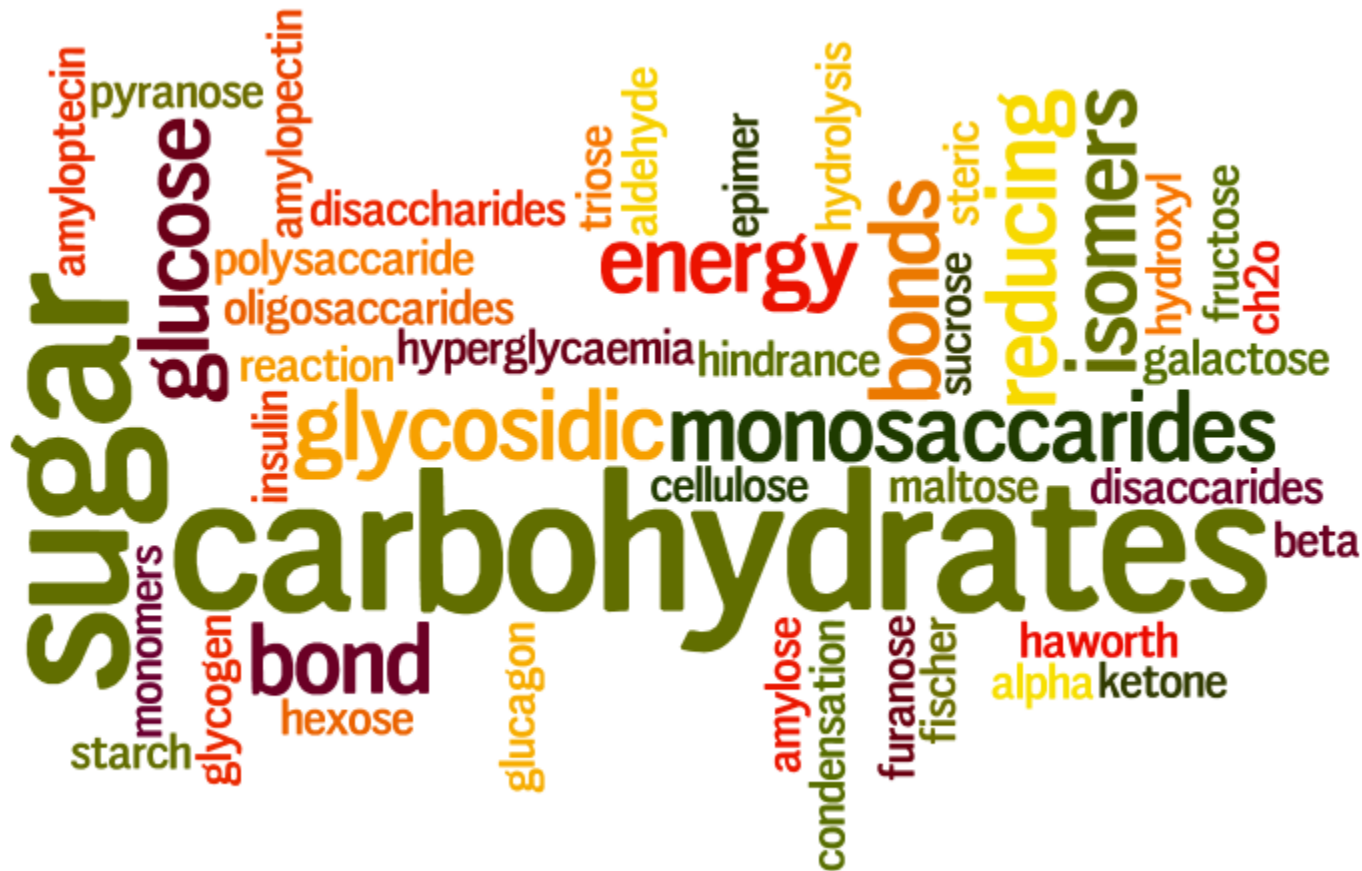


# Carbohydrates



# Carbohydrates

- Made up of C, H, and O
  - **STOP AND THINK!**
  - Why do you think they call them CARBOhydrates?

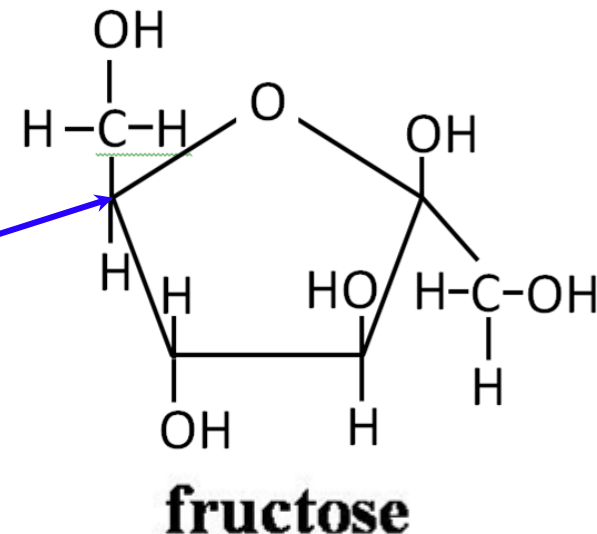
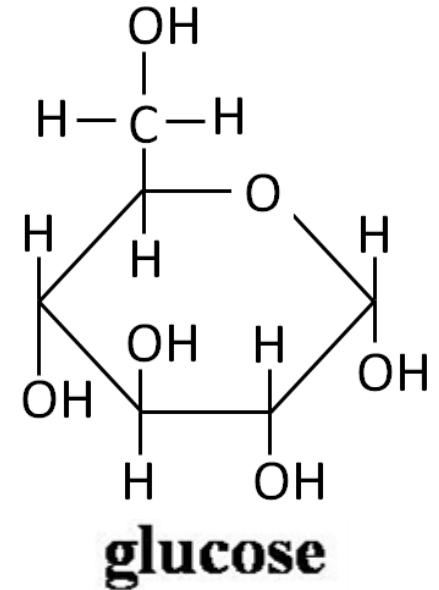


# Carbohydrates

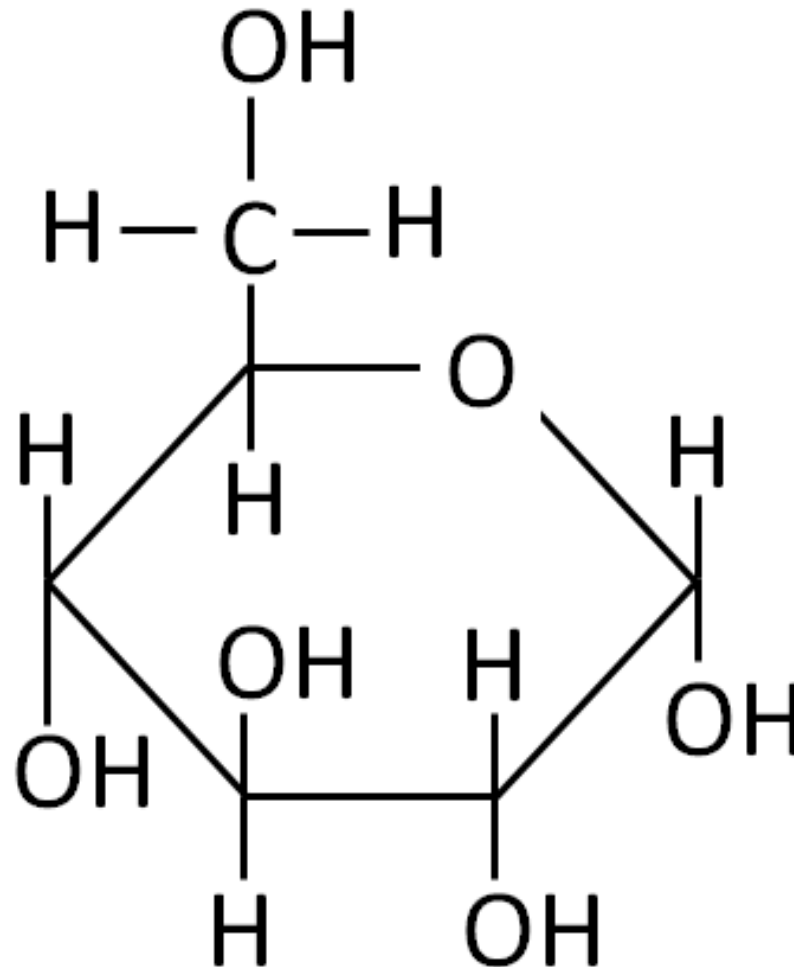
- This group contains simple and complex **sugars**
  - Typically end in letters **-ose**
  - 3 Forms:
    - Monosaccharides, i.e. gluc**ose**
    - Disaccharides, i.e. suc**rose**
    - Polysaccharides, i.e. cellul**ose**
- Can be broken down to provide a source of usable chemical **energy**

# Monosaccharides: “1”

- a.k.a. Simple Sugars
- **E.g. Glucose**
  - VERY, VERY important!
  - Produced during **photosynthesis** and the primary form of energy for almost all organisms
- **E.g. Fructose**
  - Fruit sugar
- **What atom is at each bend in the ring?**

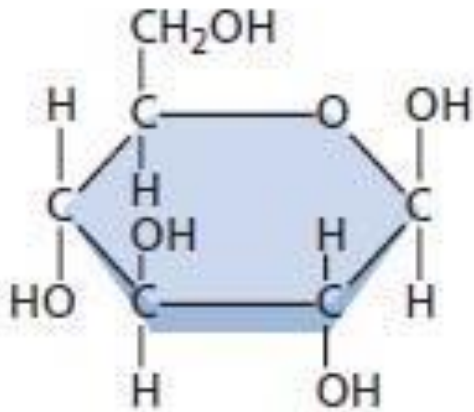


# NOW DRAW GLUCOSE IN YOUR NOTES

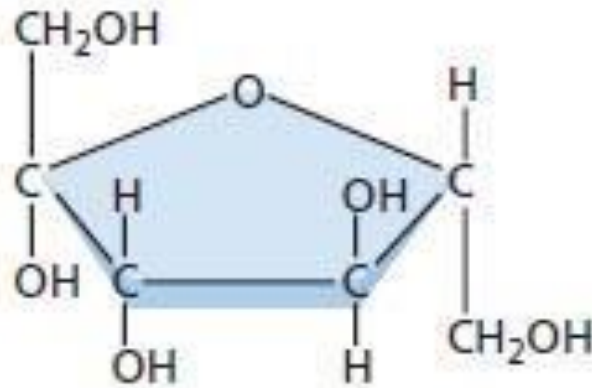


# Isomers – compounds with the same chemical **formula** but different **structure**

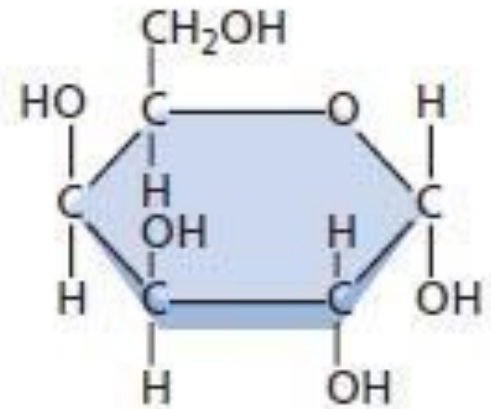
- Choose one monosaccharide below and count up how many C's, H's, and O's it has.



Glucose



Fructose

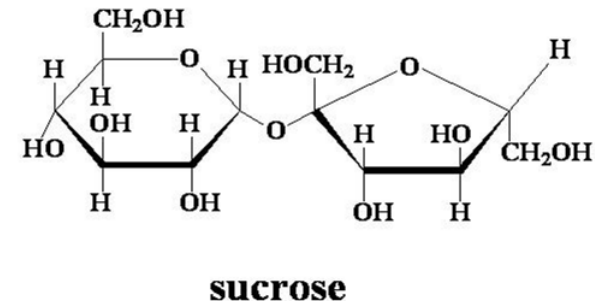


Galactose

- All 3 have the formula C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>.

# Disaccharides: “2”

- Two monosaccharides bonded together
  - The dash (—) below represents “bonded to”
- Examples:
  - glucose – glucose = maltose
  - glucose – fructose = sucrose
  - glucose – galactose = lactose



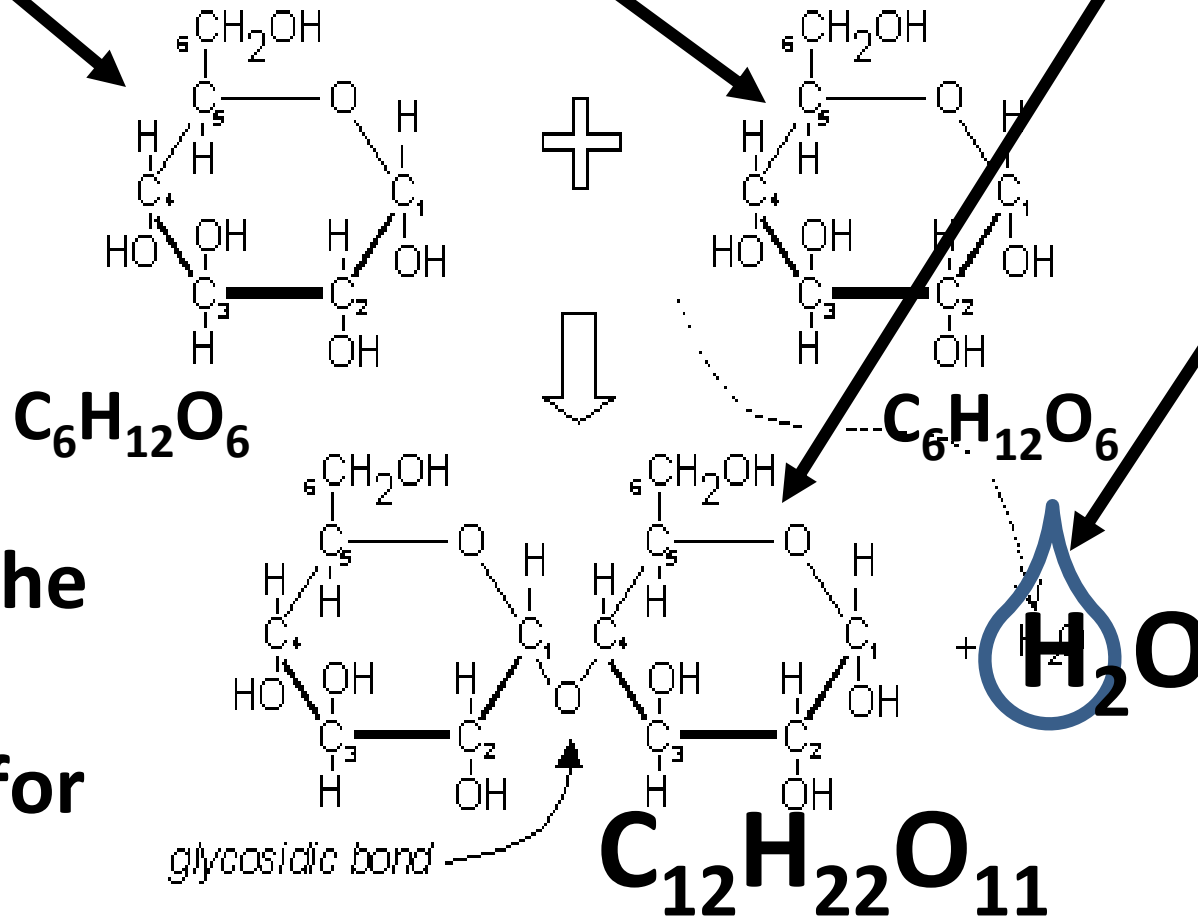
How do you think these monomers get bonded together??

**Dehydration Synthesis!**

# Example: Building Up (what is this process called??)

**Monosaccharide + Monosaccharide → Disaccharide + H<sub>2</sub>O**

**Glucose + Glucose → Maltose + H<sub>2</sub>O**



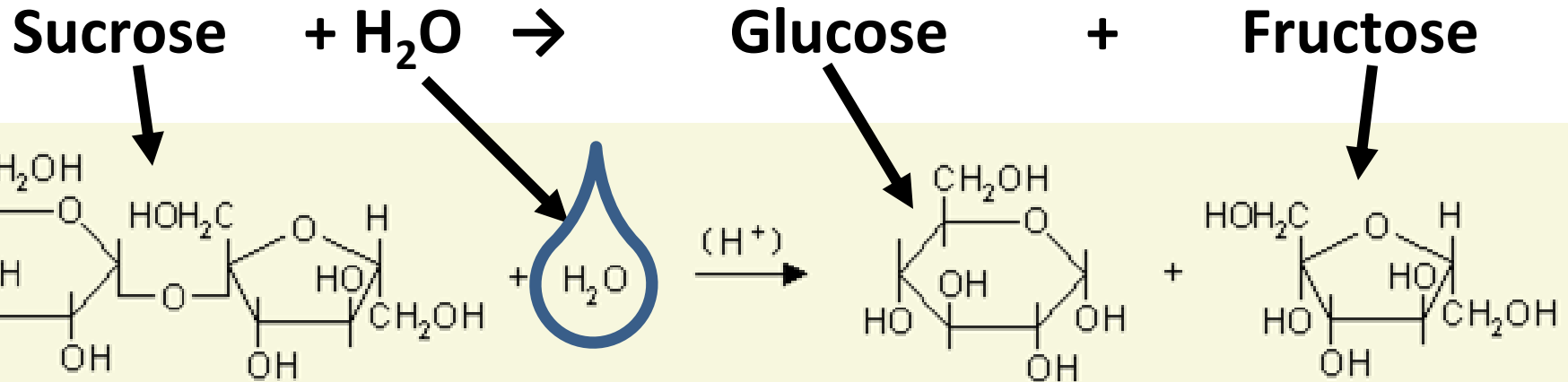
**What is the  
chemical  
formula for  
glucose?**

**What is  
the  
formula  
for  
maltose?**



# Example: Breaking Down (what is this process called??)

**Disaccharide + H<sub>2</sub>O → Monosaccharide + Monosaccharide**

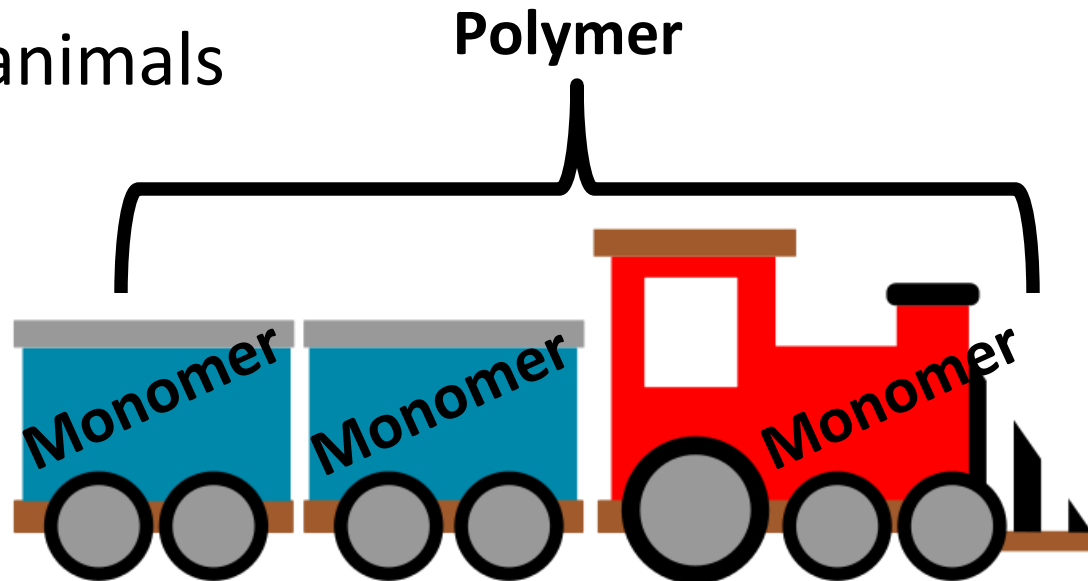


**What is the  
formula for  
sucrose?**

**What is the chemical  
formulas for glucose  
and fructose?**

# Polysaccharides: “**many**”

- **Complex** carbohydrates: long chains of monosaccharides (also joined by dehydration synthesis rxn)
  - Like a string of pearls or a train with many cars
  - **What does each pearl or train car represent?**
  - **What can we call the whole molecule?**
- Found in plants and animals
- Two basic purposes:
  - **Structural**
  - Energy **storage**



# Polysaccharides - Structural

## Animals

- **Chitin**

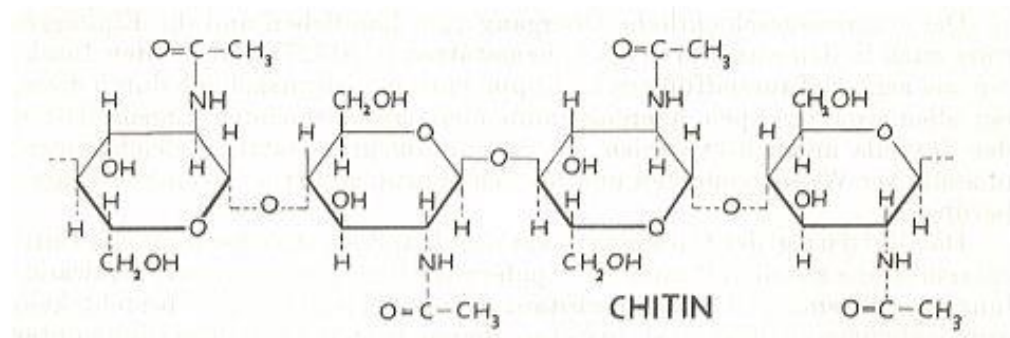
- In arthropod **exoskeletons** (crustaceans, insects and spiders) and fungal\* cell walls



## Plants

- **Cellulose**

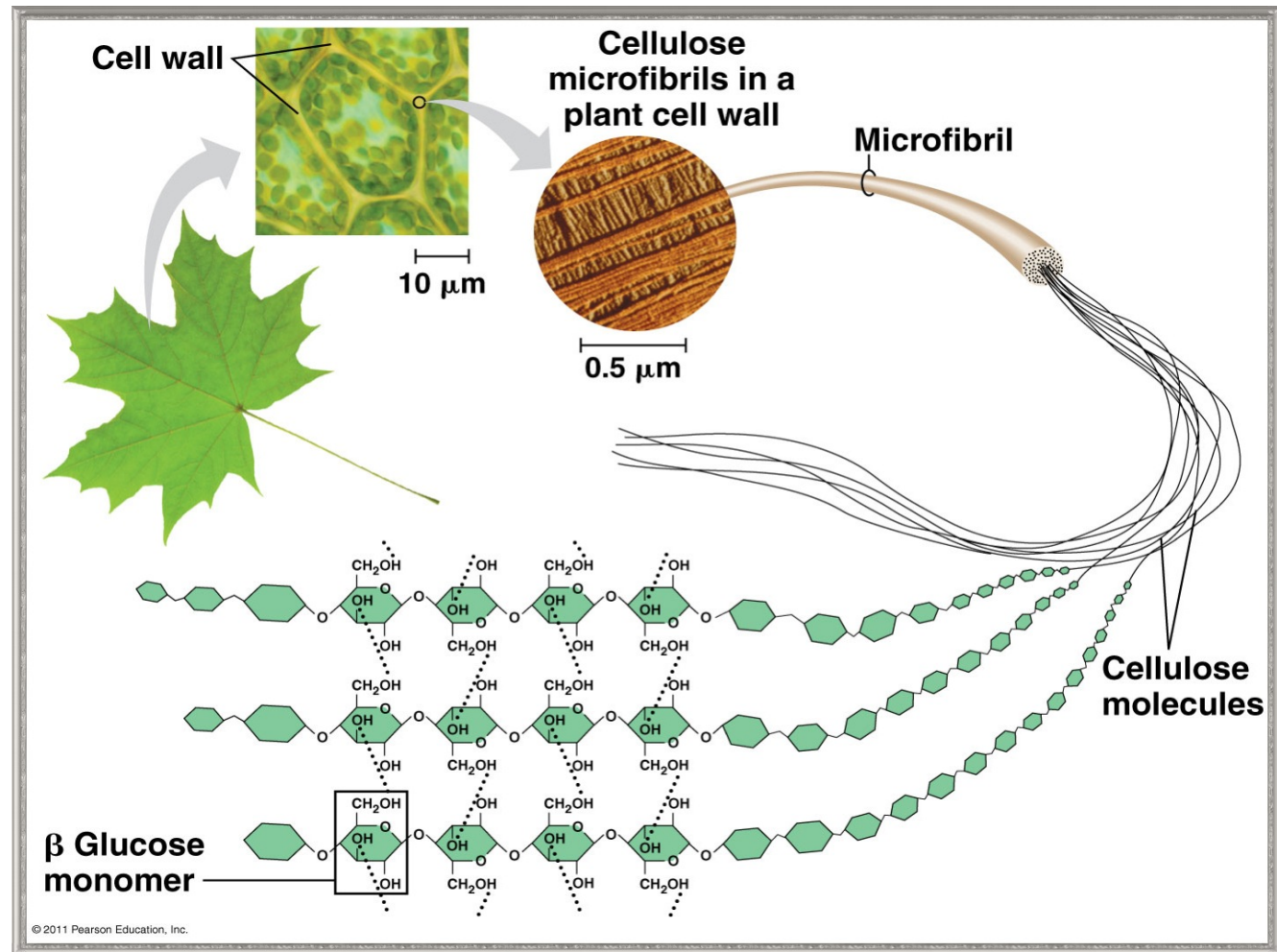
- In cell **walls**
- Most organisms lack enzymes to break down to use for energy...but it's the **FIBER** that is so important in your diet!



\*A fungus is not an animal

# Polysaccharides - Structural

**Both chitin and cellulose use modified glucose that form chains like strings of pearls.**



# Polysaccharides - Storage

We are storing  **Energy** in the bonds between monomers.

## Animals

- **Glycogen**

- Made and stored in animals
  - Stored in the liver and **muscle** tissue
- Highly branched chains of **glucose** monomers

## Plants

- **Starch**

- Made and stored in plants
  - Stored in **seeds** or specialized organelles
- Branched chains of **glucose** monomers

We tend to use the words “sugar” and “starch” and “carbohydrate” loosely.

When we say a food is “high in carbohydrates” do we mean the food is high in “sugar” or “starch” or both?

Potatoes and bread “starchy” foods and are “high in carbohydrates” due to the starch they contain.

Fruits are “high in carbohydrates” but we would never say they were “starchy” - they contain almost all simple carbohydrates such as sucrose, fructose.

We tend to say “high in carbohydrates” for foods with a high level of the complex carbohydrates known as starch. And for foods that have high levels of the simplex carbohydrates, we tend to say they are “high in sugar”.

**But sugar and starch are really the same thing! They’re both made from glucose.**

# Let's Fill in Your Macromolecule Table for Carbohydrates!

(This table was at the end of your last set of notes)

Macromolecule	Carbohydrates
Types of atoms	Carbon, Hydrogen and Oxygen
Monomers made of	Monosaccharides
Function(s)	Energy Storage, or Cell Structure
Examples	Glucose, Lactose, Cellulose
Sketch	(sketch out a monosaccharide)