Al-Mustaqbal University College

Department of Medical Physics

Lecture 3

Amino acids & peptide

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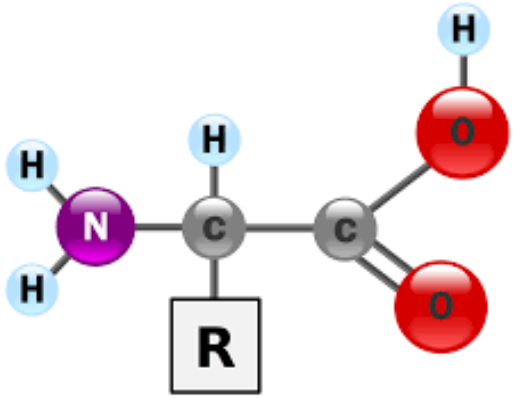
Amino Acids

Amino acids are any group of organic molecules that contain a basic amine group (NH2), a carboxylic acid group (COOH), and an organic group R that are unique to each amino acid and are the building blocks of proteins. And its shape is as follows:



Amino acids differ from each other according to the specific chemical group, the R group

The importance of amino acids

1- Help improve general mood; That is, the mental and psychological state of the human body An example is the amino acid tryptophan, which is essential for the production of serotonin.

2- Protein building :When protein is broken down, the amino acids in the body build up the protein in the body again.

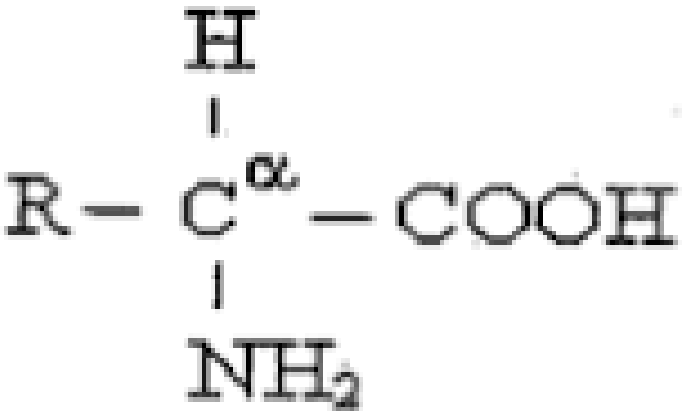
3- Amino acids, such as arginine, help the body's arteries maintain their elasticity.

4-Some amino acids, such as lysine, help the body better absorb calcium, which reduces weak and osteoporosis.

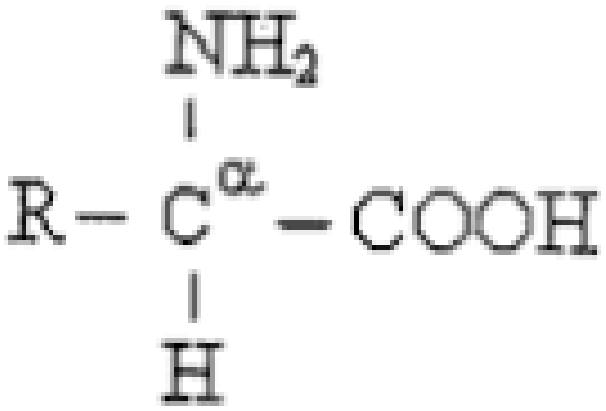
5-Muscles, skin, and connective tissues - they need amino acids to repair themselves when injured or damaged. Taking an amino acid like arginine after exercising can help your muscles recover.

If the amine group is to the right of the carbon atom The amino acid is of type D.

If the amine group is to the left of the carbon atom The amino acid is of the L type.



D-Amino acid



L-Amino acid

Types of amino acids

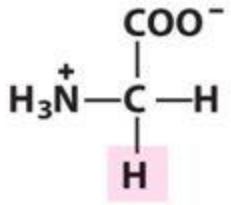
1- Nonpolar amino acids:

The first group of amino acids are: (glycine), (alanine), (valine), (leucine), (isoleucine), (proline), and (Phenylalanine, methionine and tryptophan. This makes them "hydrophobic." In solutions diluted with water. amino acids founds in Meat, poultry , and seafood

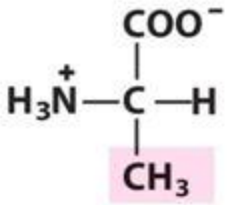
Eggs and dairy product

Nonpolar Amino Acids

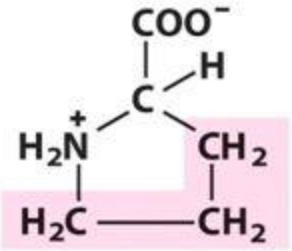
- Hydrophobic, neutral, aliphatic



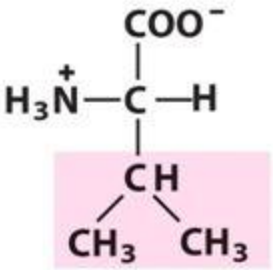
Glycine



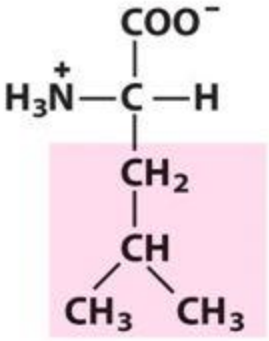
Alanine



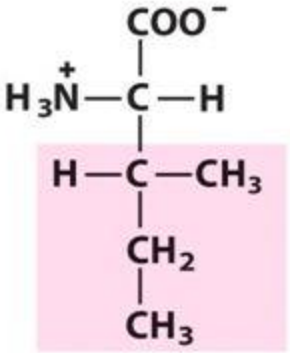
Proline



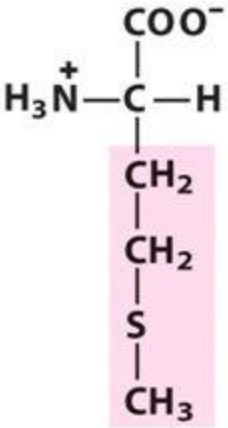
Valine



Leucine



Isoleucine

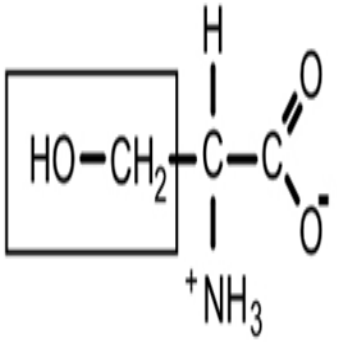


Methionine

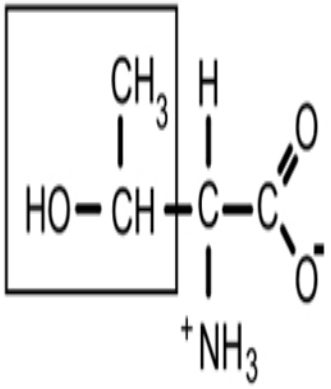
2- Polar amino acids:

The second group is: (serine), (cysteine), (threonine), (tyrosine), (asparagine), and (glutamine). The side chains in this group have at least one atom (nitrogen, oxygen, or sulfur) with electron pairs available to make hydrogen bonding with water and other molecules

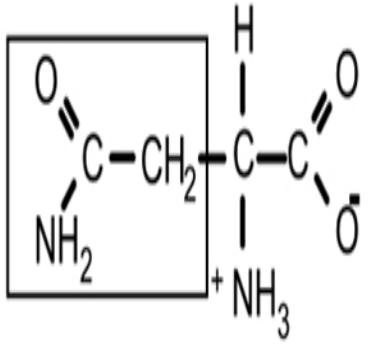
Serine (Ser, S)



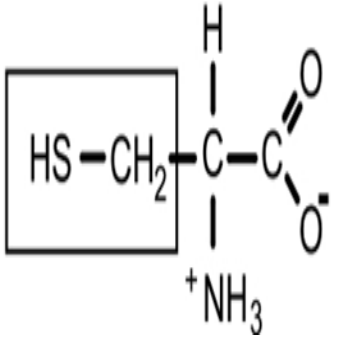
Threonine (Thr, T)



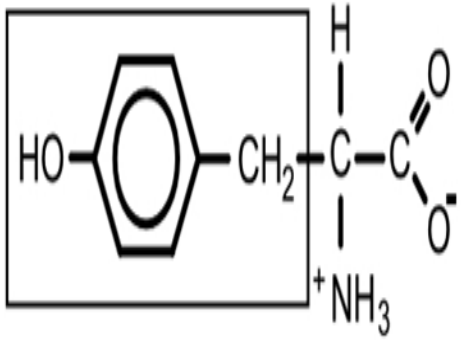
Asparagine (Asn, N)



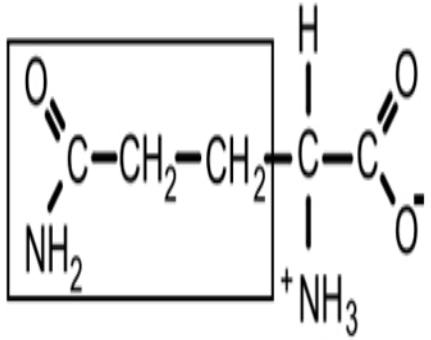
Cysteine (Cys, C)



Tyrosine (Tyr, Y)

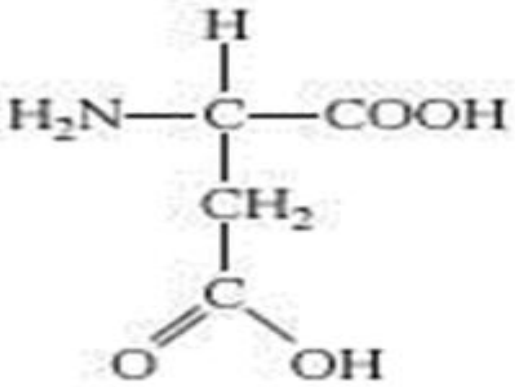


Glutamine (Gln, Q)

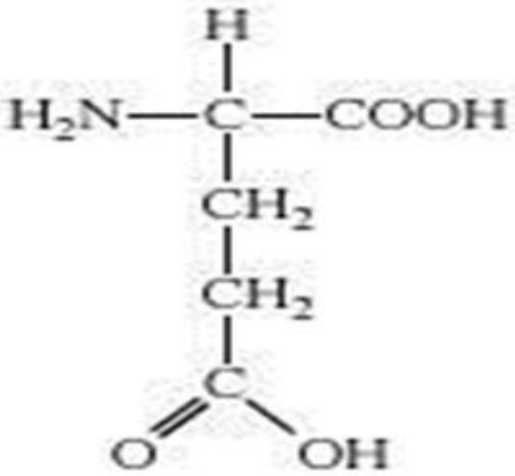


3- Acidic amino acids:

The amino acids in this group are: (aspartic acid) and (glutamic acid). Each of them has a carboxylic acid in their side chain, which gives them their acidic properties (giving a proton).



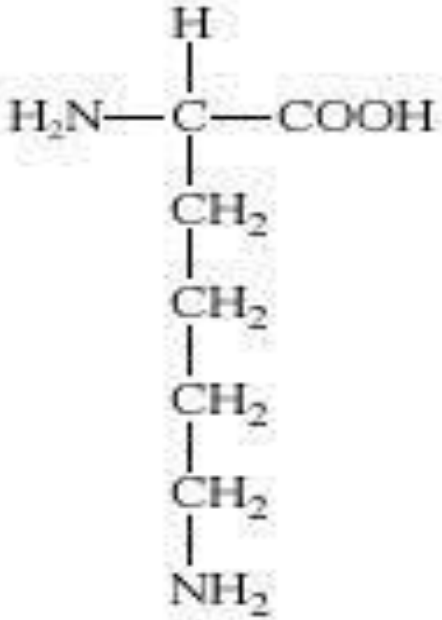
aspartic acid
(Asp, D; Asx or B)



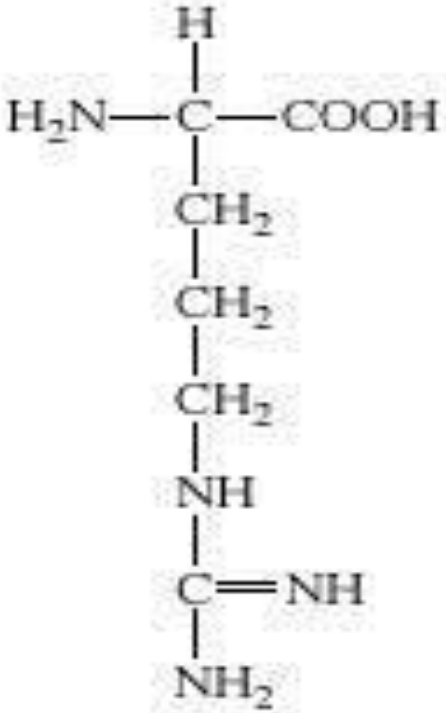
glutamic acid
(Glu, E; Glx or Z)

4- basic amino acids:

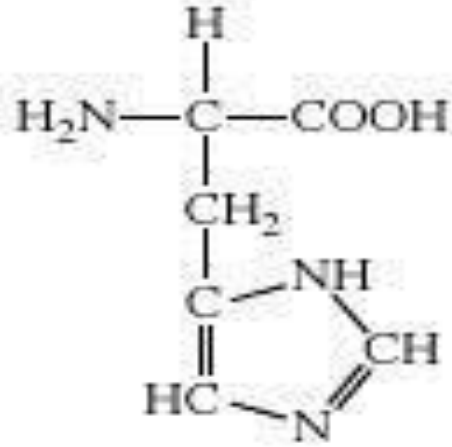
- The three amino acids in this group are: (arginine), (histidine), and (lysine)..



lysine
(Lys, K)



arginine
(Arg, R)



histidine
(His, H)

The majority of amino acids are in the second, third and fourth groups (hydrophilic).

*__Amino acids are also used in medicinal therapy__ such as (L-dihydroxyphenylalanine) or (L-dopa) for Parkinson's disease, glutamine and histidine in stomach ulcers, and arginine and ornithine in the treatment of liver disease.

Physical properties of amino acids

1- Amino acids are colorless, crystalline substance.

2- Most amino acids are tasteless but some are sweet. (Glycine, Alanine) and some are bitter (Arginine)

3- Amino acids have high melting point (200-300)C due to ionic property.

4- Solubility of amino acids depends upon polarity, iso-electric point, nature of solvent (pH) and temperature.

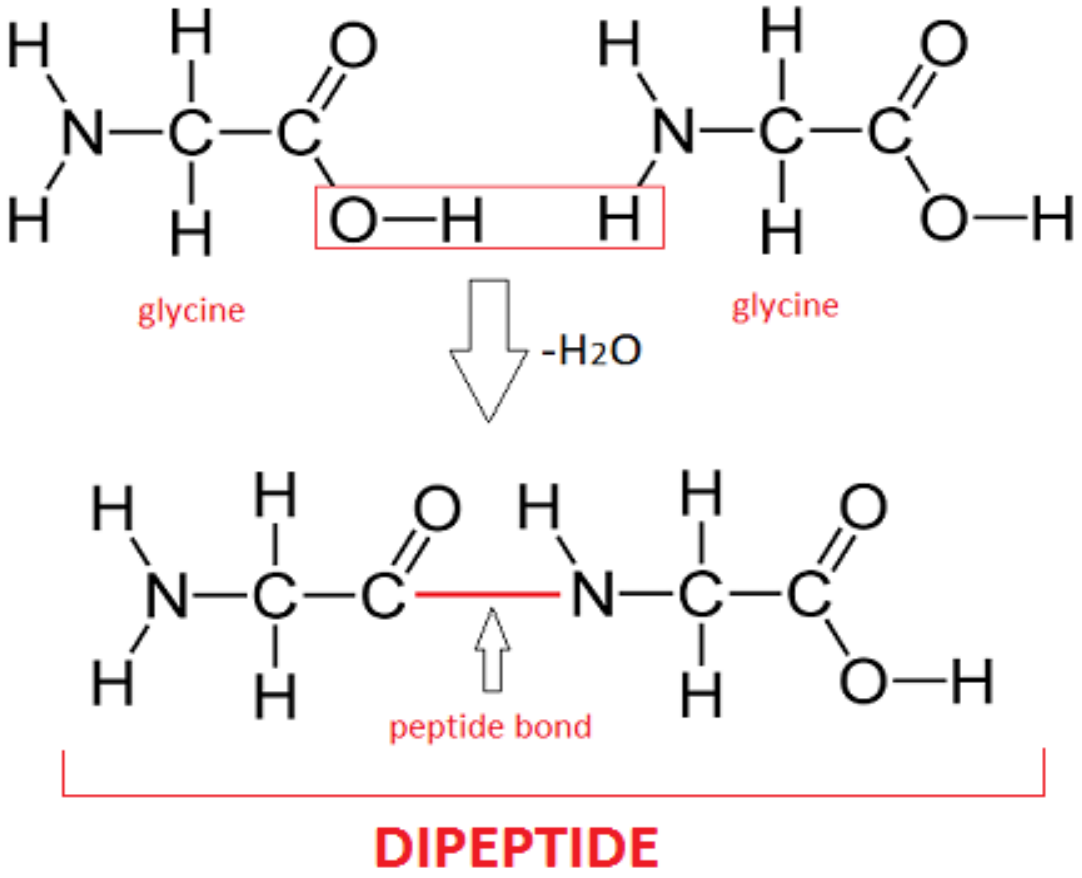
5- Amino acids are soluble in water and ethanol (i.e. polar solvent) and insoluble in non-polar solvent like benzene, ether etc.

peptides

Two or more amino acids linked together by a peptide bond.If the number of amino acids in the peptide exceeds ten, it is called a polypeptide .

Formation of Peptide

A peptide is formed by combining an alpha-carboxyl group of an amino acid with an alpha- amino group of another amino acids, thus forming a peptide bond and as a result ,a water molecule is released.

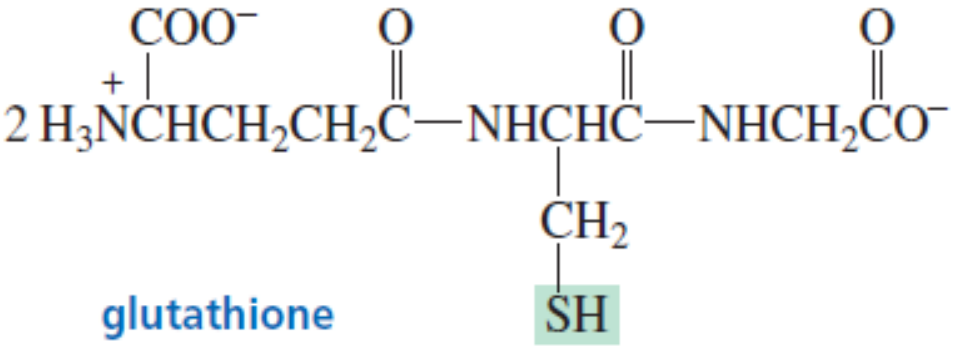

glycine
glycine
-H2O
peptide bond
DIPEPTIDE

Chains of fewer than ten or fifteen amino acids are called oligopeptides, and include dipeptides, tri peptides, and tetra peptides.

When a polypeptide contains more than approximately fifty amino acids it is known as a protein

Some Biologically important peptides

Glutathione: is a substance made from the amino acids glycine, cysteine, and glutamic acid. It is produced by the liver and involved in many body processes.



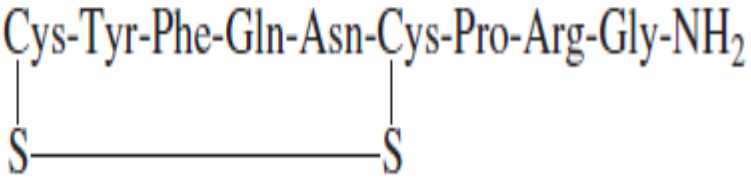
glutathione

Bradykinin: is a peptide that promot inflammation

bradykinin Arg-Pro-Pro-Gly-Phe-Ser-Pro-Phe-Arg

Vasopressin: A cyclic hormone consisting of nine amino acids, secreted by the posterior lobe of the pituitary glad. controls blood pressure by regulating the contraction of smooth muscle. It is also an antidiuretic..

vasopressin



Oxytocin: **Acyclic hormone consisting of nine amino acids.it is secreated by the posterior lobe of the pituitary gland. It is also perform the function of smooth muscles in mammary gland, generating the secreation of milk**

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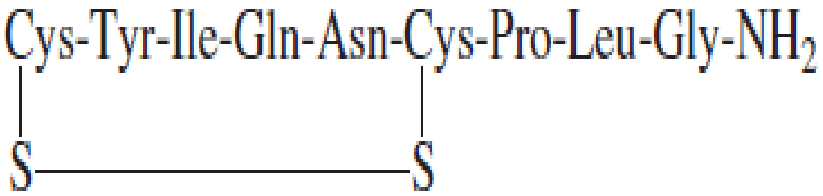
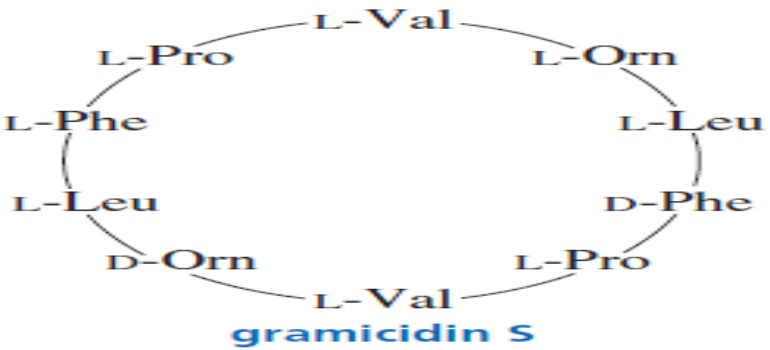
oxytocin

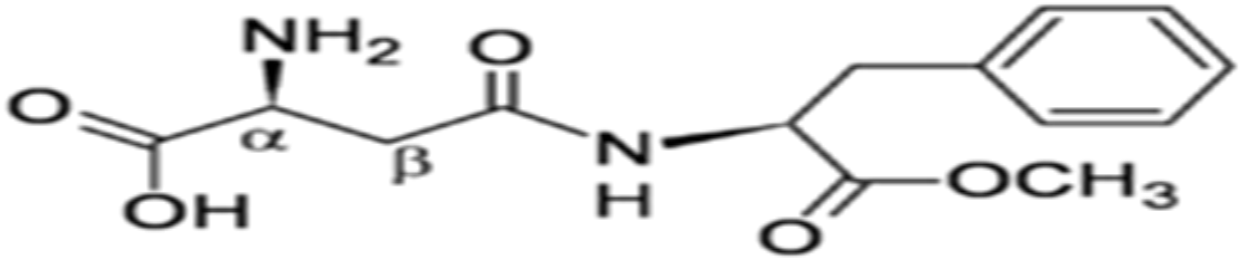


Gramicidin S: A cyclic peptide consisting of ten amino acids. Produced by fungi ,it acts as an antibiotics it acts as an antibiotics



gramicidin S

Spartame: it is the methyl ester of a dipeptide of L-aspartate and L-phenylalanine



GOOD LUCK