Chapter 2 Problems
Protein Composition and Structure

1. Identify. Examine the following four amino acids (A-D):

What are their names, three-letter abbreviations, and one-letter symbols?

2. Properties. In reference to the amino acids shown in Problem 1, which are associated with the following characteristics?
(a) Hydrophobic side chain ________________
(b) Basic side chain ________________
(c) Three ionizable groups ________________
(d) $pK_a$ of approximately 10 in proteins ________________
(e) Modified form of phenylalanine ________________

3. Match ’em. Match each amino acid in the left-hand column with the appropriate side-chain type in the right-hand column.
(a) Leu (1) hydroxyl-containing
(b) Glu (2) acidic
(c) Lys (3) basic
(d) Ser (4) sulfur-containing
(e) Cys (5) nonpolar aromatic
(f) Trp (6) nonpolar aliphatic

4. Solubility. In each of the following pairs of amino acids, identify which amino acid would be most soluble in water:
(a) Ala, Leu; (b) Tyr, Phe; (c) Ser, Ala; (d) Trp, His.

6. Name those components. Examine the segment of a protein shown here.

(a) What three amino acids are present?
(b) Of the three, which is the N-terminal amino acid?
(c) Identify the peptide bonds.
(d) Identify the a-carbon atoms.

8. Alphabet soup. How many different polypeptides of 50 amino acids in length can be made from the 20 common amino acids?

12. One from many. Differentiate between amino acid composition and amino acid sequence.

20. Permanent waves. The shape of hair is determined in part by the pattern of disulfide bonds in keratin, its major protein. How can curls be induced?


31. Scrambled ribonuclease. When performing his experiments on protein refolding, Christian Anfinsen obtained a quite different result when reduced ribonuclease was reoxidized while it was still in 8 M urea and the preparation was then dialyzed to remove the urea. Ribonuclease reoxidized in this way had only 1% of the enzymatic activity of the native protein. Why were the outcomes so different when reduced ribonuclease was reoxidized in the presence and absence of urea?