BASUDEV GODABARI DEGREE COLLEGE,KESAIBAHAL,

DEPARTMENT OF ZOOLOGY

SELF STUDY MODULE

MODULE DETAILS –

.CLASS-3RD SEMESTER

.SUBJECT NAME- ZOOLOGY

.PAPER NAME-FUNDAMENTALS OF BIOCHEMISTRY

UNIT-2-- STRUCTURE-

PROTEINS

TOPIC-AMINO-ACID,STRUCTURE,CLASSIFICATION 7GENERAL PROPERTIES

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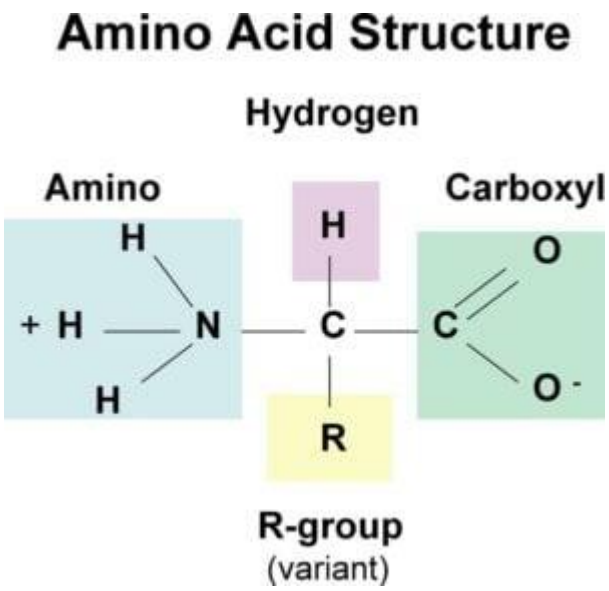
DESIGNATION- LECTURER IN ZOOLOGY

AMINO ACID

Amino Acids are the organic compounds which combine to form proteins; hence they are referred to as the building components of proteins. These biomolecules are involved in several biological and chemical functions in a human body and are the necessary ingredients for the growth and development of human beings. There are about 300 amino acids which occur in nature.

STRUCTURE OF AMINO ACID

All 20 of the common amino acids are alpha-amino acids. They contain a carboxyl group, an amino group, and a side chain (R group), all attached to the α-carbon.

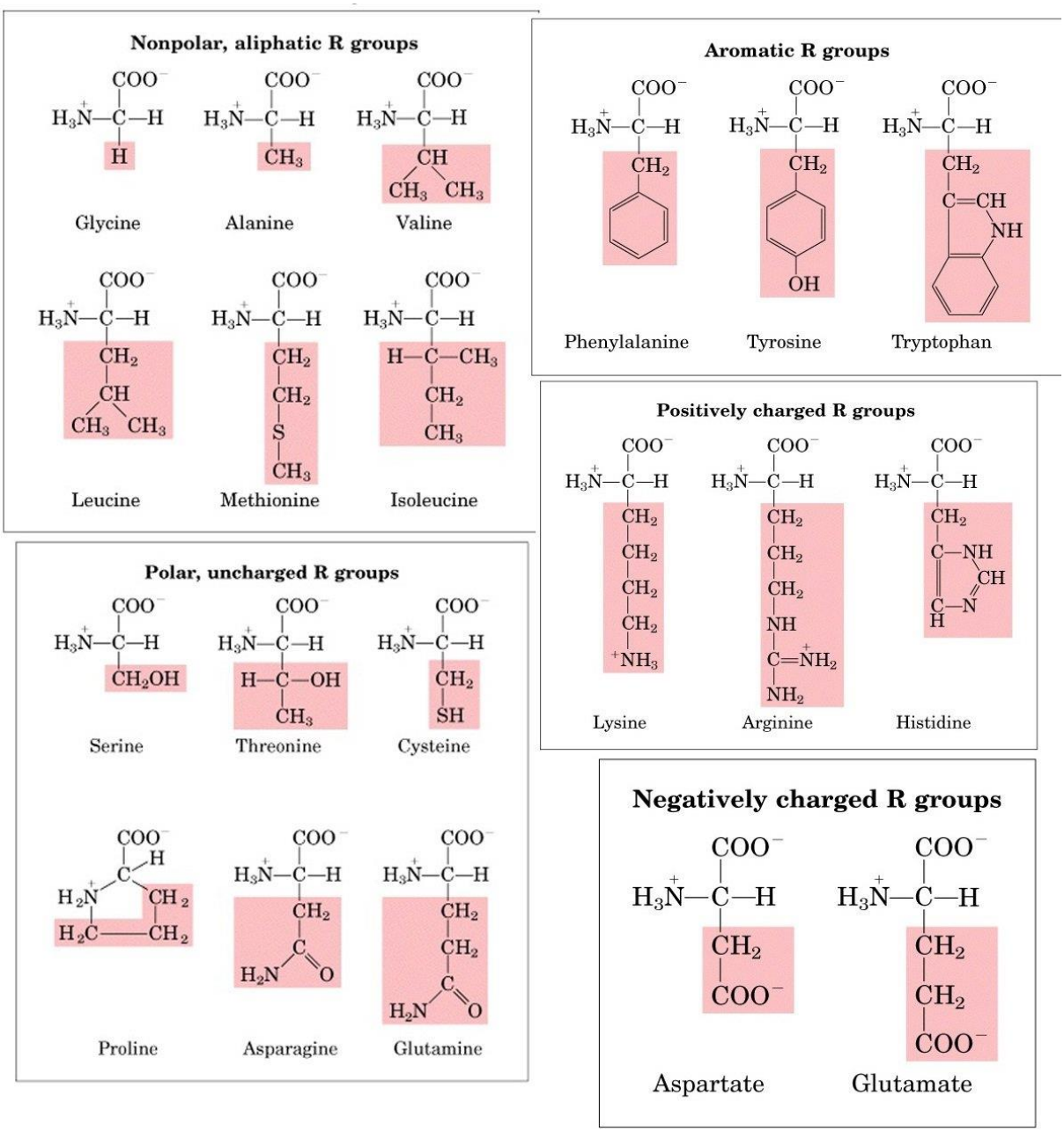


Exceptions are:

- Glycine, which does not have a side chain. Its α-carbon contains two hydrogens.
- Proline, in which the nitrogen is part of a ring.
- Thus, each amino acid has an amine group at one end and an acid group at the other and a distinctive side chain.
- The backbone is the same for all amino acids while the side chain differs from one amino acid to the next.
- All of the 20 amino acids except glycine are of the L-configuration, as for all but one amino acid the α-carbon is an asymmetric carbon. Because glycine does not contain an asymmetric carbon atom, it is not optically active and, thus, it is neither D nor L.

Classification of amino acids on the basis of R-group

1. **Nonpolar, Aliphatic amino acids**: The R groups in this class of amino acids are nonpolar and hydrophobic. Glycine, Alanine, Valine, leucine, Isoleucine, Methionine, Proline.
2. **Aromatic amino acids:** Phenylalanine, tyrosine, and tryptophan, with their aromatic side chains, are relatively nonpolar (hydrophobic). All can participate in hydrophobic interactions.
3. **Polar, Uncharged amino acids:** The R groups of these amino acids are more soluble in water, or more hydrophilic, than those of the nonpolar amino acids, because they contain functional groups that form hydrogen bonds with water. This class of amino acids includes serine, threonine, cysteine, asparagine, and glutamine.
4. **Acidic amino acids:** Amino acids in which R-group is acidic or negatively charged. Glutamic acid and Aspartic acid
5. **Basic amino acids:** Amino acids in which R-group is basic or positively charged. Lysine, Arginine, Histidine



General properties of alpha amino acids

Physical Properties

1. Amino acids are colorless, crystalline solid.
2. All amino acids have a high melting point greater than 200^{o}
3. Solubility: They are soluble in water, slightly soluble in alcohol and dissolve with difficulty in methanol, ethanol, and

propanol. R-group of amino acids and pH of the solvent play important role in solubility.

4. On heating to high temperatures, they decompose.
5. All amino acids (except glycine) are optically active.
6. Peptide bond formation: Amino acids can connect with a peptide bond involving their amino and carboxylate groups. A covalent bond formed between the alpha-amino group of one amino acid and an alpha-carboxyl group of other forming -CO-NH-linkage. Peptide bonds are planar and partially ionic.

Chemical Properties

1.Zwitterionic property

A zwitterion is a molecule with functional groups, of which at least one has a positive and one has a negative electrical charge. The net charge of the entire molecule is zero. Amino acids are the best-known examples of zwitterions.

- They contain an amine group (basic) and a carboxylic group (acidic). The -NH2 group is the stronger base, and so it picks up H+ from the -COOH group to leave a zwitterion. The (neutral) zwitterion is the usual form amino acids exist in solutions.

2.Amphoteric property

Amino acids are amphoteric in nature that is they act as both acids and base since due to the two amine and carboxylic group present.

3.Ninhydrin test

When 1 ml of Ninhydrin solution is added to a 1 ml protein solution and heated, the formation of a violet color indicates the presence of α-amino acids.

4.Xanthoproteic test

The xanthoproteic test is performed for the detection of aromatic amino acids (tyrosine, tryptophan, and phenylalanine) in a protein solution. The nitration of benzoid radicals present in the amino acid chain occurs due to reaction with nitric acid, giving the solution yellow coloration.

5.Reaction with Sanger's reagent

Sanger's reagent (1-fluoro-2, 4-dinitrobenzene) reacts with a free amino group in the peptide chain in a mild alkaline medium under cold conditions.

6.Reaction with nitrous acid

Nitrous acid reacts with the amino group to liberate nitrogen and form the corresponding hydroxyl.

THANK YOU.