

Homework #3 BCHS 3304 – Fall 2009
Basic Calculations, Proteins

Reading Assignment: Chapter 5 of *Biochemistry* (except Sec. 2 pages 95-108)

Note: Show all work and remember to incorporate your units in your calculations.

1. You are purifying the protein called myoglobin which has been expressed recombinantly in the bacteria *E. coli*. In order to release the protein, you need to add the enzyme lysozyme to break down the bacterial cell wall. Your experiment calls for 10 mg of lysozyme and recommends that you make 10 ml of a 50 mg/ml stock solution of lysozyme in TE buffer. The molecular weight of lysozyme is 14,300 g/mole. Calculate and describe how you would make your stock solution. Calculate what volume of your stock solution you would add to your protein purification experiment.
2. Your thesis advisor suggests that you make stock solutions for your protein gel electrophoresis experiment to look at your purified myoglobin. She tells you the components for 1x Tris-Glycine electrophoresis buffer, but suggests you actually make a 1.0 L 5x stock so that you simply can dilute the concentrate as you need it. Calculate and describe how you would make a 5x stock of Tris-Glycine electrophoresis buffer. (Hint: 1% = 1g/100 ml for an aqueous solution.)

1x Tris-Glycine electrophoresis buffer (25 mM Tris, 250 mM Glycine, 0.1% SDS)

Tris MW=121.4 g/mole

Glycine MW= 75.07 g/mole

SDS (sodium dodecyl sulfate) MW=288.38 g/mole

3. Your SDS-PAGE gel electrophoresis experiment requires 1.0 L of 1x Tris-Glycine buffer. Calculate and describe how you would make this solution using your 5x stock solution.
4. Name two amino acids that would be found in the core of a protein. What are their three-letter codes? What are their one-letter codes?
5. Name one hydrophobic amino acid. What is its three-letter code? What is its one-letter code?
6. Name two basic amino acids. What are their three-letter codes? What are their one-letter codes?
7. Name two amino acids that might be found on the surface of a protein. What are their three-letter codes? What are their one-letter codes?
8. Name two acidic amino acids. What are their three-letter codes? What are their one-letter codes?
9. Complete the following problems of Chapter 5 (p. 54-57) in the *Student Companion to Biochemistry*: Problems # 13, 15, 16, 17, 20, 21.
10. Complete the following problems Chapter 5 (p. 122-123) in your *Biochemistry* textbook: Problems # 8, 10, 13, 14, 15, 16, 17.

Homework #4 BCHS 3304 – Fall 2009
Basic Calculations, Protein Structure and Purification

Reading Assignment: Chapter 6 of *Biochemistry*,
Chapter 7 of *Biochemistry*,
Chapter 5, Sect. 2. pages 91-103 of *Biochemistry*

Note: Show all work and remember to incorporate your units in your calculations.

1. Your experiment requires 100 ml 20 mM Tris, pH 8.0 which also contains 0.5 mM EDTA. Calculate and describe how you would make this solution using a stock of 1 M Tris, pH 8.0 and 0.5 M EDTA, pH 8.0.
2. Valine and isoleucine are isosteric indicating that they have the same shape. Draw each of these amino acids. What are their three-letter codes? What are their one-letter codes? Draw a circle around the methyl group which distinguishes isoleucine and valine.
3. Identify and draw another pair of isosteric amino acids in addition to the valine and isoleucine pair.
4. Complete the following problems of Chapter 6 (p. 68-73) in the *Student Companion to Biochemistry*: Problems # 1, 2, 6, 7, 11, 13, 18, 20, 24, 25, 26, 30.
5. Complete the following problems of Chapter 6 (p. 173-174) in your *Biochemistry* textbook: Problems # 1, 4, 7, 8, 10, 12.
6. Complete the following problems of Chapter 7 (p. 84-87) in the *Student Companion to Biochemistry*: Problems # 1, 2, 4, 8, 9, 10, 11, 15, 21.
7. Complete the following problems of Chapter 7 (p. 216-217) in your *Biochemistry* textbook: Problems # 2, 4, 9, 17.
8. Complete the following problems of Chapter 5 (p. 52-54) in the *Student Companion to Biochemistry*: Problems # 1, 4, 6, 8, 9, 11.
9. Complete the following problems of Chapter 5 (p. 121-122) in your *Biochemistry* textbook: Problems # 1, 3, 4, 6, 7, 9.