BIOMOLECULES

PROTEINS

PROTEIN

Protein name is derived from a Greek word which means "holding first place" (Berzelius and Mulder)

- Essential elements in protein are C, H, O, N,
- Most of the proteins contain sulphur. In some proteins iodine, iron and phosphorus are present.
- After water, proteins are most abundant compounds in protoplasm. (7-14%) amount of proteins.
- Proteins are polymers of amino acids (Fisher and Hofmeister). There are approximately 300 amino acids known to exist but only 20 types of amino acids are used in formation of proteins

- Proteins are heteropolymers of amino acid.
- Amino acids contain an amino group and carboxylic group on the same carbon i.e. the α-carbon so they are called a-amino acids.
- Amino acids are substituted methanes.



- Amino acids is amphoteric compound because it contains one acidic -COOH and an alkaline group -NH₂
- At isoelectric point, amino acid is present in form of zwitter ion.

BIOLOGY

CLASS XI



- Iso electric point is that point of pH at which amino acids do not move in electric field.
- Out of 20 amino acids, 10 amino acids are not synthesized in body of animals so they are must in diet. These are called Essential amino acid . e. g. Threonine , Valine, Leucine, Isoleucine, Lysine, Methionine, Phenylalanine Tryptophan, Arginine, Histidine. Arginine and Histidine are semi essential.
- 10 amino acids are synthesized in animal body so these are called Non essential amino acids. for e.g. Glycine, Alanine, Serine, Cysteine, Aspartic acid, Glutamic acid, Asparagine, Glutamine, Tyrosine, Proline Except glycine, each amino acid has two enantiomeric isomers



• Most proteins have L- amino acids while D- amino acids occur in peptidoglycan of bacterial cell wall and · antibodies.

Amino acids are joined with peptide bond to form proteins.



• Peptidyl transferase enzyme catalyses the synthesis of peptide bond.

• Property of protein depends (i) on sequence of amino acid and (ii) configuration of protein molecules.

DENATURATION OF PROTEIN :-

• Besides changes in pH, salts, heavy metals, temperature, pressure, etc. also cause precipitation of proteins. Because of these changes, the secondary and tertiary configuration of proteins is destroyed. Such alternations in the physical state of proteins. is called denaturation. If the change in the medium of protein is mild and for a short period, then denaturation of the protein is also temporary, however, if the change in medium is strong and prolonged then denaturation is permanent and the protein becomes coagulated. For example, the white or albumen of egg is a soluble globular protein but on heating it permanently coagulates into fibrous insoluble form. It is clear, that strong alternations result in the denaturation of proteins and they lose their biological properties and significance. It is this reason, that cells of organisms a:re unable to bear strong changes and they ultimately die.





CLASS XI

BIOLOGY

TYPES OF COMPOUND PROTEIN ON THE BASIS OF PROSTHETIC GROUP.

1. Nucleoprotein :- Prosthetic group is nucleic acid.

eg. Chromosome = DNA + RNA + Protein

Ribosome = rRNA + Protein

Virus

eg.

2. Chromoprotein :- Prosthetic group is Porphyrin pigment (metal + porphyrin ring)

	Metal	Colour
Haemoglobin	Fe	Red
Cytochrome	Fe	Red
Haemocyanin	Cu	Blue

3. lipoprotein :- Prosthetic group is lipid

- eg. Plasma membrane
- 4. Phosphoprotein :- Prosthetic group is phosphoric acid (H₃PO₄)
 - \rightarrow Caseinogen Milk
 - \rightarrow Pepsin Protein digesting ernzyme.
- 5. Lecithoprotein :- Prosthetic group is Lecithin
 - eg. Fibrinogen Blood

6. Metalloprotein :- Prosthetic group is metal

eg. Enzyme with its co-factor

Glycoprotein :- Prosthetic group is carbohydrate (less than 4% carbohydrate)
eg. (1) α, β, γ globulin of blood.

Glycoproteins which are present on cell surface are helpful in cell recognition.

Human = Egg surface - Fertilizin - Glycoprotein

Sperm surface - Antifertilizin - Simple protein.

8. Mucoprotein Prosthetic group is carbohydrate (more than 4% carbohydrate)

CLASS XI

SPECIAL POINTS ON PROTEIN :

- Monomeric protein : Protein composed of one polypeptide chain.
- **Oligomeric/Polymeric/Multimeric protein :** protein composed of more then one polypeptide chains.

Some proteins and their functions

Prtein	Functions
Collagen	Interecullar ground substance
Trypsin	Enzyme
Insulin	Hormone
Antibody	Fights infectious agents
Receptor	Sensory reception (smell, taste, hormone, etc.)
GLUT-4	Enables glucose transport into cells