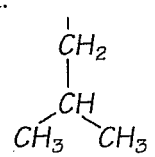
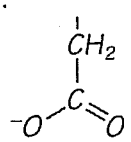
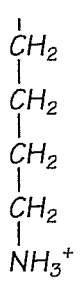
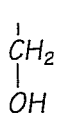
Name _____ Course/Section_____

Date _____ Professor/TA _____

Activity 4/5.2 What predictions can you make about the behavior of organic macromolecules if you know their structure?

1. Twenty amino acids are commonly utilized in the synthesis of proteins. These amino acids differ in the chemical properties of their side chains (also called R groups). What properties does each of the following R groups have? (*Note:* A side chain may display more than one of these properties.)

R Group	Basic, acidic, or neutral	Polar or nonpolar	Hydrophilic or hydrophobic
a. 			
b. 			
c. 			
d. 			

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2. Polypeptides and proteins are made up of linear sequences of amino acids. In its functional form, each protein has a specific three-dimensional structure or shape. Interactions among the individual amino acids and their side chains play a major role in determining this shape.

a. How are amino acids linked together to form polypeptides or proteins? What is this type of bond called?

b. Define the four structures of a protein.	c. What kinds of bonds hold each of these structures together?
Primary:	
Secondary:	
Tertiary:	
Quaternary:	

3. Lipids as a group are defined as being hydrophobic, or insoluble in water. As a result, this group includes a fairly wide range of compounds—for example, fats, oils, waxes, and steroids like cholesterol.

a. How are fatty acids and glycerol linked together to form fats (triglycerides)?

b. What functions do fats serve in living organisms?

c. How do phospholipids differ from triglycerides?

d. What characteristics do phospholipids have that triglycerides do not have?

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4. Use your understanding of the chemical characteristics of the four major types of macromolecules in living organisms to predict the outcome of the following experiments. Be sure to explain your reasoning.

Experiment a: You stir 10 g of glucose and 10 ml of phospholipids in a 500-ml beaker that contains 200 ml of distilled water. Draw a diagram to show where and how the glucose and phospholipids would be distributed after you let the mixture settle for about 30 minutes.

Experiment b: You do Experiment a again, but this time you stir 10 g of glucose and 10 ml of phospholipids in a different 500-ml beaker that contains 200 ml of distilled water and 100 ml of oil. Draw a diagram to show where and how the glucose, phospholipids, and oil would be distributed after you let the solution settle for about 30 minutes.

Experiment c: To completely fill a sealed 500-ml glass container that contains 490 ml of distilled water, you inject 10 ml of phospholipids into it. (A small gasket allows the air to leave as you inject the phospholipids.) You shake this mixture vigorously and then let it settle for an hour or more. Draw a diagram to show how the phospholipids would be distributed in the container.

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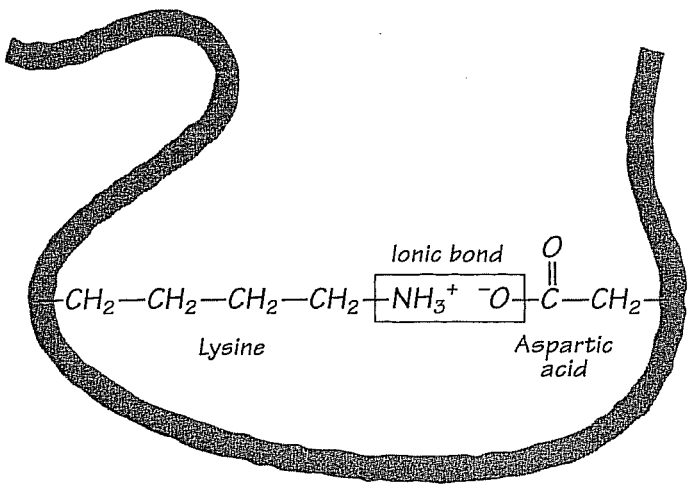
Experiment d: A globular protein that is ordinarily found in aqueous solution has these amino acids in its primary structure: glutamic acid, lysine, leucine, and tryptophan. Predict where you would find each amino acid: in the interior portion of the protein (away from water) or on the outside of the protein (facing water). (Refer to Figure 5.17, page 79.)

Experiment e: Drawn below is part of the tertiary structure of a protein showing the positions of two amino acids (aspartic acid and lysine). Replacing lysine with another amino acid in the protein may change the shape and function of the protein. Replacing lysine with which type(s) of amino acid(s) would lead to the least amount of change in the tertiary structure of this protein? (Refer to Figure 5.17, page 79.)



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