Building Glucose, Starch and Cellulose

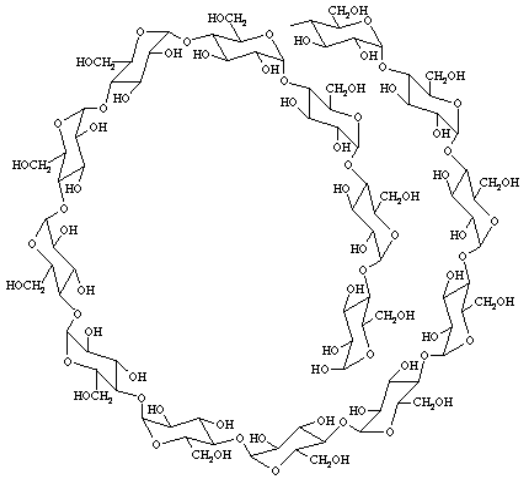
We will do the following in order to learn about sugars:

1. Build a D-glucose molecule in its open chain form.
2. Consider what change is necessary for it to become L-glucose.
3. Make our D-glucose molecule wrap into its alpha-D-glucose cyclic form.
4. Consider what change is necessary for it to become beta-D-glucose.
5. Bind all our alpha-D-glucose cyclic molecules (freeing a water molecule at each bond) into a polysaccharide called amylose, a major component of starch.
6. Change the alpha-D-glucose molecules to beta-D-glucose molecules. This changes the amylose polysaccharide into a cellulose polysaccharide.
7. Consider how hydrogen bonding can strengthen cellulose and cross-link to other cellulose molecules.

Each glucose molecule requires the following parts:

6	4-hole black carbon atoms
12	white hydrogen domes
6	2-hole red oxygen atoms
12	long rigid bonds (10 needed for the open chain form)
12	short bonds
2	long flexible bonds (needed for the open chain form)

Amylose polysaccharides tend to adopt the helical structure shown at the right:



Cellulose polysaccharides gain their strength by hydrogen bonding between units of the chain and between adjacent chains as shown in this structure diagram: