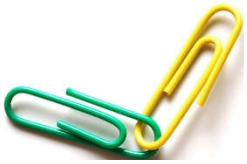
Biology
Ms. Ye

Name _____
Date _____ Block _____

Monomers vs. Polymers

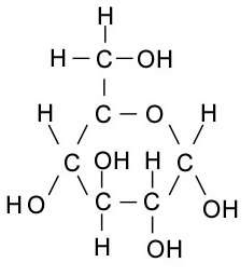


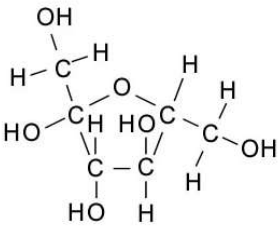
1. The prefix **mono-** means "one". The prefix **di**- means "two". The prefix **poly**- means "many". Based on the given definitions, label the pictures of paperclips above as either a "**monomer", "dimer"** or a "**polymer"**

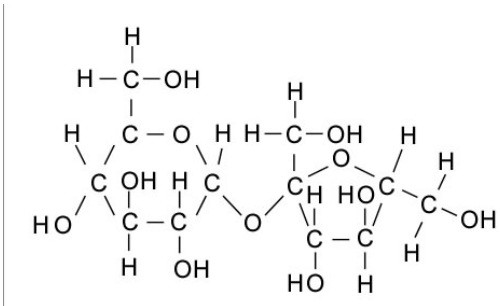
2. In terms of appearance, what is the main difference between a monomer, dimer and a polymer?

3. What is the relationship between a monomer and a polymer (which one makes up the other)?

Monomers and Polymers in Biology



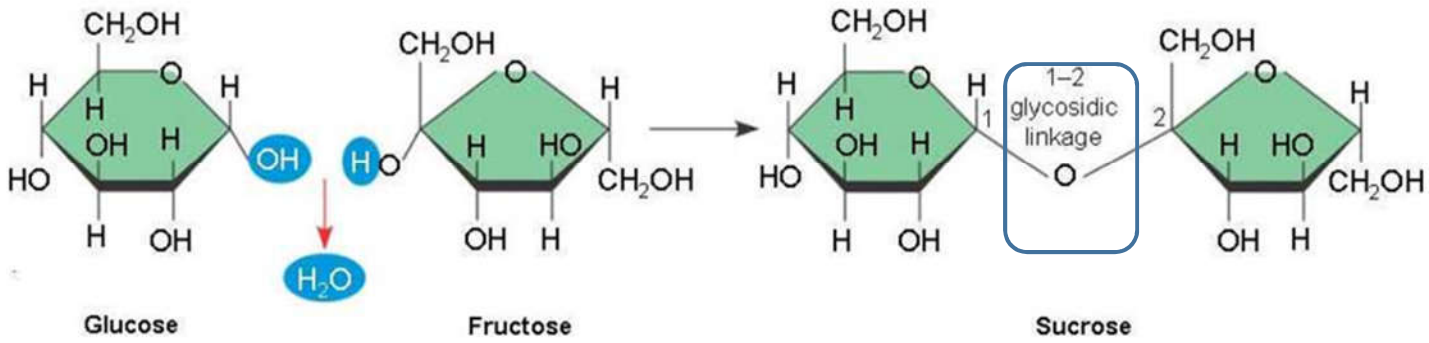




4. Take a look at the molecules above. Explain which molecules (glucose, fructose, sucrose) are the monomers and which one is the polymer (or technically, a dimer).

Making/Building Macromolecules

Take a look at the glucose and fructose molecules below that combine to make sucrose.



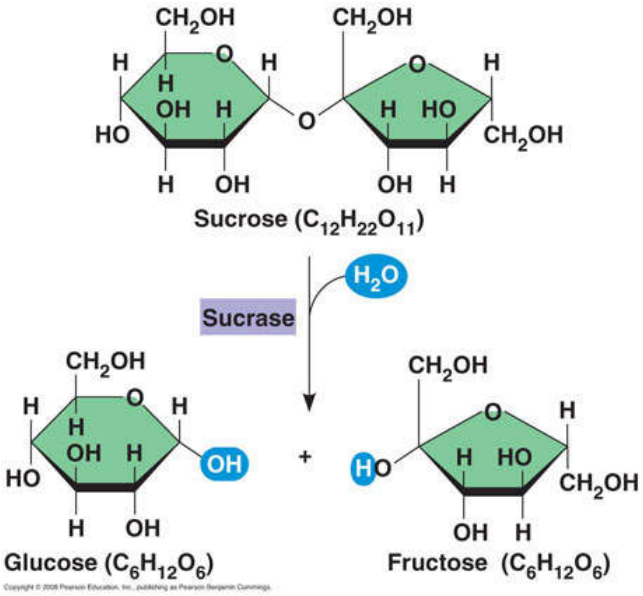
The OH and H segments of the molecule that were cleaved (cut off) are circled in the glucose and fructose molecule. The portion where the two molecules were joined are boxed in the sucrose molecule.

5. **Synthesis** means putting together and **dehydration** means loss of water. Explain why scientists refer to the formation of larger molecules as a **dehydration synthesis reaction**.

Breaking Apart Macromolecules.

In the previous example, you looked at how monomers can be joined to make larger molecules such as dimers and polymers. We can also take a larger molecule and break it down into individual monomers.

Hydrolysis Reaction

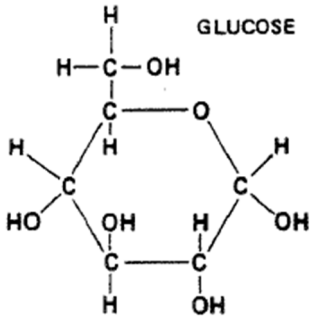


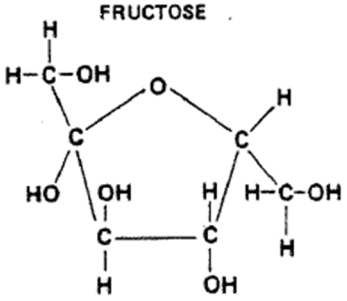
6. Take a look at the reaction above in which sucrose is broken down into glucose and fructose due to a reaction with water. **Hydro-** is a prefix that means **"water"** and **lysis** means **"to break apart".** Why do you think the above reaction is known as a **hydrolysis reaction?**

Organic Macromolecules: Use the information provided to fill out your macromolecules graphic organizer on the back page.

I. **Carbohydrates**

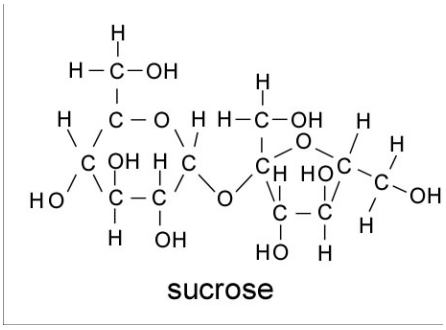
- **Monosaccharides:** Monosaccharides, or simple sugars, are the least complicated carbohydrates. The two most common simple sugars are shown below. They serve as a **source of energy** for living organisms.

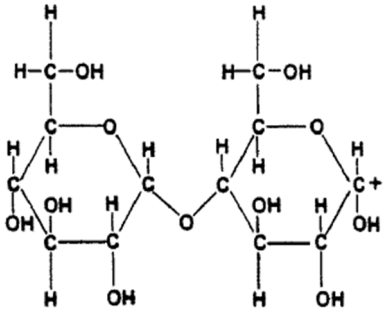




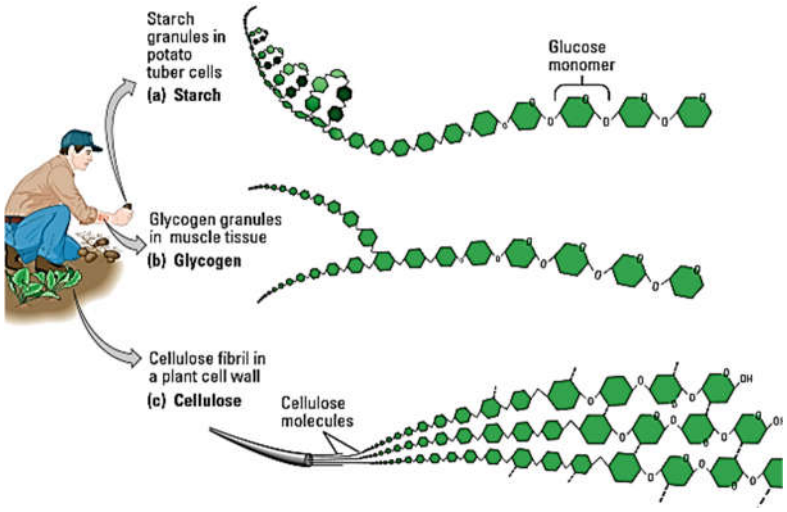
Monosaccharides are the monomers or building blocks for carbohydrates. They can be combined to make disaccharides and polysaccharides.

- **Disaccharides:** A disaccharide consists of two monosaccharides linked together. Two disaccharides are pictured below. Disaccharides are also an **energy source for living organisms**.


sucrose

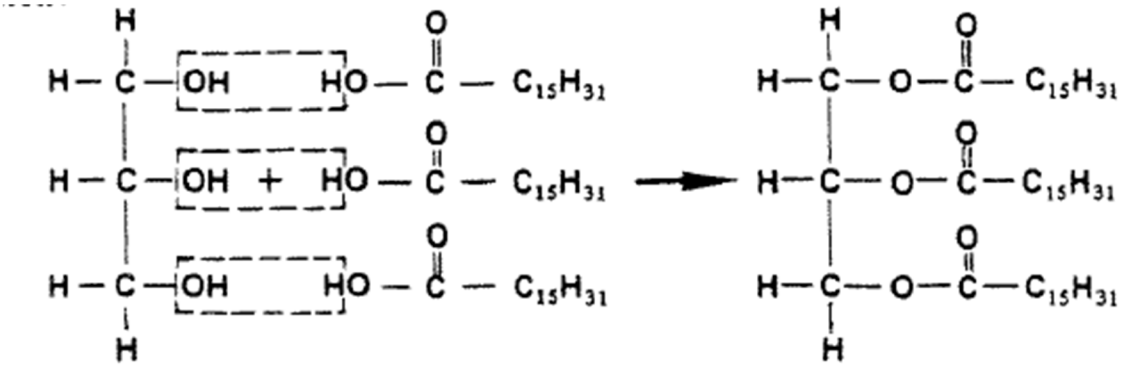

Maltose

- **Polysaccharide:** The most complex carbohydrates are the polysaccharides, which **are made up of long chains of monosaccharides** (or glucose-like units). Starch, cellulose, chitin, and glycogen are polysaccharides. **Starch** is an **energy storage** molecule in **plants,** whereas **animals store energy** in their bodies in the form **of glycogen**. **A plant's cell wall** (outermost structural layer) is made up of **cellulose** whereas the **cell wall of fungi and some insects** are made up of **chitin**.



II. **Lipids**

- **Fats:** The drawing below shows the joining of a **glycerol** molecule with **three fatty acids** to create a larger fat (lipid) molecule.



Glycerol + 3 fatty acids → fat molecule

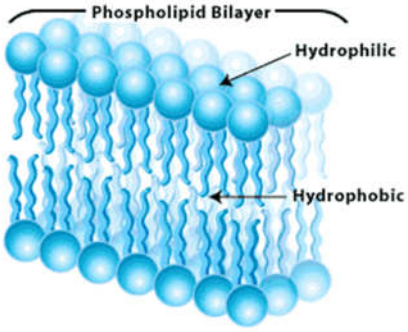
Fats have three main functions:

- Long term **energy storage** (stored in adipose tissue)
- A layer of **cushioning** that protects muscles, bones, and organs
- A layer of **insulation**, which helps to maintain a constant temperature

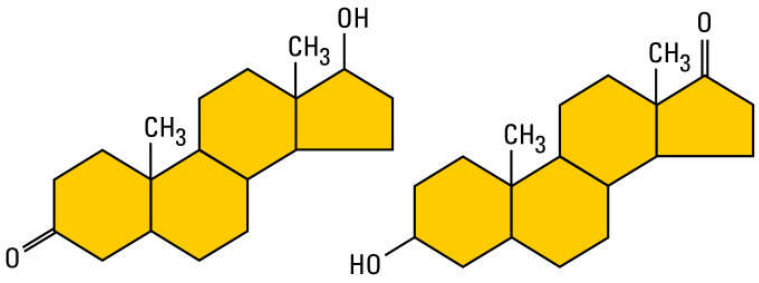
- **Other Lipids**

There are other lipids relevant in biology that don't have the same structure as the fatty acids. Their names and functions are listed below:

- **Phospholipids:** Main components of the **cell membrane**



- **Steroids:** Hormones-**Chemical Messengers**

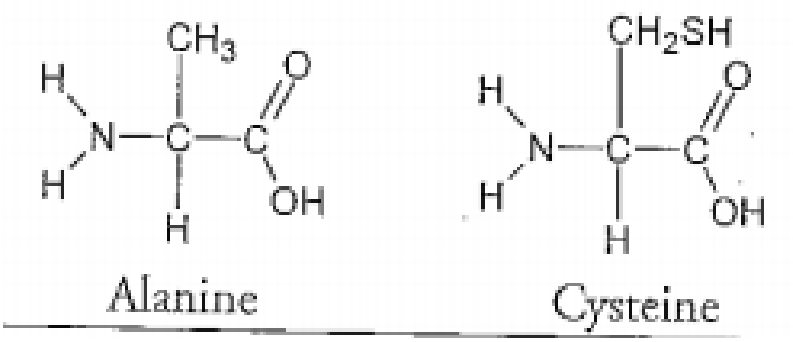


Testosterone **A type of estrogen**

- **Waxes: Water Proofing**

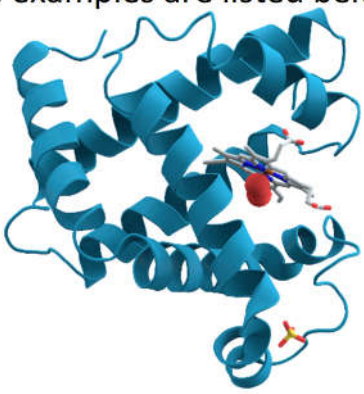
III. **Proteins**

Proteins are made up of smaller molecules known as **amino acids.** Two of the 20 amino acids are pictured below. 9 of the 20 amino acids are considered essential amino acids because the body cannot make it on its own. This means we must get them by eating food.



Proteins are the structural and regulatory units of life. Some examples are listed below

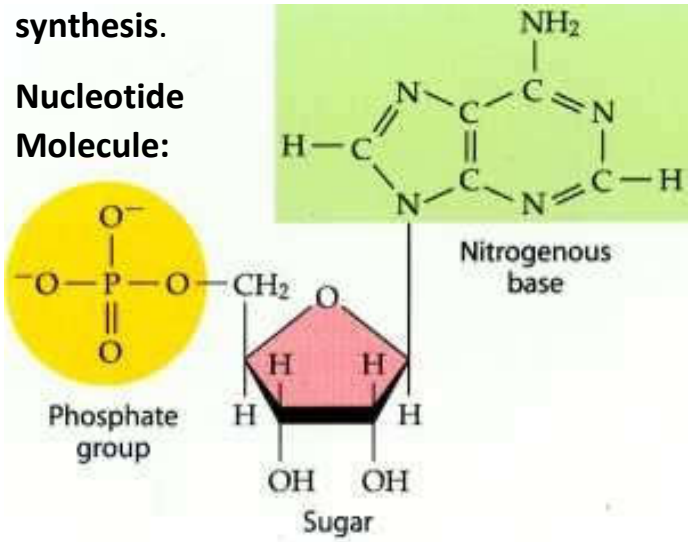
- **Structural**
  - Actin and Myosin **(muscle)**
  - Collagen **(Skin Tendons),**
  - Keratin **(hair/skin/nails)**
- **Regulatory**
  - **Enzymes: regulate reaction speeds**

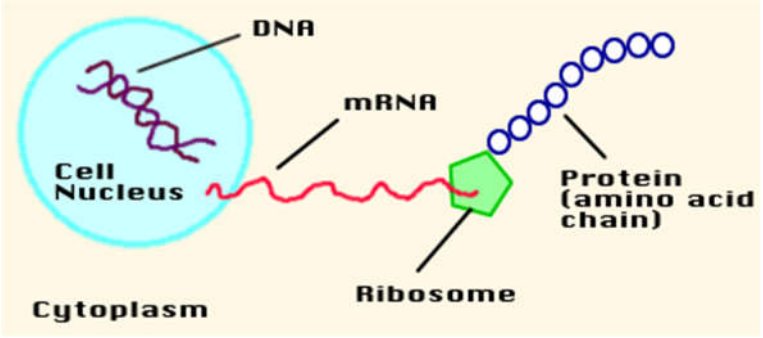


IV. **Nucleic Acids**

There are two types of nucleic acids found in living organisms—DNA (deoxyribonucleic acid) and RNA (ribonucleic acid). Both are giant molecules of high molecular weight, consisting of a series of **nucleotide** units bonded together. One nucleotide is pictured below. **DNA contains the hereditary information** and is stored in the nucleus, while **RNA functions in protein synthesis**.

Nucleotide Molecule:





Organic Macromolecules: Complete the following chart!

Group	Elements Present	Monomer/ Building Blocks	Subgroup	Examples and Function
Carbohydrates			**Monosaccharide**	**1.** **2.** *****
			Disaccharide	**1.** **2.** 3. **Lactose** (milk sugar) ***Also a source of energy for cells**
			Polysaccharide	**Energy Storage** **1. Starch-**energy storage in plants **2.** **Structure/Support** **1. Cellulose-**cell wall in plants **2.**
Lipids			**Fats**	*** energy storage** ***** *****
		No True Monomer	**Phospholipid**	
			Steroids	
			Waxes	
Proteins			**Support/ Structure**	**1.** **2.** **3.**
			Regulation	**1.**
Nucleic Acids			**DNA**	*****
			RNA	*****