Module A: Keystone Biology Review

BIO.A.1.1.1 Describe the characteristics of life shared by all prokaryotic and eukaryotic organisms.

Organized by cells made of the following macromolecules, _____, _____, _____, and _____, as well as the following organelles _____, _____, _____.

Have universal code or DNA made of _____.

Respond to Stimuli

Maintain homeostasis

Develop and Grow

Reproduce

Use Energy in the form of _____

Adapt or Evolve as a _____

BIO.A.1.2.1 Compare cellular structures and their functions in prokaryotic and eukaryotic cells.

By definition eukaryotes have _____ _____ _____ and prokaryotes do Not. However, another difference between these organisms is size. Prokaryotes are not near as big as eukaryotes. They are limited by their _____ _____ to _____ ratio, because they do not have additional membrane surface on their organelles, which can allow them to achieve larger sizes. Eukaryotes also go through the specialized nuclear division processes of _____ and _____, which prokaryotes do not have a need to undergo.

Organelle	Structure	Function	In prokaryotes	In eukaryotes
Cell/Plasma Membrane				
Ribosome				

	Structure	Function	In prokary	In eukary
Mitochondria				
Chloroplast				
Endoplasmic Reticulum				
Golgi Apparatus				
Cell wall				
Nucleus				
Cytoskeleton				
Lysosomes				

BIO.A.2.1.1 Describe the unique properties of water and how these properties support life on Earth (e.g., freezing point, high specific heat, cohesion).

Water is inorganic, yet it is crucial to living organisms. Water helps to moderate temperatures on earth to help make it habitable because of its _____ _____ ____. In addition, it also helps moderate temperatures in living things so that enzymes can function properly. Evaporative cooling helps to regular the internal temperature of many animals. All chemical reactions that occur in living things happen in water, which is a large component of the cytoplasm. Water is a liquid and solvent, so it can help to facilitate reactions at the speeds needed in living things by ensuring _____ come in contact with one another. In some of the reactions, water is even a _____ or _____. Many substances can enter and exit cells when _____ in water, because is it known as the universal _____. Additionally, water _____ when frozen, which provides insulation for aquatic organisms.

Each of the properties above relate to the molecular structure of water molecules. Water molecules are composed of the elements _____ and _____, _____ bonded together. Oxygen has a greater affinity for electrons, so they electrons are not _____ evenly. Instead the oxygen pulls the _____ electrons toward it more often than they are pulled toward hydrogen. This results in the molecule being _____ or having partial charges on it. The hydrogen atoms have partial ____ charges and the oxygen has a partial _____ charge.

Due to water's polarity, water molecules are attracted to each other due to the attraction of _____ charges. This is called _____. It also causes _____ action, which allows water to carry minerals up to even the tallest trees. We call the type of bonds between these molecules _____ bonds. They are much _____ than covalent bonds. However, they are still strong enough to allow water molecules to have large surface _____ and high specific _____. It is also deemed the _____ _____ because it can surround many substances and dissolve them.

BIO.A.2.2.1 Explain how carbon is uniquely suited to form biological macromolecules.

Has ____ valence electrons so it forms ___ _____ bonds with itself and other atoms by _____ electrons.

Forms _____, _____, and _____ bonds.

Forms _____, _____, and _____.

Therefore, it is able to form large macromolecules by bonding!

BIO.A.2.2.2 Describe how biological macromolecules form from monomers.

Biological macromolecule are _____ of building blocks called _____. Nucleic acids are made of _____. Proteins are made of _____ _____. Lipids have no true monomers, but are composed of different smaller molecules. Starches or _____ are carbohydrates, which are composed of _____. The process that joins all of these monomers can be called polymerization reactions. This is just a specialized type of chemical reaction. In addition, the term _____ _____ can be used. During these chemical reactions, water molecules are removed as the monomers are joined together to form the polymers or biological macromolecules. _____ participate in these synthesis reactions and allow them to occur at speeds that can sustain life. For example, _____ is an enzyme that is used in DNA synthesis, which is the special name for the dehydration synthesis reaction that produces DNA. The polymerization reaction that produces proteins is _____.

BIO.A.2.2.3 Compare the structure and function of carbohydrates, lipids, proteins, and nucleic acids in organisms.

	Structure (Atomic)	Structure (Molecular)	Function
Carbohydrates			
Lipids			
Proteins			
Nucleic Acids			

BIO.A.1.2.2 Describe and interpret relationships between structure and function at various levels of biological organization (i.e., organelles, cells, tissues, organs, organ systems, and multicellular organisms).

BIO.A.2.3.1 Describe the role of an enzyme as a catalyst in regulating a specific biochemical reaction.

Enzymes are _____, which are made of amino acids. They are known as biological _____ because they speed up chemical reactions in living things. They bond with reactants or _____ at their _____ _____ and allow the activation energy needed for the reactions to be _____, therefore increasing the speed of the reaction.

BIO.A.2.3.2 Explain how factors such as pH, temperature, and concentration levels can affect enzyme function.

BIO.A.3.2.2 Describe the role of ATP in biochemical reactions.

ATP or _____ _____ _____ is a modified _____ _____. It is similar to a charged battery. During _____, a phosphate group is added to _____ in order to form ATP. This is a high-energy bond, meaning it requires a lot of energy to make it. Consequently, a lot of energy is also given off when the bond is _____. Many reactions within a cell require energy and ATP is the source of this energy. The bond between the last phosphate group is _____, which releases energy the cell can use for other processes. _____ across the cell membrane, _____ to make new cells, DNA synthesis, and _____or the formation of proteins all require energy in the form of ATP.

BIO.A.3.1.1 Describe the fundamental roles of plastids (e.g., chloroplasts) and mitochondria in energy transformations.

BIO.A.3.2.1 Compare the basic transformation of energy during photosynthesis and cellular respiration.

BIO.A.4.2.1 Explain how organisms maintain homeostasis (e.g., thermoregulation, water regulation, oxygen regulation).

BIO.A.4.1.1 Describe how the structure of the plasma membrane allows it to function as a regulatory structure and/or protective barrier for a cell.

BIO.A.4.1.2 Compare the mechanisms that transport materials across the plasma membrane (i.e., passive transport—diffusion, osmosis, facilitated diffusion; and active transport—pumps, endocytosis, exocytosis).

BIO.A.4.1.3 Describe how membrane-bound cellular organelles (e.g., endoplasmic reticulum, Golgi apparatus) facilitate the transport of materials within a cell.

This endomembrane system also causes eukaryotes to be able to reach _____ sizes than _____ because this system can help to move materials around the cell.

The membranes of these various organelles are linked, yet differ in structure in function. The directions to make _____, which are a diverse group of macromolecules that can perform a multitude of functions in the cell, are contained in the _____ of the cell. The instructions from the DNA are then copied into _____. It leaves the nucleus through _____ _____ and then joins with proteins to form _____. These organelles can be freely in the cytoplasm or on the surface of the _____ _____.

Proteins that are destined to leave the cell or end up in the cell membrane are made at ribosomes on the rough endoplasmic reticulum and are inserted into the membranes of the endoplasmic reticulum. Here they can be chemically _____. Sometimes carbohydrates are added to them to produce glycoproteins that may ultimately end up as part of the cell membrane. After proteins are modified in the endoplasmic reticulum, they are moved through transport _____ or tiny membrane bound structures. In the _____ apparatus or bodies, the protein may be modified further, _____, and then dispatched in a new transport _____. These _____ move though the _____ to their final destinations using microfilaments and tubules that are part of the _____. If the protein is made for a particular organelle, it is transported there in the same way. Proteins made to leave the cell, called secretory proteins are transported to the cell membrane. There the vesicles fuse with the cell membrane and deposit their contents outside of the cell.