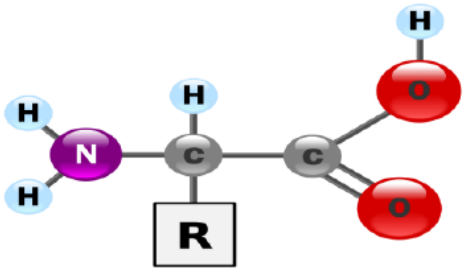
Amino acids



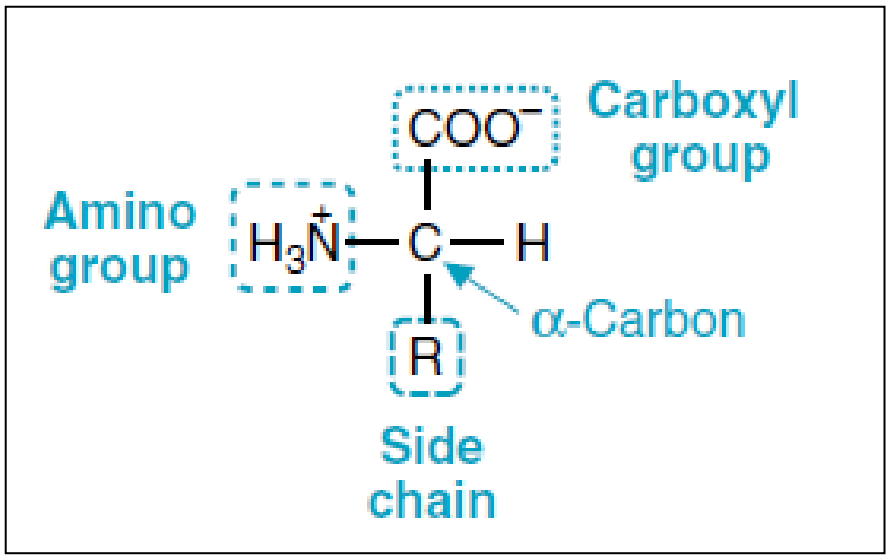
Amino acids: are biologically important organic compounds composed of amine ($-NH_2$) and carboxylic acid(-COOH) functional groups, along with a side-chain specific to each amino acid. The key elements of an amino acid are carbon, hydrogen, oxygen, and nitrogen, though other elements are found in the side-chains of certain amino acids. About 500 amino acids are known, and can be classified in many ways. Structurally they can be classified according to polarity, pH level, and side chain group type (aliphatic, acyclic, aromatic, containing hydroxyl or sulfur, etc.). Amino acids having both the amine and carboxylic acid groups attached to the first (alpha-) carbon atom have particular importance in biochemistry. They are known as **2-, alpha-,** or **α-amino acids** (generic formula $RH_2NCHCOOH$ in most cases, where R is an organic substituent known as a "side-chain").

STRUCTURE OF THE AMINO ACIDS

Each amino acid (except for proline) has:

1. A carboxyl group ($-COO^-$).
2. An amino group ($-NH_3^+$).
3. Side chain ("R-group") bonded to the α-carbon atom.

These carboxyl and amino groups are combined in peptide linkage.



Classification of Amino Acids

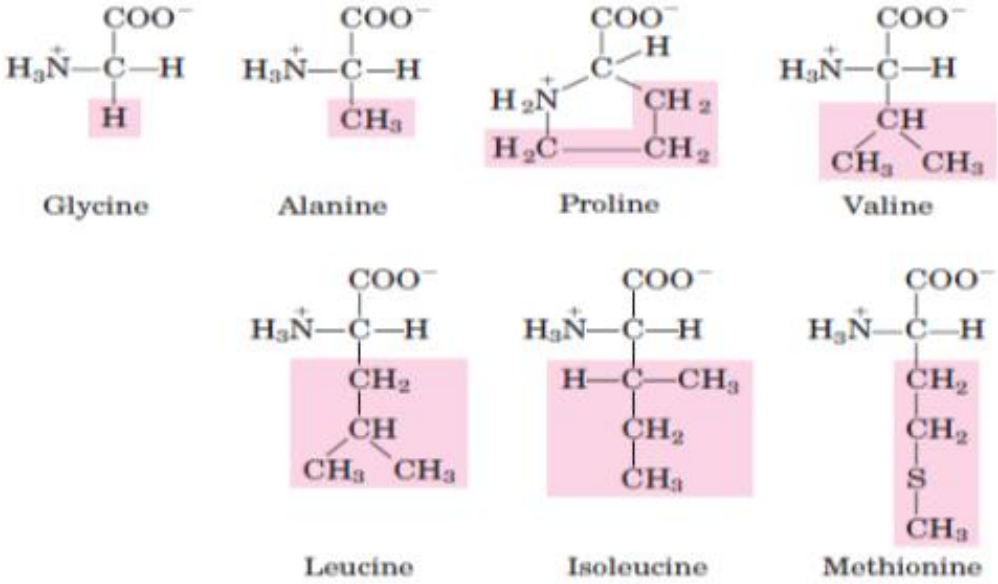
They classified according to the side chain:

- Amino acids with nonpolar side chains.
- Aromatic R Groups.
- Amino acids with uncharged polar side chains.
- Positively Charged (Basic) R Groups.
- Amino acids with acidic side chains.

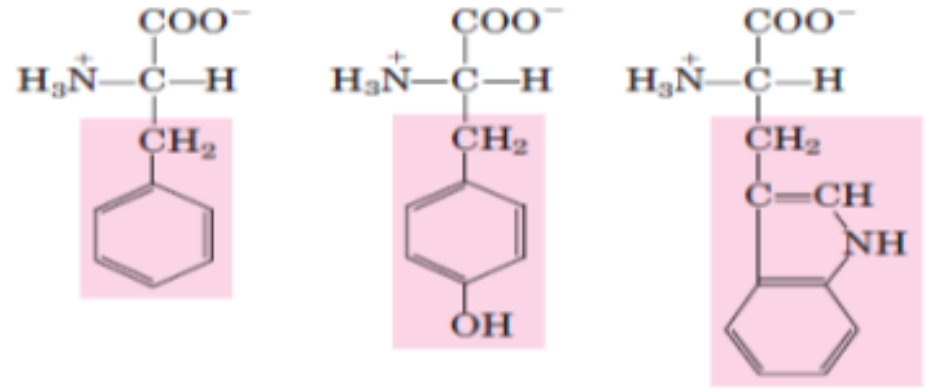
Essential Amino Acids: Obtained from diet because body cannot synthesize them: Phenylalanine, Tryptophan, Valine, Isoleucine, Leucine, Methionine, Lysine, and Threonine.

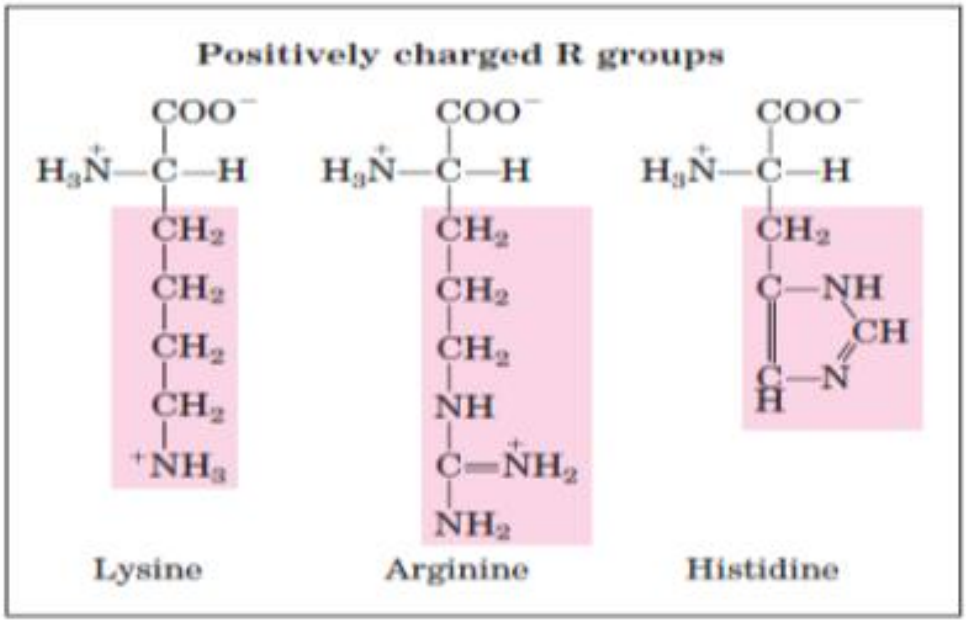
Non-Essential Amino Acids: All other Amino Acids body can synthesize them. Alanine, Asparagine, Aspartic acid, Cysteine, Glutamic acid, Glutamine, Glycine, Proline, Serine, and Tyrosine.

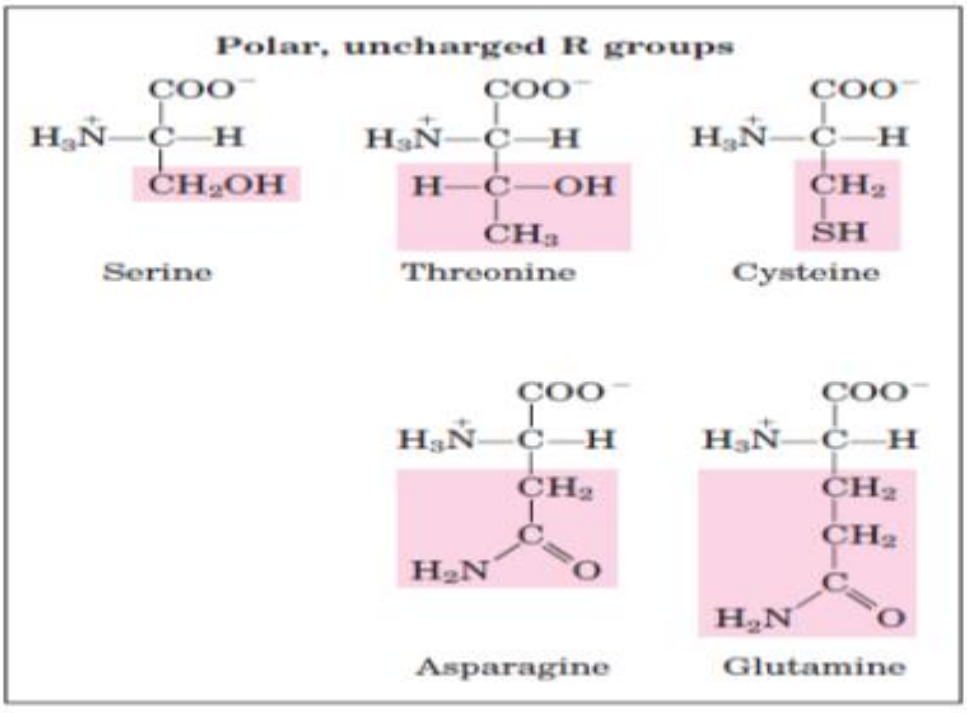
Nonpolar, aliphatic R groups

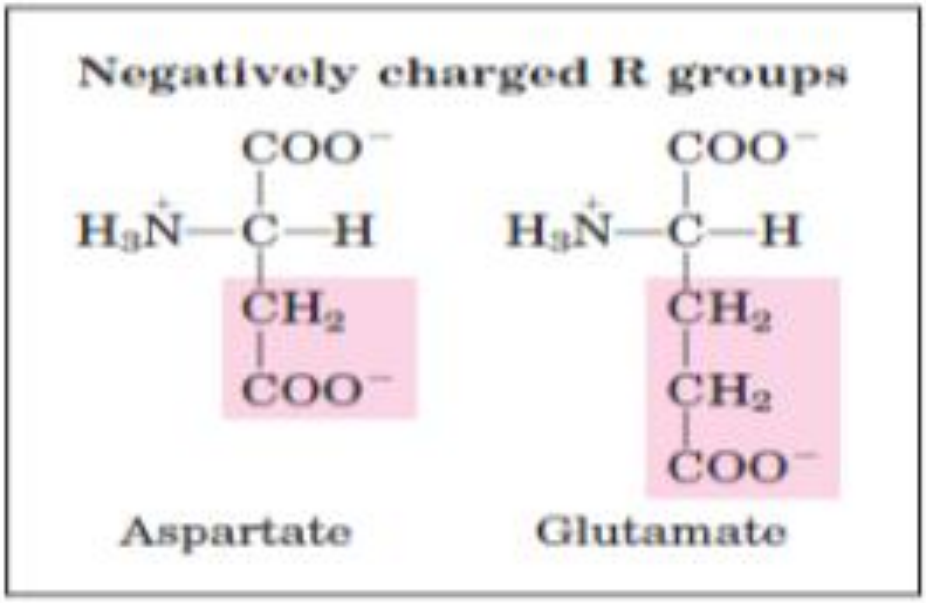


Aromatic R groups




Positively charged R groups
Lysine
Arginine
Histidine


Polar, uncharged R groups
Serine
Threonine
Cysteine
Asparagine
Glutamine



The Peptide Bond

The simple peptide, a **dipeptide**, contains a single peptide bond formed by the condensation of the carboxyl group of one amino acid with the amino group of the second with the concomitant elimination of water. Peptide bond formation is a condensation reaction leading to the polymerization of amino acids into peptides and proteins. Peptides are small consist of few amino acids.