Disaccharides

Disaccharides: two monosaccharides can form a disaccharide with a glycosidic bond.

The glycosidic bond can be alpha or beta with respect to the anomeric carbon.
Common Disaccharides

- Sucrose: Table sugar/sugar. Formed from glucose and fructose.
Common Disaccharides

- Maltose: Produced during digestion of starch and ultimately hydrolyzed (broken apart by water) into glucose to be used by the body; produced by malt in the manufacture of beer. Formed from α-D-Glucose.
Common Disaccharides

- Lactose: Major carbohydrate of mammalian milk; an individual who is lactose intolerant is deficient in the enzyme necessary to hydrolyze the beta-1,4-glycosidic linkage in lactose.
Polysaccharides

**Polysaccharides:** Polymers of monosaccharides connected by glycosidic linkages.
- **Cellulose:** Consists of numerous beta-D-Glucose monomers connected by beta-1,4-linkages.

![Cellulose structure](image-url)
Polysaccharides Continued...

- **Starch**: Consists of numerous alpha-1,4 glycosidic links. Consists of amylose (20%) and amylopectin (80%). Plants use starch for carbohydrate storage. They can break starch down into glucose monomers for energy.
  - Amylose: consists of hundreds to about a thousand alpha-D-glucose monomers linked by alpha-1,4 glycosidic bonds. The straight chain forms a coil. (Figure A below)
  - Amylopectin: Has thousands of the glucose monomers connected by alpha-1,4 glycosidic bonds and has branching glucoses approximately every 25 units along the chain. (Figures B and C below)

- **Glycogen**: Structure is the same as amylopectin, but with more frequent branching (every 8-12 glucose units is branched). Serves as the source of carbohydrate energy storage in animals. (Figures B and C below)
Problems

1. Which of the following are anomers:
   a. D-glucose and L-glucose
   b. Alpha-D-glucose and beta-D-glucose
   c. D-glucose and D-galactose
   d. Sucrose and maltose

2. Which of the following is a polysaccharide made up of D-glucose units with beta-1,4 glycosidic linkages?
   a. Glucose
   b. Maltose
   c. Cellulose
   d. Glycogen