University of Baghdad
College of Science for Women
Department of Chemistry

BIOCHEMISTRY LAB

(Third class)

Prepared and Design by

Lecturer Seenaa Abood Mustafa

Dr. Noor Ulhuda Ghazi Mohammed

Assist Lecturer Suha Neser

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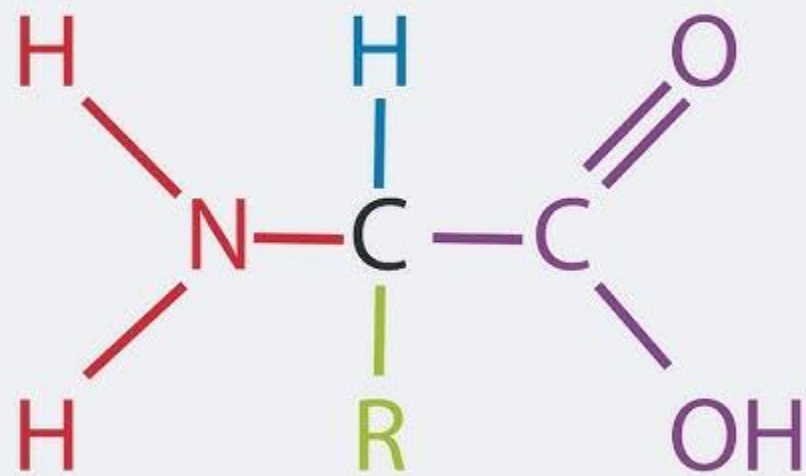
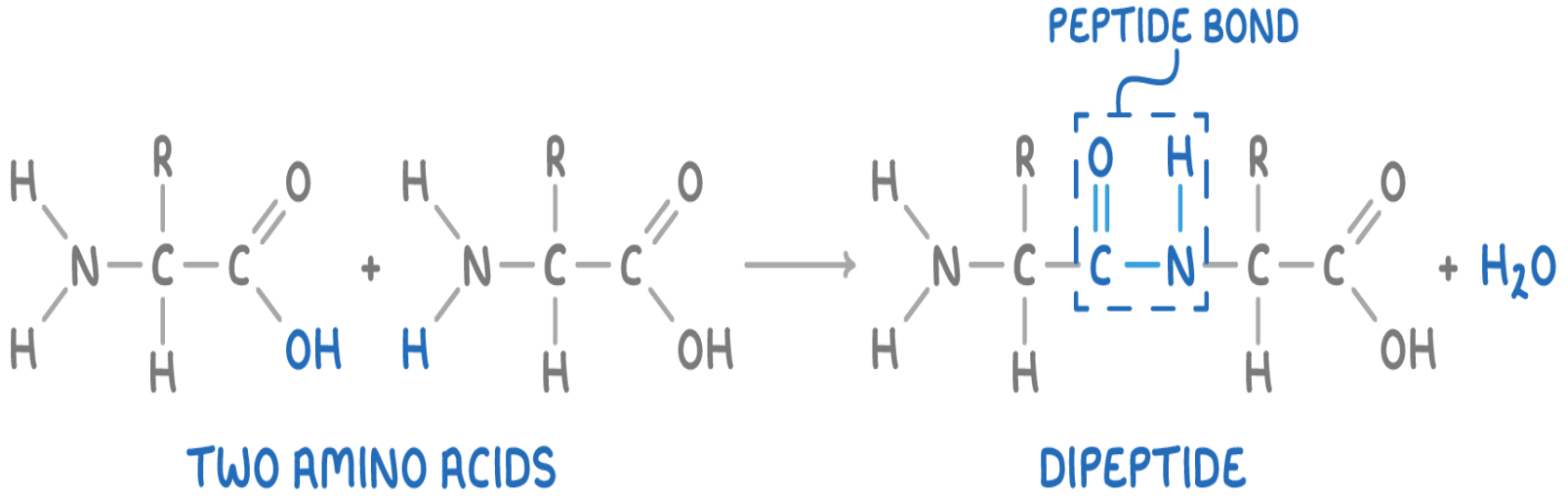
Proteins

- Proteins are the most abundant organic molecules (carbon containing) in the living system. They offer structural and dynamic function .They are polymers of amino acids linked by covalent peptide bonds. Proteins ingested undergo digestion and get absorbed as amino acids into the portal vein and reaches liver and then to other tissues.

Amino Acids

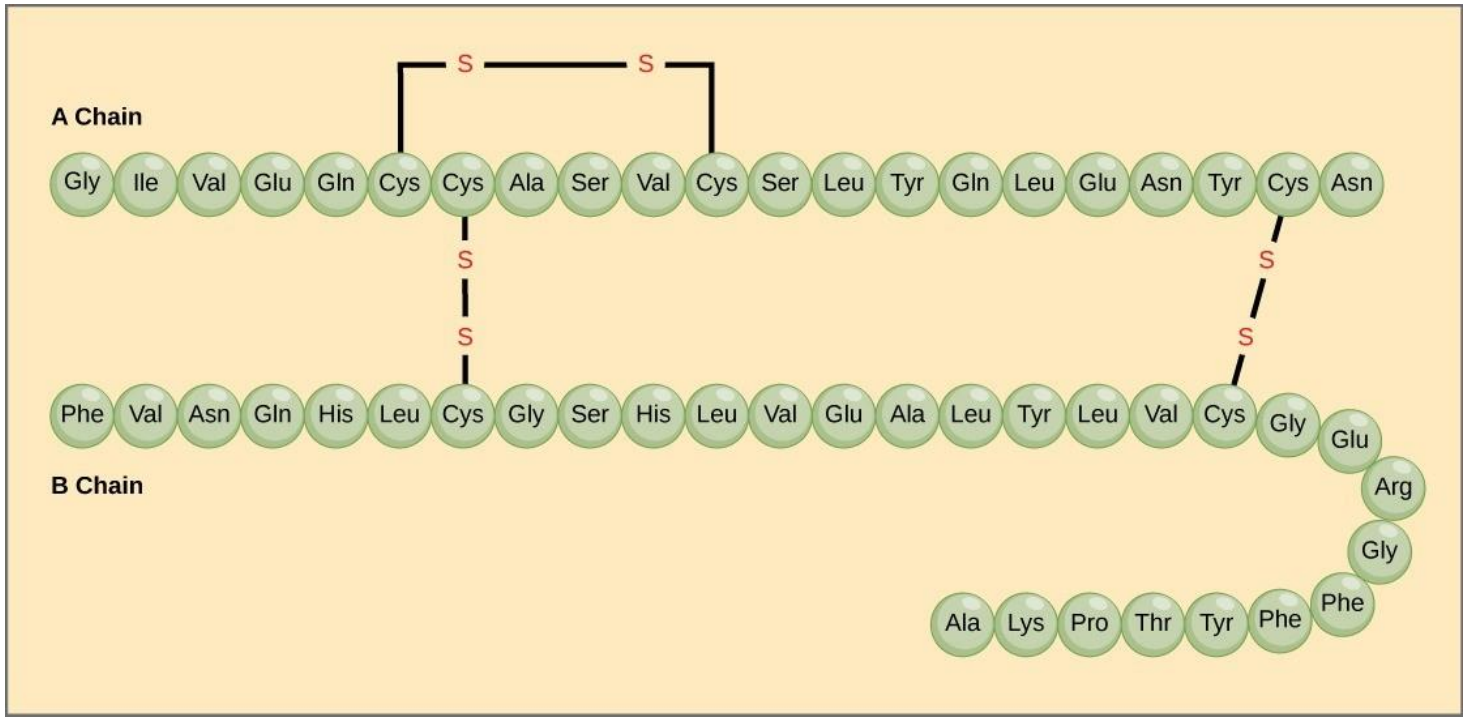


Proteins consist of several thousand to millions of amino acids linked together by peptide bonds



Primary or preliminary composition

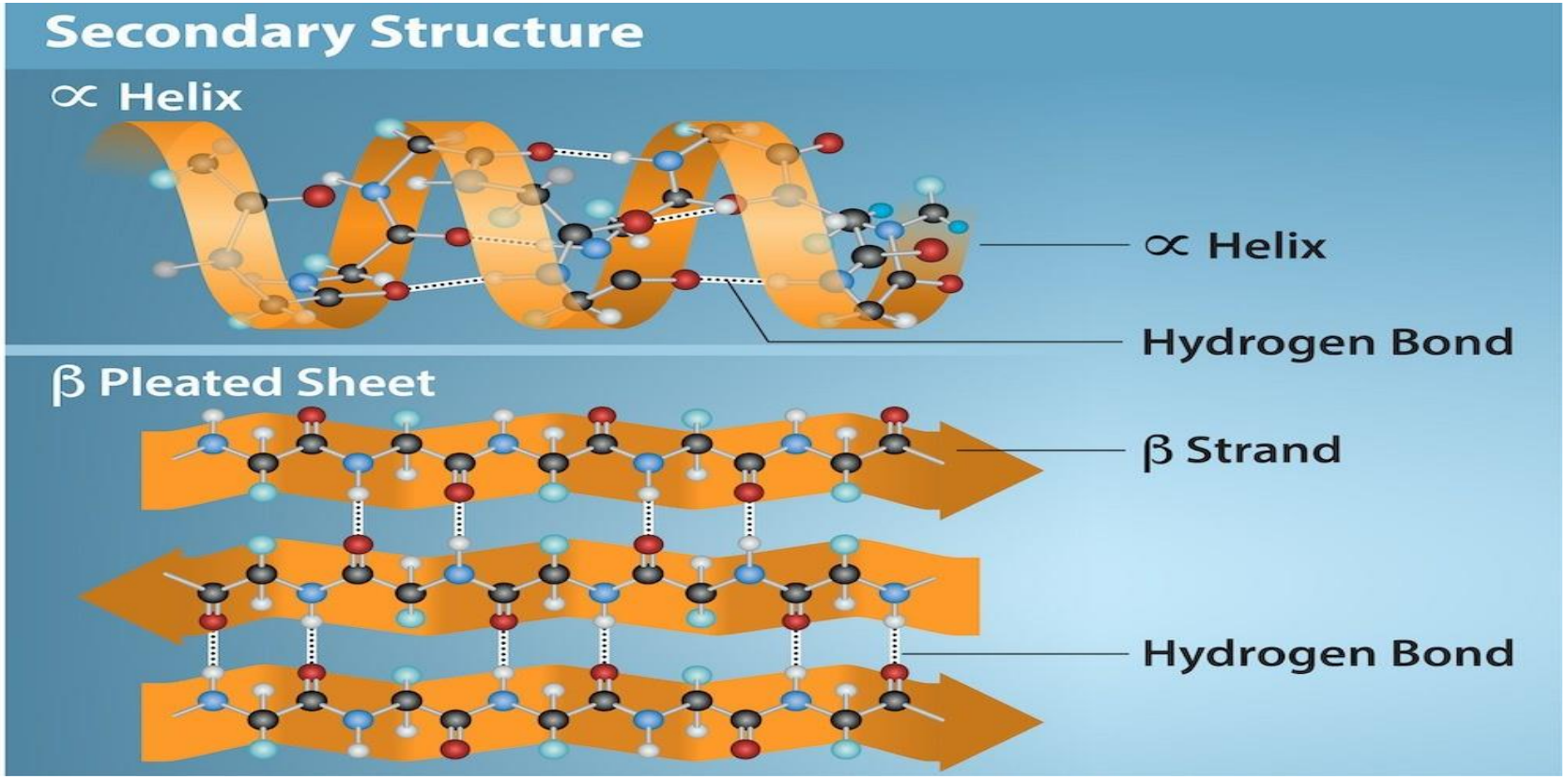
- It is the sequence of amino acids in the peptide chain that forms the structure of the protein molecule



Secondary composition

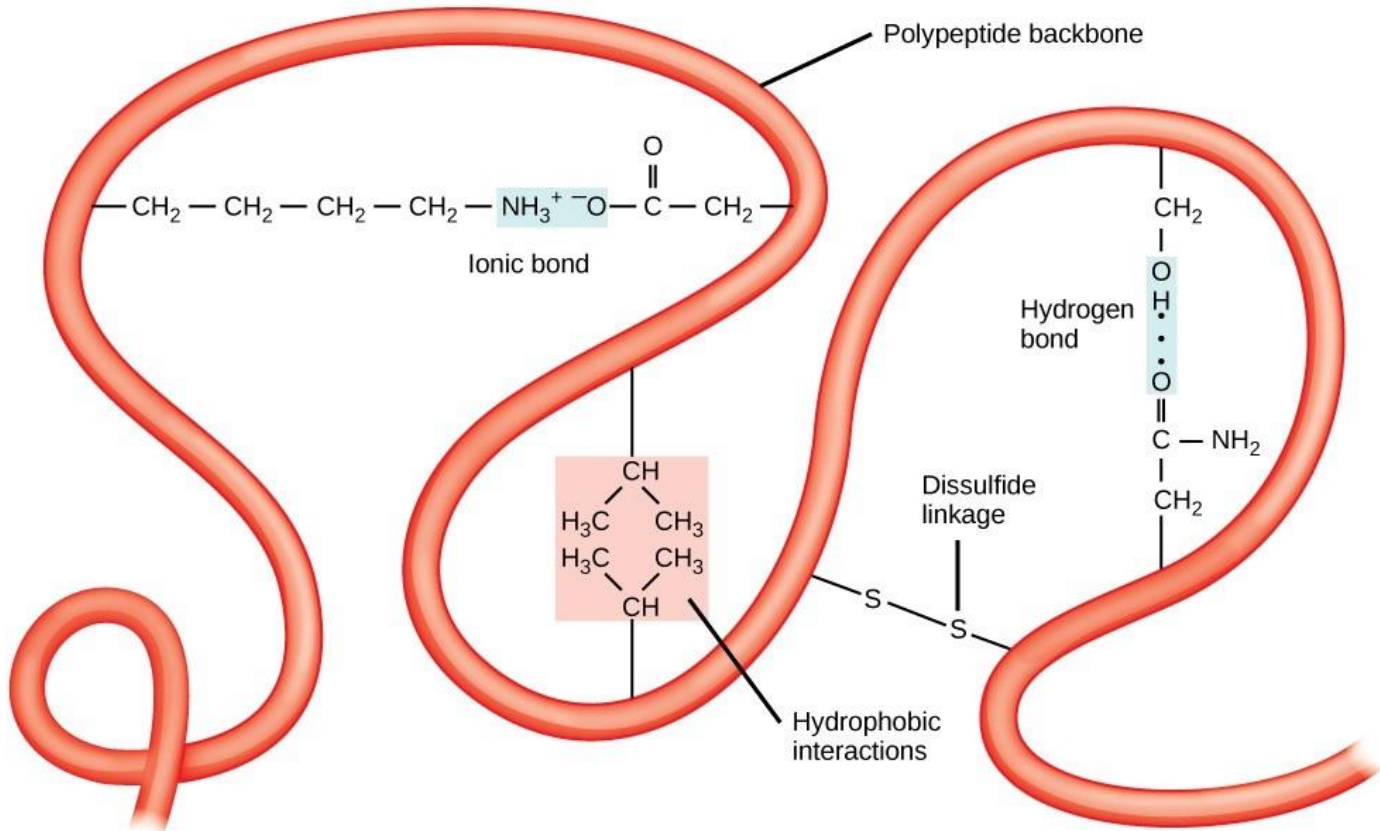
- The oxygen of the carbonyl group and the hydrogen attached to the nitrogen atom in the peptide bond have the ability to form hydrogen bonds.
- The resulting structures of this bonding form what is called the secondary structure of the protein

- Which comes in two types: helical structure and beta sheets



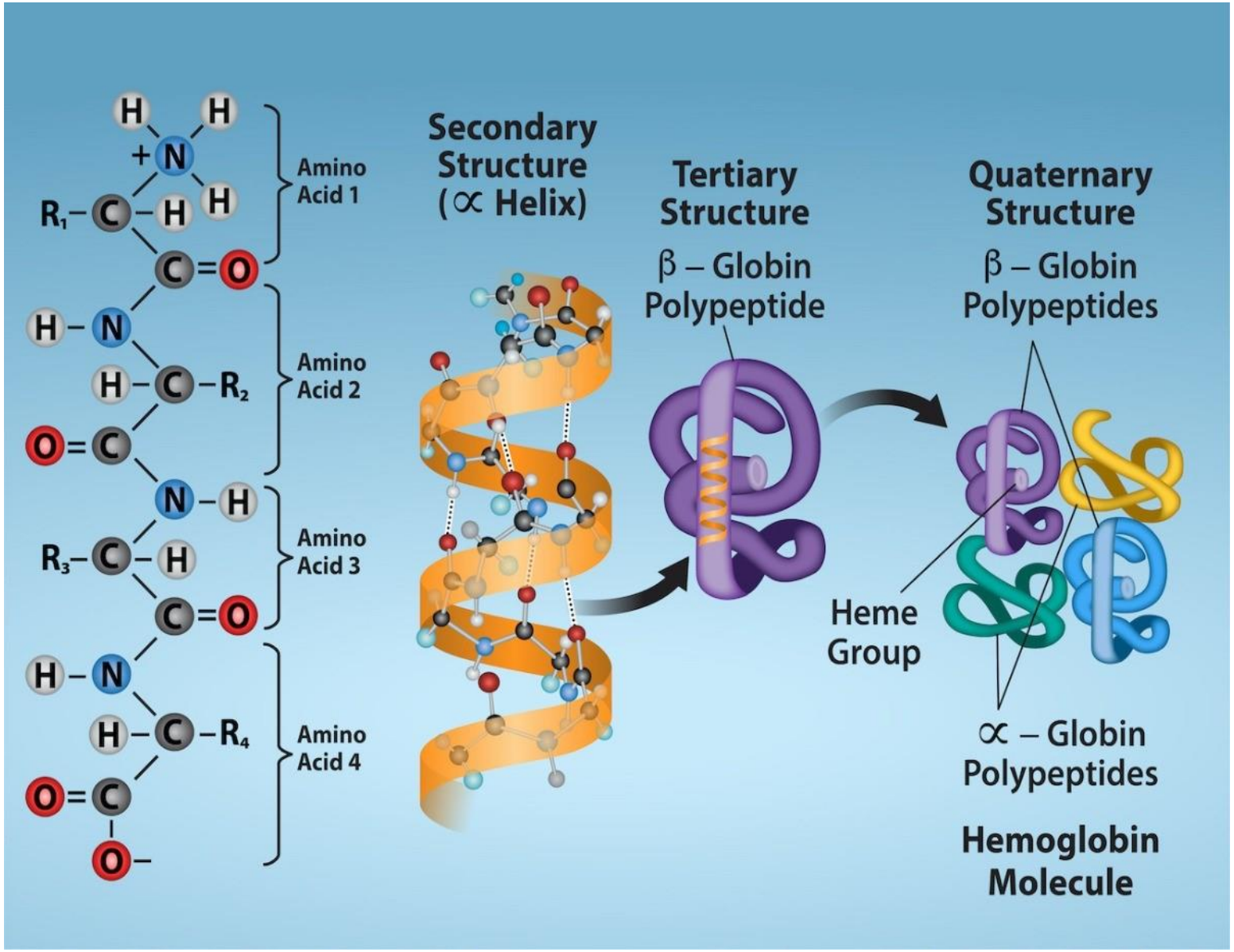
Tertiary composition

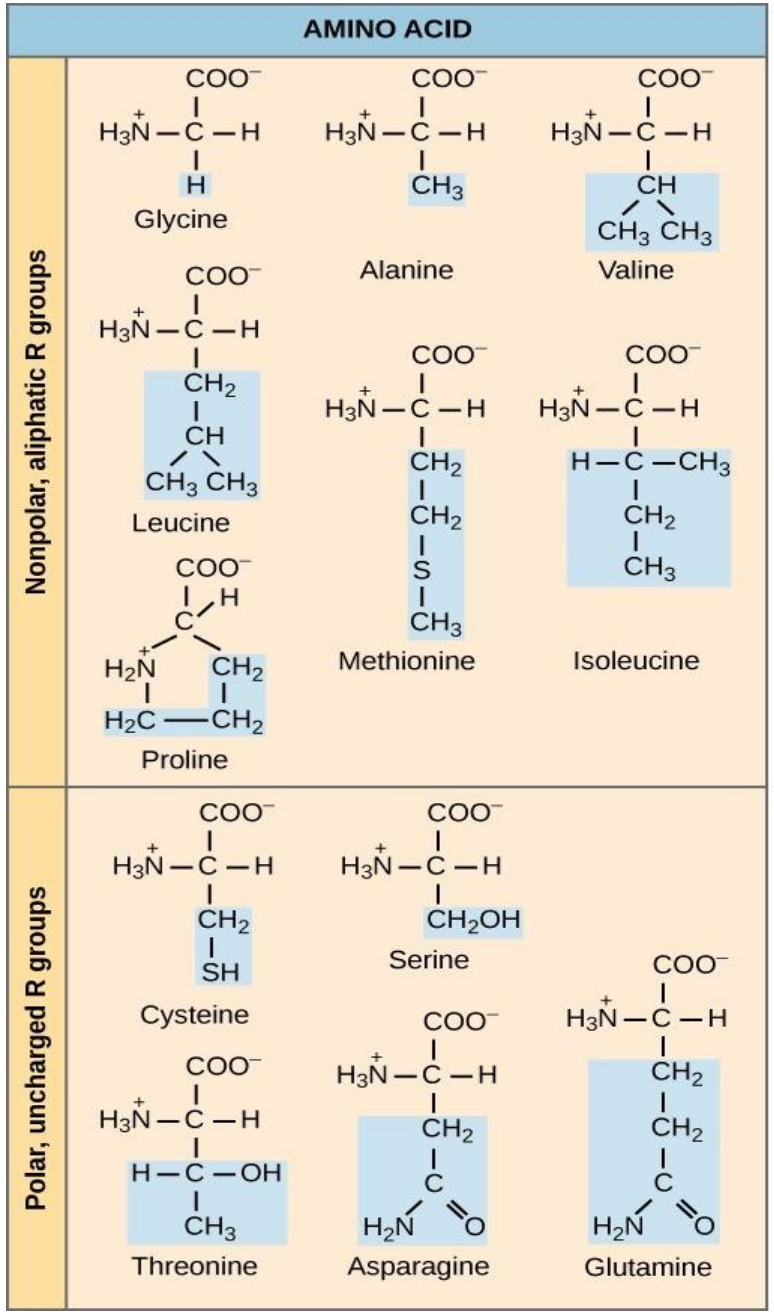
- It is the spherical or oval shape of the helical form resulting from the bending of the helical structure, in which hydrogen and salt bonds are formed between the free carboxyl groups and the free amine groups, as well as sulfur bonds.

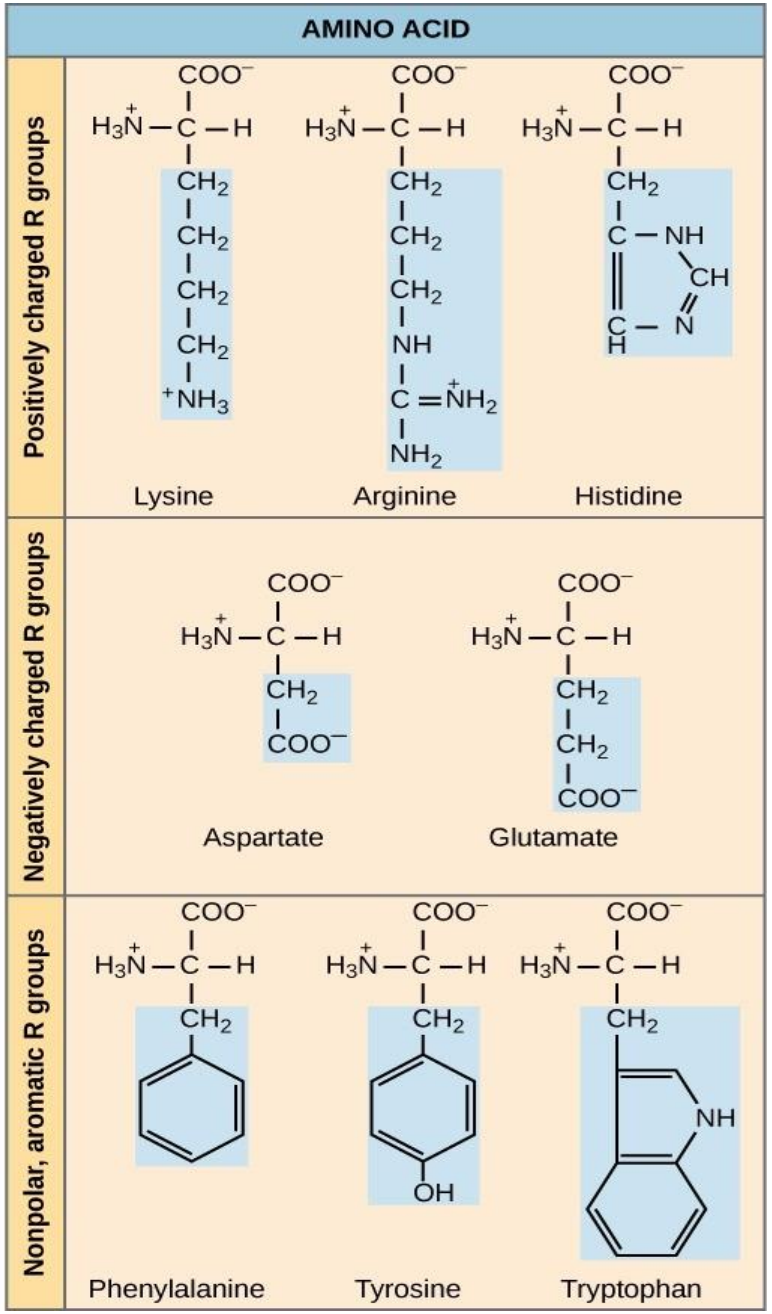

Polypeptide backbone
Ionic bond
Hydrogen bond
Dissulfide linkage
Hydrophobic interactions

Quaternary composition

- It regularly forms folded or bent structures that combine with each other by non-covalent bonds to form specialized butenes


Amino Acid 1
Amino Acid 2
Amino Acid 3
Amino Acid 4
Secondary Structure (∝ Helix)
Tertiary Structure
β – Globin Polypeptide
Quaternary Structure
β – Globin Polypeptides
Heme Group
∝ – Globin Polypeptides
Hemoglobin Molecule

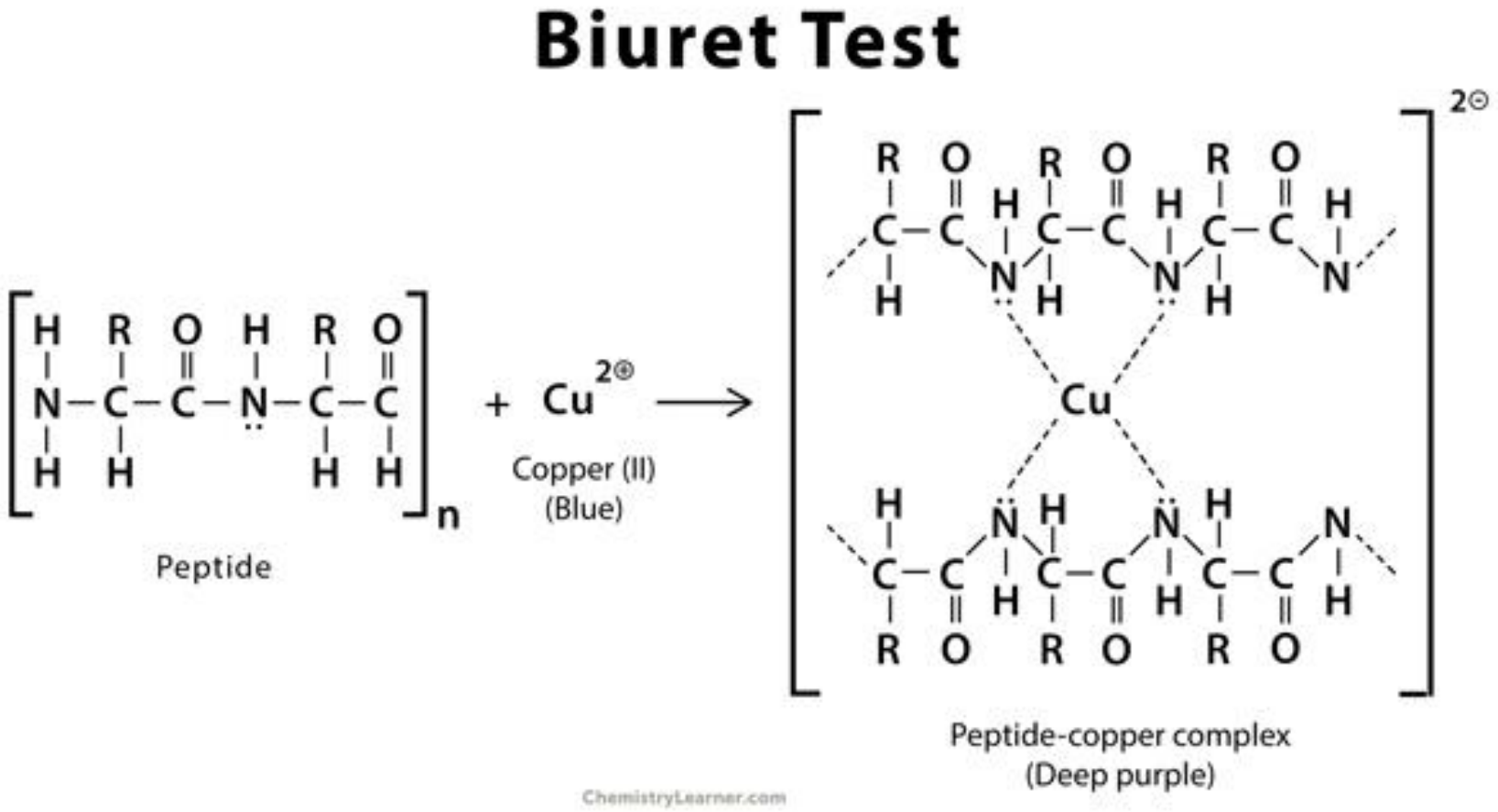

AMINO ACID
Nonpolar, aliphatic R groups
Glycine
Alanine
Valine
Leucine
Methionine
Isoleucine
Proline
Polar, uncharged R groups
Cysteine
Serine
Threonine
Asparagine
Glutamine


AMINO ACID
Positively charged R groups
Lysine
Arginine
Histidine
Negatively charged R groups
Aspartate
Glutamate
Nonpolar, aromatic R groups
Phenylalanine
Tyrosine
Tryptophan

Biuret test:

- This detection is considered general for proteins, as it depends on the presence of two bonds or more of peptide bonds, as a purple color is formed when the protein interacts with a strong base and a little copper sulfate.

- The color is due to the strength of the coordination bonds of the compound resulting from the bonding of cupric acid with four nitrogen atoms to form a chelating compound.



Procedure

1- Take two test tubes, put 1 milliliter of protein (albumin) in the first, and in the second, an amino acid.

2- Add 5 drops of sodium hydrochloride 10% to the tubes.

3- Add one drop of copper sulfate to each tube and observe the result…

- There are compounds other than proteins that give a positive test for this test, such as urea and biuret
- The light blue color change to dark blue indicates a negative test as a result of the formation of $Cu(OH)_2$due to the addition of a large amount of $CuSO_4$.