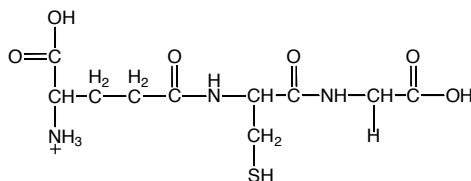


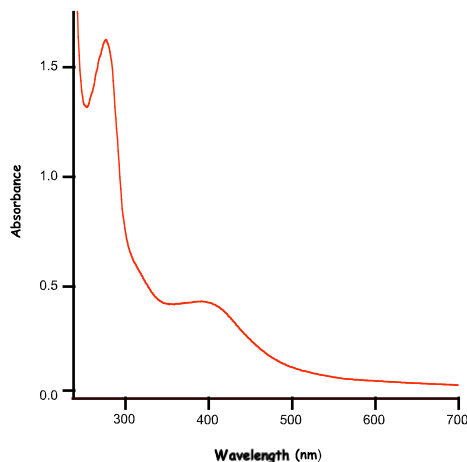
BMB 401 (2003) Make-up

Exam #1

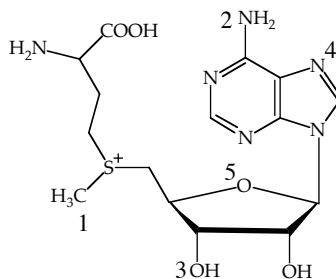
- Describe and discuss the major forces that are operable in biochemistry. In particular, discuss why it is inaccurate to describe hydrophobic interactions as forces. (10 points)
- What is the pH of a 0.1 M solution of acetic acid? $pK_a = 4.76$ (10 points)
- Draw the structure of a hydronium ion. What is the concentration of hydronium ions at a pH of 5? (5 points)
- For the next few questions, consider the following peptide A-P-K-Y-D-G-V-W-N-K-M-R-Q-V-F-I-E-G. (15 points, 5 points each)
 - If the above peptide were subjected to complete cleavage by trypsin, how many of the resulting peptides would absorb UV-visible light in the 220 – 300 nm range?
 - If the above peptide were subjected to acid hydrolysis (6 N HCl, 110°C for 24 h), what would the amino acid profile of the hydrolysate look like (i.e. what amino acids would be found)?
 - If the above polypeptide were subjected to 1) cleavage by chymotrypsin, 2) treatment with 1-fluoro, 2,4-dinitrobenzene (Sanger's Reagent) and 3) acid hydrolysis (in that order), what amino acids would be detected as the 2,4-dinitrobenzene derivative?
- Predict the elution pattern of the following amino acids from an **anion** exchange column (R, M, C, D, H, N). (10 points)
- The peptide glutathione is shown below. Write the one-letter code, the three letter code, and the name of each amino acid in this peptide (6 points). Estimate the pI of this peptide (9 points). What is **unique** about the peptide backbone of this molecule (5 points)?



7. A spectrum of lipoyl synthase from *Escherichia coli* was obtained by Rob Cicchillo in a cuvet of 1 cm path length, and is displayed below. It was determined from amino acid analysis that the concentration of the protein in the cuvet is $30 \mu\text{M}$. What is the molar absorptivity of the 1-mL sample *E. coli* lipoyl synthase at 400 nm. (5 points).



8. In the molecule shown below, which of the numbered positions cannot act as a hydrogen bond donor? (5 points)



9. At pH 7, would the molecule above be expected to elute before, after, or at the same time as methionine on a cation exchange column? (5 points)

10. What reagent might be used to detect the molecule above as it eluted from the cation exchange column? (5 points)

11. Phosphoric acid (2.45 g) and potassium hydroxide (2.45 g) were dissolved in water and diluted to 600 mL. Determine the pH and concentration of the resulting buffer. (15 points).

$$\text{pK}_a 1 = 2.14$$

pKa 2 = 6.86
pKa 3 = 12.4

Molecular weight of phosphoric acid = 98

The molecular weight of potassium hydroxide is 56