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| **AP Biology** | **Curriculum Map**  **Chemistry of Living Organisms**  http://www.jeffersontownship.org/Portals/0/Images/Logos/hornet.jpg | | | |
| Textbook Resources:  **Chapters 2, 3, 4, 5** | | Month(s):  **October** | Time Frame:  **11 days (8/3 block)** | Assessment:  **Reading Quizzes**  **Unit Test** |
| **Learning Targets** | | | **Support Text** | **Bozeman Podcasts** |
| **EK 1.D.1: There are several hypotheses about the natural origin of life on Earth, each with supporting scientific evidence.** | | | | |
| 1. Scientific evidence supports the various models. 2. Primitive Earth provided inorganic precursors from which organic molecules could have been synthesized due to the presence of available free energy and the absence of a significant quantity of oxygen. 3. In turn, these molecules served as monomers or building blocks for the formation of more complex molecules, including amino acids and nucleotides. 4. The joining of these monomers produced polymers with the ability to replicate, store and transfer information. 5. These complex reaction sets could have occurred in solution (organic soup model) or as reactions on solid reactive surfaces. 6. The RNA World hypothesis proposes that RNA could have been the earliest genetic material. | | | **Origin of Life**  Chapter 4.1 (p.58-59)  Chapter 25.1 (p.507-510) | [Abiogenesis](https://www.youtube.com/watch?v=W3ceg--uQKM) |
| **EK 2.A.3: Organisms must exchange matter with the environment to grow, reproduce and maintain organization.** | | | | |
| 1. Molecules and atoms from the environment are necessary to build new molecules. 2. Carbon moves from the environment to organisms where it is used to build carbohydrates, proteins, lipids or nucleic acids. Carbon is used in storage compounds and cell formation in all organisms. 3. Nitrogen moves from the environment to organisms where it is used in building proteins and nucleic acids. 4. Phosphorus moves from the environment to organisms where it is used in nucleic acids and certain lipids. 5. Living systems depend on properties of water that result from its polarity and hydrogen bonding.    * + Cohesion/adhesion      + High specific heat capacity      + Universal solvent supports reactions      + Heat of vaporization      + Heat of fusion      + Water’s thermal conductivity | | | **Chemistry Review**  Chapter 2 (p.30-45)  Chapter 3.3 (p.53-56) | [Atoms & the Periodic Table](https://www.youtube.com/watch?v=3nge3LrK1S0&feature=youtu.be)  [Chemical Bonds: Covalent vs. Ionic](https://www.youtube.com/watch?v=7DjsD7Hcd9U)  [Drawing Lewis Dot Structures](https://www.youtube.com/watch?v=ulyopnxjAZ8)  [Acids, Bases, & pH](https://www.youtube.com/watch?v=Xeuyc55LqiY) |
| **Nutrient Cycling**  Chapter 55, Fig 55.14 (p.1228-1229) | [Environmental Matter Exchange](https://www.youtube.com/watch?v=9b_95wj3wyg) |
| **Properties of Water**  Chapter 3.1, 3.2 (p.46-52) | [Water: A polar Molecule](https://www.youtube.com/watch?v=iOOvX0jmhJ4)  [Water & Life](https://www.youtube.com/watch?v=ZScEgE55XTM) |
| **EK 4.A.1: The subcomponents of biological molecules and their sequence determine the properties of that molecule.** | | | | |
| 1. Structure and function of polymers are derived from the way their monomers are assembled. 2. In nucleic acids, biological information is encoded in sequences of nucleotide monomers. Each nucleotide has structural components: a five-carbon sugar (deoxyribose or ribose), a phosphate and a nitrogen base (adenine, thymine, guanine, cytosine or uracil). DNA and RNA differ in function and differ slightly in structure, and these structural differences account for the differing functions. 3. In proteins, the specific order of amino acids in a polypeptide (primary structure) interacts with the environment to determine the overall shape of the protein, which also involves secondary tertiary and quaternary structure and, thus, its function. The R group of an amino acid can be categorized by chemical properties (hydrophobic, hydrophilic and ionic), and the interactions of these R groups determine structure and function of that region of the protein. 4. In general, lipids are nonpolar; however, phospholipids exhibit structural properties, with polar regions that interact with other polar molecules such as water, and with nonpolar regions where differences in saturation determine the structure and function of lipids. 5. Carbohydrates are composed of sugar monomers whose structures and bonding with each other by dehydration synthesis determine the properties and functions of the molecules. Illustrative examples include: cellulose versus starch. | | | **Versatility of Carbon**  Chapter 4.2 (p.60-63)  **Functional Groups**  Chapter 4.3, Fig 4.9 (p.64-65)  **Carbohydrates**  Chapter 5.2 (p.69-74)  **Lipids**  Chapter 5.3 (p.74-77)  **Proteins**  Chapter 5.4 (p.77-78)  **Nucleic Acids**  Chapter 5.5 (p.86-89) | [Biological Molecules](http://www.bozemanscience.com/042-biologoical-molecules)  [Carbohydrates](http://www.bozemanscience.com/carbohydrates)  [Lipids](http://www.bozemanscience.com/lipids)  [Proteins](http://www.bozemanscience.com/proteins)  [Nucleic Acids](http://www.bozemanscience.com/nucleic-acids)  [Polymers](http://www.bozemanscience.com/polymers) |
| 1. Directionality influences structure and function of the polymer.    1. Nucleic acids have ends, defined by the 3' and 5' carbons of the sugar in the nucleotide, that determine the direction in which complementary nucleotides are added during DNA synthesis and the direction in which transcription occurs (from 5' to 3').    2. Proteins have an amino (NH2) end and a carboxyl (COOH) end, and consist of a linear sequence of amino acids connected by the formation of peptide bonds by dehydration synthesis between the amino and carboxyl groups of adjacent monomers.    3. The nature of the bonding between carbohydrate subunits determines their relative orientation in the carbohydrate, which then determines the secondary structure of the carbohydrate. | | | **Carbohydrates**  Chapter 5.2 (p.69-74)  **Proteins**  Chapter 5.4 (p.77-58)  **Nucleic Acids**  Chapter 5.5 (p.86-89) | [Carbohydrates](http://www.bozemanscience.com/carbohydrates)  [Proteins](http://www.bozemanscience.com/proteins)  [Nucleic Acids](http://www.bozemanscience.com/nucleic-acids) |
| **EK 4.C.1: Variation in molecular units provides cells with a wider range of functions.** | | | | |
| 1. Variations within molecular classes provide cells and organisms with a wider range of functions.  * Different types of phospholipids in cell membranes * Hemoglobin vs. myoglobin | | | **Membrane Lipid Composition**  Chapter 7.1 (p.128)  **Hemoglobin** **& Myoglobin**  Chapter 42.5 (p.924) | [Cell Membranes](https://www.youtube.com/watch?v=y31DlJ6uGgE)  [Cellular Variation](https://www.youtube.com/watch?v=q3dM-JzNs50) |

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| **Vocabulary** | | | | | |
| elements | covalent bond | pH scale | cellulose | phospholipid | Oparin & Haldane |
| oxygen | nonpolar covalent | organic compounds | glycogen | steroid | Harold Urey |
| carbon | polar covalent | inorganic compounds | plastids | glycerol |  |
| hydrogen | polar | carbohydrates | amino acids | ester linkage |  |
| nitrogen | hydrogen bond | monosaccharides | amino group | saturated |  |
| trace elements | cohesion | disaccharides | carboxyl group | unsaturated |  |
| atom | adhesion | polysaccharides | R group | polyunsaturated |  |
| protons | surface tension | glucose | side chain | hydrophobic |  |
| neutrons | capillary action | fructose | functional group | hydrophilic |  |
| electrons | heat capacity | glycosidic linkage | dipeptide | amphipathic |  |
| nucleus | acidic | dehydration synthesis | peptide bond | nucleic acids |  |
| isotopes | basic | hydrolysis | polypeptide | nucleotides |  |
| compound | neutral | polymer | protein | deoxyribonucleic acid |  |
| ionic bond | alkaline | fat | lipid | ribonucleic acid |  |