



4) (5 points) What constitutes a conservative substitution for an amino acid residue in a protein?

5) (5 points) List three methods of determining the molecular mass of a protein. Which is the most accurate, and why?

6) (6 points) What is the amino acid sequence of the polypeptide that gives the following fragments when cleaved by the given proteases?

a) trypsin

i) DLVNALYK

ii) DPWTM

iii) IAYGVR

iv) GFR

v) TTGWICGK

b) Pepsin

i) FRDLVNAL

ii) WICGKIA

iii) TTG

iv) WTM

v) YGVRG

vi) YKDP

7) (10 points) Describe the similarities and differences between denaturing gel electrophoresis and gel filtration column chromatography.

8) (10 points) Describe the similarities and differences between native gel electrophoresis and denaturing gel electrophoresis. In your discussion, address the reagents used in each type of electrophoresis and why these reagents affect the basis of separation of proteins.

9) (4 points) Draw a peptide bond. Show which bond is described by  $\psi$  and which bond is described by  $\phi$ .

10) (1 point) Which amino acid would allow the most structural flexibility when it's in a protein?

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11) (16 points) Define the following terms as they apply to protein structure.  
Include the type(s) of bonds or interactions that stabilize each level of structure.

a) primary structure

b) secondary structure

c) tertiary structure

d) quaternary structure

12) (5 points) Under physiological conditions, polyarginine assumes a random coil conformation. Under what conditions might it form an  $\alpha$ -helix? Explain your reasoning.

13) (5 points) Describe the energy and entropy changes that occur during protein folding.

14) (5 points) Explain how the side chains of amino acid residues contribute to secondary structure, even though they do not participate in hydrogen bonding.

15) (5 points) Describe the characteristics of the side chains of amino acid residues that would be found in a  $\beta$  sheet.

16) (6 points) Draw an antiparallel  $\beta$  sheet involving two  $\beta$  strands.

17) (2 points) What is the difference between a motif and a domain?