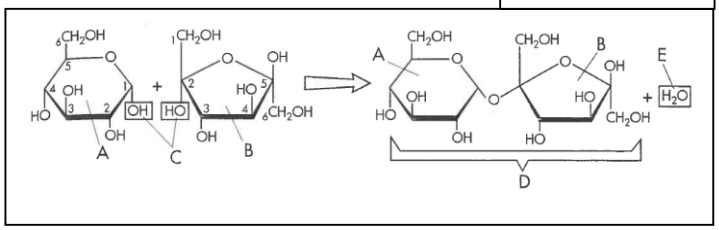
Name: _____ Date: _____ Period: _____

Four Macro-Molecules of Life! – Function Option 1

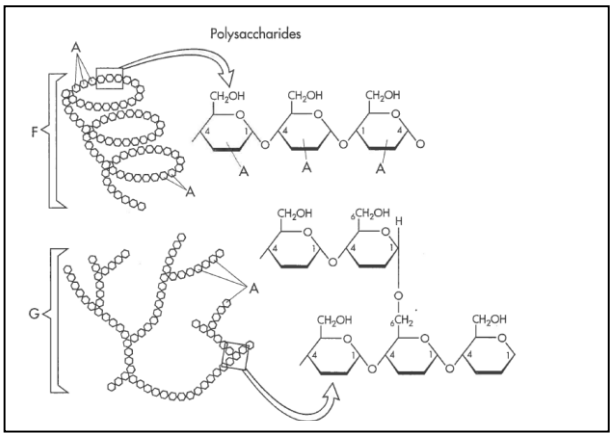
CARBOHYDRATES-

Use the information in the article and your notes to answer the following questions:

Simple Sugars



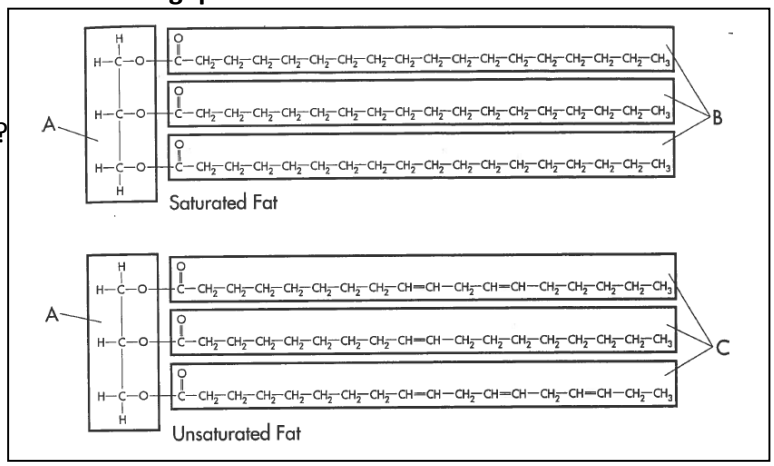
1. What are carbohydrates primarily used for?
2. What are the three elements found in carbohydrates?
3. What is the general shape of a saccharide?
4. What two monosaccharides bond together to form a disaccharide called sucrose?
5. Monosaccharide means ONE sugar, Disaccharide means _____ sugars.
6. What is a polysaccharide?
7. Where is starch found and what does it do?
8. Where is glycogen found and what does it do?



On the images for carbohydrates, outline the glucose (A) molecule in red and the sucrose (D) molecule in orange. Label both molecules.
Outline the starch (F) molecule in green. Label the molecule.
Outline the glycogen (G) molecule in blue. Label the molecule.

LIPIDS-

Use the information in the article and your notes to answer the following questions:

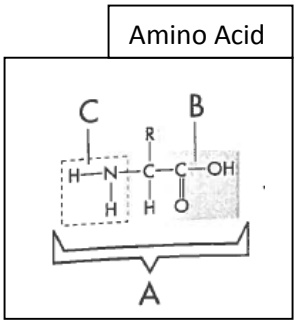


1. Do lipids dissolve in water?
2. What are the three atoms/elements found in lipids?
3. What holds more energy – lipids or carbohydrates?
4. What are two functions of fats?
5. What is a monomer (subunit) of saturated fat?
6. Which type of fat has NO double bonds (=) in the fatty acid chain (look between the CH's)?
7. Which type of fat has double bonds (=) in the fatty acid chain?
8. When fats release energy, what form is it in?
9. Where is the key use of phospholipids?
10. What other macro-molecule is found with phospholipids in the cell membrane?

Shade in the glycerol green and the fatty acid chains yellow

PROTEINS-

Use the information in the article and your notes to answer the following questions:



1. List three functions of proteins.

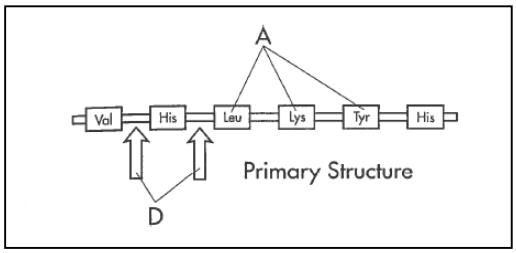
2. What are the monomers (subunits) of proteins?

3. Does the sequence of amino acids matter or make a difference to the protein's function?

4. What type of bond holds the amino acids together in a protein?

5. What is a completed polypeptide chain called?

6. What is the function of an enzyme?



Look at the images. Label the primary structure bonds (D) and monomers (A) with their correct names. Color the amino acids orange and the peptide bonds blue.

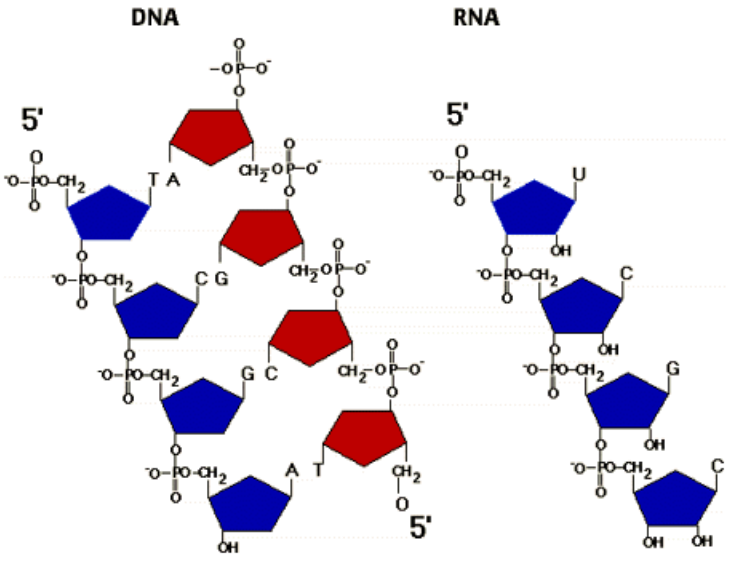
NUCLEIC ACIDS (DNA & RNA)-

Use the information in the article and your notes to answer the following questions:

1. What are the two types of nucleic acids?

2. What are the subunits (monomers) of nucleic acid?

3. What is the purpose/function of nucleic acid?



Four Macro-Molecules of Life!

Option 1

Carbohydrates

A thorough understanding of biology requires that one have an understanding of the fundamentals of chemistry, because life is basically a chemical process.

Many of the chemical substances associated with living things are referred to as organic substances; organic substances are substances that contain carbon. (All other substances are called inorganic.) Four classes of organic compounds are studied in depth in this book: carbohydrates, lipids, proteins, and nucleic acids. This plate centers on the first group, the carbohydrates. Carbohydrates are primarily used as sources of energy in living things.

All plants, animals, and microorganisms use carbohydrates as sources of energy. Carbohydrates are also used as structural building blocks. For instance, the cellulose of plant cell walls is composed of carbohydrates. Carbohydrates are made up of carbon, hydrogen, and oxygen atoms. In the upper portion of the plate, we show a **glucose molecule (A)**. This is a basic carbohydrate known as a monosaccharide, or simple sugar. It consists of six carbon atoms located at the positions that are designated one through six. Carbon 1 and carbon 5 are connected by an oxygen molecule, as the diagram shows.

A second monosaccharide is the **fructose molecule (B)**. This molecule also consists of six carbon atoms, but they are arranged differently than the carbons in glucose. Notice that the oxygen atom joins carbons 2 and 5, and that fructose is a five-membered ring, while glucose's ring contains six members.

Extending from both glucose and fructose molecules are a number of –OH groups, or **hydroxyl groups (C)**. When the molecules combine, an –OH group leaves the glucose molecule and an –H atom leaves the fructose. They unite to form a **water molecule (E)**. The two monosaccharides then bond with one another to form a molecule of **sucrose (D)**, and this double sugar is called a disaccharide.

Polysaccharides are molecules that can consist of hundreds or thousands of monosaccharide units. The first polysaccharide molecule we will look at (in the bracket) is a starch molecule (F), which is found in plants such as corn and wheat.

Starch molecules represent a storage form of glucose; as the diagram shows, a starch molecule is composed of many glucose

The second polysaccharide we will mention is glycogen. A **glycogen molecule (G)** is indicated by the bracket at the bottom of the page. Glycogen is often referred to as animal starch. It is stored in the liver and muscles when the body has to store excess glucose molecules. Note that the glycogen molecule is composed of glucose units, but that glycogen is highly branched—this distinguishes glycogen from starch.

Lipids

Lipids are a group of organic molecules that dissolve in oils, but not water.

Fats are very efficient energy-storage molecules that yield about twice the amount of chemical energy per gram as do carbohydrates. Fats are important in the construction of plasma membranes, and they also provide physical and thermal insulation to animals.

Lipid molecules contain Carbon, Hydrogen and Oxygen.

Saturated and unsaturated fats are extremely important to the metabolism of organisms. Fats are broken down into two-carbon units, and these units are used in the Krebs cycle (discussed later). They undergo a series of conversions and release their energy in the form of ATP molecules. Fats serve as a supplemental energy source when carbohydrate stores are exhausted.

One of the key uses of phospholipids is in the formation of the cell (plasma) membrane. The cell membrane consists of two layers of phospholipids with associated proteins.

Proteins

Organic molecules provide the body with structural materials to form cells, tissues, and organs; regulatory substances to direct and govern the interactions of molecules; and energy to fuel the chemical operations of cells.

Proteins are molecules that are formed from units called amino acids. A protein may contain as few as ten amino acids, or it may contain thousands. The sequence of amino acids in proteins gives them unique functional characteristics.

The nitrogen from one amino acid bonds with the carboxyl carbon of the adjacent amino acid, and this bond is called the **peptide bond**

As amino acids are added to the growing peptide, a polypeptide results, and when the polypeptide is modified to its working structure, it is called a protein.

One type of protein is an enzyme. An enzyme speeds up chemical reactions in your body and lowers the activation energy necessary for that reaction to occur, both beneficial in maintaining homeostasis.

NUCLEIC ACIDS

Two types of nucleic acids exist: deoxyribonucleic acid (DNA) and ribonucleic acid (RNA). DNA is the genetic material of organisms, while RNA is used during the construction of proteins.

DNA exists in the chromosome of the living eukaryotic cell, and in the cytoplasm of prokaryotic cells. DNA is composed of repeating units known as nucleotides. Each nucleotide has three components: a molecule of the carbohydrate deoxyribose, a phosphate group, and a nitrogenous base.