Introduction to biomolecules ppt

1. Biological MoleculesBiological Molecules 2. ⍰ most biological molecules are made from covalent combinations of six important elements, whose chemical symbols are CHNOPS. the letters are for the chemical abbreviations of carbon, hydrogen, nitrogen, oxygen, phosphorus, and sulphur. ⍰ The four most important elements, which represent more than 99% of the atoms found in living things, are: Carbon Oxygen Oxygen Nitrogen ⍰ Biological Molecules, or biomolecules, are constructed by joining the atoms by covalent bonds. 3. Why is carbon so special? Why is carbon so special? ⍰ Carbon has four valence electrons. ⍰ carbon can form up to four bonds with other atoms. ⍰ This allows carbon (C) to form many different types of structures and molecules, all with different functions. ⍰ carbon can form long ring chains or structures, which can be considered the basic skeletons of organic molecules to which groups of other atoms attach themselves. 4. What is a biomolecule or biological What is a biomolecule or a biological molecule?molecule? ⍰ biomolecules are organic molecules, especially macromolecules such as carbohydrates, proteins in living organisms. All living forms of life are made of similar macromolecules that are responsible for life. All life forms are composed solely of biomolecules. ⍰ biomolecules are molecules that occur naturally in living organisms. ⍰ biomolecules consists mainly of carbon and hydrogen with nitrogen, oxygen, sulphur and phosphorus. ⍰ biomolecules include macromolecules such as proteins, carbohydrates, lipids and nucleic acids. But it also includes small molecules such as primary and secondary metabolites and natural products. ⍰ biomolecules are very large molecules of many atoms, which are covalent linked to each other. 5. Some definitions to keep in mind... Some definitions to keep in mind... ⍰ Organic Molecule: contains at least C (carbon) and H (hydrogen) ⍰ Macromolecule (giant molecule): a large biological molecule, such as a protein or nucleic acid ⍰ Monomer: a relatively simple molecule that is used as a cornerstone for thr synthesis of a polymer. Many monomers come together to make a polymer. ⍰ Polymer: a giant molecule made from many similar repeated sub-units assembled in chains. 6. Monomers and polymersMonomers and polymers 7. CarbohydratesCarbohydrates ⍰molecular: shows the atoms a quantity ⍰Structural formula: shows the arrangements of the atoms using a diagram. ⍰Ring: The chain closes 8. Glycosidic FormationSepicforming of the glycosidic link: Condensationbond: Condensation monosaccharides have main functions: 'Commonly used as an energy source' are important as building blocks of larger molecules -Monosaccharides and disaccharides are sugars. 9. Polysaccharides.Polysaccharides. ⍰Polysaccharides are monosaccharide polymers. They they non-soft and complex carbohydrates. They are insoluble in water and are not in crystalline form. Examples: starch, glycogen, cellulose. ⍰Starch and glycogen ⍰Cellulose ⍰Structure and function 10. Glucose storageStorage of glucose ⍰ glucose is the main form of energy for cells, which is why it is important for lenf organisms to store it. ⍰ If glucose was accumulated in cells: 1. It would affect osmotic properties 2. It would interfere with cellular chemistry ⍰ how to solve the problem? Glucose is converted to storage polysaccharide: Starch in Glycogen plants in animals ⍰ Glucose can quickly become available to the body, through a rapid reaction controlled by enzymes 11. Starch starch and glycogen ⍰ Starch: ⍰ Mixture of two substances: amylosis and amylopectine ⍰ Amylose: 1.4 linked glucose molecules --- ⍰ Amylopectine: 1.4 glucose bound, but with branvhes (1.6 bonds) ⍰ Glycogen: ⍰ One type of molecule, similar to amilopectine, but more ram ram ramité 12. CelluloseCellulose ⍰ the most abundant molecule on the planet (due to its presence in the walls of plant cells and slow decomposition rate) ⍰ Mechanically strong Molecule - form of cell walls ⍰ differs from starch and glycogen, because cellulose is formed by β-glucose. ⍰ this arrangement allows the formation of hydrogen og - STRONG!!!!! 13. LipidesLipids ⍰ Lipids are a heterogeneous group of natural (organic) compounds, which are more linked by their physycal than by their chemical properties. ⍰ they have in common the property of being relatively insoluble in water and soluble in non-polar solvents such as ether and chloroform. ⍰ real fats are esters formed by fatty acids combined with alcohol. 14. Lipid classificationClassification of lipids 15. Fatty AcidsAffaments - Fatty acids are important components of lipids in plants, animals and microorganisms. A fatty acid consists of a straight chain of carbon atoms, with hydrogen atoms along the chain and at one end of the chain, and a carboxyl group (COOH) at the other end. It is this group carboxyl that makes it an acid (carboxylic acid). Fatty acids are included in the group of derived lipids - If carbon-carbon bonds are simple, the acid is saturated; If one of the bonds is double or triple, the acid is unsaturated and more reactive. 16. Fatty acid structure Structure acid weak 17. ⍰ fatty acids are not in a free state in nature; generally they exist combined with glycerol forming triglycerides. ⍰ Alcohols are a series of organic molecules that contain a hydroxil group (-OH) attached to an atom Carbon. ⍰ glycerol is an alcohol with three carbons and three hydroxyl groups. ⍰ The reaction between an acid and an alcohol, called condensation, produces a chemical known as ester. The established chemical link alcohol and an acid is called a ester bond. In each condensation reaction, water forms. ⍰ Tryglicerides are esters formed by a glycerol molecule combined with three fatty acids. 18. Condensation reaction Condensation reaction 19. Phospholipids: a special type of lipidsPhospholipids: a special type of lipid 20. Roles of lipidsIlils ⍰Triglycerides ⍰ Energy source ⍰ Energy reserves (energy storage form - adipose tissue) ⍰ Body isolation and protection around organs ⍰ Sensory qualities (adds flavour and texture to foods) ⍰ Contribute to satiety ⍰Phospholipids ⍰ Membrane Shape Structure, cell wall matrix, honeyin sheath, among other ⍰ carrying ions through membranes ⍰ perform many vital functions in the body 21. Phospholipids are constituents of phospholipids are constituents of membranes ⍰ Phospholipids are composed of a hydrophilic head, which is attracted by water, and two hydrophobic tails, which repel water. Because these cells contain molecules that simultaneously attract and resist water, they are considered amphipathic (water soluble and non-water soluble). 22. Different fats: what do they look like? Different lipids: what do they look like? 23. ProteinsProteins ⍰Aminos ⍰ Link ⍰Primary, secondary, third and cuaternary structure 24. ProteinProteins ⍰ extremely important group of biological molecules. What for? ⍰ Huge variety, but common basic monomers: amino acids 25. Peptide BondPeptide ⍰ Two amino acids can come together through a peptide bond ⍰ In this reaction, a water molecule is formed ⍰ Dipeptide: molecule formed by two amino acids ⍰ Polypeptide: molecule formed by many amino acids linked Polypetides are another example of polymers and macromolecules 26. ⍰ protein molecule may have a single chain of polypeptide, or two or more chains interacting with each other 27. Protein structure, Protein structure and ⍰ primary structure: is the sequence of amino acids in a polypeptide or protein. ⍰ secondary structure: is the structure of a protein molecule resulting from the regular ensiling or folding of the amino acid chain. For example, β pleated α-helix leaf. ⍰ tertiary structure: is the compact structure of a proteinmolecule resulting from the three-dimensional ensiling of the already folded chain of amino acids. IMPORTANT: Different types of bonds (SEE LIVRET) ⍰ Quaternary Structure: is the three-dimensional arrangement of two or more polypeptides, or a polypeptide and a non-protein component such as haem, in a protein molecule. 28. Globular and fibrous proteinsGlobular and fibrous proteins ⍰ proteins folded and rolled. Usually water soluble (because hydrophilic groups stay outdoors). Many globular proteins have roles in metabolic reactions. For example: enzymes and myoglobin ⍰ fibrous proteins: Don't cower, but long strands. Usually not water soluble, and have structural roles. For example: collagen and keartin. 29. WaterWater is ⍰ most important biochemical??? Oh, really? What for? Although it is a small molecule, it has surprising properties that make it simply essential to life as we know it ⍰ Water as a solvent: excellent solvent for ions and polar molecules (which explains its importance to organisms!) ⍰ Water as a means of transport: water is the means of transport in the blood, Lymphatic system, excretory and digestive system in animals, and in the vascular tissues of plants ⍰ Water as replenishment: it takes part as a replenishment in certain chemical reactions inside the cell. For example, in photosynthesis 30. Properties of water propertiesProperties of water ⍰A high specific thermal capacity ⍰A high latent heat of the vaporization ⍰Dedity and freezing properties ⍰Relevating voltage 31. Useful linksThe links ⍰ ⍰ ⍰ ⍰ ⍰ ⍰ ⍰ (the latter, start on slide 30) 30) 30) 30)