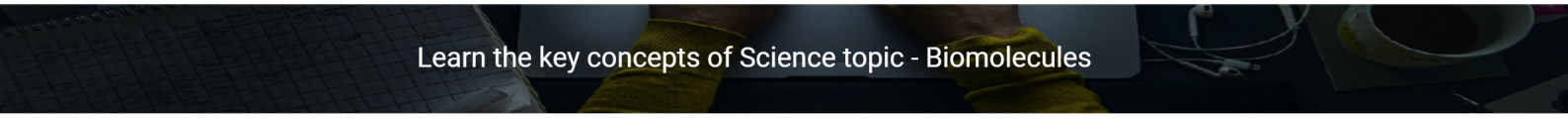


In our earlier blog, we talked about biomolecules like carbohydrates and amino acids. in our today's blog we will be taking our earlier discussion further and study about more Biomolecules that are Proteins, Enzymes, Vitamins, Nucleic Acids, Polymers.

Proteins

They are linear polymers of a-amino acids.

Structure of Proteins:

(a) Primary structure: It simply reveals the sequence of amino acids.

(b) Secondary structure: Francis Crick and James Watson described the structure of DNA double helix in 1953. α-helix structure maintained by hydrogen bonds or β-pleated sheet structure when R is a small group.

(c) Tertiary structure: The folding and superimposition of polypeptide chains forms a compact **globular shape**, termed a tertiary structure. It is stabilized by covalent, ionic, hydrogen and disulphide bonds.

Denaturation of Proteins:

The process that changes the three-dimensional Structure of native proteins is called denaturation of proteins. It can be caused by change in pH, addition of electrolyte, heating or addition of solvent like water, alcohol or acetone.

Enzymes

Enzymes constitute a group of complex proteinoid organic compounds, produced by living organisms which catalyse the chemical reaction. Non-proteinous components enhance the activity of certain enzymes and are known as co-enzymes. These include metal ions like Mn^{+2}, Mg^{+2}, K^{+} , Na^{+} , Zn^{+2}, Co^{+2}, etc., heterocyclic ring systems (pyrrole, purine, pyridine, etc.), a sugar residue, phosphoric acid and residue of vitamins like thiamine, riboflavin etc. Endoenzyme acts in the same cell in which it is synthesised, while exo-enzyme acts outside the cell in which it is synthesised.

Vitamins

The organic compounds other than carbohydrates, proteins and fats which are required by body to maintain normal health, growth and nutrition are called vitamins. The vitamins are complex organic molecules. They are represented by letters such as A, B, C, D, E, K.

Vitamins are broadly classified into two types,

1. Water-soluble vitamins and
2. Fat-soluble vitamins.

Vitamins A, D, E and K are fat-soluble whereas vitamins B and C are water-soluble. Vitamin H is neither fat-soluble nor water-soluble.

Vitamin	**Deficiency**
A (Carotenoids or Axerophytol or retinol)	Night blindness, Xerophthalmia (cornea becomes opaque), drying of skin
B1 (Thiamine)	Beriberi, loss of appetite.
B2 (Riboflavin)	Cracked lips, sore tongue and skin disorders.
B6 (Pyridoxine)	Nervous disturbances and convulsions
B12 (Cyanocobalamin)	A serious type of anaemia. (pernicious anaemia)
C (Ascorbic Acid)	Scurvy, dental caries, pyorrhea, anaemia.
D (Ergocalciferol)	Infantile rickets, deformation of bones and teeth.
E (Tocopherol)	Loss of sexual power and degeneration of muscle fibers in animals.
K (phylloquinone)	Tendency to hemorrhage and impaired clotting of blood.

Nucleic Acids

Important Terms of Nucleic Acids:

(i) Nitrogenous base: Derived from purines having two rings in their structure. e.g. Adenine (A) and Guanine (G) and derived from pyrimidines having one ring in their structure e.g. Thymine (T), Uracil (U) and Cytosine (C). Two H–bonds are present between A and T (A = T) while three H-bonds are present between C and G (C ≡ G).

(ii) Pentose sugar: It is either ribose or deoxyribose (not having oxygen at C2)

(iii) Nucleoside: Ribose–/deoxyribose + one base unit from A, G, C, Tor U.

(iv) Nucleotides: Nucleotides consist of 5-carbon sugar + nitrogenousbase +1, 3-phosphate groups.

(v) Ribonucleotide: Phosphate unit + Ribose + one base unit from A, G, C, or U.

(vi) Deoxyribonucleotide: Phosphate unit + Deoxyribose + one base from A, G, C or T.

DNA and RNA:

Nucleic acid is a polynucleotide, present in the living cells or bacterial cells having no nucleus and in viruses having no cells. These are of two types:

1. DNA: Deoxyribonucleic acid. DNA + $H_2O \Rightarrow$ Phosphoric acid + deoxyribose + A, G, C, T
2. RNA: Ribonucleic acid. RNA + $H_2O \Rightarrow$ Phosphoric acid + Ribose + A, G, C, U

Polymers

The word polymer has a Greek origin, which means many units (parts). Polymer is defined as a chemical substance of a high molecular mass formed by the combination of a large number of simple molecules, called monomers, e.g. **Polymerisation:** The process by which the monomers combine with each other and transform into polymers, is known as polymerization.

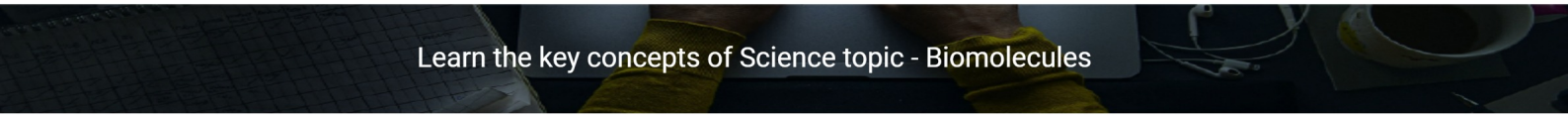
Difference between Polymers and Macromolecules:

Polymers are also called macromolecules due to their large size but converse is not always true. A macromolecule may or may not contain monomer units, e.g. chlorophyll ($C_{55}H_{72}O_5N_4Mg$) is a macromolecule but not a polymer since there are no monomer units present. So, we can conclude that all polymers are macromolecules while all macromolecules are not polymers. Polymers are a diverse class of materials that have a wide range of properties, depending on their molecular structure, composition, and processing conditions. Polymers possess high molecular weight, low density, High strength and stiffness, Ductility and toughness, Thermal and electrical insulation, Chemical resistance, Biodegradability. These are just a few of the many properties that polymers an exhibit. The specific properties of a polymer depend on its chemical composition, molecular structure, processing conditions, and application requirements.

Name of Polymers with monomers:

Polymers are large molecules composed of repeating units known as monomers. Monomers are small molecules that can join together chemically to form long chains, which can then further interact with each other to form three dimensional structures. Polymers can be created from a wide range of monomers, such as ethylene, propylene, styrene, vinyl chloride, and many others. The properties of the resulting polymer will depend on the specific monomer(s) used, as well as the conditions under which the polymerization reaction takes place.

Polymers		Monomers
	Polythene	Ethylene or ethene
	Polystyrene	Styrene
Polyolefins	Polyvinyl Chloride (PVC)	Chloroethene (vinyl chloride)
	Polypropyle ne (PP) (Ziegler- Natta catalyst)	Propylene
	Polytetraflu oroethylene (Teflon)	Tetrafluoroethene
	Polyacryloni trile (PAN)	Acrylonitrile
Polyamides	Nylon-6, 6	Hexamethylenediamine + adipic acid
	Nylon-6	caprolactam
	Bakelite	Phenol + formaldehyde
	Melamine - Formaldehy de resin	Melamine + formaldehyde
Resins	Urea- formaldehy de resin	Urea + formaldehyde
	Natural rubber	isoprene
	Neoprene	Chloroprene
	Buna-N	Buta-1,3-diene + acrylonitrile
	Polymethyl methacrylate (PMMA)	Methyl Methacrylate in organic peroxide
Polyesters	Glyptal	Ethylene glycol + Phthalic acid
	Terlene (Dacron)	Ethylene glycol + Terephthalic acid



In this blog, we explained about the characteristics of biomolecules like proteins and nucleic acids and hormones. For more such informative blogs stay connected with us.