The Structure and Function of Large Biological Molecules Review
Chapter 5

1. Identify the four main classes of large biological molecules. Identify the class that is not a polymer. (The four main classes are proteins, carbohydrates, lipids, and nucleic acids. Lipids are not polymers.)
2. a) Imagine you eat a big plate of pasta. Describe the reactions that must occur for the glucose in the pasta to be stored as glycogen in your liver. (The glucose molecules in the starch must be released in hydrolysis reactions. The free glucose molecules must then be stored as glycogen by dehydration reactions.)
   b) State the number of water molecules required to hydrolize a polymer that is 10 monomers long. (Nine. One water molecule is required to hydrolyze each connection between adjacent monomers.)
3. Distinguish between carbohydrates, monosaccharides, disaccharides and polysaccharides. (Monosaccharides are single sugar molecules that can be joined together by dehydration reactions. If two are joined, the resulting molecule is a disaccharide. If several are joined, the resulting molecule is a polysaccharide. Carbohydrates are a class of molecules containing monosaccharides, disaccharides and polysaccharides.)
4. Identify the functions of starch and glycogen. Describe the structural differences between them. (Starch is a storage polysaccharide found in plants. Glycogen is a storage polysaccharide found in animals. Glycogen is highly branched while starch is relatively unbranched.)
5. Compare and contrast starch and cellulose. (These are both polysaccharides found in plants. Starch is a storage polysaccharide while cellulose is a structural polysaccharide.)
6. Distinguish between saturated and unsaturated fats. (Saturated fats contain the greatest possible number of hydrogen atoms. Unsaturated fats are missing one or more hydrogen atoms, resulting in double bonds between carbon atoms.)
7. Compare the structure of a fat (triglyceride) with that of a phospholipid. (Both have a glycerol molecule attached to fatty acids. The glycerol of a fat has three fatty acids attached, whereas the glycerol of a phospholipid is attached to two fatty acids and one phosphate group.)
8. Suggest a reason phospholipids and human sex hormones are considered lipids. (Human sex hormones are steroids, a type of compound that is hydrophobic and thus classified as a lipid.)
9. Draw and label a typical amino acid.
10. Explain the importance of having amino acids with different properties.
11. Identify the parts of an amino acid that participate in the bonds holding together secondary structure and those involved in holding together tertiary structure. (Secondary structure involves hydrogen bonds between atoms of the polypeptide backbone. Tertiary structure involves interactions between atoms of the side chains of the amino acid subunits.)
12. Find the structures of valine and glutamic acid. Propose an explanation for the dramatic effect on protein function that occurs when valine is substituted for glutamic acid. (Valine is nonpolar while glutamic acid is charged. The charge of glutamic acid would make it impossible to be in a hydrophobic environment, changing the structure and, therefore, the function of the protein.)
13. Describe the relationship between protein structure and function. (In order to perform its function, every protein has a particular shape.)
14. Predict the location in a folded polypeptide where you would expect a polypeptide region containing several valine, leucine and isoleucine monomers to be located. (These are all nonpolar, hydrophobic amino acids, so you would expect this region to be located in the interior of the folded polypeptide, where it would not contact the aqueous environment inside the cell.)
15. Describe how sequencing the entire genome of an organism help scientists to understand how that organism functioned. (The DNA of an organism encodes all of its proteins, and proteins are the molecules that carry out the work of cells, whether an organism is unicellular or multicellular. By

knowing the DNA sequence of an organism, scientists would be able to identify all the protein sequences as well.)

16. Considering the function of DNA, describe why you would expect very similar organisms to have very similar genomes. (The DNA sequence contains the information to make the proteins that determine the traits of a particular species. Because the traits of the two species are similar, you would expect the proteins to be similar as well, and therefore the gene sequences should also be quite similar.)