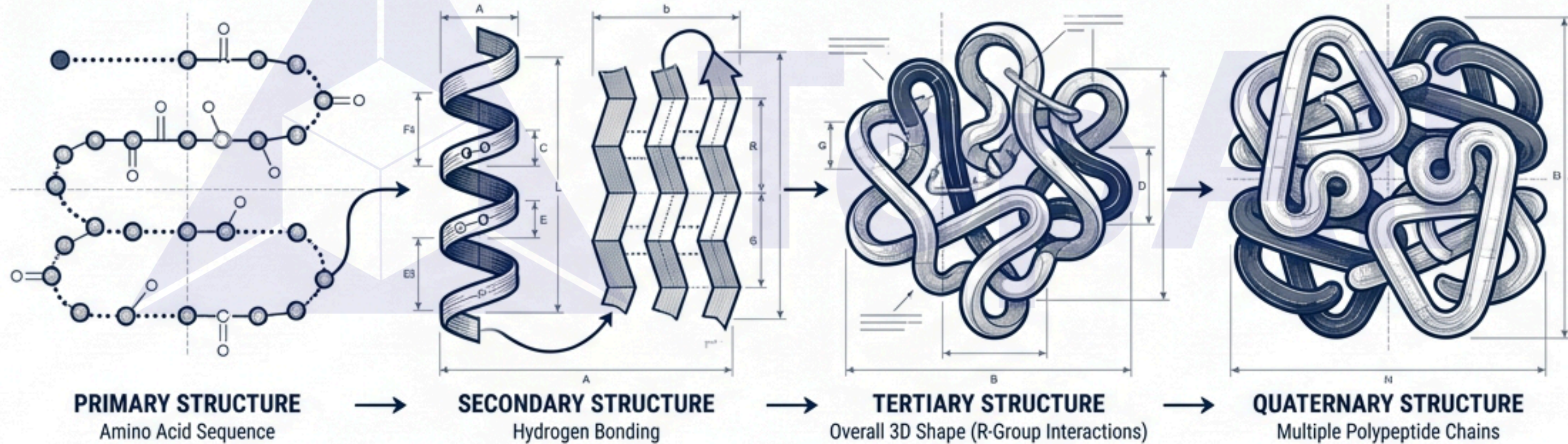


Structure of Proteins

From fundamental peptide linkages to complex 3D biological architectures.



Level 0: The Chemical Foundation

The Peptide Linkage



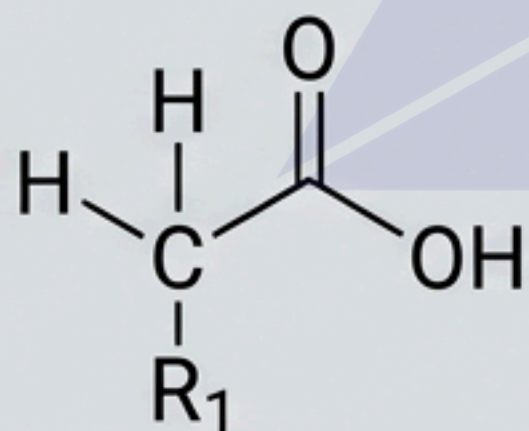
Concept Card

Proteins are polymers of α -amino acids connected by **peptide bonds**. Chemically, this is an amide linkage formed between the **carboxyl** group of one amino acid and the amino group of another.

Hero Panel

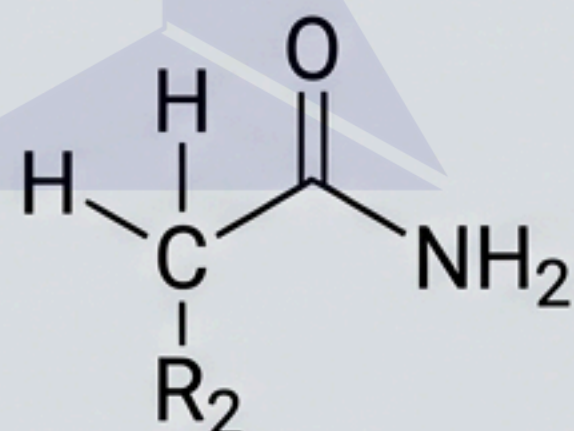
STEP 1: Reactants

Amino Acid 1
(-COOH)

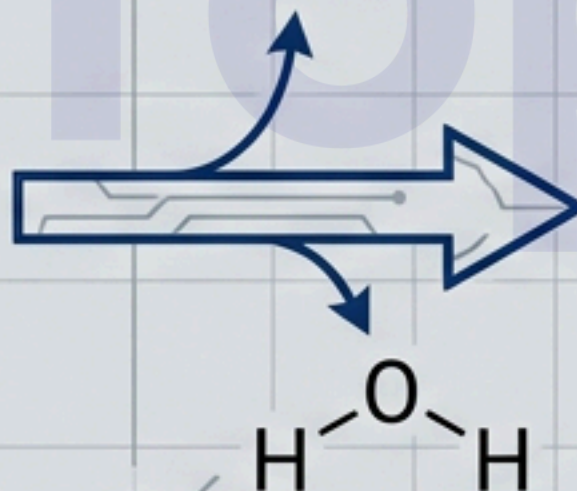


+

Amino Acid 2
(-NH₂)

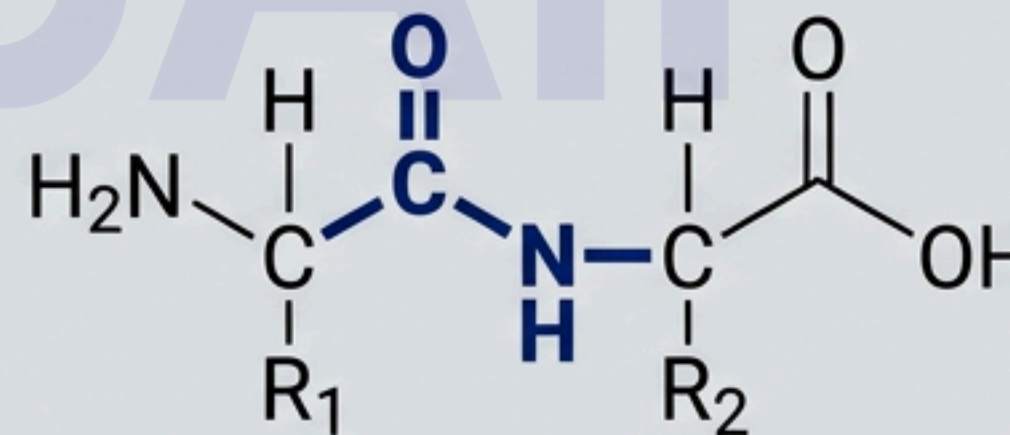


-H₂O



STEP 3: Product

Dipeptide



Peptide Bond
(Amide Linkage)

Recap Strip

Example Application: Combining glycine and alanine yields the dipeptide glycylalanine.

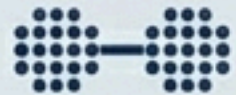
Scaling the Chain

From Peptides to Proteins

Scale Timeline

Dipeptide

2 amino acids,
1 peptide linkage



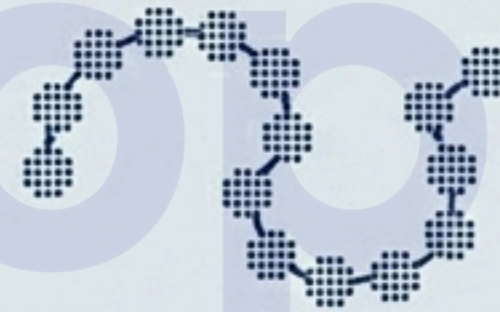
Tripeptide

3 amino acids,
2 peptide linkages



Polypeptide

More than 10
amino acids



Protein

>100 amino acid
residues AND
molecular mass
>10,000u

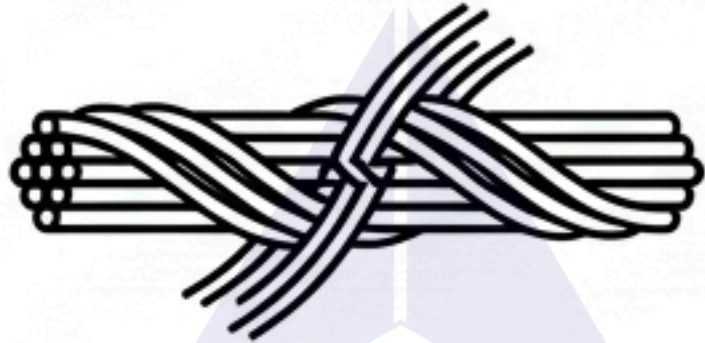


Exam-Smart

Boundary Note

The size boundary is not absolute. Polypeptides with fewer amino acids are still classified as proteins if they possess a well-defined native conformation. Example: Insulin contains only 51 amino acids but is universally classified as a protein.

The Two Major Classifications



Fibrous Proteins

Structure: Polypeptide chains run parallel, firmly held together by hydrogen and disulfide bonds.

Shape: Fibre-like / strand-based.

Solubility: Insoluble in water.

Examples: Keratin (hair, wool, silk), Myosin (muscles).



Globular Proteins

Structure: Chains of polypeptides coil around to give a compact, 3D shape.

Shape: Spherical / Globular.

Solubility: Usually soluble in water.

Examples: Insulin, Albumins.



You've Learned the Theory. Let's Test Them Now.

$$E=mc^2$$



Turn theory into marks with **unlimited MCQs, smart analysis, and focused revision.**

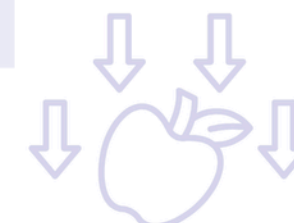
Practice Now



At prep.topall.app

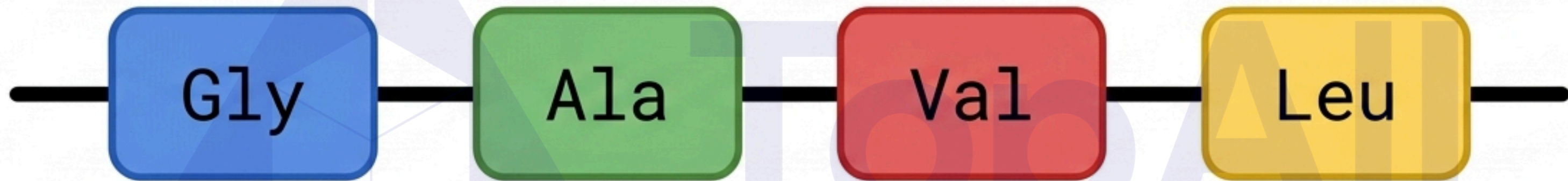
Key Highlights

- » Free Study Material, Videos & Infographics
- » Push Your Limits with Level-Based Challenges
- » Climb the Leaderboard Among Fellow Aspirants
- » Practice Unlimited MCQs for NEET & JEE
- » Get Clear Explanations, Not Just Marks
- » Track Your Performance Smarter



Primary Structure (1°)

Sequence Strip



The specific, exact sequence of amino acids in a polypeptide chain. Each polypeptide in a protein has a unique primary structural code.

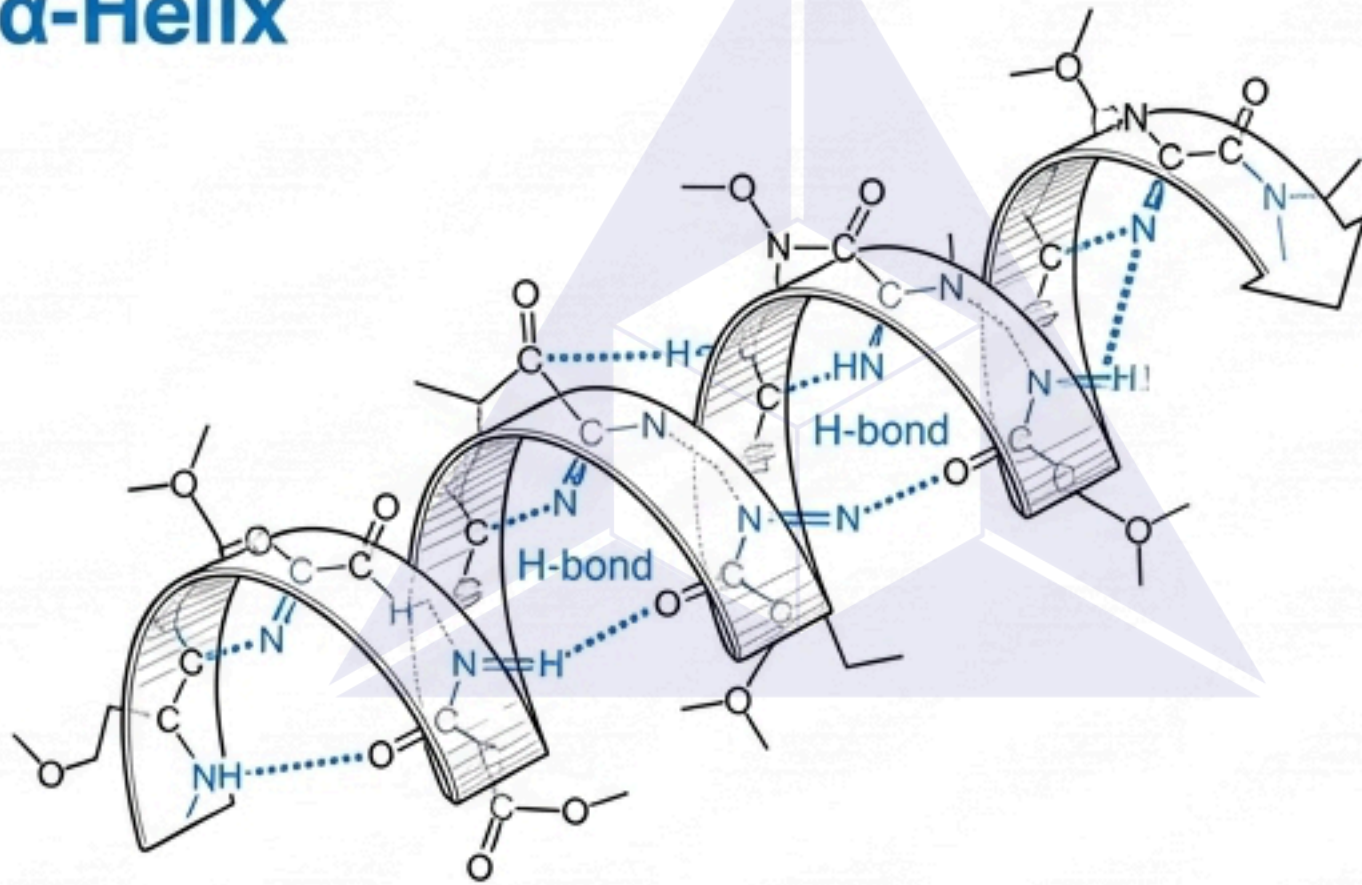
Key-Takeaway

Sequence Dictates Identity. Any change in this primary structure (even the alteration of a single amino acid) creates a fundamentally different protein.

Secondary Structure Folding (2°)

The shape assumed by a long polypeptide chain due to regular folding of the backbone, stabilized by hydrogen bonding between $>\text{C}=\text{O}$ and $-\text{NH}-$ groups.

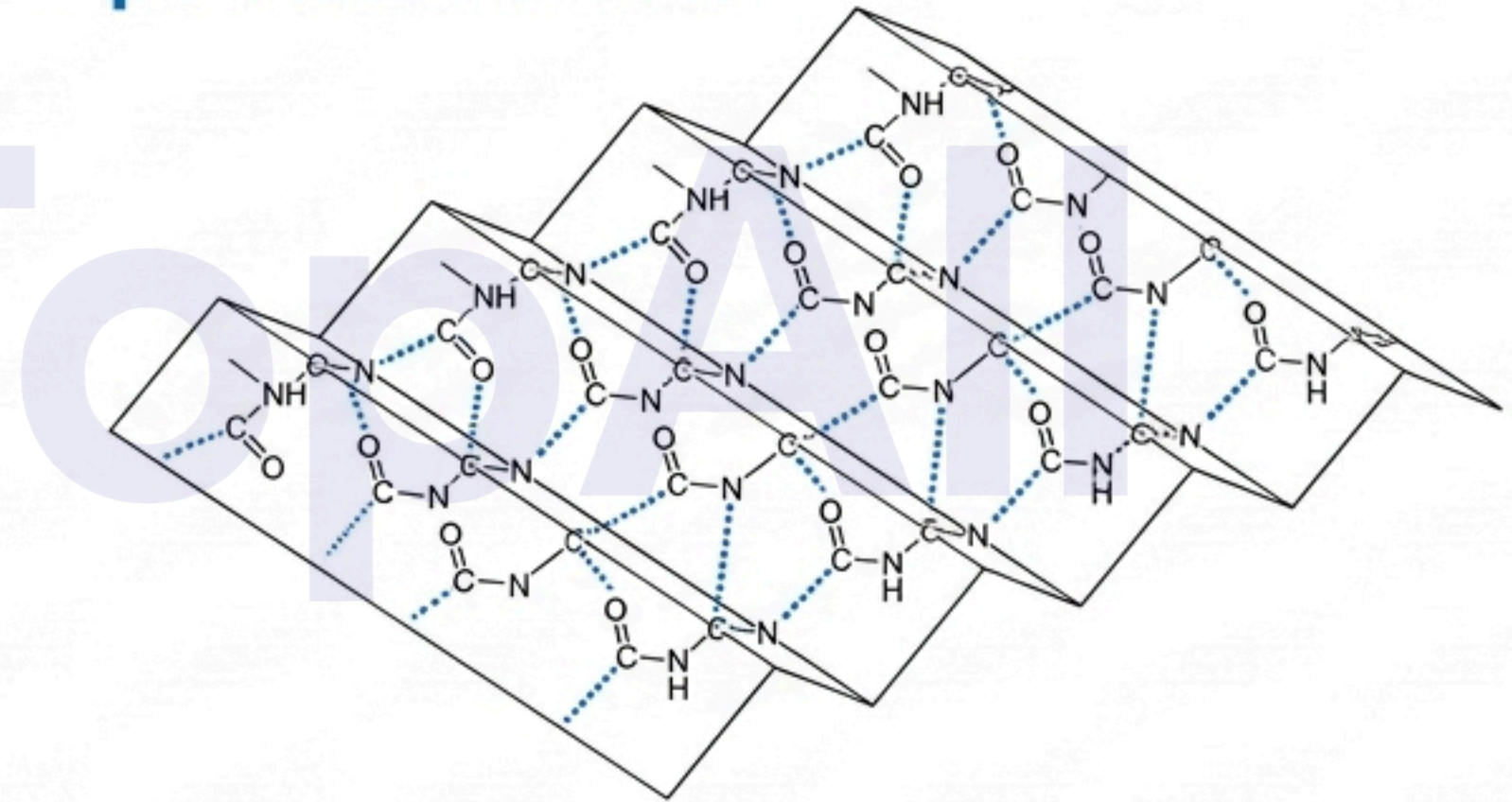
A. α -Helix



Structure: Chain twists into a right-handed screw.

Bonding Mechanism: H-bonds form between the $-\text{NH}$ group of each amino acid residue to mat between the $-\text{NH}$ group of each amino acid residue and the $>\text{C}=\text{O}$ of an adjacent turn of the helix.

B. β -Pleated Sheet

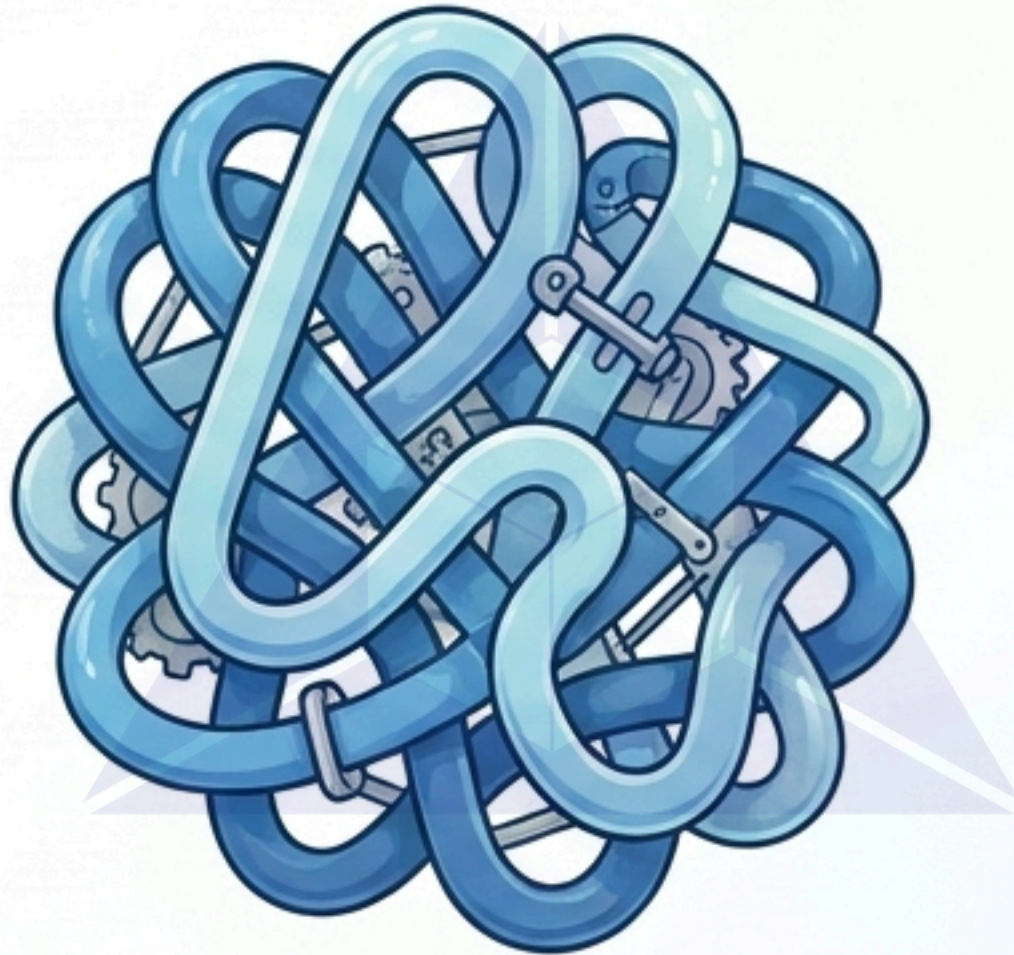


Structure: Chains are stretched to maximum extension and laid side-by-side.

Bonding Mechanism: Intermolecular H-bonds hold adjacent chains together, visually resembling the pleated folds of drapery.

3D Conformation & Sub-unit Assembly

Tertiary Structure (3°)



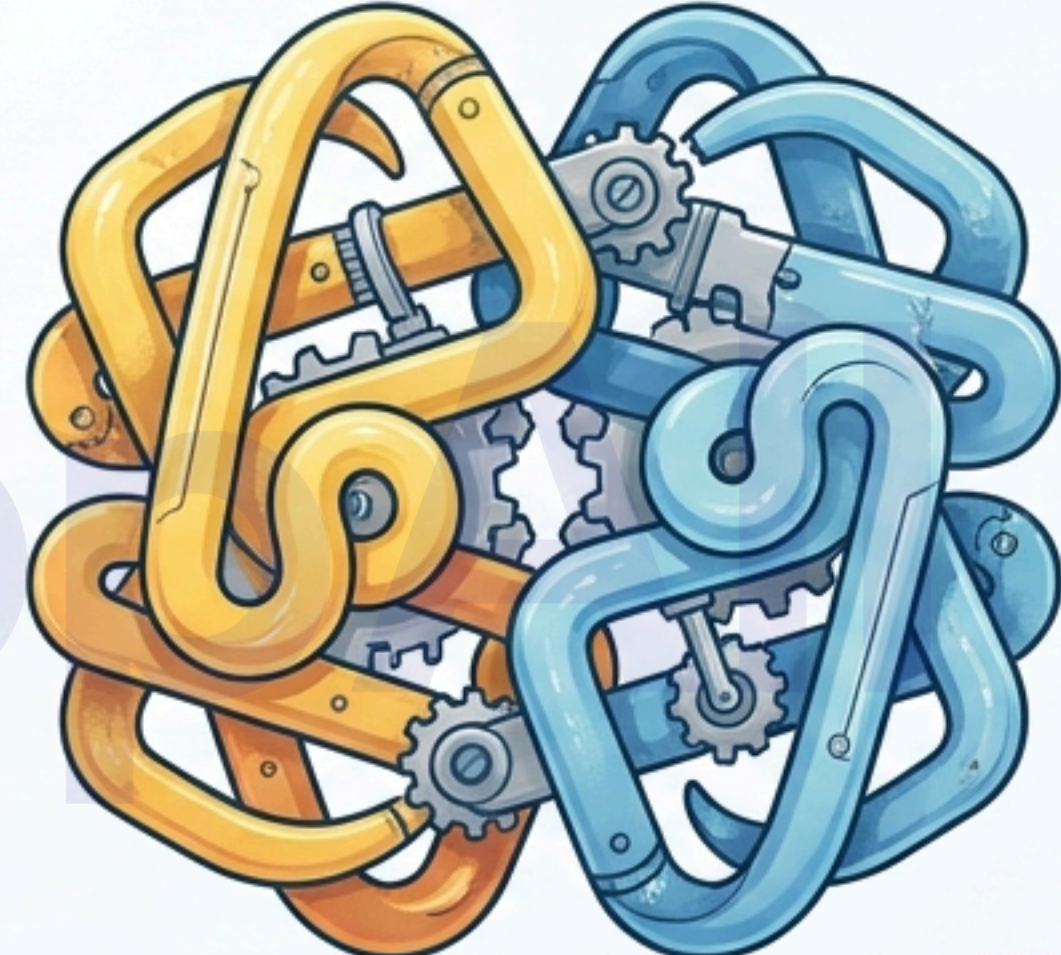
Concept: The overall 3D folding of the entire polypeptide chain (further folding of the 2° structure). This generates the final Fibrous or Globular macroscopic shapes.

Stabilizing Forces

Maintained by four distinct forces:

1. Hydrogen bonds
2. Disulfide linkages
3. van der Waals forces
4. Electrostatic forces of attraction.

Quaternary Structure (4°)



Concept: The spatial arrangement of two or more polypeptide chains (called sub-units) with respect to each other.

Note

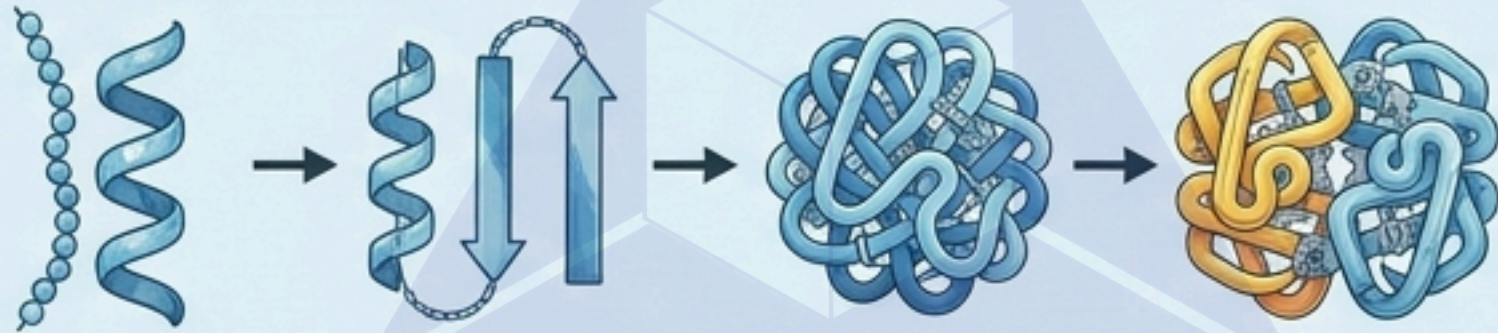
Not all proteins possess a quaternary structure—only those composed of multiple sub-units.

Sequence -> Shape -> Function

Sequence (1°) dictates ->



Folding (2°, 3°, 4°) which creates ->



Native Protein: A unique 3D shape possessing specific biological activity.



! Alert



Denaturation of Proteins

Trigger: Physical change (e.g., temperature) or chemical change (e.g., pH) disturbs stabilizing hydrogen bonds.

Mechanism: Globules unfold and helices uncoil, resulting in the loss of biological activity.

Exam-Smart Rule: 2° and 3° structures are completely destroyed, but the 1° structure remains intact.

Real-World Examples: Coagulation of egg white upon boiling; curdling of milk (caused by lactic acid bacteria).



You've Learned the Theory.

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