

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.



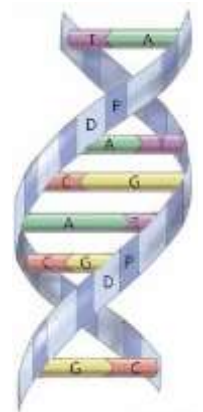
Proteins

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.