

Biomolecules

Living systems are made up of various complex biomolecules like carbohydrates, proteins, nucleic acids, lipids, etc. Proteins and carbohydrates are essential constituents of our food. These biomolecules interact with each other and constitute the molecular logic of life processes. In addition, some simple molecules like vitamins and mineral salts also play an important role in the functions of organisms.

1- A carbohydrate: are primarily produced by plants and form a very large group of naturally occurring organic compounds. Some common examples of carbohydrates are cane sugar, glucose, starch, etc. It is a biomolecule composed of carbon, hydrogen, and oxygen with a ratio of about two hydrogen atoms (H-C-OH).

- **Monosaccharide:** also called simple Carbohydrates, if the number of carbon atoms in a molecule is low (from three to seven), then the carbohydrate is a simple sugar, or monosaccharide. Common examples are the glucose and fructose.

- **Disaccharide:** contains two monosaccharides. When glucose and fructose join, the disaccharide sucrose forms.

- **Polysaccharides:** the largest carbohydrate molecules are polysaccharides, polymers composed of many monosaccharide subunits. The starch, glycogen, and cellulose are examples of polysaccharides.

Importance of Carbohydrates

Carbohydrates are essential for life in both plants and animals.

- 1- They form a major portion of our food. Honey has been used for a long time as an instant source of energy.
- 2- Carbohydrates are used as storage molecules as starch in plants and glycogen in animals.
- 3- Cell wall of bacteria and plants is made up of cellulose.



2- Lipids: are large biomolecules that are made mostly of carbon and hydrogen with a small amount of oxygen. Fats, oils, waxes, and steroids are all lipids. They are insoluble in water because their molecules are nonpolar and are not attracted by water molecules. Lipids are very important for the proper functioning of organisms. Cells use lipids for energy storage, insulation, and protective coverings.



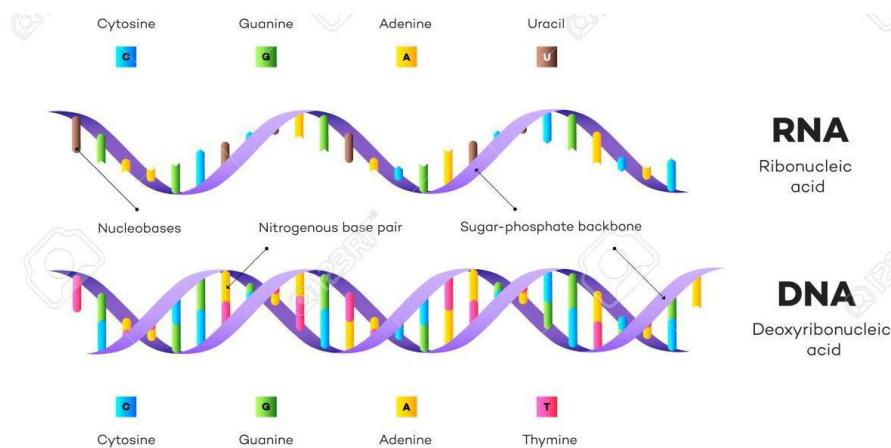
3- Proteins: Proteins are the most abundant biomolecules of the living system. Chief sources of proteins are milk, cheese, pulses, peanuts, fish, meat, etc. A protein is a large, complex polymer composed of carbon, hydrogen, oxygen, nitrogen, and sometimes sulfur. The basic building blocks of proteins are called amino acids. Enzymes are important proteins found in living things.

An enzyme is a protein that changes the rate of a chemical reaction. In some cases, enzymes increase the speed of reactions that would otherwise occur slowly.



4-Nucleic acids: are another important type of organic compound that is necessary for life. A nucleic acid is a complex biomolecule that stores cellular information in the form of a code. Nucleic acids are polymers made of smaller subunits called nucleotides. Nucleotides consist of carbon, hydrogen, oxygen, nitrogen, and phosphorus atoms. Nucleic acids, such as DNA (deoxyribonucleic acid) and RNA (ribonucleic acid). The nucleotides in DNA contain the sugar deoxyribose, and in RNA they contain the sugar ribose.

There are four different types of bases in DNA: A _ adenine, T _ thymine, G _ guanine, and C _ cytosine. In RNA the base uracil replaces the base thymine.



5-Vitamins: It has been observed that certain organic compounds are required in small amounts in our diet but their deficiency causes specific diseases. Most of the vitamins cannot be synthesized in our body but plants can synthesize almost all of them, so they are considered as essential food factors. However, the bacteria of the gut can produce some of the vitamins required by us. Vitamins are designated by alphabets A, B, C, D, etc. Some of them are further named as sub-groups e.g. B1, B2 , B6 , B12.

Classifications of Vitamins:

Vitamins are classified into two groups depending upon their solubility in water or fat.

- (i) **Fat soluble vitamins:** Vitamins which are soluble in fat and oils but insoluble in water are kept in this group. These are vitamins A, D, E and K. They are stored in liver and adipose (fat storing) tissues.
- (ii) **Water soluble vitamins:** B group vitamins and vitamin C are soluble in water so they are grouped together. Water soluble vitamins must be supplied regularly in diet because they are readily excreted in urine and cannot be stored in our body.