3.16 POLYSACCHARIDE SYNTHESIS AND GLYCOSIDIC BONDS

The reaction that is used by the organism to build bigger sugars from the smaller monomer units is the **dehydration synthesis reaction**. As noted above, this is the same general type of anabolic reaction that is used to build lipids, nucleic acids, and proteins. However, each of the four classes of organic molecules have their own unique reaction which synthesizes the polymer molecules.

Synthesizing carbohydrates involves removing a hydroxide group (OH^-) from one saccharide and one hydrogen atom (H^+) from the other saccharide. This results in the formation of one molecule of water (H_2O) and the new sugar. The new molecule is held together with an oxygen atom in the middle, linked to a carbon atom on one saccharide unit and another carbon atom on the other saccharide unit. The oxygen atom is a "bridge" between the two saccharide units. This type of bond is called a **glycosidic bond**.

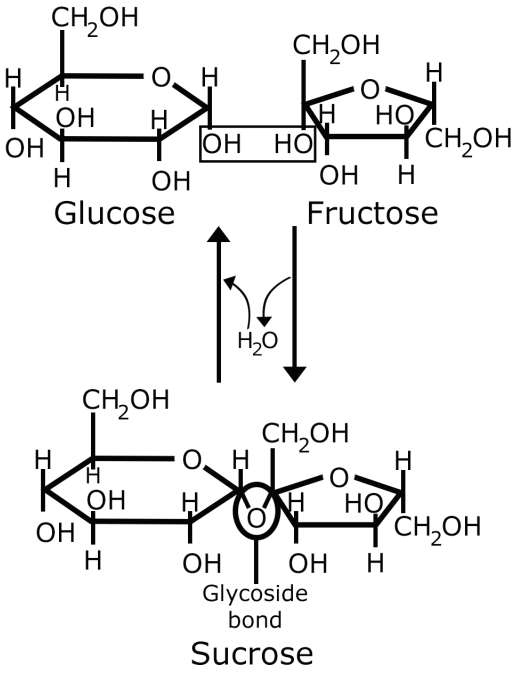

Figure 3.16.1

Glycoside Bond
The formation of a glycoside, or glycosidic, bond is shown for the anabolic condensation synthesis reaction of the monosaccharides glucose and fructose to form the disaccharide sucrose. Sucrose is table sugar. Note that water is a product of the condensation reaction and that the oxygen molecule bonds to a carbon on the glucose and a carbon on the fructose to form the glycoside bond. During the catabolic hydrolysis reaction, water is added to the glycoside bond and the two monomers separate.

Glycosidic bonds can also be "reversed." Reversing a glycosidic bond is called breaking a glycosidic bond. A glycosidic bond is broken by a hydrolysis reaction. When water is added to a glycosidic bond, the molecules held together by the glycosidic bond are broken apart.

3.17 DISACCHARIDES

Monosaccharides are the monomers used by organisms to build bigger sugars. The next biggest size, structurally speaking, in the carbohydrate class is the **disaccharides**. A disaccharide is formed when two monosaccharides are linked together. This occurs via the dehydration synthesis reaction, when a hydrogen ion from one monosaccharide is removed and a hydroxide ion from the other monosaccharide is removed to form the new disaccharide plus one molecule of water. The two monosaccharide units of a disaccharide are held together by a glycosidic bond. If the organism needs to, the disaccharide bond can be broken by a hydrolysis reaction. Water is added to the glycosidic bond of the disaccharide. This separates both of the monosaccharides.

There are many disaccharide sugar molecules. A few of the common disaccharides are **sucrose, maltose, and lactose**. Sucrose is also known as table sugar. It is formed from a glucose and a fructose molecule getting linked together. Maltose is a common sugar that is used to make beer. It is formed by linking together two glucose molecules. Lactose is the sugar that is in dairy products such as milk and ice cream. It is formed by linking together a glucose and a galactose molecule. The reason that some people are "lactose