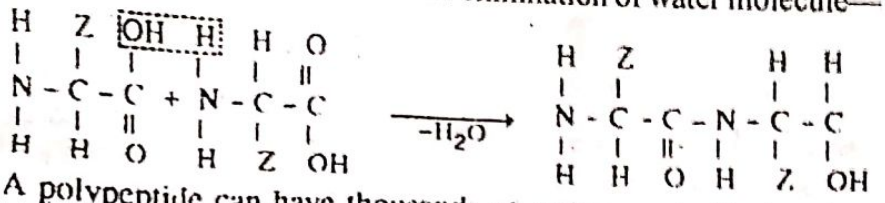
Q.65. Give the general idea of proteins.

Ans. : The word protein is derived from the Greek proteios whic means 'first' because it is the first vital chenicals for life. They are present in all living cells. Plants can synthesize proteins from CO_2, H_2O and nitrogenous compounds but animals depend mainly on plants or other animals for their protein requirments. Proteins perform various biological functions e.g. keratin is the structural meterials for hair, insulins in pancreas regulate metabolic processes and haemoglobin in blood, transport oxygen within the body, enzymes are proteinic catalysts wnich carry out many bio-reactions in the body.

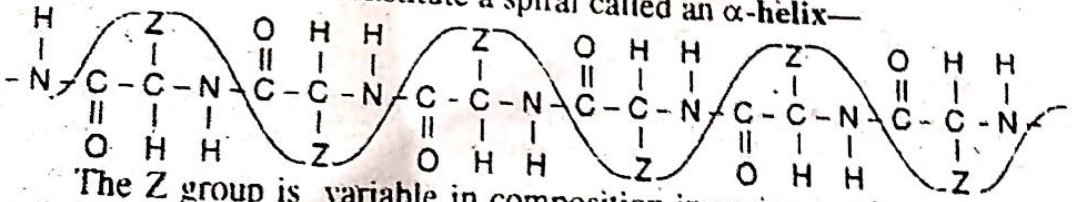
Chemically, proteins are polyamides of α-amino acid units

$(NH_2 - CH(Z).COOH)$ linked to one another by peptide bonds. A peptide (– CO – NH –) bond is formed by the union of – COOH group of one amino acid with amino group of other amino acid with the elimination of water molecule—



A polypeptide can have thousands of amino acids. Each polypeptide chain contains a free NH_2 and a free COOH groups at the two ends. There are about 20 naturally occurring α-aminoacids. A polypeptide can have any number of any one or different naturally occurring amino acids. The specific sequence in which given numbers and type of amino acids can be found as a chain can vary almost without any restriction. Hence there are a number of chemically different proteins. Indeed, no two organisms have exactly the same type of proteins.

A line connecting the Z groups of consecutive L-amino acids units in the polypeptide chain constitute a spiral called an **α-helix**—



The Z group is variable in composition in various amino acids. The α -helixes are held together by H-bonds between H of –NH of one amino acid and O of C = O in another amino acid at a distance of three units. There are 3-7 amino acid units per turn of the spiral. If long coiled, thread like structure of this type of this remain extended as strand, the protein is called fibrous. Hair, hoofs, skin, nails, silk and wool are fibrous proteins. However, there are many proteins in which coils are looped, twisted and folded back on themselves forming ball like three dimensional configurations. Such proteins are called **globular**. Globular proteins catalyse the reactions occurring in body cells and called as **enzymes**. Therefore proteins represent vital contruction materials out of which the basic frame work of cells is build up, often soluble proteins such as globular proteins are converted into the fibrous or insoluble proteins by the action of heat and chemicals.

Classification : Proteins are classified on the basis of their structures into three types–simple, conjugated and derived.

Simple proteins yield amino acid mixture only on hydrolysis as they are made up of amino acids. They may be fibrous or globular. Collagens and keratins are fibrous proteins whereas albumins & globulins are globular proteins.

Conjugated proteins contain non-protein part called prosthetic group attached to the protein parts. On hydrolysis they give non-protein component and amino acid mixture.

Conjugated protein = Protein part + Prosthetic part

They are classified as per the nature of prosthetic part e.g.

Conjugated proteins	Prosthetic part	Example
Nucleoproteins	Nucleic acid	Virus proteins
Phosphoproteins	Phosphoric acid	Casein of milk
Glycoproteins	Carbohydrate	Mucin of saliva
Lipoproteins	Lipid	Serum
Metalloproteins	Metals (Zn, Fe & Cu)	Cytochrome
Flavo proteins	Riboflavin	Biological redox reactions

Derived Proteins are formed from simple and conjugated proteins. The products of partial hydrolysis of proteins are often classified as derived proteins.

General properties of proteins :

1. They have high mol wts.
2. They are colloidal in nature.
3. They produce amino acids on complete hydrolysis.
4. They are amphoteric.
5. They are optically active as they contain an asymmetric C-atom.
6. They have L-configurations.
7. They undergo suitable changes in their behaviour when subjected to the action of heat and chemicals. They are rendered insoluble and lose their physiological activity. This phenomenon is called **denaturation**. The denaturation is generally irreversible. Coagulation of egg white on heating is an example of the denaturation of protein. White of raw egg is a globular protein. When the egg is boiled hard, the protein changes to insoluble fibrous form and the protein is coagulated.

Q.66. Amino acids exist as Zwitter ions—Comment.

Ans. : Amino acids behave both as acids and bases i.e. amphoteric in nature e.g. in aqueous solution a typical amino acid, glycine exists as—