

# What is Protein Structure?

## Worksheet

Protein structure is the three-dimensional arrangement of a protein's amino acid chain, organized into primary, secondary, tertiary, and (sometimes) quaternary levels that together determine how the protein functions.

## Questions

1. Which structural level is the linear sequence of amino acids?
  - A) Secondary
  - B) Tertiary
  - C) Primary
  - D) Quaternary
2. Alpha helices and beta sheets belong to which level of structure?
  - A) Primary
  - B) Secondary
  - C) Tertiary
  - D) Quaternary
3. Hemoglobin's four subunits assembling into one molecule is an example of
  - A) Primary structure
  - B) Secondary structure
  - C) Tertiary structure
  - D) Quaternary structure
4. What mainly drives tertiary structure formation?
  - A) Peptide bonds only
  - B) Interactions among amino acid R-groups (side chains)
  - C) DNA base pairing
  - D) Ribosomal binding
5. Hemoglobin is a protein made of 4 polypeptide subunits (2 alpha chains of 141 amino acids each, 2 beta chains of 146 amino acids each). What level of structure describes the assembly of these 4 subunits?
6. A polypeptide of 120 amino acids folds so that 40 of them form an alpha helix. What structural level does this helix represent?
7. A single-chain enzyme (no subunits) folds into a compact globular shape stabilized by disulfide bonds and hydrophobic interactions. Which structural level is this?
8. Define: What is primary protein structure?
9. Define: What is secondary protein structure?
10. Define: What is tertiary protein structure?

## Answer Key

1. C) Primary - Primary structure is simply the order of amino acids in the chain.
2. B) Secondary - These local folding patterns, stabilized by hydrogen bonds, define secondary structure.
3. D) Quaternary structure - Quaternary structure describes multiple polypeptide subunits joining into one complex.
4. B) Interactions among amino acid R-groups (side chains) - Tertiary folding results from interactions-hydrophobic, ionic, hydrogen bonds, disulfide bridges-between side chains.
5. Each subunit alone is a folded polypeptide (tertiary structure) Hemoglobin combines 4 subunits (2 + 2) into one functional unit This assembly of multiple subunits = quaternary structure Total amino acids: (2141) + (2146) = 282 + 292 = 574
6. The linear order of all 120 amino acids = primary structure Local coiling of the 40 amino acids into a helix, held by hydrogen bonds = secondary structure This helix is one small part within the protein's larger 3D shape
7. It is one polypeptide chain, so no quaternary structure exists The compact 3D folding of the entire single chain = tertiary structure Disulfide bonds and hydrophobic interactions are typical tertiary-structure stabilizers
8. The linear sequence of amino acids in a polypeptide chain, linked by peptide bonds.
9. Local folding patterns-alpha helices and beta sheets-stabilized by hydrogen bonds between backbone atoms.
10. The complete 3D folded shape of a single polypeptide chain, driven by R-group interactions.

### **Bounlu**

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