

7.013 Recitation 2 - 2013

Summary of Lectures 2 & 3:

Bonding: There are many types of bonds that hold molecules together. Covalent bonds result when two atoms share a pair of electrons between them, such as the bonds between C and H in methane. Ionic bonds occur between atoms with a very high difference in electronegativities. Hydrogen bonds occur between polar molecules, such as molecules of water, because of the partial negative charge on the O and the partial positive charge on the H i.e. difference in the electronegativity of O and H atoms. Van der Waals forces are very weak forces that occur between all atoms because of random distribution of electrons. Hydrophobic effects promote the association of hydrophobic molecules together in order for them to avoid water and thereby increase entropy.

Biological macromolecules- Lipids and Carbohydrates: All the cells, whether prokaryotic or eukaryotic, have biological polymers or macromolecules. They are composed of the same major classes of macromolecules: lipids, carbohydrates, nucleic acids and proteins.

Lipids or fats are predominately hydrocarbon chains that are used as energy storage and insulation. Lipids are hydrophobic in nature. Modified lipids form phospholipids, steroid hormones, cholesterol and some vitamins. Cell membranes are composed of lipid bilayers, which separate the aqueous inside of the cell (the cytoplasm) from the aqueous outside of the cell (the extra cellular environment). One specific type of lipid, called phospholipids, has polar phosphate groups as heads and two long hydrocarbon tails that are hydrophobic. Phospholipids form lipid bilayers in aqueous solutions that expose the phosphate head groups on each side of the layer and hide the hydrophobic tails in between the two rows of head groups. Cell membrane is selectively semi-permeable. Only small hydrophobic molecules can pass through cell membranes. All large or polar or charged molecules must cross the membrane through protein pores in the membrane.

Carbohydrates include monosaccharides and disaccharides like glucose and lactose. A monosaccharide is composed of carbons flanked by H atoms or -OH groups and can be linear or have a ring structure. Many monosaccharides are linked together to form polysaccharides like starch and cellulose. Carbohydrates are used as an energy source, as a source for carbon, and can be attached to other molecules to serve as recognition markers for the cell.

Questions:

1. Many glucose monomers can be linked together through glycosidic bonds to make polysaccharides such as glycogen in animals and starch in plants. What is the advantage of storing carbohydrates as polysaccharides as opposed to monosaccharides?

2. Oil is fluid at room temperature but butter is solid. Which types of fats (saturated/unsaturated) predominate in oil and butter?

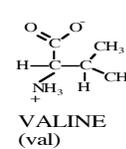
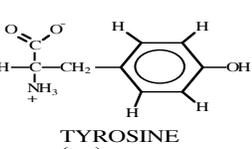
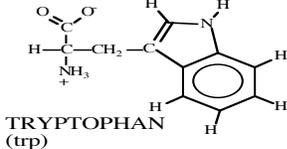
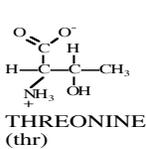
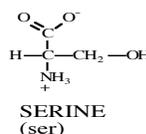
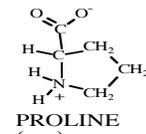
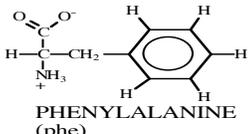
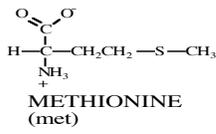
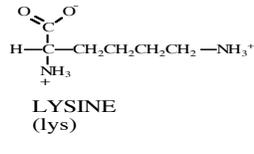
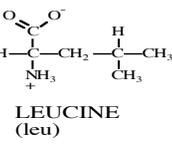
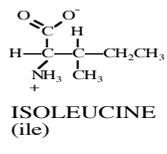
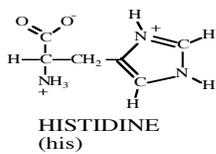
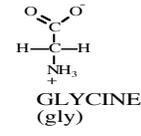
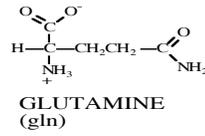
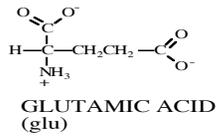
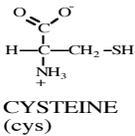
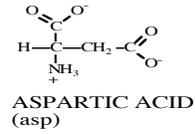
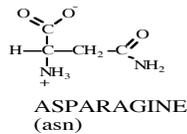
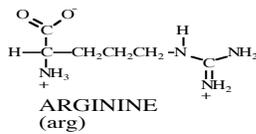
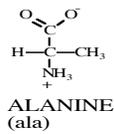
a) Identify the amino acids (1), (3) and (4) in the schematic above.

b) Classify the amino acids that you have identified above as polar/nonpolar, charged/ uncharged and hydrophilic/hydrophobic.

c) Complete the following table.

<u>R Group</u>	<u>Interaction(s) of R Group with Substrate</u>	<u>Classification of R Group</u>
(1)		
(3)		
(4)		

STRUCTURES OF AMINO ACIDS at pH 7.0



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