

B.Sc.III Semester V Semester V



Plant Biochemistry and Molecular Biology

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UNIT 3: PROTEINS



- **3.1 INTRODUCTION, STRUCTURE, PROPERTIES, CHARACTERISTICS AND CLASSIFICATION OF AMINO ACIDS**
- **3.2. BRIEF OUTLINE OF BIOSYNTHESIS OF AMINO ACID: PROLINE**
- **3.3. GENERAL STRUCTURE, CLASSIFICATION OF PROTEIN**
- **3.4. PROTEIN BIOSYNTHESIS IN EUKARYOTES: TRANSCRIPTION AND TRANSLATION**

Introduction

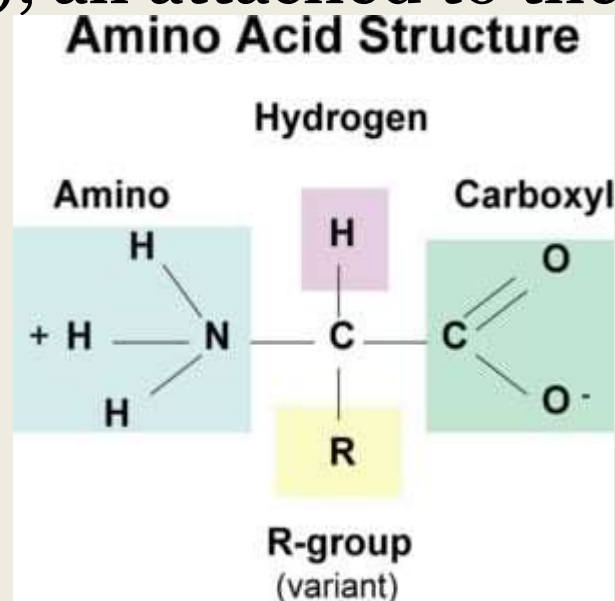


- **Proteins** are biosynthesized from 20 amino acids in a system involving strict genetic control.
- Thus, amino acids are the basic unit of proteins.
- More than **300** amino acids are found in nature but only **20** amino acids are standard and present in protein because they are coded by genes.
- Other amino acids are modified amino acids and called non-protein amino acids.

Structure of Amino acids



- All 20 of the common amino acids are alpha-amino acids.
- They contain a carboxyl group, an amino group, and a side chain (R group), all attached to the α -carbon.



Physical Properties Of Amino acids



- Colorless, crystalline solid.
- High melting point greater than 200°
- Soluble in water, slightly soluble in alcohol and dissolve with difficulty in methanol, ethanol, and propanol.
- Tasteless[tyrosine], sweet[glycine, alanine] •
- Optically active (except glycine)
- Peptide bond formation



- Optical isomers due to the presence of asymmetric α -carbon atoms.
- Structurally stable and sterically hindered [Glycine]
- Posses enzymatic activities
- Exhibit colloidal nature and denaturing property
- Zwitterionic property

- Amphoteric property



- **Ninhydrin test**
- **Xanthoproteic test**
- **Reaction with Sanger's reagent**
- **Reaction with nitrous acid**

Classification of amino acids on the basis of R-group

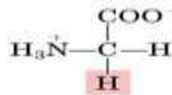


- **Nonpolar, Aliphatic amino acids**
- **Aromatic amino acids**
- **Polar, Uncharged amino acids**
- **Acidic amino acids**
- **Basic amino acids**

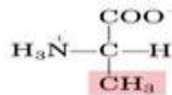
Classification of amino acids on the basis of R-group



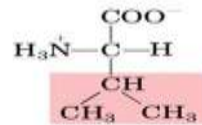
Nonpolar, aliphatic R groups



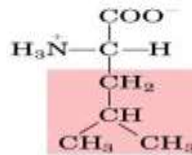
Glycine



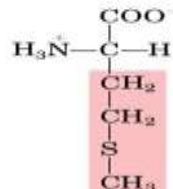
Alanine



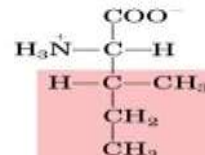
Valine



Leucine

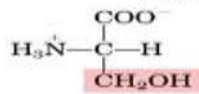


Methionine

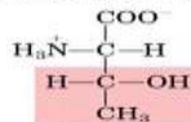


Isoleucine

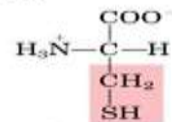
Polar, uncharged R groups



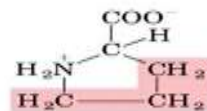
Serine



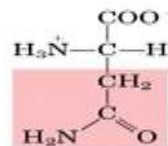
Threonine



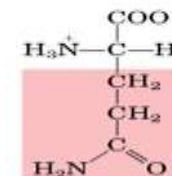
Cysteine



Proline

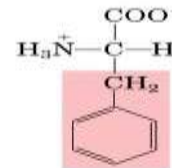


Asparagine

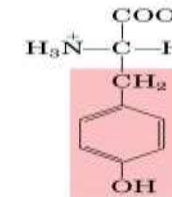


Glutamine

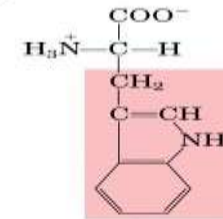
Aromatic R groups



Phenylalanine

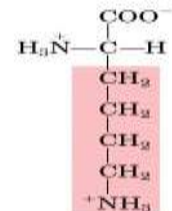


Tyrosine

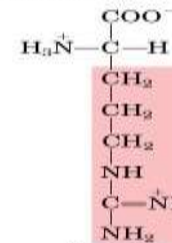


Tryptophan

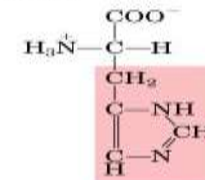
Positively charged R groups



Lysine

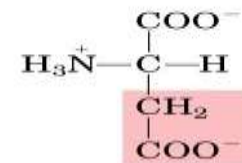


Arginine

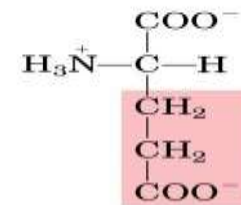


Histidine

Negatively charged R groups



Aspartate



Glutamate

Classification of amino acids on the basis of nutrition



- **Essential amino acids (Nine)**
- **Non-essential amino acids (Eleven)**

Essential	Conditionally Non-Essential	Non-Essential
Histidine	Arginine	Alanine
Isoleucine	Cystine	Asparagine
Leucine	Glutamine	Aspartate
Lysine	Glycine	Glutamate
Methionine	Proline	Serine
Phenylalanine	Tyrosine	
Threonine		
Tryptophan		
Valine		

Classification of amino acids on the basis of the metabolic fate



- **Glucogenic amino acids**
- **Ketogenic amino acids**
- **Both glucogenic and ketogenic amino acids**

Functions of Amino acids



- Production of hormones
 - Structure of muscles
 - Human nervous system's healthy functioning
 - The health of vital organs
 - Normal cellular structure
- The amino acids are used by various tissues to synthesize proteins and to produce nitrogen-containing compounds (e.g., purines, heme, creatine, epinephrine), or they are oxidized to produce energy.
- The breakdown of both dietary and tissue proteins yields nitrogen-containing substrates and carbon skeletons.
- The nitrogen-containing substrates are used in the biosynthesis of purines, pyrimidines, neurotransmitters, hormones, porphyrins, and nonessential amino acids.
- The carbon skeletons are used as a fuel source in the citric acid cycle, used for gluconeogenesis, or used in fatty acid synthesis.

• THANK YOU

