Practice with Macromolecules (Carbon Compounds)

The food you eat, the silk a spider uses to make a web, the muscles in your body – all of these structures are made of macromolecules. Macromolecule is the term that biologists use for large molecules. There are four types of macromolecules that are important in biology: carbohydrates, lipids, proteins, and nucleic acids.

**Carbohydrates**

Carbohydrates are a primary source of short term energy in our diet. When we eat foods that contain carbohydrates, the energy in them is changed in our cells to a form that our bodies can use. Carbohydrates also form cellulose that makes up plant cell walls. Carbohydrates can include simple sugars (glucose, fructose, lactose, etc.) that you get from sweet food like fruits and candy. They can also include more complex carbohydrates (starches) which made up of lots of simple sugars bonded together (creating a polysaccharide). A single sugar monomer is called a monosaccharide. Starch is an example of a complex carbohydrate polymer made using polymerization (linking together many monosaccharides). Plants often store carbohydrates energy in the form of starch. Eating potatoes or grains is the main source of starch for humans.

**Lipids**

Lipids are macromolecules that include fats, which store large amounts of energy. Lipids can also make up waxes and steroids/hormones. Fats are formed by monomers (building blocks) called triglycerides. Fats can be saturated, meaning that they have only single bonds within the carbon chain of their fatty acids. Saturated fats are a solid at room temperature like lard and butter. Fats are also unsaturated, which means that they have at least one double bond within the carbon chain of their fatty acids. Unsaturated fats are liquids at room temperature like vegetable oil. An important behavioral characteristic of lipids is that they are hydrophobic which means that they do not mix with water.

**Proteins**

Proteins are a group of macromolecules that have many different structures and functions. Proteins can make up your hair, muscles, bones and fingernails, but they can also do many other jobs. One important type of proteins are enzymes, which make chemical reactions occur faster. For example, enzymes in your stomach help you to digest your food. All proteins are made of monomers (building blocks) called amino acids. The amino acid chain in each protein is different and is determined by the letter code in your DNA.

**Nucleic Acids**

The two types of nucleic acids are DNA or deoxyribonucleic acid (double stranded and has the sugar deoxyribose) and RNA or ribonucleic acid (single stranded and has the sugar ribose). DNA is the molecule that carries all the instructions to make an organism. DNA is passed from parent to offspring. DNA is made of monomers (building blocks) called nucleotides. DNA is found in the nucleus of cells. All living things from bacteria to elephants have DNA made of nucleotides in their cells.
Macromolecule Questions

1. **True or False.** Macromolecules are **small** molecules.

2. **Carbohydrates** are a source of ________________________ in the human diet.

3. Which carbohydrate below makes up the structure of **plant cell walls**?
   a. starch
   b. chitin
   c. cellulose
   d. sucrose

4. How is a **starch** molecule made? Where can you get starch in your diet?

5. What is a common behavioral characteristic of all **lipids**?

6. Fats that come from animals are solid at room temperature. This means they are ____________ fats.

7. When a fat is **unsaturated**, it has at least one ________________________ in its fatty acid chain.

8. ________________ are **proteins** that make chemical reactions occur **faster**.

9. List two jobs of **proteins** in your body.
   a)
   b)

10. List the **monomers** (building blocks) for each of the macromolecule **polymers**:
   i. **Carbohydrates** are made from ________________________.
   ii. **Lipids** are made from ________________________________.
   iii. **Proteins** are made from ______________________________.
   iv. **Nucleic acids** are made from __________________________.

11. **DNA** and **RNA** are found in the _______________ of your cells.

12. How is the **structure** of each **protein** determined? (what makes proteins different)
Molecules of Life Answers

1. True or False. Macromolecules are small molecules.

2. Carbohydrates are a source of energy in the human diet.

3. Which carbohydrate below makes up the structure of plant cell walls?
   a. starch
   b. chitin
   c. cellulose
   d. sucrose

4. What is a characteristic of all lipids? hydrophobic

5. Fats that come from animals are typically solids at room temperature. This means they are saturated fats.

6. True or False. Lipids are a huge source of energy.

7. Enzymes are a group of proteins that make chemical reactions occur faster.

8. List one structure in your body that contains proteins. Muscles, fingernails, hair...

9. The building blocks of proteins are amino acids, and the building blocks of nucleic acids are nucleotides.

10. DNA is found in the nucleus of your cells.