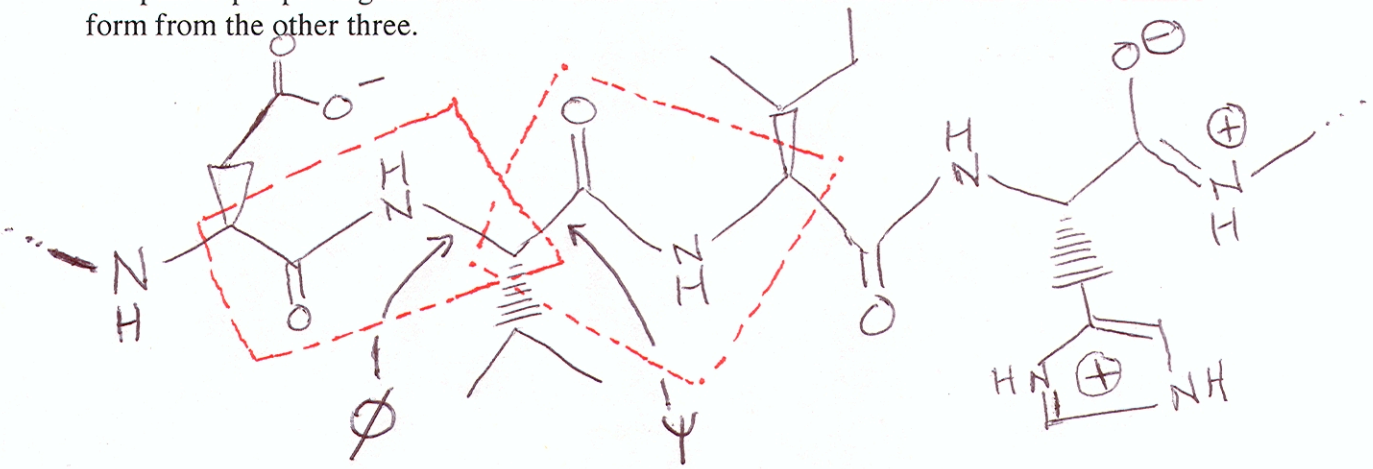
Chemistry and Biochemistry 3511 Midterm # 2, February 23, 2005

Print Name _KEY_____ Signature _____

1. Consider the peptide DVIHSAVDAC

1a) (20 pts) Draw the two-dimensional chemical structure of the first four residues only of this peptide. Indicate correct stereochemistry of the α-carbons. Draw the predominant form if the pH is 5.5. Draw boxes around two adjacent sets of six co-planer atoms. Label one pair of phi/psi angles. Draw the backbone of the fourth reside a different resonance form from the other three.



1b) (5 pts) Rewrite the peptide (one letter code) exactly as it is given above. Starting with the first residue (D), underline the residues you would expect to form a common face if this peptide adopts an α-helix.

DVIHSAVDAC

1c) (10 pts) Would the stability of the a-helix increase or decrease if you increased the pH to 7.0. Explain why in 2 sentences max.

Increasing the pH from 5.5 to 7.0 will deprotonate H, and decrease the electronstatic attraction between the D's and the H. The helix will be destabilized.

1d) (5 pts) Rewrite the peptide (one letter code) exactly as it is given above. Starting with the first residue (D), underline the residues you would expect to form a common face if this peptide adopts a β-sheet.

DVIHSAVDAC

/40

Chemistry and Biochemistry 3511 Midterm # 2, February 23, 2005

Print Name _KEY_____ Signature _____

2) True of False (2 each)

a) During an electrophoresis experiment, DNA always migrates toward the positively charged electrode. (T/F)

b) During an electrophoresis experiment, proteins always migrate toward the negatively charged electrode. (T/F)

c) During an electrophoresis experiment, SDS-treated proteins always migrate toward the negatively charged electrode. (T/F)

d) Electrophoresis can be used to determine whether two proteins are linked by disulfide crosslinks. (T/F)

e) Electrophoresis can be used to estimate protein molecular weight. (T/F)

f) One can determine the three-dimensional structure of a protein (excluding sidechains) from a Ramachandran Map (a phi/psi map). (T/F)

g) An α-helix has a net dipole moment. (T/F)

h) β-sheets are either parallel or anti-parallel but never mixed. (T/F)

i) Proteins can be denatured, then renatured. (T/F)

j) Valine is more likely to be found on the exterior of a globular protein, then on the interior. (T/F)

k) Protein disulfide cross-links can be broken with urea. (T/F)

l) Proteins can be denatured with urea. (T/F)

m) Proteins can be chemically degraded with urea. (T/F)

n) A type I β-turn can be converted to a type II b-turn changing a single torsion angle. (T/F)

o) An α/β-barrell (aka a TIM barrel) contains an amphipathic β-sheet. (T/F)

p) Proteins fold by random exhaustive exploration of conformational space. (T/F)

q) Hydrophobic effects are important in maintaining globular protein conformations. (T/F)

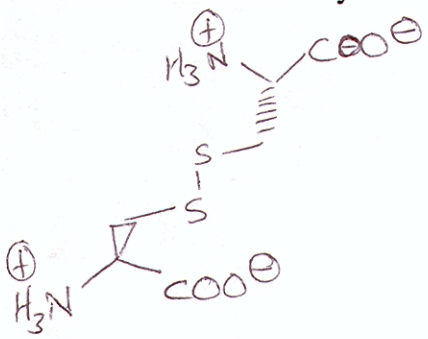
/34

Chemistry and Biochemistry 3511 Midterm # 2, February 23, 2005

Print Name _KEY_____ Signature _____

3) Consider a native globular protein with 3 cysteines and 1 disulfide crosslink.

a) (6 pts) Draw a disulfide crosslink. Make sure all your amino acids are complete, with correct stereochemistry.



b) (10 pts) If the protein is denatured, then treated first with O_2, then with 2-mercaptoethanol, how many intra-molecular products will there be? Sketch them (it) (at low resolution, using lines for the backbone).

c) (10 pts) If the protein is denatured, then treated with O_2, then renatured, then treated with 2-mercaptoethanol, how many intra-molecular products will there be? Sketch them (it) (at low resolution, using lines for the backbone).

4) Bonus question (2 pts, any answer is correct but you must answer it). If Georgia Tech offered a degree of BS in Biochemistry I would have
(ignored it / considered it / chosen it). (circle one)

/28