Chem 130: Chemistry for Funeral Services
Problem Set 11

Name: **KEY** Date:

Each question is worth one point except as noted. Show your work wherever calculations are required.

1. What is the difference between a ketose and an aldose? Why are sugars considered polyalcohols?

   An aldose is a monosaccharide containing an aldehyde group. A ketose is a monosaccharide that contains a ketone group. Sugars are considered polyalcohols because they contain many hydroxyl groups

2. In detail, explain why monosaccharides are drawn in a ring structure. What is the reaction that causes the ring to form?

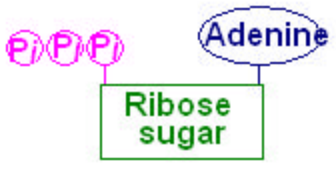
   Alcohol groups can react with either aldehyde or ketone carbonyl groups to form hemiacetals or hemiketals. Since monosaccharides are polyalcohols that also contain either an aldehyde or a ketone group, the molecule is able to undergo an intramolecular (reacts with self) reaction to form the ring. The ring is usually formed with five or more typically six atoms. Rings of this size are fairly stable. The actual reaction forms a hemiacetal or a hemiketal.

3. What is the relationship between dehydration reactions and hydrations reaction in forming/decomposing dissacharides and polysaccharides? Describe one of the major polysaccharides in some detail (starch, glycogen or cellulose).

   Disaccharides are formed from monosaccharides in dehydration reactions (loss of water to form a bond). Polysaccharides are formed from a whole series of dehydration reactions. To reform the monosaccharides, the water must be added back to the bonds through hydration reactions. So hydration reactions and dehydration reactions are really the same type of reactions but run in opposite directions. For descriptions of the major polysaccharides, see the text book.

4. How do molecules like ATP and GTP store energy? Draw a simplified version of one of these molecules.

   Energy is stored in bonds to inorganic phosphate groups.



Pi = Inorganic Phosphate

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5. (3 points) Glycolysis, Kreb's cycle and the electron transport chain are three important aspects of the production of chemical energy for cells. What is the major function of each of these steps (three separate answers)? What is the overall balanced equation for the breakdown of one molecule of glucose?

Glycolysis: Split glucose into two three carbon chains and produce pyruvate and high energy molecules.
Krebs: Transfer acetyl group to Coenzyme A then transfer two carbons to carbon dioxide. Produce more high energy molecules.
Electron transport: Take many of the high energy molecules produced in Glycolysis and Krebs Cycle and convert to ATP. End reaction with production of water from O_2.
Equation: See electron transport handout.

6. (2 points) Describe muscle contraction and rigor mortis on a chemical level. Be sure to discuss ATP in your answer.

Answer should include the structure of the sacromeres, the interactions of myosin and actin and how the interaction of these two molecules changes when ATP is hydrolyzed to ADP and P_i. Rigor mortis portion of the answer should include a discussion of the depletion of ATP after death and how ATP depletion relates to muscle relaxation.

7. Describe on of the major reactions of carbohydrates other than oxidation or hydrolysis. Be sure to include a balanced equation.

Several answers possible. Choose from fermentation, photosynthesis or the reaction with Benedict's or Fehling's solution (discussed in chapter, not in lecture). See lecture notes and text for details.