4 classes of organic macromolecules

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In this chapter, these questions will be addressed.3.1: Synthesis of biological macromoleculesBiological macromolecules are large molecules needed for life that are made up of smaller organic molecules. There are four main classes of biological macromolecules (carbohydrates, lipids, proteins, and nucleic acids); each is an important component of the cell and performs a wide range of functions. Combined, these molecules make up the majority of the dry mass of a cell (I recall that water makes up the majority of its full mass).3.2: Carbohydrates Carbohydrates are actually an essential part of our diet; cereals, fruits and vegetables are all natural sources of carbohydrates. Carbohydrates provide energy to the body, especially through glucose, a simple sugar that is a component of starch and an ingredient in many staple foods. Carbohydrates also have other important functions in humans, animals, and plants.3.3: LipidsLipids include a diverse group of compounds that are largely non-polar in nature. This is because they are hydrocarbons, which include predominantly non-polar carbon or carbon-hydrogen bonds. Non-polar molecules are hydrophobic (water fears) or insoluble in water. Lipids perform many different functions in a cell. Cells store energy for prolonged use in the form of fat. Lipids also provide environmental isolation for plants and animals.3.4: ProteinsProteins are some of the most common organic molecules in living systems and have the most diverse functions of all macromolecules. Proteins can be structural, regulatory, shrinking or protective; they may serve in transport, storage or membranes; or may be toxins or enzymes. Each cell in a living system can contain thousands of proteins, each with a unique function. Their structures, such as their functions, vary considerably.3.5: Nucleic nucleic acids are the most important macromolecules for life continuity. They carry the genetic instructions for the functioning of the cell. Miniature: 1K6F_Crystal structure of collagen Triple Helix model Pro- Pro-Gly103. (CC-SA-BY-3,0; Associates and attributions Connie Ree (College of Eastern Mississippi), Robert Musz (University of Wisconsin, Oshkosh), Vladimir Zhubukowski (County Suffolk County College), Jean DeSaix (University of North Carolina at Chapel Hill), Jung Choi (Georgia Institute of Technology), Yael Avisar (Rhode Island College) and other contributors. Original content from OpenStax (CC BY 4.0; Download for free at 9.87). Functional groups are groups of molecules attached to organic molecules and give them specific identities or functions. Describe the importance of functional groups for organic molecules Key groups key points Functional groups are collections of atoms that give the carbon skeleton of an organic molecule and give specific properties. Each type of organic molecule has its own specific type of functional group. Functional groups in biological molecules play an important role in the formation of molecules such as DNA, proteins, carbohydrates and lipids. Functional groups include: hydroxyl, methyl, carbonyl, carboxyl, amino, phosphate and sulphhydril. Key hydrophobic conditions: lack of affinity for water; cannot absorb or be wetted by hydrophilic water: have an affinity for water; capable of absorbing or being wetted by water Functional groups are groups of atoms that occur in organic molecules and give specific chemical properties to these molecules. When functional groups are displayed, the organic molecule is sometimes referred to as R. Functional groups are located along the carbon support of macromolecules formed by chains and/or rings of carbon atoms with the accidental replacement of an element such as nitrogen or oxygen. Molecules with other elements in their carbon base are replaced by hydrocarbons. Each of the four types of macromolecules – proteins, lipids, carbohydrates and nucleic acids – has its own characteristic set of functional groups, which contributes significantly to its different chemical properties and function in living organisms. Properties of functional groups Functional group can participate in specific chemical reactions. Some of the important functional groups in biological molecules include: hydroxyl, methyl, carbonyl, carboxyl, amino, phosphate, and sulphhydril groups. These groups play an important role in the formation of molecules such as DNA, proteins, carbohydrates, and lipids. Classification functional groups Functional groups are usually classified as hydrophobic or hydrophilic depending on their charge or polarity. An example of a hydrophobic group is the non-polar molecule of methane. Among the hydrophilic functional groups is the carboxylic group, some chains of amino acids, and heads of fatty acids that form triglycerides and phospholipids. This carboxylic group of ions is separated from the COOH group, which leads to a negatively charged coo – group; this contributes to the hydrophilic nature of each molecule on which it is located. Other functional groups, such as the carbonyl group, have a partially negatively charged oxygen atom that can form hydrogen bonds with water molecules, again making the molecule more hydrophilic. Examples of functional groups: The functional groups shown here are found in many different biological molecules, where R is the organic molecule. Hydrogen bonds between functional groups of hydrogen bonds between functional groups (within the same molecule or between different molecules) are important for the function of many macromolecules and help them fold properly and maintain the appropriate shape necessary for proper operation. Hydrogen bonds are also involved in various recognition processes, such as DNA complementing a base pair and the binding of the enzyme to its substrate. Hydrogen bonds in DNA: Hydrogen bonds bind two strands of DNA to create the double helix structure. Carbon is the most important element for living beings because it can form many different types of bonds and form basic compounds. Explain the carbon properties that allow it to serve as a building block for biomolecules Key points Key points All living beings contain carbon in some form. Carbon is the main component of macromolecules, including proteins, lipids, nucleic acids and carbohydrates. Carbon's molecular structure allows it to connect in many different ways and with many different elements. The carbon cycle shows how carbon movements pass through living and non-living parts of the environment. Key terms rule octet: A rule that states that atoms lose, win or share electrons to have a full shell of 8 electrons (there are some exceptions). carbon cycle: the physical cycle of carbon through the biosphere, geosphere, hydrosphere and atmosphere; includes such processes as photosynthesis, decomposition, respiration and carbonification macromolecule: a very large molecule, especially used in comparison with large biological polymers (e.g. nucleic acids and proteins) Carbon is the fourth most abundant element in the universe and is a building block of life on earth. On earth, carbon circulates through the earth, ocean and atmosphere, creating what is known as the Carbon Cycle. This global carbon cycle can be divided into two separate cycles: geological carbon cycles take place over millions of years, while the biological or physical carbon cycle takes place from days to thousands of years. In a non-living environment, carbon dioxide may exist carbonates, coal, petroleum, natural gas and dead organic Plants and algae convert carbon dioxide into organic matter through the process of photosynthesis, the energy of light. Carbon is present in every life: All living things contain carbon in some form, and carbon is the main component of macromolecules, including proteins, lipids, nucleic acids and carbohydrates. In this sheet there is carbon in many forms, including in pulp, to form the structure of the leaves and in chlorophyll, a pigment that makes the leaves green. Carbon is important for life In food metabolism and breathing, an animal consumes glucose ($C_6H_{12}O_6$), which is combined with oxygen (O_2) to produce carbon dioxide (CO_2), water (H_2O) and energy that is given as heat. The animal does not need carbon dioxide and releases it into the atmosphere. A plant, on the other hand, uses the opposite reaction of an animal through photosynthesis. It takes carbon dioxide, water and energy from sunlight to make its own glucose and oxygen gas. Glucose is used for chemical energy, which the plant is metabolized in a similar way to the animal. The plant then releases the remaining oxygen into the environment. The cells are made up of very complex molecules called macromolecules, which include proteins, nucleic acids (RNA and DNA), carbohydrates, and lipids. Macromolecules are a subset of organic molecules (all containing carbon liquid, solid or gas) that are particularly important for life. The main component for all these macromolecules is carbon. The carbon atom has unique properties that allow it to form covalent bonds to four different atoms, making this universal element ideal to serve as the main structural component, or spine, of macromolecules. The structure of carbon individual carbon atoms has incomplete the out-of-the-way electronic shell. With atomic number 6 (six electrons and six proton), the first two electrons fill the inner shell, leaving four in the second shell. Therefore, carbon atoms can form four covalent bonds with other atoms to satisfy the octet rule. The methane molecule gives an example: it has a chemical formula CH_4. Each of its four hydrogen atoms forms a covalent bond with the carbon atom by sharing a pair of electrons. This leads to a full outer shell. Methane structure: Methane has tetra-large geometry, with each of the four hydrogen atoms distributed 109.5° apart. Apart.