Problem set 2

The structure of D-mannose differs from that of D-glucose at the asymmetric center that is vicinal to the anomeric center. Knowing the structure of glucose, draw the chair form of mannose.

Now compare the two structures. Clearly they are not the same. Are they enantiomers or diastereomers? How do you know?

The convention for numbering a sugar backbone is to label the anomeric center as C-1 and to continue the count by increasing the number as one moves toward the ring oxygen. Carry out this exercise for mannose and glucose. When you do, you will discover that their absolute stereochemistries differ at one of the carbons. What number? That center is said to be an epimeric center and the two compounds are said to be epimers.

Do you think that glucose can be oxidized? Where? That is, at which carbon(s)?

It turns out that glucose can be oxidized. The substance (a reagent of some sort) that carries out the oxidation is called the oxidizing agent. It is reduced by the sugar as the sugar is being oxidized by the oxidizing agent. The sugar, therefore, is said to be a reducing sugar. This is an important term that we will discuss in class. I thought that you could figure things out for yourself given a little bit of guidance. That's what I've tried to do. How'd you do?

Show that the absolute configuration at the center of chirality in the products resulting from a nucleophilic 1,2-addition to methyl ethyl ketone depends upon whether the attack occurs from the top or bottom face of the carbonyl. What term describe the relationship between the products? How much of each do you anticipate will be formed? Why? [This question relates to sugar chemistry. Be certain you understand how.]