Macromolecules Study Guide **Key**

Standard 1: Explain how the carbon atom and water are important to life

The carbon atom is one of the most important elements on the planet because it has ___four___ free electrons and can form four bonds with other atoms. Often these are ___covalent___ bonds and are considered strong bonds. As a result of this ability of carbon, it can form ___chains___, ___rings___, and ___branched rings___. This is important because it allows for a wide variety of shapes and functions when carbon is used in making molecules. The bonds between ___carbon___ and ___hydrogen___ contain large amounts of energy.

Water is ___liquid___ at room temperature, but will ___float___ when frozen because it has a lower ___density___ than the liquid form. Water is made of ___oxygen___ and ___hydrogen___ atoms. The ___oxygen___ have a negative charge and the ___hydrogen___ have a positive charge. This creates an ___unequal___ distribution of charges and is the reason why water is called a ___polar___ ___molecule___. Additionally, water is able to create ___hydrogen___ bonds with other water molecules because the negative ___oxygen___ atoms of one molecule bond with the positive ___hydrogen___ atoms of another molecule.

	Surface Tension	**Adhesion**	**Cohesion**	**Temperature Moderation**
Characteristics:	Liquids resistance to an external/outside force	Different molecules attracted to one another	Similar molecules attracted to one another	Large bodies of water take lots of energy to heat up or cool down
Examples:	Belly flops hurt, water striders ability to skim across top of water	Water molecules attracted to molecules in cell stem allow water to move up or against gravity in plants	Water moleucles attracted to other water molecules allow water to form a bubble on top of a cop before spilling over	Land around large bodies of water have a stable/moderated temperature because the water takes lots of energy to heat up or cool down; beach towns have more stable temperature than towns in the midwest

Standard 2: Identify the characteristics and examples of carbohydrates, proteins, lipids.

	Carbohydrates	Proteins	Lipids	Nucleic Acids
Monomers:	Monosaccharide	Amino Acid	No Monomer	Nucleotide
Characteristics:	Carbon, Hydrogen, Oxygen	Carbon, Hydrogen, Oxygen, Nitrogen	Carbon, Hydrogen, Oxygen	Carbon, Hydrogen, Oxygen, Nitrogen, Phosphorous
Uses, functions, examples:	Short term energy storage	Enzymes, transport materials, support & structure	Long term energy storage, insulation, structural component (cell membrane)	Contain "code" to make proteins
Food Examples:	Pastas, Breads, Potatoes	Hemoglobin, Hormones, Enzymes	Fats, waxes, steroids, butter, oil	

Macromolecules are made of simple single units calle monomers. These can be combined by joining two together through a process called dehydration synthesis. The end result of this process is water & polymers.

Carbohydrates:

Carbohydrates can be used to store energy in plants through a highly branched molecule called starch. Animal energy store in animals is called glycogen. Plant cell walls (stems and leaf) are made of cellulose which provides structure and support. A large number of carbohydrate monomers (monosaccharide) create a molecule called polysaccharide.

Proteins:

Proteins can serve as enzymes which reduce the energy necessary or speed up a reaction. They can also serve as transporters in the cell membrane or for oxygen in hemoglobin. They help to maintain muscles, bones, tendons, etc.

Lipids:

Lipids are a major component of the cell membrane. They are also helpful for storing energy for long time and insulation (warmth).

Nucleic Acids:

Contain the genetic instructions for making proteins. Examples are DNA and RNA