**PROTEIN**

Proteins are the most abundant biological macromolecules, occurring in all cells.It is also the most versatile organic molecule of the living systems and occur in great variety; thousands of different kinds, ranging in size from relatively small peptides to large polymers.

Proteins are the polymers of amino acids covalently linked by the peptide bonds.The building blocks of proteins are the twenty naturally occurring amino acids.Thus, proteins are the polymers of amino acids.

Properties of Proteins

1. Solubility in Water

The relationship of proteins with water is complex. The secondary structure of proteins depends largely on the interaction of peptide bonds with water through hydrogen bonds. Hydrogen bonds are also formed between protein (alpha and beta structures) and water. The protein-rich static ball is more soluble than the helical structures.

At the tertiary structure, water causes the orientation of the chains and hydrophilic radicals to the outside of the molecule, while the hydrophobic chains and radicals tend to react with each other within the molecule (hydrophobic effect).

2. Denaturation and Renaturation

Proteins can be denatured by agents such as heat and urea that cause unfolding of polypeptide chains without causing hydrolysis of peptide bonds. The denaturing agents destroy secondary and tertiary structures, without affecting the primary structure. If a denatured protein returns to its native state after the denaturing agent is removed, the process is called renaturation. Some of the denaturing agents include

Physical agents: Heat, radiation, pH

Chemical agents: Urea solution which forms new hydrogen bonds in the protein, organic solvents, detergents.

3. Coagulation

When proteins are denatured by heat, they form insoluble aggregates known as coagulum. All the proteins are not heat coagulable, only a few like the albumins, globulins are heat coagulable.

4. Isoelectric point

The isoelectric point (pI) is the pH at which the number of positive charges equals the number of negative charges, and the overall charge on the amino acid is zero. At this point, when subjected to an electric field the proteins do not move either towards anode or cathode, hence this property is used to isolate proteins.

5. Molecular Weights of Proteins

The average molecular weight of an amino acid is taken to be 110. The total number of amino acids in a protein multiplied by 110 gives the approximate molecular weight of that protein. Different proteins have different amino acid composition and hence their molecular weights differ. The molecular weights of proteins range from 5000 to 109 Daltons.

6. Posttranslational modifications

It occurs after the protein has been synthesized on the ribosome. Phosphorylation, glycosylation, ADP ribosylation, methylation, hydroxylation, and acetylation affect the charge and the interactions between amino acid residues, altering the three-dimensional configuration and, thus, the function of the protein.