BC367, Fall 2019 Problem set #8 Due: Friday, November 8th

(Problems must be done on separate pages & short answer questions must be typed.)

1. With respect to ketoheptopyranoses ($C_7H_{14}O_7$),

    a. How many unique stereoisomers are there in total?

    b. For a *given* ketoheptopyranose, how many unique stereoisomers are there?

    c. Draw structures for all of the stereoisomers of a given D-ketoheptopyranose.

2. Look up and re-draw the structures of the artificial sweeteners aspartame and sucralose and discuss how their chemistry makes them useful food additives.

3. Sucrose is a product of photosynthesis in green leaves and is catalyzed by an array of enzymes. The final step of sucrose synthesis – *O*-glycosidic bond formation yielding β-D-fructofuranosyl-α-D-glucopyranoside – must occur despite a mixture of monosaccharide anomers present in the cell.

    a. Sketch the mechanism (*i.e.* electron pushing) of this glycosidic bond formation from the appropriate monomers sans catalyst.

    b. Is the enzyme likely to use these monomers as substrates? Why or why not?

    c. Discuss how the enzyme responsible for this step could differentiate the correct anomers for sucrose formation from the incorrect anomers.

4. A sample of glycogen is treated with dimethyl sulfate, which methylates free hydroxyl groups, then treated with strong acid to hydrolyze the glycosidic bonds. The reaction products are then analyzed

    a. Assuming complete methylation and hydrolysis, how many unique, modified monosaccharides would be produced?

    b. Draw the structure of the most abundant modified monosaccharide.