

Biomolecules

Introduction:

Biomolecules are the organic compound which form the basis of life i.e. they build up the living system and responsible for their growth and maintenance.

The sequence that relates biomolecule to living organism is

Biomolecules \rightarrow Organelles \rightarrow Cells \rightarrow Tissue \rightarrow Organ \rightarrow Living organism

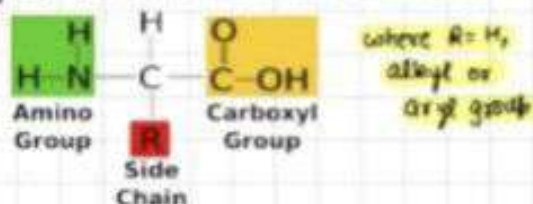
\rightarrow Living systems are made up of various complex biomolecules like carbohydrate, proteins, nucleic acids, lipids etc.

Proteins and carbohydrates are essential constituents of our food.

\rightarrow In addition, some simple molecules like vitamins and mineral salts also play an important role in the function of organisms.

Amino Acids & Proteins

The compounds containing amino group ($-NH_2$) and carboxylic group ($-COOH$) are called amino acids.

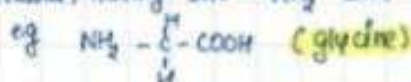


\rightarrow except glycine ($\text{H}_2\text{N}-\text{CH}_2-\text{COOH}$), others are optically active in nature.

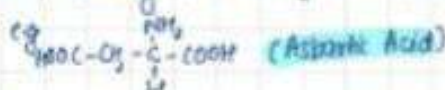
* Classification of amino acids \rightarrow

\rightarrow α , β , γ - amino acids depending upon the position of $-NH_2$ with respect to $-COOH$ group.

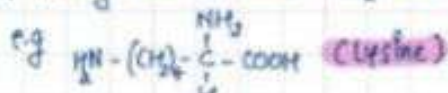
\rightarrow Neutral, having one $-NH_2$ and one $-COOH$ group.



\rightarrow Acidic, having one $-NH_2$ and two $-COOH$ group.



\rightarrow Basic, having two or more $-NH_2$ and one $-COOH$ group.

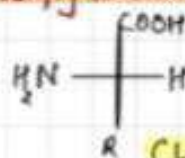


* Essential and Non-Essential Amino Acids:

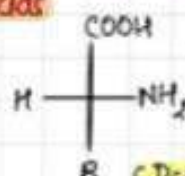
Those amino acids which can be synthesized by our body are known as non-essential amino acids while which can't be synthesized by our body so must be supplied through our diet are called essential amino acids.

Essential	Conditionally Non-Essential	Non-Essential
Histidine	Arginine	Alanine
Isoleucine	Asparagine	Aspartate
Leucine	Glutamine	Cysteine
Methionine	Glycine	Glutamate

Configuration of α -amino acids



(L-amino acid)
(NH_2 on LHS)



(D-amino acid)
(NH_2 on RHS)

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\rightarrow Naturally occurring α -amino acids are L-amino acids. D-amino acids occur in some antibiotics and bacterial cell walls.

Zwitter ion: When a proton is migrated from carboxyl group to amino group, a dual ion is formed and this dual ion is called zwitter ion.



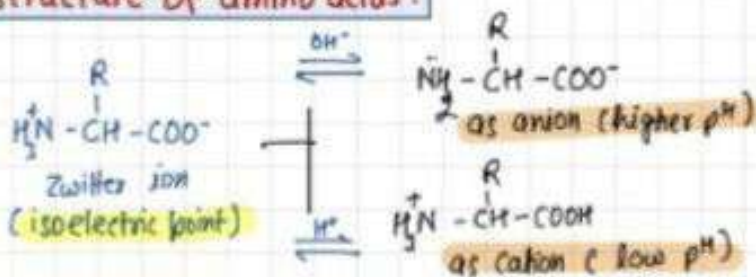
Isoelectric Point (pI)

Zwitter ion, which is electrically neutral can only exist at a specific pH, that pH is called isoelectric point which is different for all amino acids.

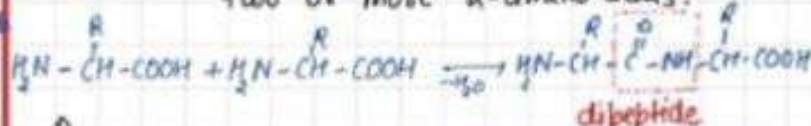
e.g. pI of Leucine $pH = 6.0$

pI of Arginine $pH = 10.8$

Structure of amino acids:



* **Peptide** \rightarrow peptides are condensation products of two or more α -amino acids.



$-\text{C}(=\text{O})-\text{NH}-$ is known as peptide linkage or peptide bond.

\rightarrow 2 molecules of α -amino acid form dipeptide.

3 molecules of α -amino acid form tripeptide.

\rightarrow Tripeptide has only one peptide bond.

Tripeptide has only two peptide bond.

Polypeptide:

Condensation products of many amino acid (≈ 10000) is known as polypeptide and these polypeptide which have molecular mass above than 10000 u are called proteins.

Proteins

They are linear polymers of α -amino acid.