**Biophysical Chemistry – CH 4404 01**
**Assignment 1**

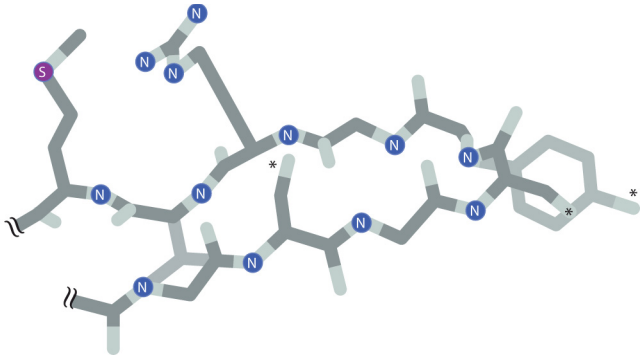
**Due Friday, August 30 (by 5:00 pm)**

1. Complete the PyMOL tutorial found on the course website, and submit your answers to the questions as part of this assignment. (20 points)

2. The diagram below shows a graphical representation of the structure of a peptide segment (that is, a short portion of a larger protein chain). Hydrogen atoms are not shown. Nitrogen and sulfur atoms are indicated by "N" and "S." Side chain oxygen atoms are indicated by "*."

   a. Identify each of the amino acid residues in the peptide. Be sure to order your sequence in the N-terminal to C-terminal direction! (3 points)

   b. Draw a linear chemical structure showing the covalent bonding, including the hydrogen atoms, of the entire peptide. (5 points)



   For this question, you must use some logic to determine the structure of each side chain. For example, knowing the protein backbone structure, you can determine whether light grey atoms correspond to backbone oxygen atoms or whether they correspond to side chain carbon atoms in the background. (8 points)

3. *Molecules of Life*[*], Chapter 1, Question 22. (3 points)

4. *Molecules of Life,* Chapter 1, Question 26. (2 points)

[*] Chapter 1 of *The Molecules of Life* is available for free from the Garland website at the following link: http://www.garlandscience.com/res/pdf/9780815341888_ch01.pdf

5. Using the definitions of intensive and extensive quantities discussed in class, identify whether the following variables are intensive or extensive. (5 points)

   a. Volume
   b. Mass
   c. Density
   d. Internal energy
   e. Temperature

6. Having visited Starbucks, you leave the Union building with 200 g of premium-grade coffee at 85 $^{o}$C. When you finally reach Hand Lab, your coffee has cooled to 80 $^{o}$C.

   a. Calculate the energy lost by the coffee during your trip. What assumptions did you have to make when calculating this value? (3 points)

   b. In the example above, define the system and the surroundings. (2 points)

   c. Where did the energy go? (2 points)