**Biomolecules Summary**

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|  | **Carbohydrates** | **Lipids** | **Proteins** | **Nucleic Acids** |
| **Elements** | Carbon, hydrogen, & oxygen  CHO  (usually 1:2:1 ratio) | Carbon, hydrogen, & oxygen  CHO  (and phosphorus (P) for phospholipids) - CHOP | Carbon, hydrogen, oxygen, & nitrogen  CHON | Carbon, hydrogen, oxygen, nitrogen, & phosphorus  CHONP |
| **Monomer** | Sugar or glucose or  monosaccharide or simple sugar or C6H12O6 | Fatty acids & glycerol  \*not a true monomer  Triglycerides- 3 fatty acids & glycerol  Phospholipids- 2 fatty acids & glycerol | Amino acids  (20 different types due to a variable “R group”)  \* contains an amino and carboxyl group | Nucleotides  \* Phosphate group attached to a sugar molecule (ribose in RNA or deoxyribose in DNA) which is attached to a nitrogenous base (adenine, cytosine, guanine, thymine or uracil) |
| **Structure of monomer** |  | Triglycerides    Phospholipids |  | Nucleotide |
| **Function** | \* Quick energy  \* Structural purposes in plants (cellulose cell wall), fungi (chitin cell wall), & insects (chitin exoskeleton) | \* Store energy  \* Part of biological membranes (phospholipids)  \* Waterproof coverings  \* Hormones, such as steroids | \* Control the rate/speed of chemical reactions  \* Transport substances into and out of cells  \* Help fight disease | \* Store and transmit genetic information  \* Code for the production of proteins |
| **Examples** | Monosaccharides: glucose, galactose, & fructose  Disaccharides: sucrose, maltose, & lactose  Polysaccharides: plant starch, glycogen (equivalent of starch in animals), cellulose, & chitin | Phospholipids  Steroids  Fat  Cholesterol  Oil | Enzymes  Antibodies | DNA  RNA |
| **Notes** | \* Polymers are held together by glycosidic bonds  \* Made during photosynthesis in the chloroplasts  \* Energy is released from sugar in cellular respiration in the mitochondria | \* Saturated fats- has the maximum # of hydrogen atoms attached to every carbon atom. All the carbons are attached to each other with single bonds  \* Unsaturated fats- not all carbon atoms are attached to a hydrogen atom  \* Polar/hydrophilic head and non-polar/hydrophobic tails in phospholipids  \* Synthesized at the smooth endoplasmic reticulum (SER) | \* Amino acids held together by peptide bonds (di- or polypeptide)  \* Has a specific shape that can denature (altered shape) when exposed to high temperatures and a significant change in pH  \* Synthesized at ribosomes  \* Primary structure -unique order of the amino acids joined together  \* Secondary structure- coiling and folding of a polypeptide chain that gives the protein its 3-D shape – notably, α) helix and beta (β) pleated sheet  \* Tertiary structure- comprehensive 3-D structure of the polypeptide,  \* Quaternary structure- refers to the structure of a protein macromolecule formed by interactions between multiple polypeptide chains | \* The 2 types of nitrogenous bases are purines (adenine and guanine) and pyrimidines (thymine and cytosine)  \* Nitrogenous bases are held together by hydrogen bonds and nucleotides are held together by covalent or phosphodiester bond  \* DNA is in the form of chromosomes which contain genes (which code for protein production)  \* DNA is located in the nucleus in eukaryotes and is located in the cytoplasm in prokaryotes |