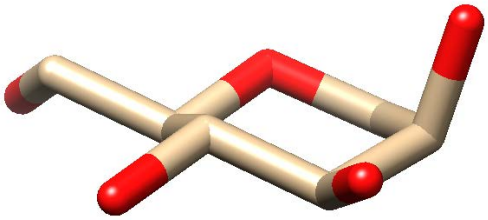
Problem Set 5 - Partial (**Due Sept 30th**)

1. Draw the Hawthorn projection (ring form) of Mannose and its C2 epimer. What is the common name of this epimer?

2. Examine the sugar shown here.
   a. Is this an aldose or ketose? Pentose or hexose?
   b. Label each carbon appropriately (C1, C2, etc.)
   c. From the image, how can you be sure that it's an epimer of glucose?
   d. Which sugar is it?
   e. Draw the sugar using a Hawthorn projection and a Fisher projection.



3. Sucrose is a common disaccharide. What is the full name of this sugar?

4. What is meant by the term reducing sugar? Which of the common disaccharides discussed in class are not reducing sugars? Justify your answer. What experiment can you do to determine if a disaccharide is reducing?

5. Using Chimera or another 3D molecule viewer, open pdbID 4B7I (the last letter is eye, not el).
   a. Verify that this is an N-linked oligosaccharide. What is the residue number of the glycosylated Asn?
   b. Does the protein follow the correct amino acid pattern for glycosyl transferase specificity? Be specific – you book discusses three invariable features of N-linked sugars.
   c. Using a sketch like seen in Figure 8.19, map the sugars. For each glyosidic bond, determine the linkage (e.g. $\alpha(1\rightarrow4)$). Hint: To determine the α/β orientation, you can set the focus to each sugar and observe if the anomeric carbon orientation is axial (α) or equatorial (β).
   d. Are there any H-bonds between the oligosaccharide and amino acid side chains?
   e. Draw this oligosaccharide using a Hawthorn projection. Make sure to show the linkage to Asn.

6. Discuss the differences between starch and cellulose. Make sure to consider the 3D structure of the polymers and how each interacts with other polymers.

7. Bacterial cell walls are made from repeating patterns of two modified sugars. Draw these sugars as they would look in a cell wall. Discuss how linear polymers are connected in a cell wall.