

ESSENTIAL
QUESTIONS:

- What is the role of carbon in living organisms?
- What are the four major families of biological macromolecules?
- What are the functions of each group of biological macromolecules?

What are Living Things Made of?

- There are about _____ elements that are essential to living organisms.
- All living things contain organic compounds ("macromolecules") – compounds that contain _____.
- Carbon's _____ outer electrons allow for up to 4 single _____ bonds to form with other elements.
- The most common elements found within living things are:
Sulfur, Phosphorus, _____, Nitrogen, Carbon, and _____

S 16 32.07 Sulfur	P 15 30.97 Phosphorus	O 8 16.00 Oxygen	N 7 14.01 Nitrogen	C 6 12.01 Carbon	H 1 1.008 Hydrogen
					

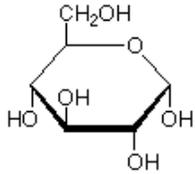
- **Macromolecules** are _____ – large molecules formed by joining smaller organic molecules (called monomers) together.
- **Polymers** are large molecules made from repeating units of similar compounds called **monomers**.

Macromolecules

- Macromolecules are organized into four major categories:
 1. Carbohydrates
 2. _____
 3. Proteins
 4. Nucleic _____

First Group of Macromolecules: Carbohydrates

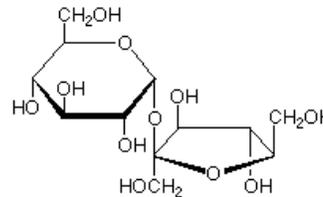
- Ratio of 1 carbon: 2 _____: 1 oxygen
- Function = quick _____ source and cellular _____ in plants, fungi, and animals



monosaccharide (glucose)

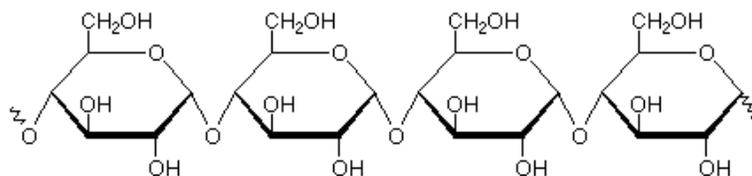
- **monosaccharide** – building _____ of carbohydrates
- Example: _____ ($C_6H_{12}O_6$)

- **disaccharide** – two monosaccharides
- Example: _____ (table sugar)



disaccharide (sucrose)

- **polysaccharide** – three or more monosaccharides
- Examples: _____ (made by plants) and _____ (made by animals)
 - o Both are used for _____



polysaccharide (amylose starch)

- Example: _____ provides structural support in cell walls. Cellulose is made of _____ bonded together to form _____. Cotton is almost pure cellulose.
- Example: _____ is the main component in the exoskeletons of shrimp, lobsters, and some insects.

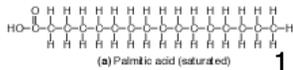
Second Group of Macromolecules: Lipids

- Lipids are _____ organic compounds that are primarily used for long-term _____ storage.
- Lipids make up _____, oils, and waxes.
- Of the four types of macromolecules, lipids are not considered _____.
- Lipids have a starter molecule like glycerol followed by _____.
- o Fatty acids are chains of _____ with hydrogen attached along their sides.
- o The _____ lipid head is hydrophilic.
- o The nonpolar lipid fatty acid tails are _____.
- Four Types of Lipids:

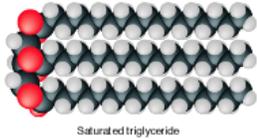
1. **Triglycerides (fats/oils)** – used for _____ storage, insulation, protection

- Made of _____ fatty acid chains attached to a glycerol group

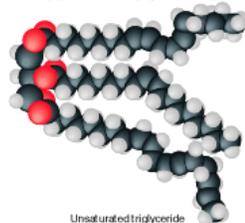
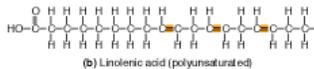
- (tri = 3 fatty acids, glyceride = 1 glycerol)



1. Two Types of Triglycerides:



1. Saturated Fats have _____ bonds and are _____ at room temperature. (Example: _____)



2. Unsaturated Fats have _____ bonds (due to missing hydrogen). This causes _____ in the chains, resulting in them being _____ at room temperature. (Example: _____)

- Fats are used for energy storage (for both plants and animals – but only animals contain the fatty tissue known as _____).

2. **Waxes** – mainly used for covering and _____ (leaf cuticle, _____, earwax)

- Made of _____ fatty acid chain attached to a long-chain alcohol group.

3. **Phospholipids** are the main component of _____ membranes.

- Made of 1 _____ (PO₄) group and two fatty acid chains.
- They are _____ and don't allow water and other molecules to freely enter the cell.

4. **Steroids** include cholesterol and some _____.
- Made of 4 carbon-based _____ (and NO fatty acid chains).
 - Cholesterol allows for membrane _____ and is required to make Vitamin _____, estrogen, and testosterone.