

BMB 401 Make-up Exam #1

Please write your answers legibly and in proper order for full credit.

Problem 1 (10 points) Give two reasons why biomolecules, and therefore life are carbon based.

Problem 2 (20 points) Discuss the hydrogen bonding pattern in ice, and why the density of solid H₂O (ice) is less than the density of liquid H₂O (water).

Problem 3 (10 points) Please describe the nature of hydrophobic interactions, and explain why it is inaccurate to describe them as forces.

Problem 4 (15 points) Please calculate the final pH (within 2 decimal places) of the following solutions (No partial credit given)

- 10 mM acetic acid
- 2×10^{-9} M NaOH.
- 6×10^{-9} M HCl
- 2 mL of 2 M HCl diluted to a final volume of 100 mL
- 20 mM phosphoric acid

Problem 5 (5 points) Predict the order of elution of the following amino acids from an anion exchange column at pH 7.0: **D, H, M, C, K** (No partial credit given).

Problem 6 (5 points) What is the final pH when 50 mL of 0.2 M NaOH is added to 200 mL of 0.2 M acetic acid?

Problem 7 (9 points) Calculate the isoelectric points of amino acids R, H, and E.

Problem 8 (5 points) Of the twenty naturally occurring amino acids, one does not have an S configuration at its alpha carbon. Please draw that amino acid in its correct stereochemical form, using dashed and bold lines to indicate stereochemistry.

Problem 9 (10 points) Draw the **predominant** ionized form of the amino acid **Y** at pH 11. Draw the predominant ionized form of amino acid **H** at pH 5.

Problem 10 (11 points) The ninhydrin Reaction

- a. How many moles of ninhydrin per mole of amino acid are required for the color change? (3 points)
- b. Other than the purple complex (Ruheman's purple), give another product in the ninhydrin reaction (5 points).
- c. Name one amino acid that will give a yellow color when treated with ninhydrin (3 points)