

PROTIENS

Presented by:

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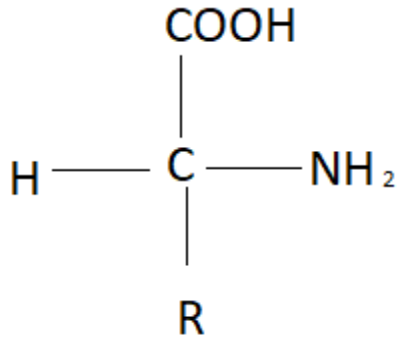
PROTEINS

- These are defined as the essential component in all the plants and animals i.e. they are responsible for plant growth and maintenance of life.
- They can also be considered as the polymers of amino acid joined mainly through specific type of covalent linkages.
- The name protein was first suggested by a Swedish chemist Berzilius in 1838.

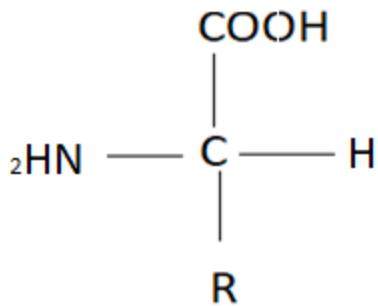
AMINO ACIDS

- ✘ These are building blocks of all proteins, joined together by peptide linkages.
- ✘ Around 100 amino acids have been separated till date from different species of plants and animals. Therefore the basic type of amino acids are greater than 100.
- ✘ But 20 amino acids have been uniformly distributed in plants and animals. Therefore, these 20 can combine in different proportions and different arrangements to give infinity no. of genes, that is why they are also called “Magic 20”.
- ✘ The first amino acid discovered was “asparagine” in 1806.
- ✘ All of them have common names, in some cases names are derived from the sources from which they were first isolated or presence of any special feature.
- ✘ e.g. Asparagine = first found in Asparagus;
- ✘ e.g. Glycine = because of its sweet taste.

STRUCTURE OF AMINO ACID



D-amino acid



L-amino acid

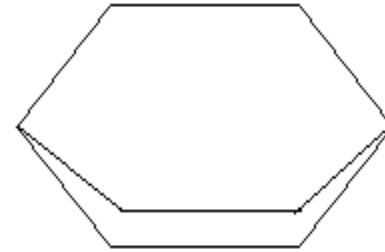
- ✘ The first carbon is a part of carboxyl group
- ✘ The second carbon to which amine group is attached is called alpha carbon.
- ✘ The alpha carbon is asymmetric and because of it, it exists in two optical forms.
- ✘ D form = having amine group on right
- ✘ L form = having amine group on left.
- ✘ At pH 7 (neutral), isoelectric point arises and both groups of amino acid undergo ionisation to give dipolar ion known as "Zwitter ion".

STEREOCHEMISTRY OF AMINO ACID

- All amino acids, excepts glycine contains a chiral carbon. Therefore, these are optically active.
- If the amino acid rotate the plane polarised light towards right ,it is called dextro-rotatory amino acid ;.e.g. glutamic acid shows rotation of +12 degree towards right hand side,therefore it is dextro rotatory.
- If the amino acid rotate the plane polarised light towards left ,it is called levo -rotatory amino acid; e.g. alanine shows rotation of -86.2 degree towards left hand side,therefore it is levorotatory.

PHYSICAL PROPERTIES OF AMINO ACIDS

- ✘ All the amino acids are colourless, crystalline solids. They have different crystalline shape; e.g. tyrosine exhibits long cylindrical needle type shape and cystine shows hexagonal plane plate type shape.
- ✘ Different amino acid have different taste behaviour. Taste varies from tasteless to sweet to bitter; e.g. glycine, alanine are sweet, tyrosine is tasteless, arginine is bitter in taste.
- ✘ Amino acid possess high melting point i.e. above 200 degree centigrade because of electrostatic forces of attractions of dipolar amino acids.

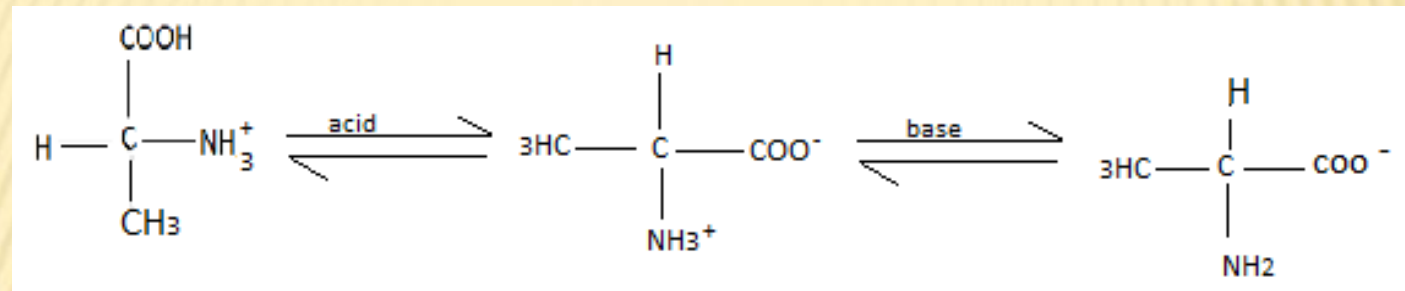


cystine



Tyrosine

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- ✘ Some amino acids like tryptophan, histidine and phenylalanine shows absorption maximum between 260-290 nm i.e. UV range.
 - ✘ These are soluble in polar solvents like water, alcohol and chloroform, etc. Insoluble in non-polar solvents such as benzene and ether.
 - ✘ Electrochemical properties; amino acids are amphoteric in nature. Amphoteric are those species which donate as well as accept an electron. Amino acid exist as Zwitter ion, therefore, are amphoteric in nature. Amino acid react with acids and bases to give cation and anion. Therefore, they are amphoteric and behave like buffer.
 - ✘ Amino acid undergoes two types of dissociations, corresponding to dissociation of COOH gp = pK_a and $NH_3 = pK_b$. In between these there is a point known as isoelectric point. When amino acid are acidic in nature, there is an additional pK_a value. Parallely, when amino acid are basic in nature there is an additional pK_b value, but in between all these values, there is an isoelectric point; .e.g., let us consider alanine; it exist as a zwitter ion and net charge on zwitter ion is zero.



At pI only zwitter ion exist. Therefore, amino acid do not show movement towards any electrode, while at pKa it moves towards cathode and at pKb it moves towards anode in the medium.

CLASSIFICATION OF AMINO ACIDS

- Amino acid can be easily classified on the basis of alkyl group attached to alpha carbon into 4 categories.
 - a) Amino acid having non polar alkyl group= in these, there are either aliphatic side chain or aromatic side chain. this category of amino acids have amino acids named alanine

Sr.	Name of amino acid	Chemical name	abbreviation
1	Alanine	Alpha amino propanoic acid	Ala
2	Valine	Alpha amino valeric acid	Val
3	Leucine	Alpha amino caproic acid	Leu
4	Isoleucine	Alpha amino beta methyl valeric acid	Ile
5	Proline	2-pyrrolidinecarboxylic acid	Pro
6	Phenylalanine	2-amino-3-phenylpropanoic acid	Phe
7	Tryptophan	2-amino-3-(1H-indol-3-yl)propanoic acid	Trp
8	Methionine	2-amino-4-(methylthio)butanoic acid	Met

b. Amino acid with polar but uncharged alkyl group

In this category of amino acid, there are some groups like -OH, -SH or -H attached to alkyl gp developing a partial charge separation. This category includes 7 amino acids.

1. Glycine
2. Serine
3. Tyrosine
4. Cystine
5. Asparagine
6. Glutamine
7. Threonine

Sr.	Name of amino acid	Chemical name	abbreviation
1	glycine	Alpha amino acetic acid	Gly
2	Serine	Alpha amino beta hydroxy propanoic acid	Ser
3	Threonine	Alpha amino beta hydroxy butanoic acid	Thr
4	Cystine	Alpha amino beta thio propanoic acid	Cys
5	Tyrosine	2-amino-3-(4-hydroxyphenyl)propanoic acid	Tyr
6	Asparagine	2-amino-3-carbamoyl propanoic acid	Asn
7	Glutamine	2-amino-3-amido-glutamic acid	Glu

c.Amino acid with negatively charged alkyl group

In this category, amino acid carry more than one dissociable proton which produces negatively charged alkyl group in aqueous medium. There are two amino acids in this group

Sr.	Name of amino acid	Chemical name	abbreviation
1	Aspartic acid	Alpha amino succinic acid	Asp
2	Glutamic acid	Alpha amino glutamic acid	Glu

d. Amino acid with positively charged alkyl group

In this category of amino acid there is an extra amino acid group which imparts basic character to the amino acids.

Sr.	Name of amino acid	Chemical name	abbreviation
1	Lysine	Diammino hexanoic acid	Lys
2	Arginine	Alpha amino delta guanidinovalerate	Arg
3	Histadine	Alpha amino beta imidazolopropionate	His

NON STANDARD AMINO ACID OR RARE PROTEIN AMINO ACID

- ✘ These are defined as those amino acids which are not abundantly found in most of the proteins.
- ✘ These are found only in few proteins.
- ✘ Therefore, these are known as non standard amino acid; .e.g.;
- i. Hydroxyproline
- ii. Hydroxylysine
- iii. N-Methyllysine
- iv. Delta carboxyglutamate

NON PROTEIN AMINO ACID

- ✘ These are defined as those amino acids which are not found in proteins but play metabolic roles in the body; .e.g.;
- i. L-ornithine
- ii. L-citruline
- iii. Creatine
- iv. Gama amino butyrate
- v. Beta alanine

REFERENCES

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