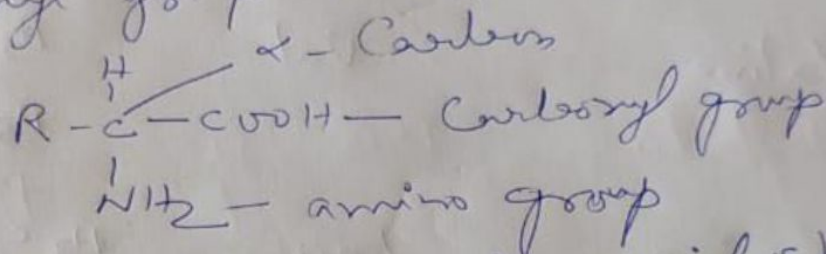


## Structure & Classification of Amino Acids

Amino Acids are the building blocks of or monomeric units of proteins and are also regarded as alphabets of proteins. There are 20 different amino acids present in proteins, which are termed as standard amino acids. The term "amino acid" owes its name to its structure, with the presence of both an amino group and a carboxyl group linked to  $\alpha$ -Carbon.



Structure of an amino acid showing an amino group and a carboxyl group linked to  $\alpha$ -Carbon

The 20 amino acids of proteins differ from each other in the nature of R-group determined by the structure, size, electrical charge and solubility in water. Based on polarity of R-groups, standard amino acids have been classified into following four classes -

1. Amino acids with nonpolar (hydrophobic) R group.
2. Amino acids with uncharged polar R-g



- 3. Amino acids with positively charged polar R-groups.
- 4. Amino acids with negatively charged polar R-groups.

These standard amino acids have been assigned three letter and one letter symbols.

1. Amino acids with nonpolar (hydrophobic)

R-group →

<u>Name</u>	<u>Symbol</u>	<u>Structure</u>
(i) Alanine	Ala	$\text{CH}_3 - \underset{\text{NH}_3^+}{\text{CH}} - \text{COO}^-$
(ii) Valine	Val	$\begin{matrix} \text{H}_3\text{C} \\ \text{H}_3\text{C} \end{matrix} \text{ > } \underset{\text{NH}_3^+}{\text{CH}} - \text{CH} - \text{COO}^-$
(iii) Leucine	Leu	$\begin{matrix} \text{H}_3\text{C} \\ \text{H}_3\text{C} \end{matrix} \text{ > } \text{CH} - \text{CH}_2 - \underset{\text{NH}_3^+}{\text{CH}} - \text{COO}^-$
(iv) Isoleucine	Ile	$\begin{matrix} \text{CH}_3 - \text{CH}_2 \\ \text{CH}_3 \end{matrix} \text{ > } \underset{\text{NH}_3^+}{\text{CH}} - \text{CH} - \text{COO}^-$
(v) Proline	Pro	$\begin{matrix} \text{H}_2\text{C} \\ \text{H}_2\text{C} \end{matrix} \text{ - } \underset{\text{NH}_2}{\text{C}} \text{ - } \text{CH} - \text{COO}^-$
(vi) Phenylalanine	Phe	$\text{C}_6\text{H}_5 - \text{CH}_2 - \underset{\text{NH}_3^+}{\text{CH}} - \text{COO}^-$

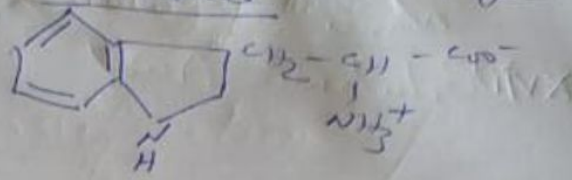


(ii) Tryptophan

Synbol  
Trp

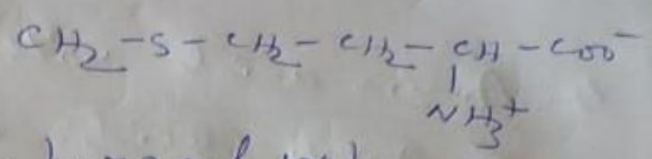
Structure

(Pg-3)



(iii) Methionine

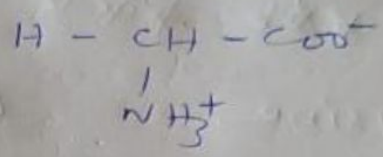
met



Amino acids with uncharged polar R-group

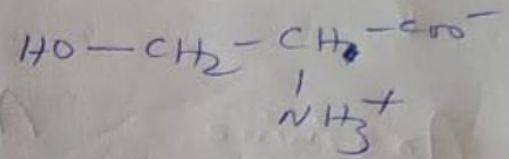
(x) Glycine

Gly



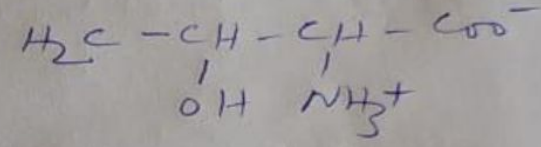
(x) Serine

Ser



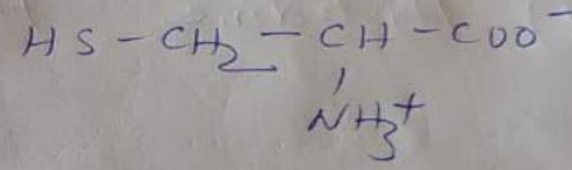
(xi) Threonine

Thr



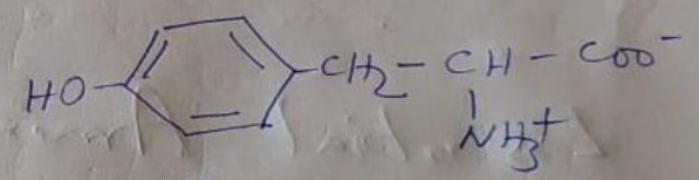
(xii) Cysteine

Cys



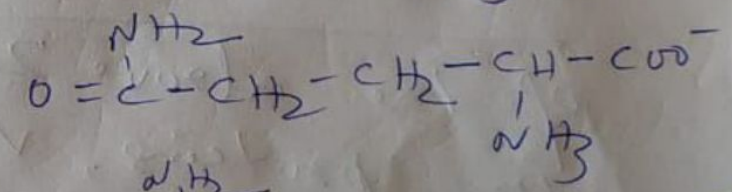
(xiii) Tyrosine

Tyr



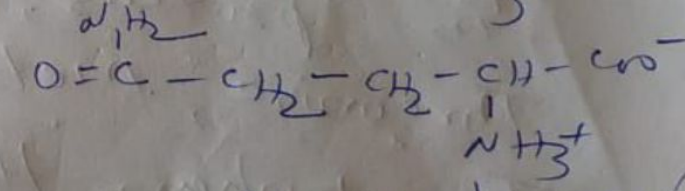
(xiv) Asparagine

Asn



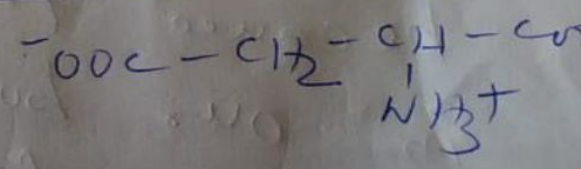
(xv) Glutamine

Gln



Amino Acids with negatively charged polar R-group (Acidic amino acids)

Asp





Name	Symbol	Structure
(xvi) Glutamic Acid	Glut.	$\text{COO}^- - \text{CH}_2 - \underset{\text{NH}_3^+}{\text{CH}} - \text{COO}^-$

4. Amino acids with positively charged Polar R-group (acidic amino acids). -

(xvii) Aspartic acid Asp

(xviii) Lysine Lys  $\text{H}_3\text{N}^+ - \text{CH}_2 - \text{CH}_2 - \text{CH}_2 - \underset{\text{NH}_3^+}{\text{CH}} - \text{COO}^-$

(xix) Arginine Arg.  $\text{H}_2\text{N} - \underset{\text{NH}_2}{\text{C}} - \text{NH} - \text{CH}_2 - \text{CH}_2 - \underset{\text{NH}_3^+}{\text{CH}} - \text{COO}^-$

(xx) Histidine His  $\text{HC} = \underset{\text{H}}{\text{C}} - \text{CH}_2 - \underset{\text{NH}_3^+}{\text{CH}} - \text{COO}^-$   
 $\text{H}^+ \text{N} \quad \text{NH}$

### Essential Amino Acids -

of the above 21 amino acids found in proteins, Valine, Leucine, Isoleucine, Threonine, Methionine, Phenylalanine, Tryptophan, Histidine, and Lysine are called Essential amino acids because they are not synthesized by our body and their presence in our diet is essential. Absence



[Pg-5]

of any of these nine amino acids leads to serious health problems.

### Amino Acid Derivatives in Proteins -

Besides, these 21 amino acids there are some amino acids which are derivatives of some of the standard amino acids. For example 4-hydroxy proline is found in hydrolysate of collagen, 5-hydroxylysine, N-methyllysine, N-trimethyllysine and methylhistidine are found in some muscle proteins such as collagen, etc. Similarly, desmosine and isodesmosine are found in elastin, monoiodotyrosine, diiodotyrosine, triiodotyrosine and thyroxine are found in the protein thyroglobulin.

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