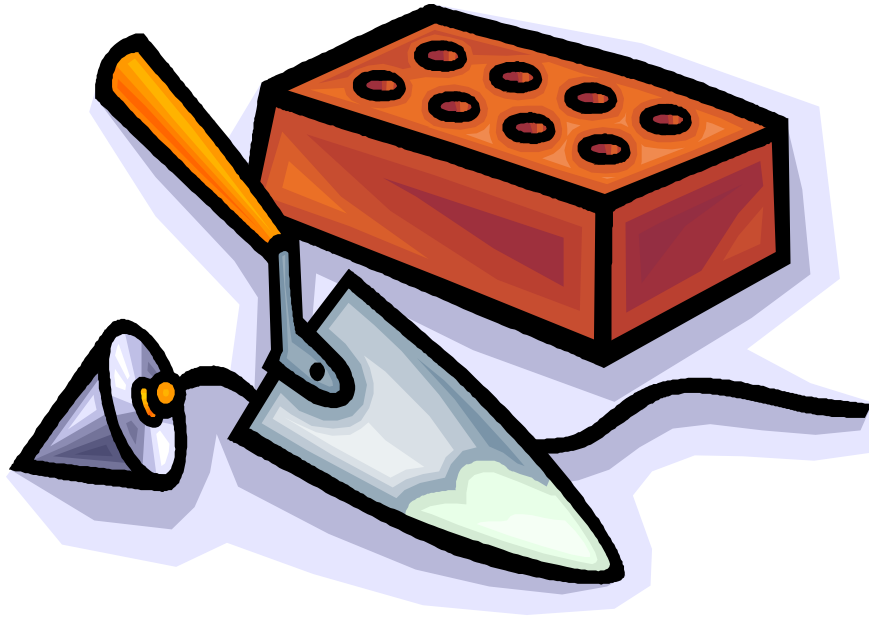
- A large molecule made of many smaller molecules & atoms (monomers)



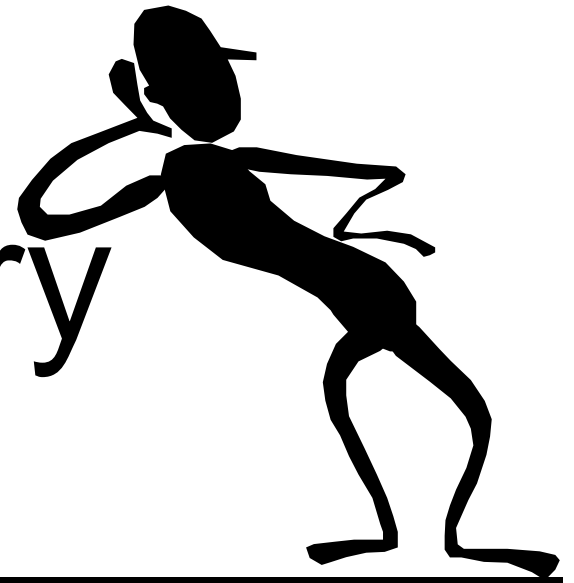
Polymers are made  
of monomers like a  
wall is made of  
bricks.



Monomers:  
building blocks of polymers



# Biochemistry



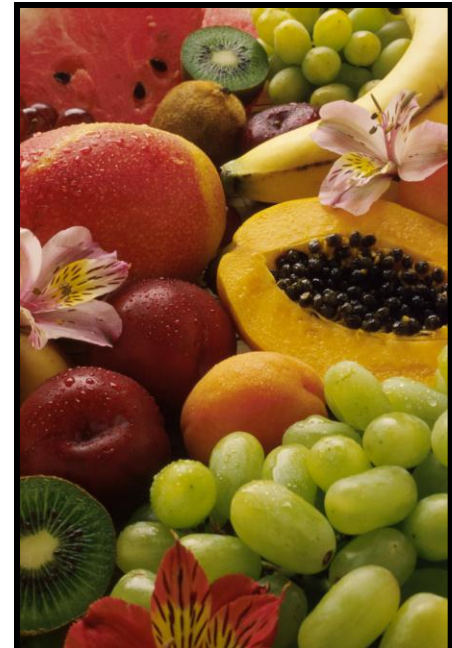
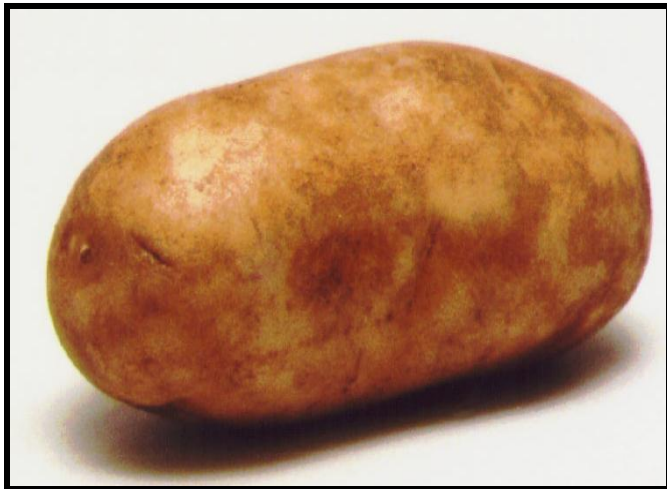
- Biochemistry = chemistry of living organisms
- All living things are organic: carbon-based

- Organic molecules are the molecules in living things
- There are four types of organic (carbon-based) molecules:
  - Carbohydrates
  - Lipids (fats)
  - Proteins
  - Nucleic Acids



# Carbohydrates

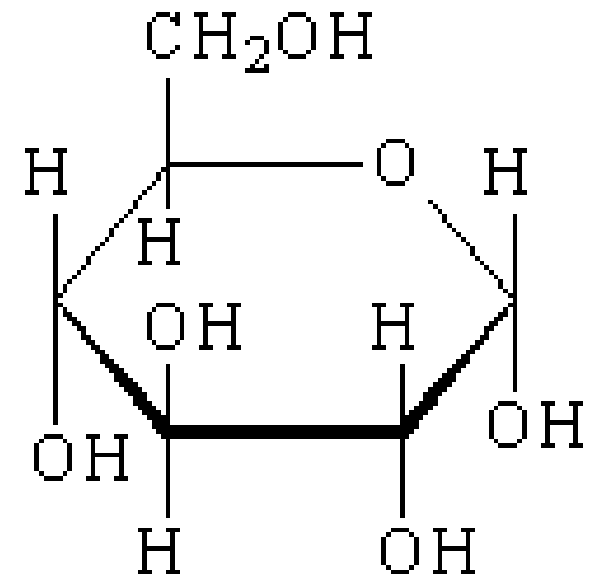
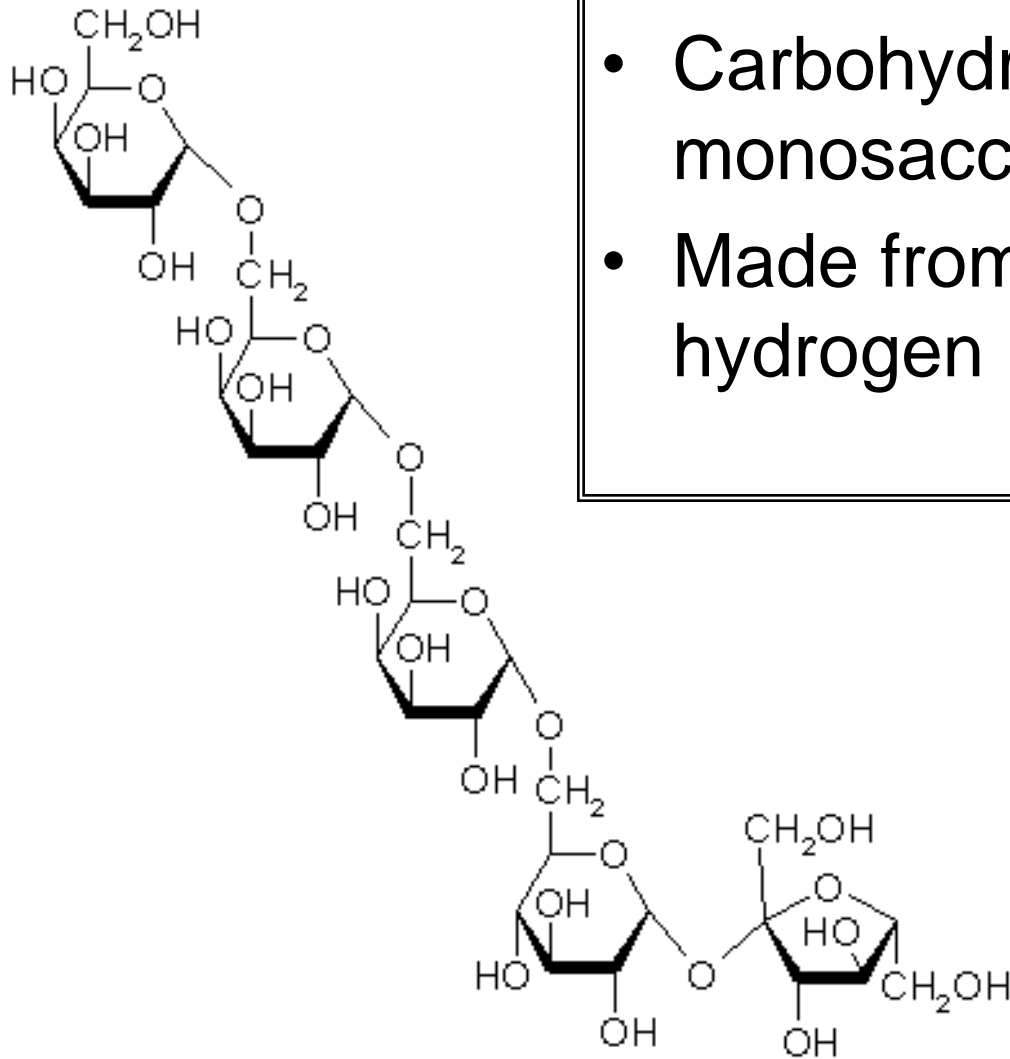
- Starches, sugars, and fiber
- Provide quick energy
  - Body's main source of energy
  - Gives cells energy to make ATP
- Chains of sugars





# Carbohydrates (Sugars)

- Carbohydrates are polymers of monosaccharides (sugars)
- Made from carbon, oxygen, and hydrogen



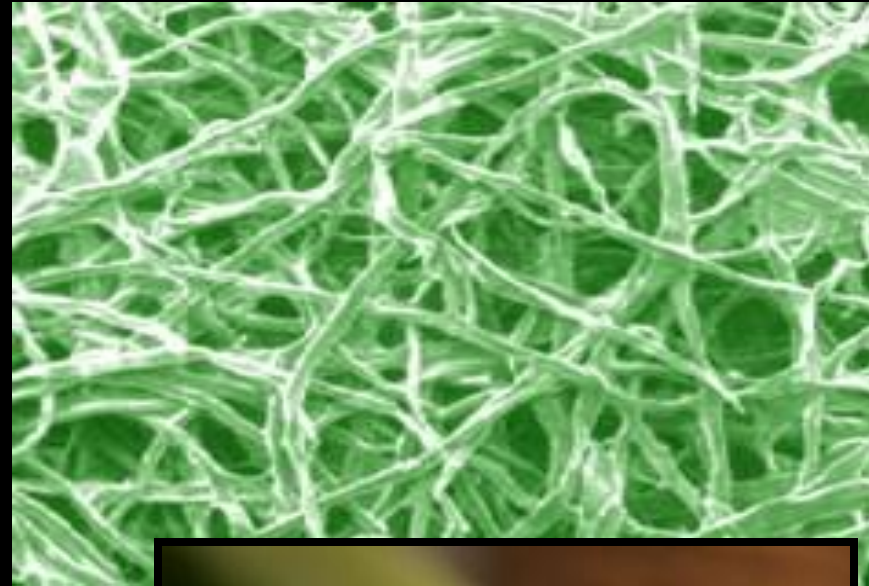
# Function of Carbohydrates

## 1.) Provide Energy

- Gives cells energy to make ATP

## 2.) Structure

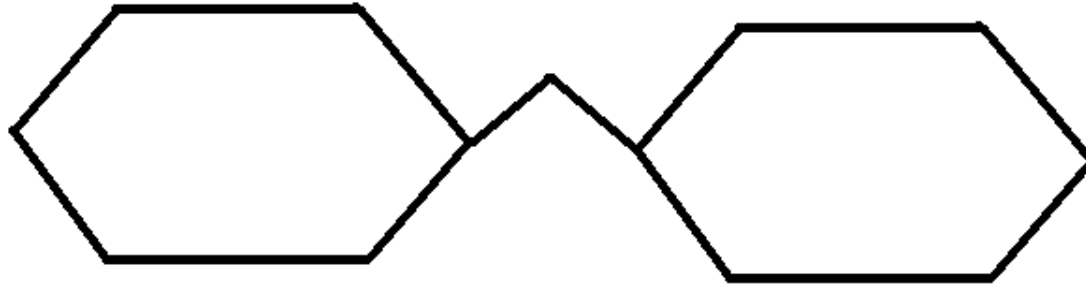
- Form the fiber in plant stalks & tree trunks
- Keep plants upright



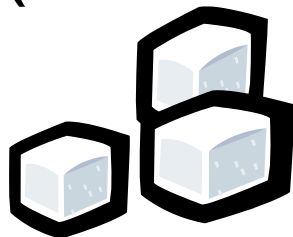
# Word Origin

- Monosaccharide
  - Mono = one
  - Saccharine/saccharide = sugar
  - Monosaccharide = one sugar
- Glucose is a monosaccharide  
 $C_6H_{12}O_6$

- Di- = two
- Disaccharide = two sugars (two monosaccharides)



- Lactose (milk sugar) is made from glucose + galactose
- Sucrose (table sugar) is glucose + fructose



# Polysaccharides

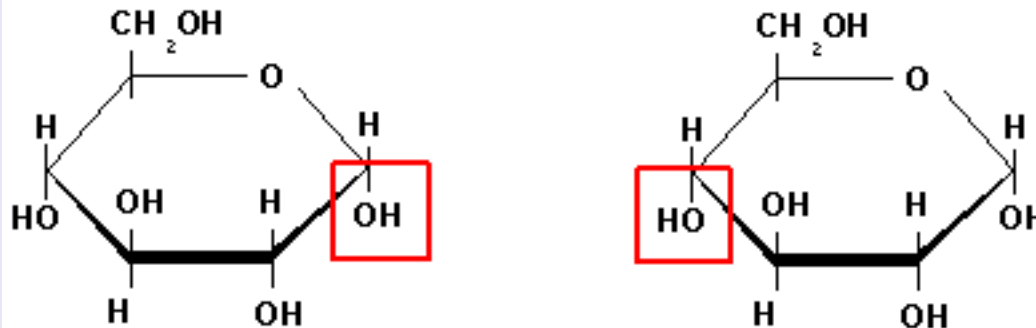
- Poly- means many
- **Polysaccharide** = a polymer made of many sugars



- Carbohydrates are polysaccharides

# How do we build/make the bond...

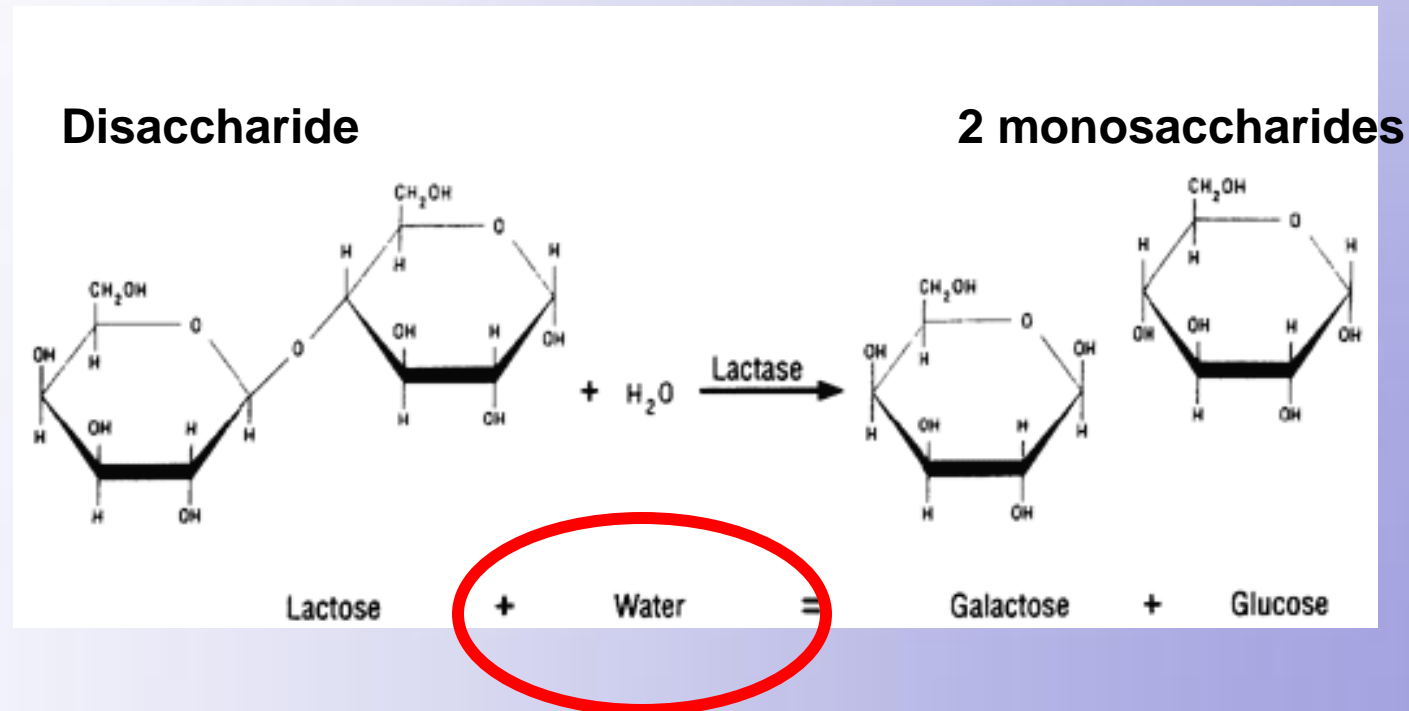
## Dehydration Synthesis



form a bond while  
losing a water molecule

# How do we break the bond...

- Hydrolysis
  - Add water to break the bond





# Types of Polysaccharides

Three important polysaccharides:

- Starch
- Cellulose
- Glycogen

# Starch

- **Plant energy storage**
  - **Glucose is stored as starch in plants**
- **Potatoes, rice, pasta**
- **Breaks down easily into glucose in digestive system**
- **Glucose provides energy to body**



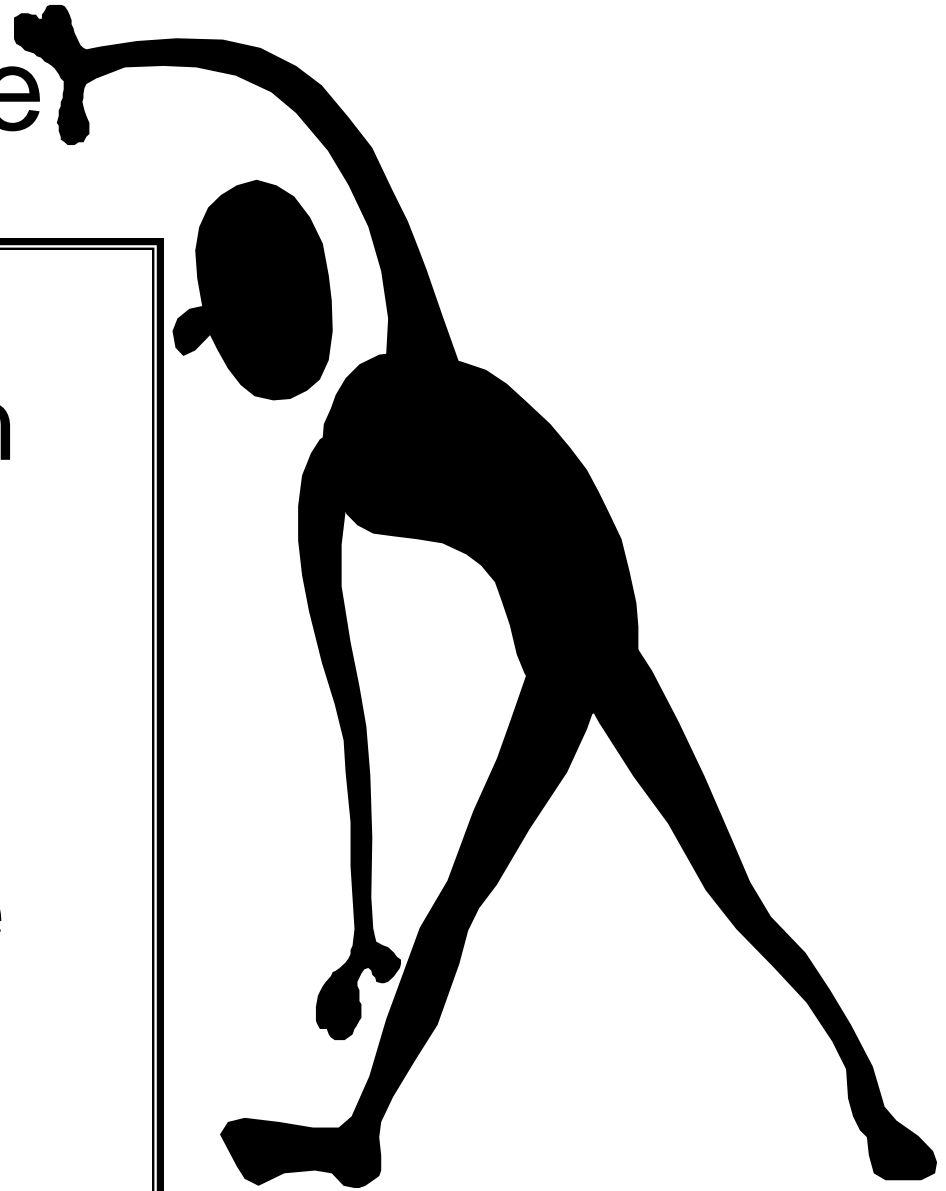
# Cellulose

- Plant **fiber**
- Very rigid & strong
  - Wood
  - Cotton
  - Fruits
  - Vegetables
  - Whole grains



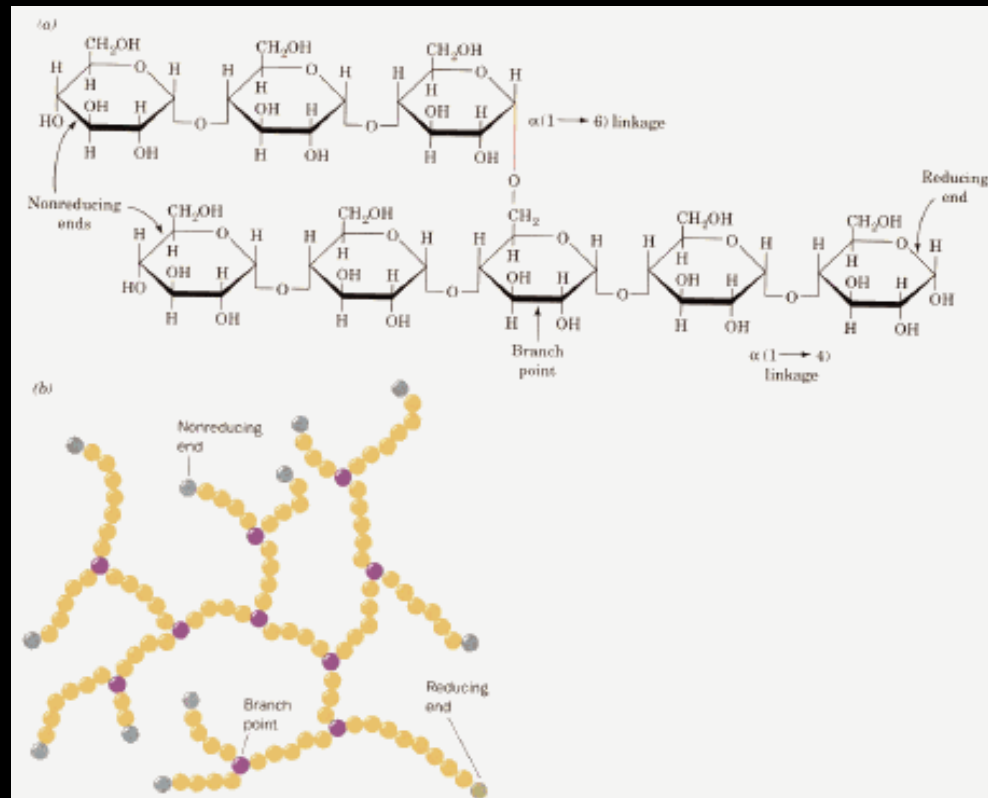
# Cellulose

- Strong bonds cannot be broken down by human enzymes
- Cellulose passes through digestive system without being absorbed



# Glycogen

- Glucose is stored as glycogen in animals



# Quiz

1. What element does organic chemistry revolve around?
1. What are the four classes of organic molecules?
1. How are polymers and monomers related?

# Quiz

1. Draw a:

1. Disaccharide
2. Monosaccharide
3. Polysaccharide

2. What are the two functions of carbohydrates?

1. Match:

- |             |                                     |
|-------------|-------------------------------------|
| 1. Glycogen | a. plant storage of energy/glucose  |
| 2. Starch   | b. animal storage of energy/glucose |

2. What process builds a bond between two monomers?

3. What process breaks a bond in a polymer?