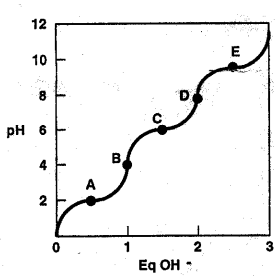
Recitation #04 Problems

QUESTION WARM UP 1 (EXAM 1, 2002)

The figure below shows the titration curve of one of the common amino acids.



(A) What is the amino acid?
(B) What is going on at points A, C, and E?
(C) What is the pI of the amino acid?
(D) What is the net charge at points B & D?

QUESTION 1 If you have a peptide: (C')--Val-Ile-Cys-His-Gly-Leu-Gly-Ala-(N')

a) What will an HCl workup and purification tell you?
b) What would be the first two products of Edman degradation

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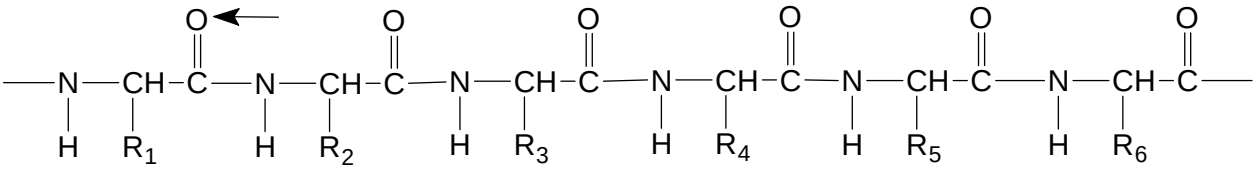
QUESTION 2 Suppose that the following protein sequence forms an alpha helix. Which atom will form a hydrogen bond with the indicated oxygen atom?



QUESTION 3 What is the difference between magnification and resolution?

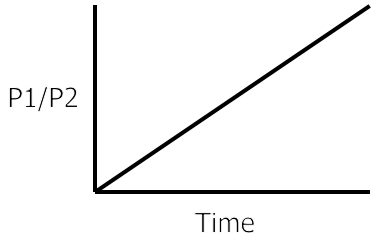
QUESTION 4 (Gumport 3-6) A survey of the location of reverse turns in soluble proteins shows that most reverse turns are located at the surface of the protein, rather than within the hydrophobic core of the folded protein. Can you suggest a reason for this observation?

QUESTION 5 (Stryer 4-2) Anhydrous hydrazine (H_2N-NH_2) has been used to cleave peptide bonds in proteins. What are the reaction products? How might this technique be used to identify the carboxyl-terminal amino acid?

QUESTION 6 (Stryer 4-13) A protein was purified to homogeneity. Determination of the molecular weight by molecular exclusion chromatography yields 60 kd. Chromatography in the presence of 6 M urea yields a 30 kd species. When the chromatography is repeated in the presence of 6 M urea and 10 mM β-mercaptoethanol, a single molecular species of 15 kd results. Describe the nature of the molecule.

QUESTION 7: (1999 Problem Set 10 #1) When proteins are unfolded by the addition of heat, they often precipitate. Why?

QUESTION 8: You are given a novel esterase, MITase. When you assay the appearance of the two products, P1 and P2, vs. time, you observe the following graph. What does this suggest about the mechanism of MITase?



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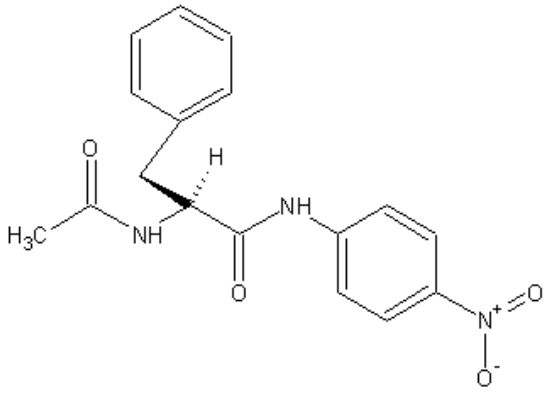
QUESTION 9: (1996, Exam 4) What are the significant conformational changes that occur when chymotrypsinogen is cleaved to yield π-chymotrypsin? Explain how these changes are thought to affect the enzymatic activity of the protein.

QUESTION 10: (Stryer 9-1) Examination of the cleavage of the chromogenic amid substrate, A, by chymotrypsin with the use of stopped-flow kinetics reveals no burst. Why?



QUESTION 11: (Stryer 9-2) Consider the subtilisin substrates A & B:
A: Phe-Ala-Gln-Phe-X
B: Phr-Ala-His-Phe-X

These substrates are cleaved (between Phe and X) by native subtilisin at essentially the same rate. However, the His 64 - to - Ala mutant of subtilisin cleaves substrate B more than 1000-fold as rapidly as it cleaves substrate A. Propose an explanation.

QUESTION 12: (Stryer 9-4) In chymotrypsin, a mutant was constructed with Ser 189, which is in the bottom of the substrate specificity pocket, changed to Asp. What effect would you predict for this Ser 189 -> Asp 189 mutation?