

Biol 223 – BIOL 190 Review Experiment – Spring 2020

Student Name _____

Building Molecular Models of Biomolecules

Originally Prepared by

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And

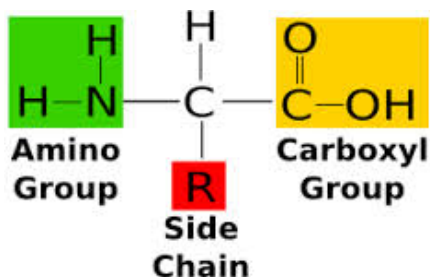
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Further Modification by Dr. Carman for Spring 2020 BIOL 223

I. PROTEINS

Amino acids are the building blocks of proteins. Amino acids contain two different functional groups, the amino group and a carboxyl group. There are 20 amino acids which only differ in the R group attached to the alpha carbon. Glycine is the simplest amino acid.

The basic structure for an amino acid is shown below.



The amino acid backbone of any amino acid is called

N **C α** (alpha) **C'** (prime)

PROTEINS (cont.)

The **N** stands for the amino group, **C alpha** stands for one carbon away from a carboxyl carbon HO-C=O, and **C' prime** stands for the carboxyl carbon HO-C=O.

Draw an amino functional group below.

Draw a carboxyl functional group below.

What is the R group in glycine?

Draw the Lewis Structure below for glycine .

Use the molecular model set to make glycine. Using your phone take a picture of the glycine model and submit it as a jpg or png (ONLY) in Canvas.

What is the R group in alanine?

Draw the Lewis structure for alanine.

PROTEINS (cont.)

Make a model of alanine, take a picture, and submit in Canvas as instructed for gly, above.

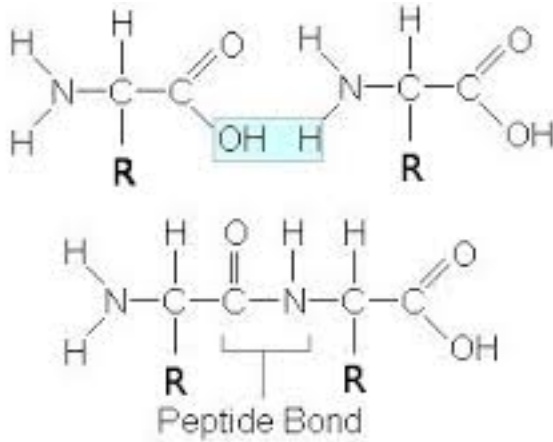
Draw the structure of an amino acid with a (+) charged side chain.

Draw the structure of an amino acid with a nonpolar side chain.

Draw the structure of an amino acid with a polar side chain.

PROTEINS (cont.)

Use the molecular model kit to make the dipeptide gly-ala. Connect the two amino acids together with a peptide bond.



Take a picture of the dipeptide and submit it in Canvas as instructed for gly and ala, above.

Proteins have 4 levels of structure.
Name the four levels below.

1. _____
2. _____
3. _____
4. _____

PROTEINS (cont.)

Draw your version of an alpha helix, take a picture of it with your phone and submit in Canvas as instructed, previously.

Draw your version of a beta pleated sheet, take a picture of it with your phone and submit in Canvas as instructed, previously

What type of bond holds the alpha helix and the beta pleated sheet together?

II. CARBOHYDRATES

Monosaccharides are the building blocks of carbohydrates. Glucose is the most common monosaccharide. Glucose contains the polar hydroxyl group.

Draw a hydroxyl group.

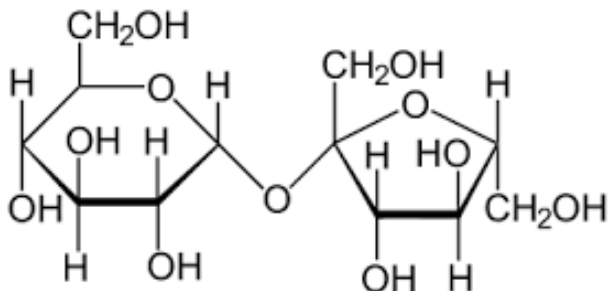
Draw a Haworth projection of α -glucose and β -glucose. Label the anomeric carbon in both.

CARBOHYDRATES, Cont'd

Use the molecular model kit to make both forms of glucose, take a picture of them together with your phone and submit in Canvas as instructed, previously

Do the same above two steps for α -fructose and β -fructose. Label the anomeric carbon in both.

Make a model of the disaccharide sucrose, draw your model, below, then take a picture of your model with your phone and submit in Canvas as instructed, previously.



III. LIPIDS

Lipids are mainly hydrophobic molecules containing small polar groups sometimes. A fat molecule, a triglyceride, is a common lipid. A triglyceride is made from a glycerol molecule and three fatty acids.

Draw the structural formula for glycerol.

Make a model of glycerol, take a picture of it with your phone and submit in Canvas as instructed, previously

Draw the structural formula for 16:0, take a picture of it with your phone and submit in Canvas as instructed, previously.

Using multiple molecular model kits, build trilaurin, take a picture of it with your phone and submit in Canvas as instructed, previously.

LIPIDS (cont.)

Draw the structural formula for **22:5 n-3, proper**, take a picture of it with your phone and submit in Canvas as instructed, previously.

Draw the structural formula for the **conjugated form of 22:5 n-3**, take a picture of it with your phone and submit in Canvas as instructed, previously.

Are the two 22:5, n-3 molecules identical? Why or why not?

Another common lipid is cholesterol.

Using multiple molecular model kits, build cholesterol, take a picture of it with your phone and submit in Canvas as instructed, previously.

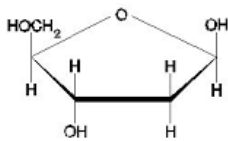
What is the polar group in cholesterol?

NUCLEIC ACIDS

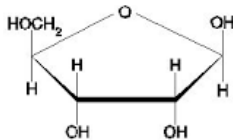
DNA and RNA are nucleic acids. DNA and RNA are made up of nucleotides. Nucleotides are made of a five carbon sugar, phosphates, and a nitrogenous base. The ribonucleotide ATP is used to make RNA, and it is also used for cellular energy storage.

What's the difference between a nucleoside and a nucleotide?

What is the structural difference between the sugars deoxyribose and ribose?



Deoxyribose



Ribose

The highest level of DNA structure is the quaternary structure. What is it that gives this level of structure and how is the DNA organized?