

Honors Biology

Understanding Chemical Reactions

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A + B



C + D

Reactants

Products

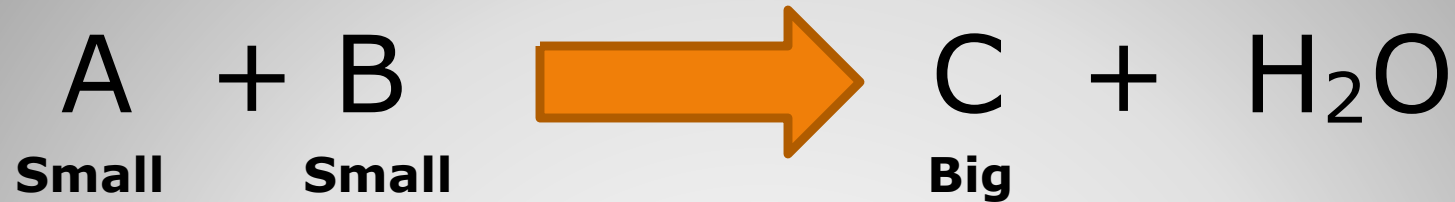
$6\text{CO}_2 + 6\text{H}_2\text{O}$



$\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$

Photosynthesis equation

Chemical Reaction



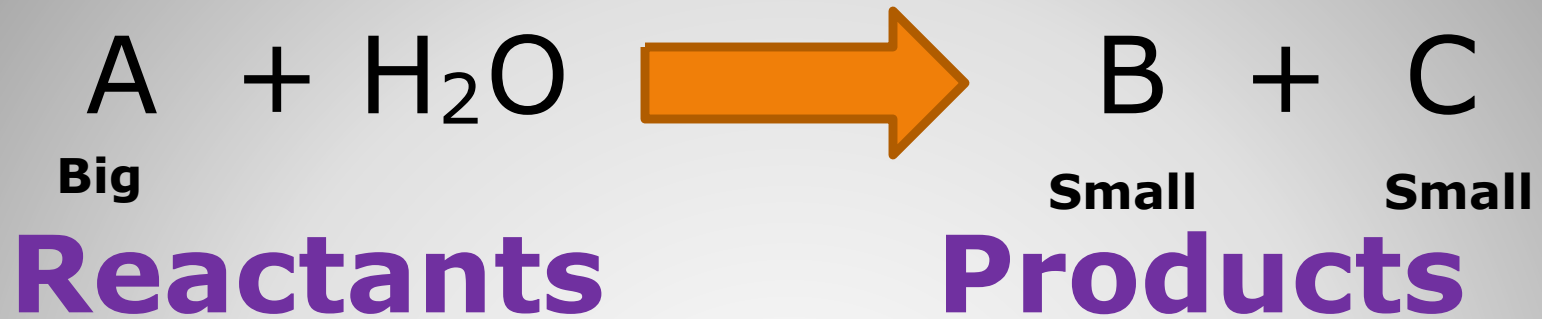
Reactants

Products

Anabolic reaction

**Condensation/ dehydration
synthesis reaction**

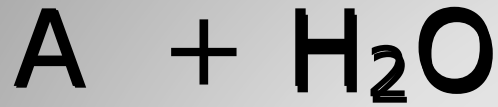
This is a chemical process by which 2 molecules are joined together to make a larger, more complex, molecule, with the loss of water.



Catabolic reaction

Hydrolysis reaction

A Hydrolysis is the process in which water is used to split a substance into smaller particles



Big

Polymer

Reactants

Hydrolysis



Small

Small

Monomer

Products



Small

Small

Monomer

condensation

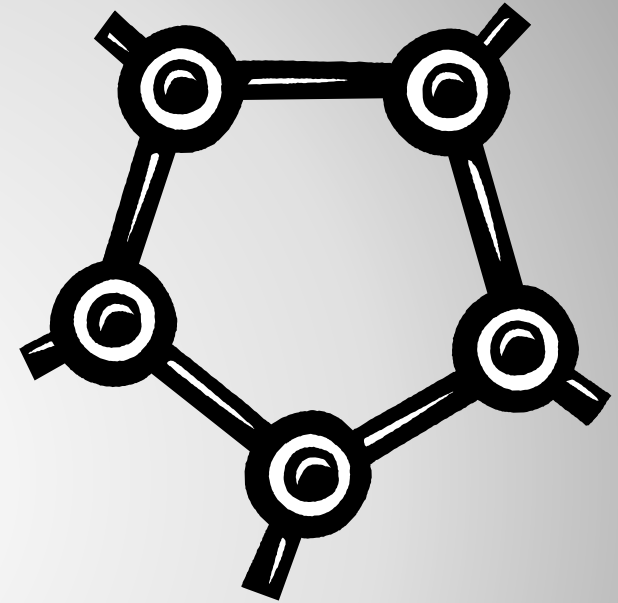


Big

Polymer

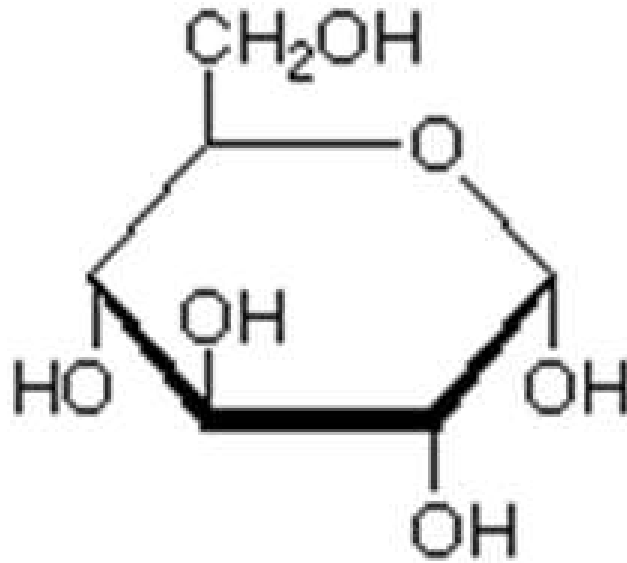
Condensation vs. Hydrolysis

- **Carbohydrates**
- **Proteins**
- **Lipids**
- **Nucleic Acids**



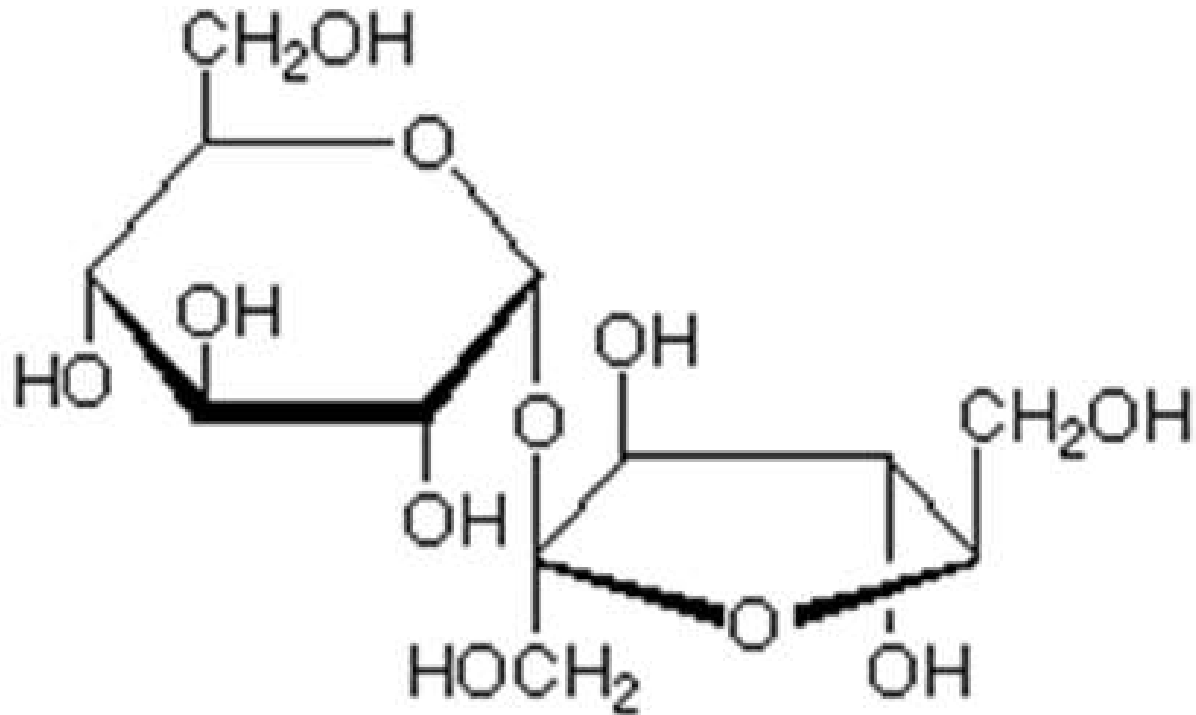
**Who undergoes condensation
dehydration Rx. ?**

Monosaccharide



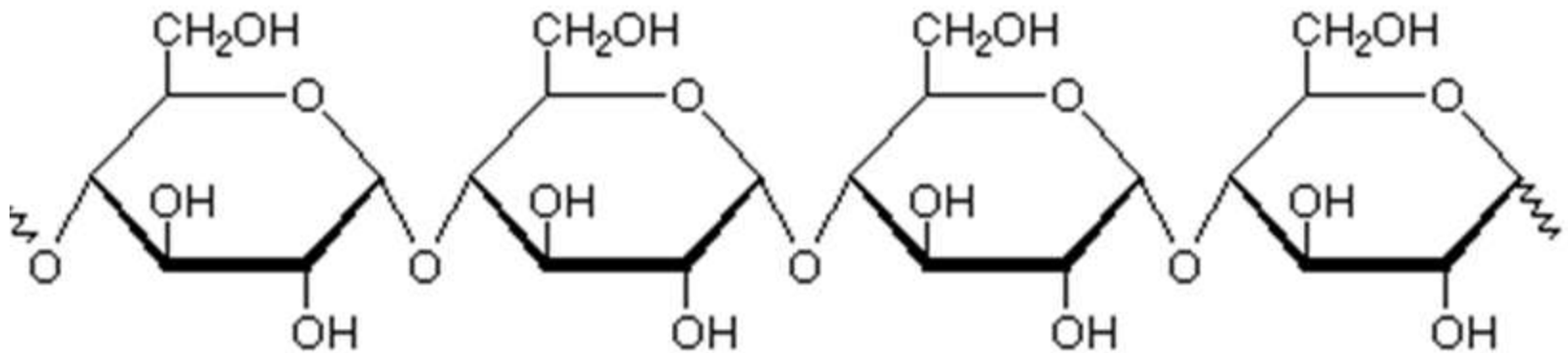
monosaccharide (glucose)

Disaccharide



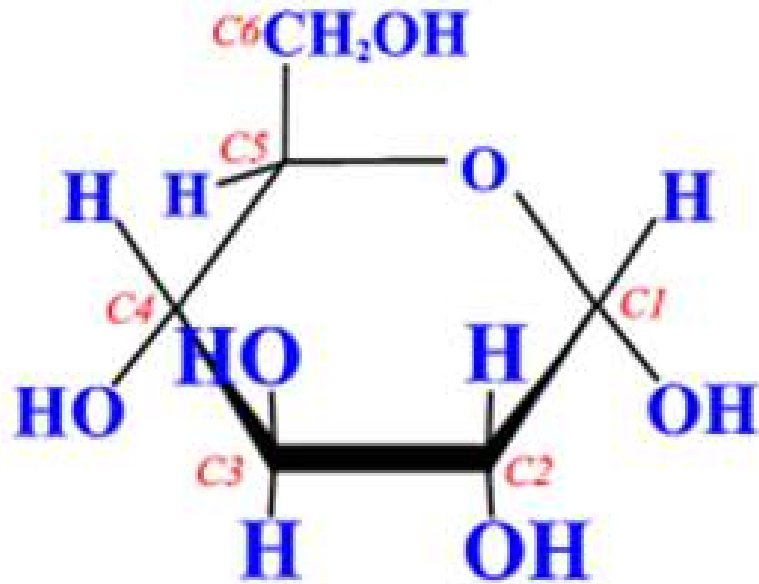
disaccharide (sucrose)

Polysaccharide

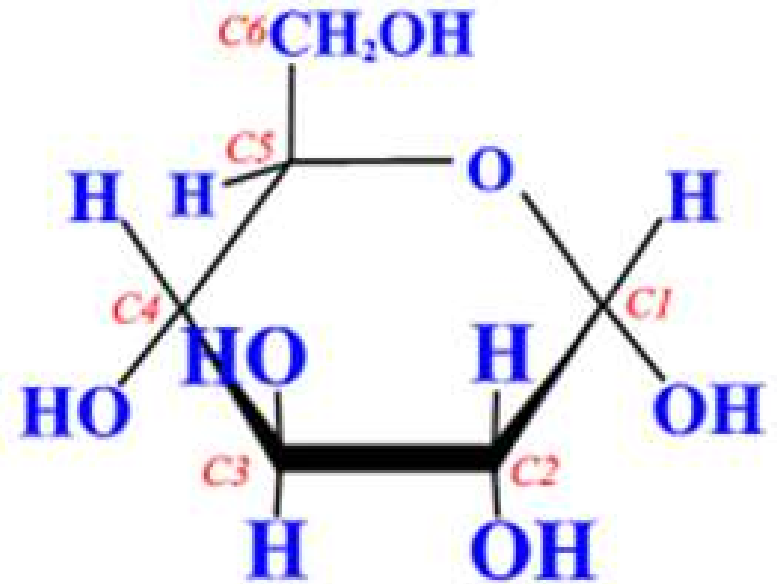


Saccharides

Animation



Monosaccharides



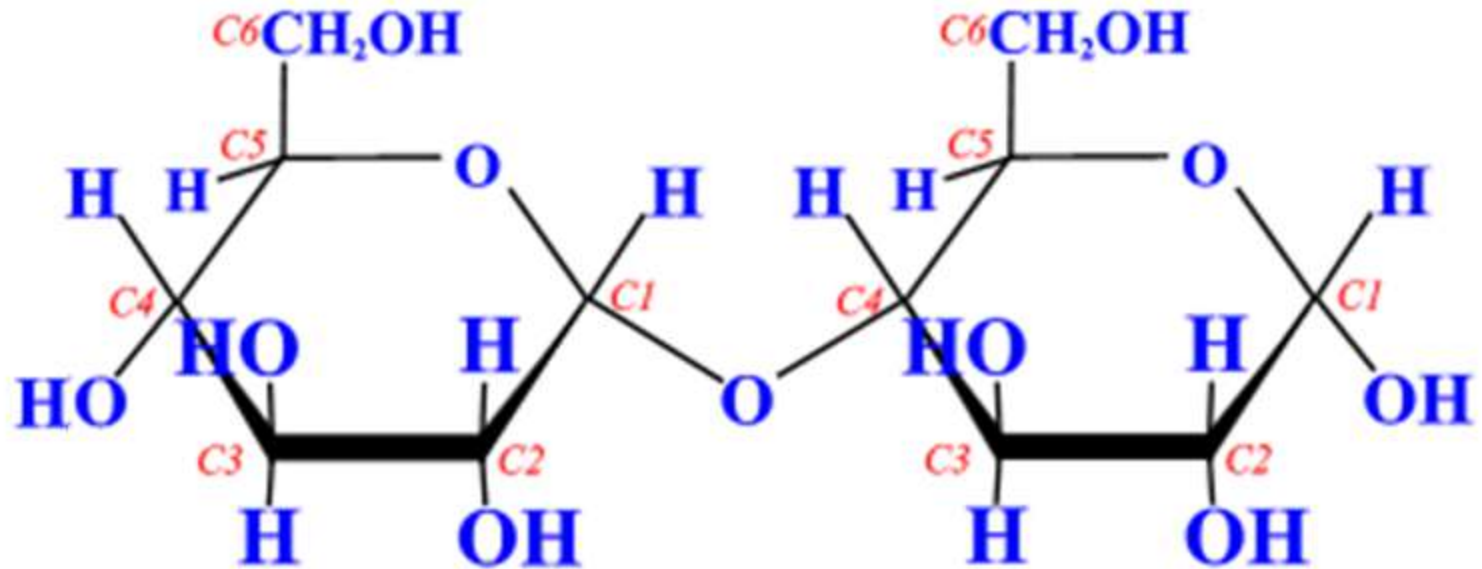
Monosaccharides

- **Glucose**
- **Fructose**
- **Galactose**



Monosaccharides Examples

Disaccharides

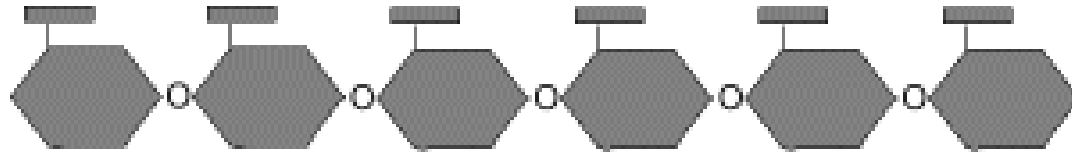


- A disaccharide is produced by joining 2 monosaccharide (single sugar) units.
- 2 glucose molecules are combined using a condensation reaction, with the removal of water to produce maltose.
- Maltose is a disaccharide.

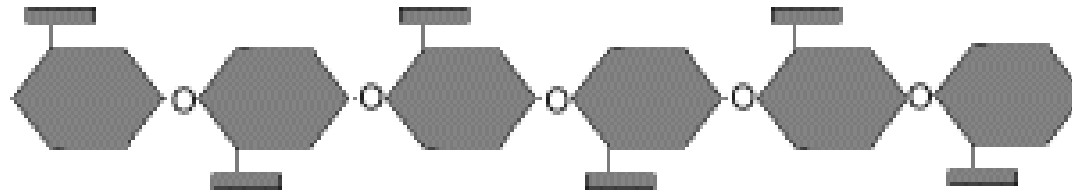
- **Glucose + Glucose = Maltose**
- **Glucose + Fructose = Sucrose**
- **Glucose + Galactose = Lactose**
- **Fructose + Galactose = Lactulose**

Disaccharides Examples

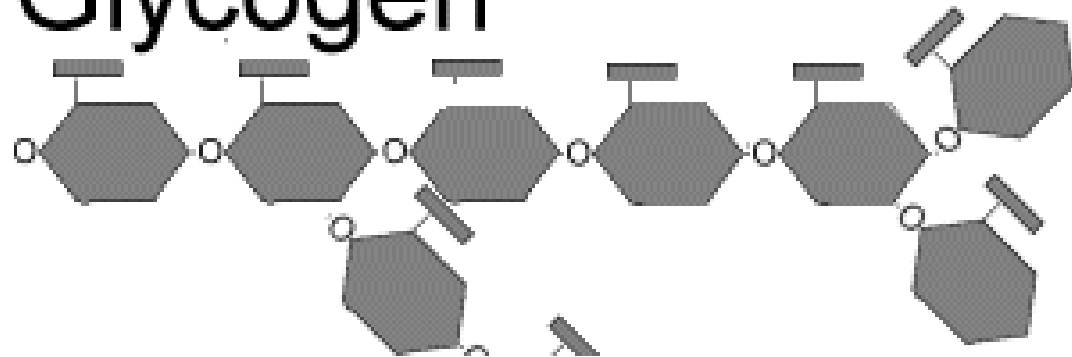
Starch



Cellulose



Glycogen



Polysaccharides Examples

- Cellulose is the carbohydrate that makes up the main structure of plants.
- It is also referred to as "***fiber***" and is indigestible by humans.
- Cotton fiber is almost pure cellulose.
- Cellulose is a very strong substance because the straight-chain molecules hydrogen bond
- In plant cell walls this gives rigidity to structure.

Cellulose

- **Polysaccharides** are carbohydrate polymers consisting of tens to hundreds to several thousand monosaccharide units.
- All of the common polysaccharides contain glucose as the monosaccharide unit.
- Polysaccharides are synthesized by plants, animals, and humans to be stored for food, structural support, or metabolized for energy.

Polysaccharide

- Chitin is the primary component in the exoskeleton of an insect and other arthropods that gives it strength.
- Second most abundant **polysaccharide** in nature.
- Stronger than cellulose.

Chitin is generally collected from crab and shrimp shells.

- It is used in waste water clearing, in cosmetics, and for several veterinary applications.
- Chitin is also used for surgical thread. Surgical thread made of chitin is strong and flexible, and decomposes over time once the wound heals so that it's not necessary to remove stitches.

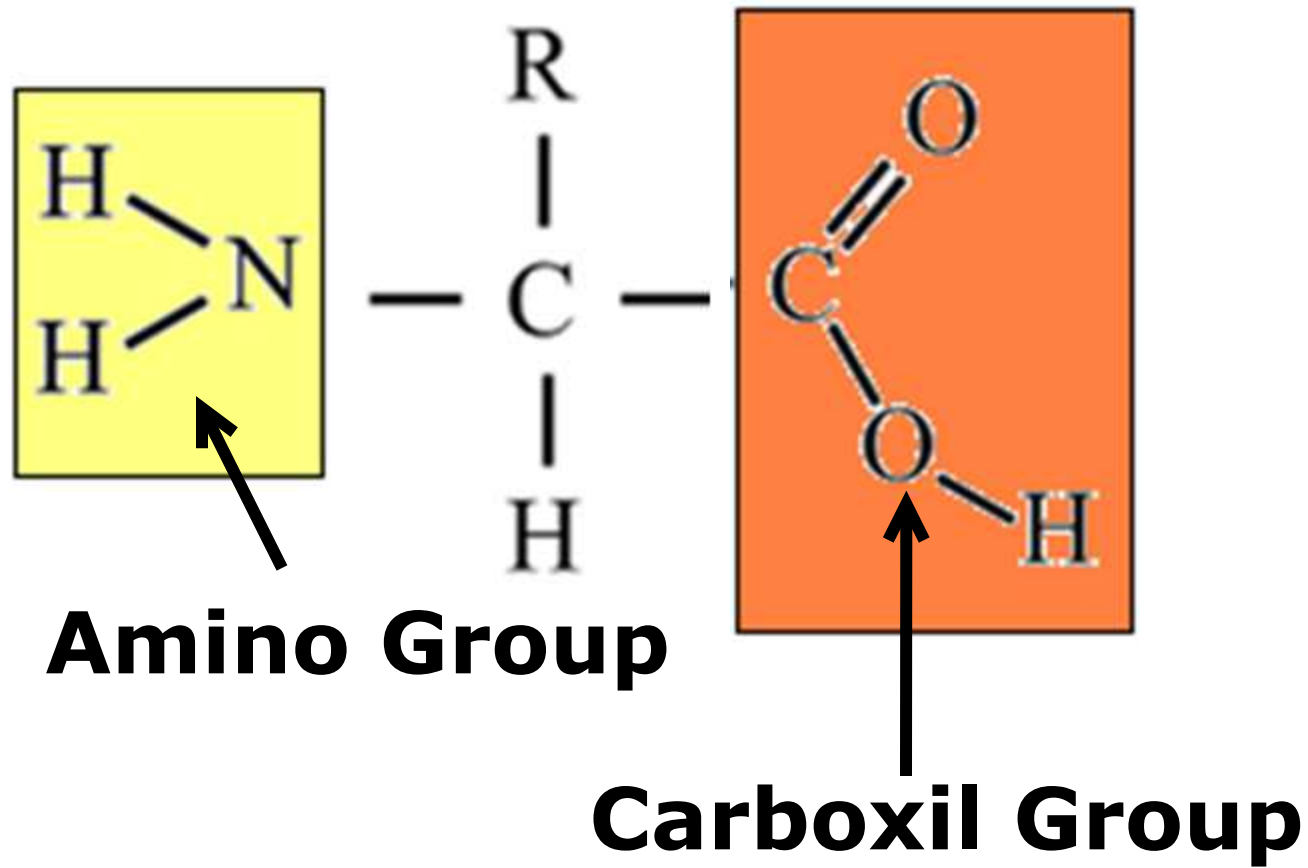
Chitin

- **Glycogen** is a polysaccharide that is the principal storage form of glucose in animal and human cells.
- A polysaccharide that is the main form of carbohydrate storage in animals and occurs primarily in the liver and muscle tissue.
- It is readily converted to glucose as needed by the body to satisfy its energy needs.
- Also called animal starch.

Glycogen



Amino Acid



Polymers vs. Monomer

- **Carbohydrates - Monosaccharides**

Polymers

Monomer

- **Lipids - glyceride + 3 fatty acid**

Polymers

Monomer

- **Protein - Amino Acids**

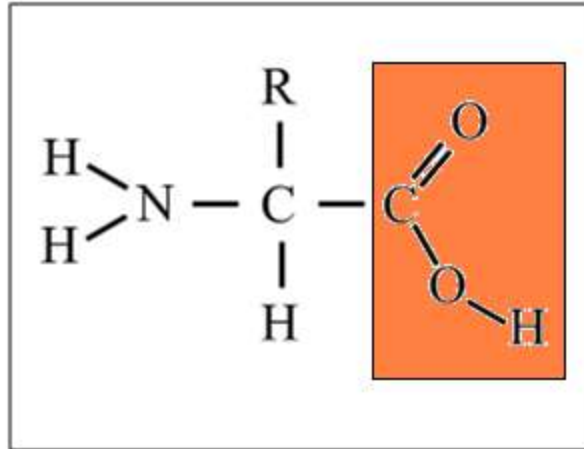
Polymers

Monomer

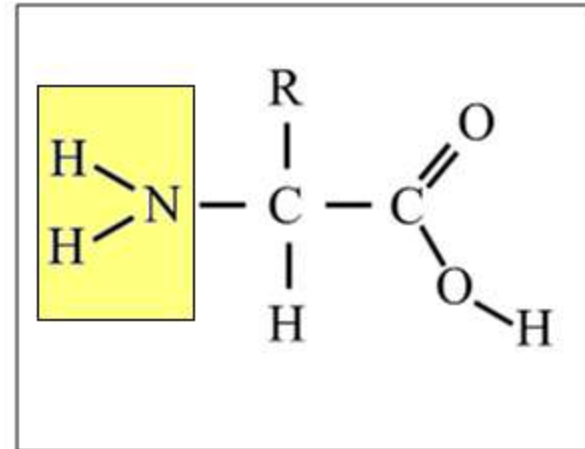
- **Nucleic Acid - Nucleotide**

Polymers

Monomer

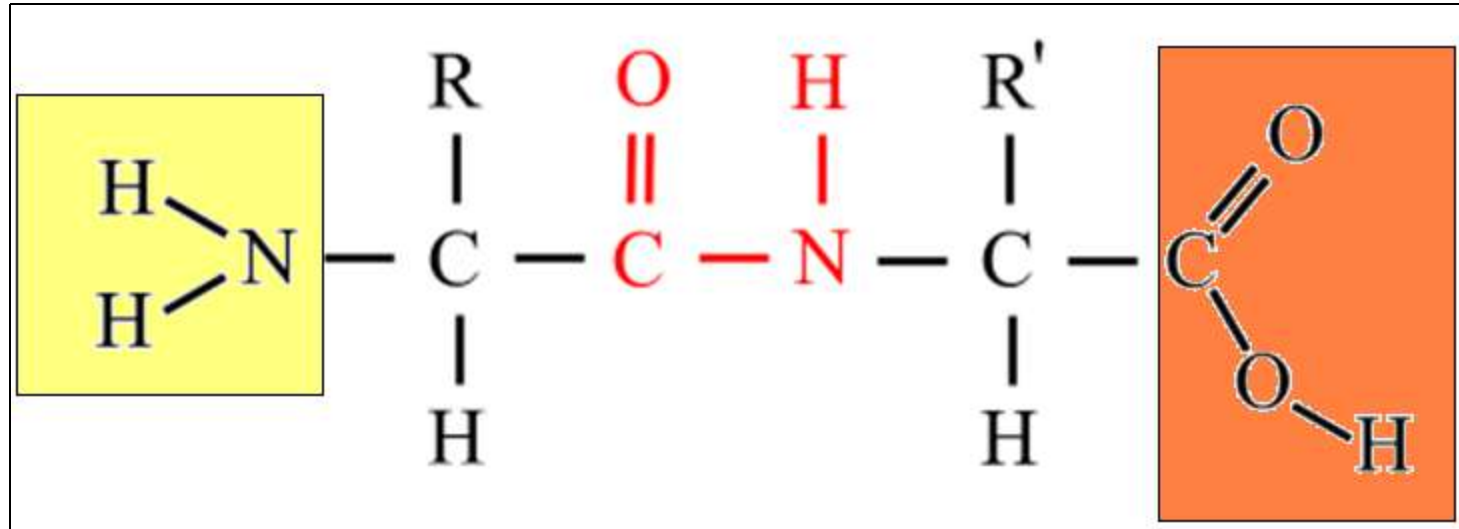


Amino Acid



Amino Acid

Amino Acid Condensation



[Animation](#)



Water Molecule Release

- The molecule formed when two amino acids are combined is called a dipeptide.
- The condensation process can be continued repeatedly to form polypeptides.

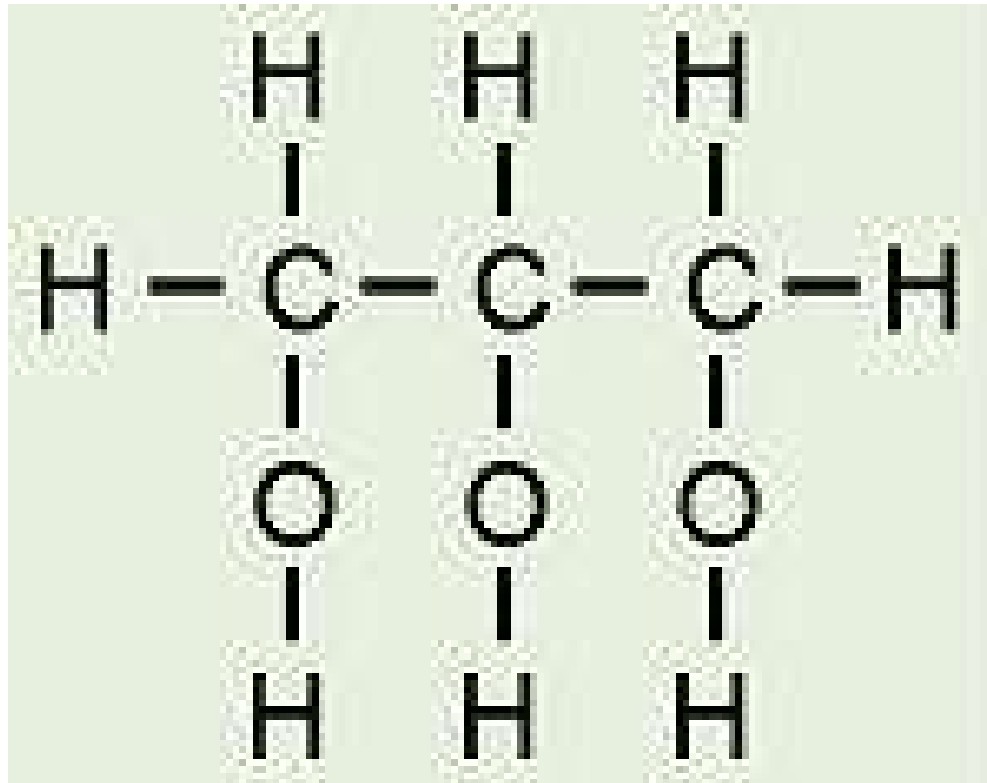
- **Proteins are macromolecules.**
- **They are constructed from one or more chains of amino acids.**
- **A typical protein contains 200–300 amino acids.**
- **Also known as polypeptides these are the largest to date is titin a protein found in skeletal and cardiac muscle; one version contains 34,350 amino acids in a single chain.**

Proteins

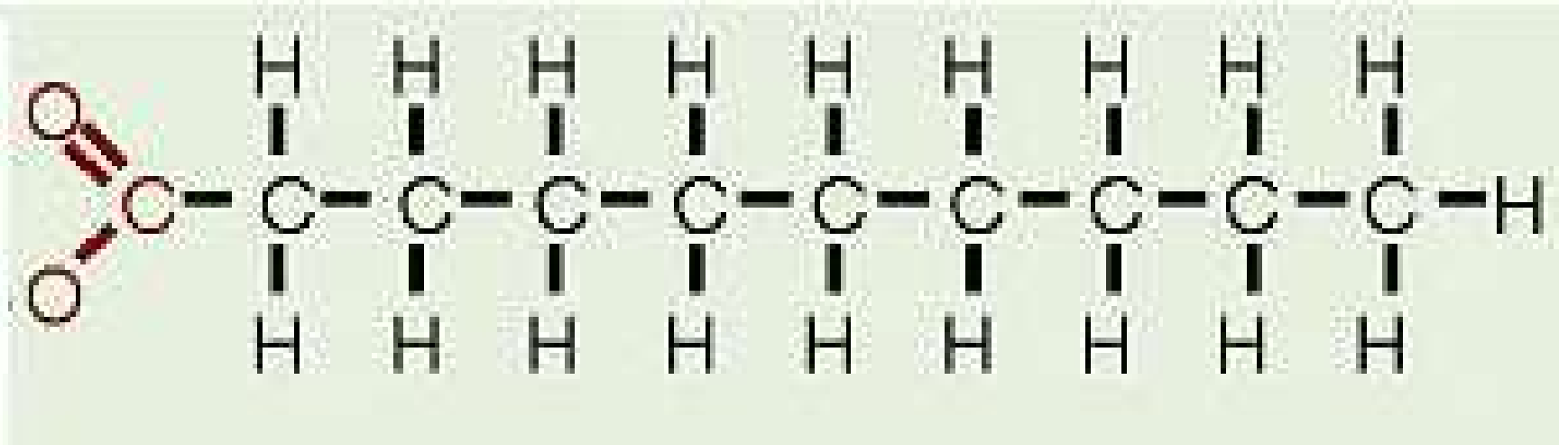


- **Fats and oils are made from two kinds of molecules: glycerol and three fatty acids.**
- **The main distinction between fats and oils is whether they're solid or liquid at room temperature.**
- **Fats animal source solid at room temp.**
- **Oils plant source liquid at room temp.**

Lipids



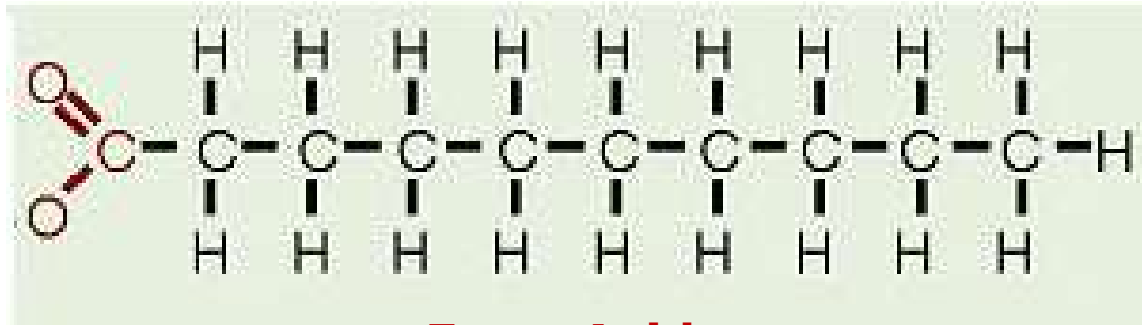
Glycerol



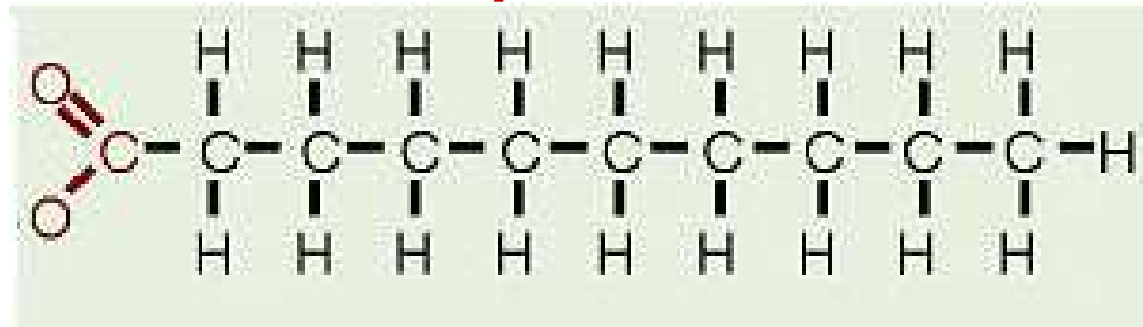
Fatty Acid



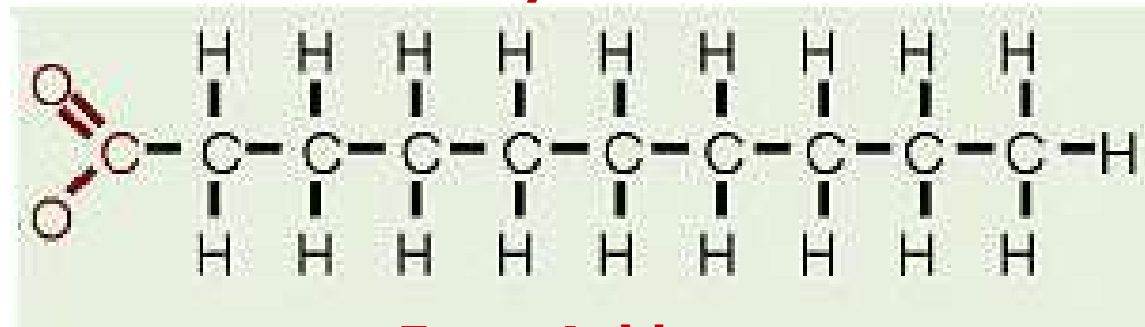
Glycerol



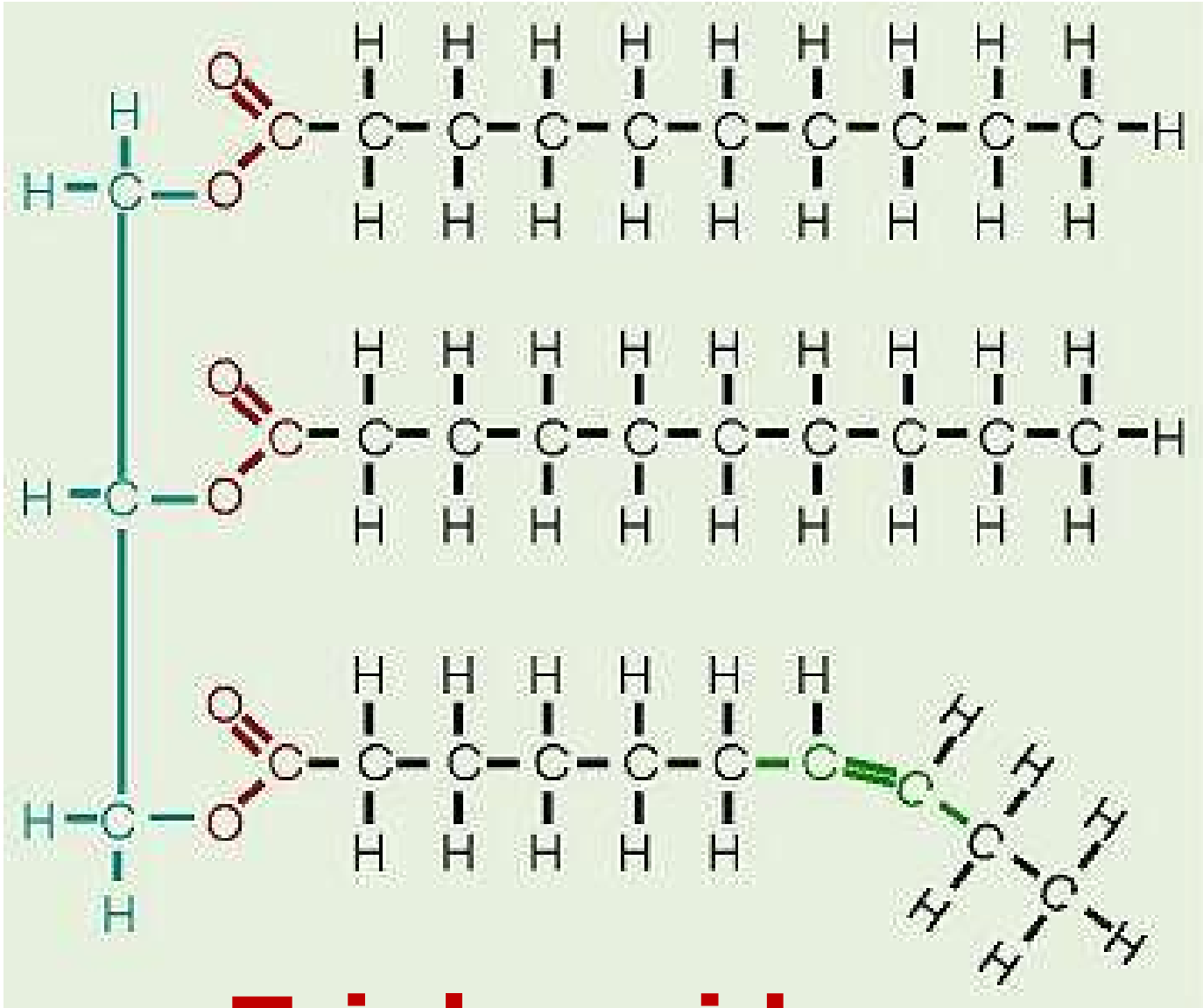
Fatty Acid



Fatty Acid

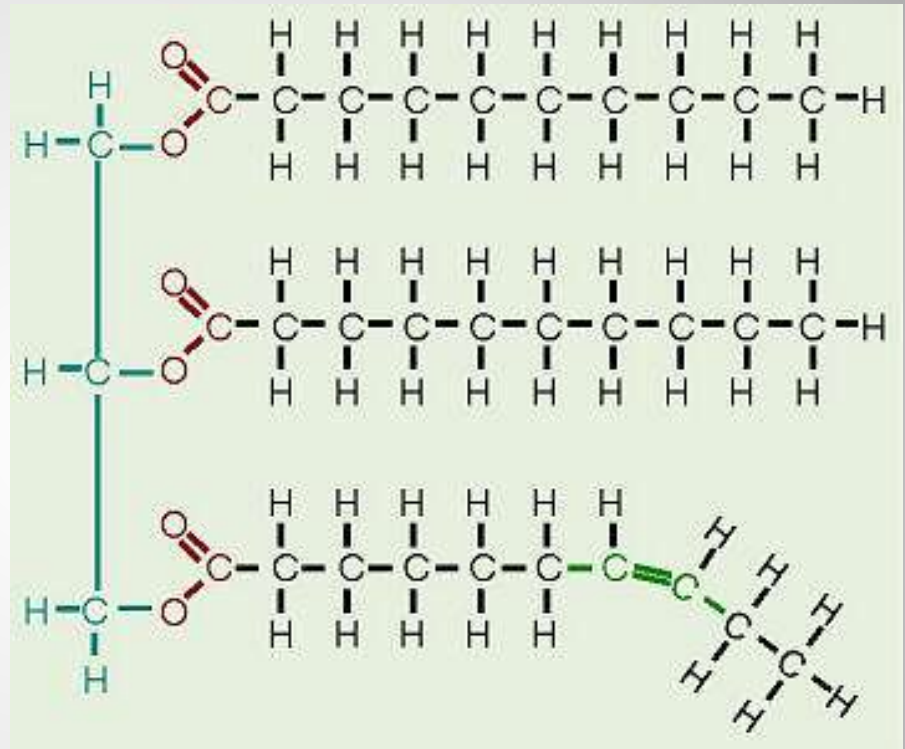


Fatty Acid



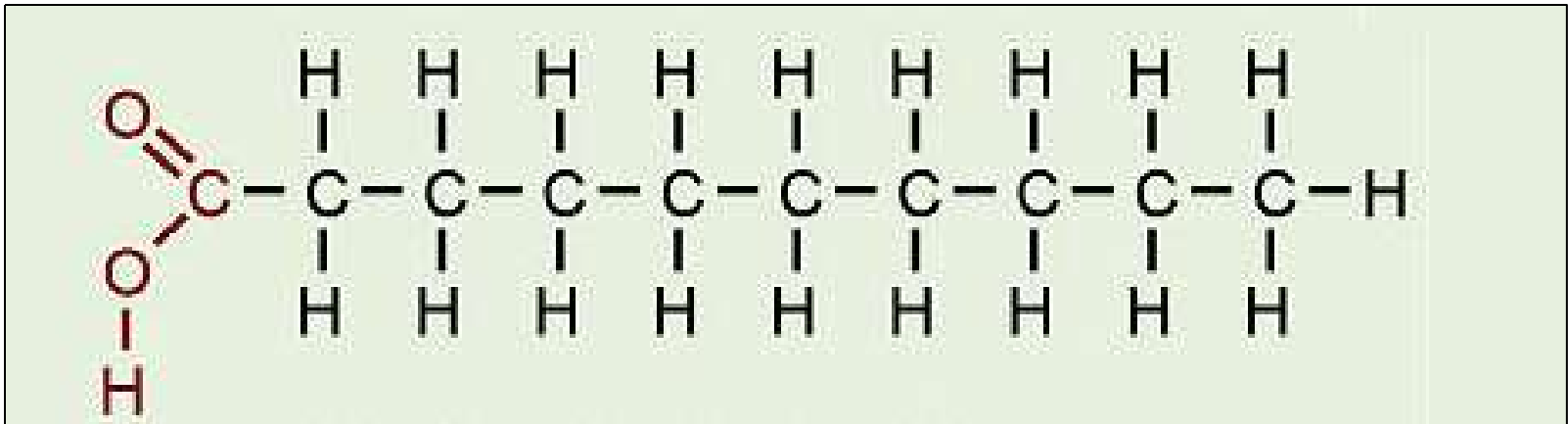
Triglycerides

- Three fatty acids bonded to Glycerol.
- Triglycerides are Energy-storage molecules.

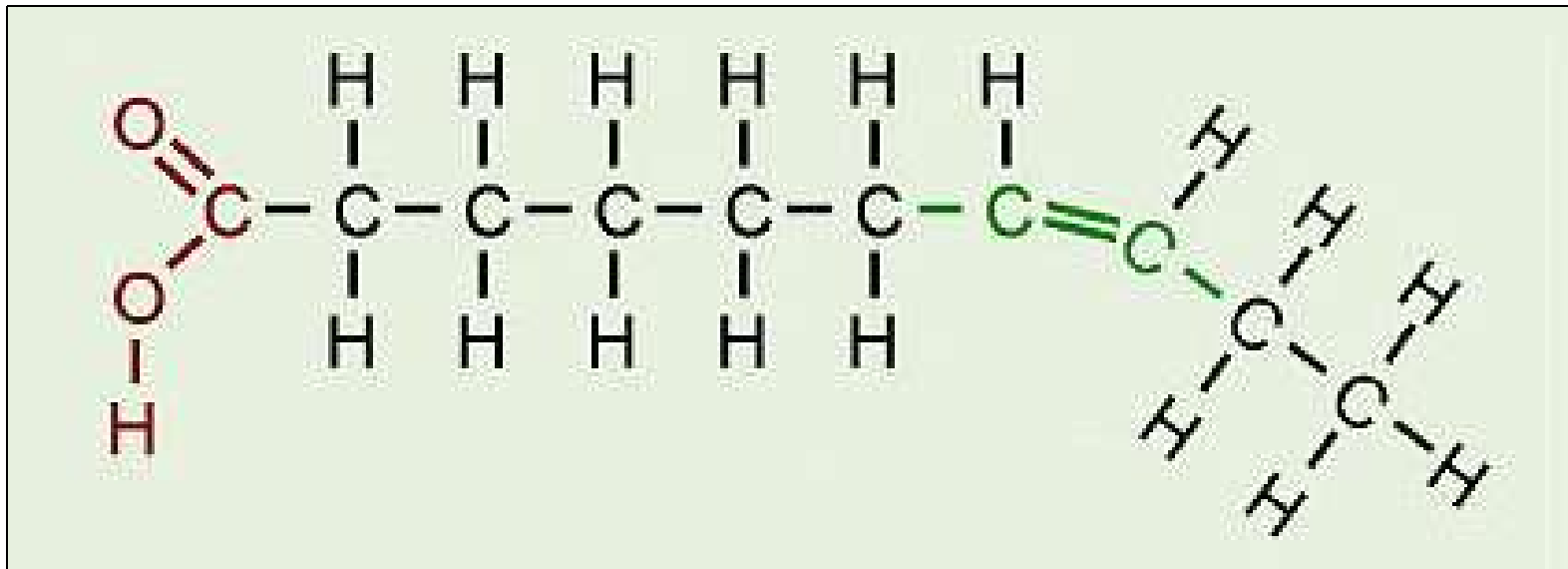


Triglycerides

Saturated Fat



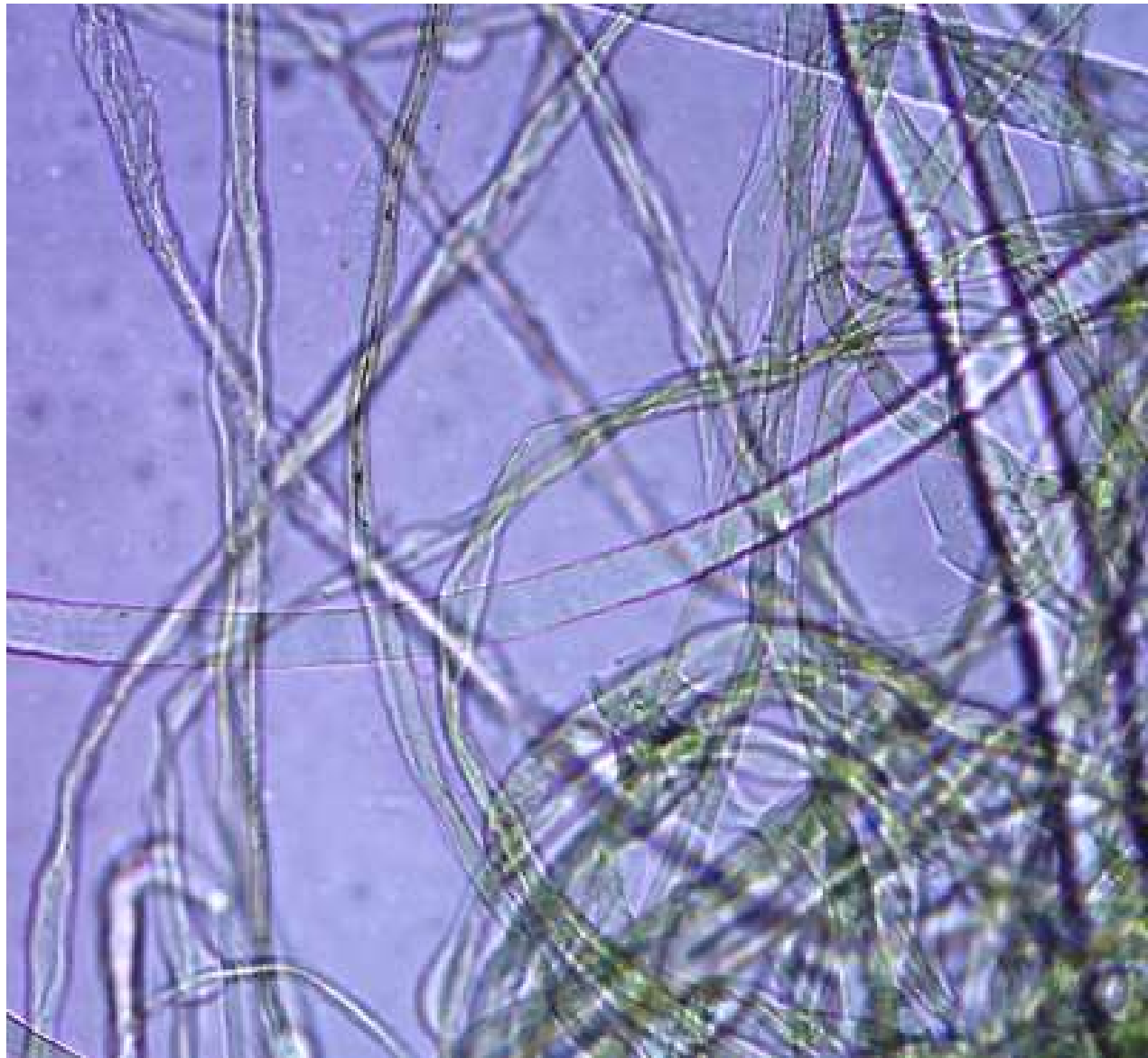
Unsaturated Fat

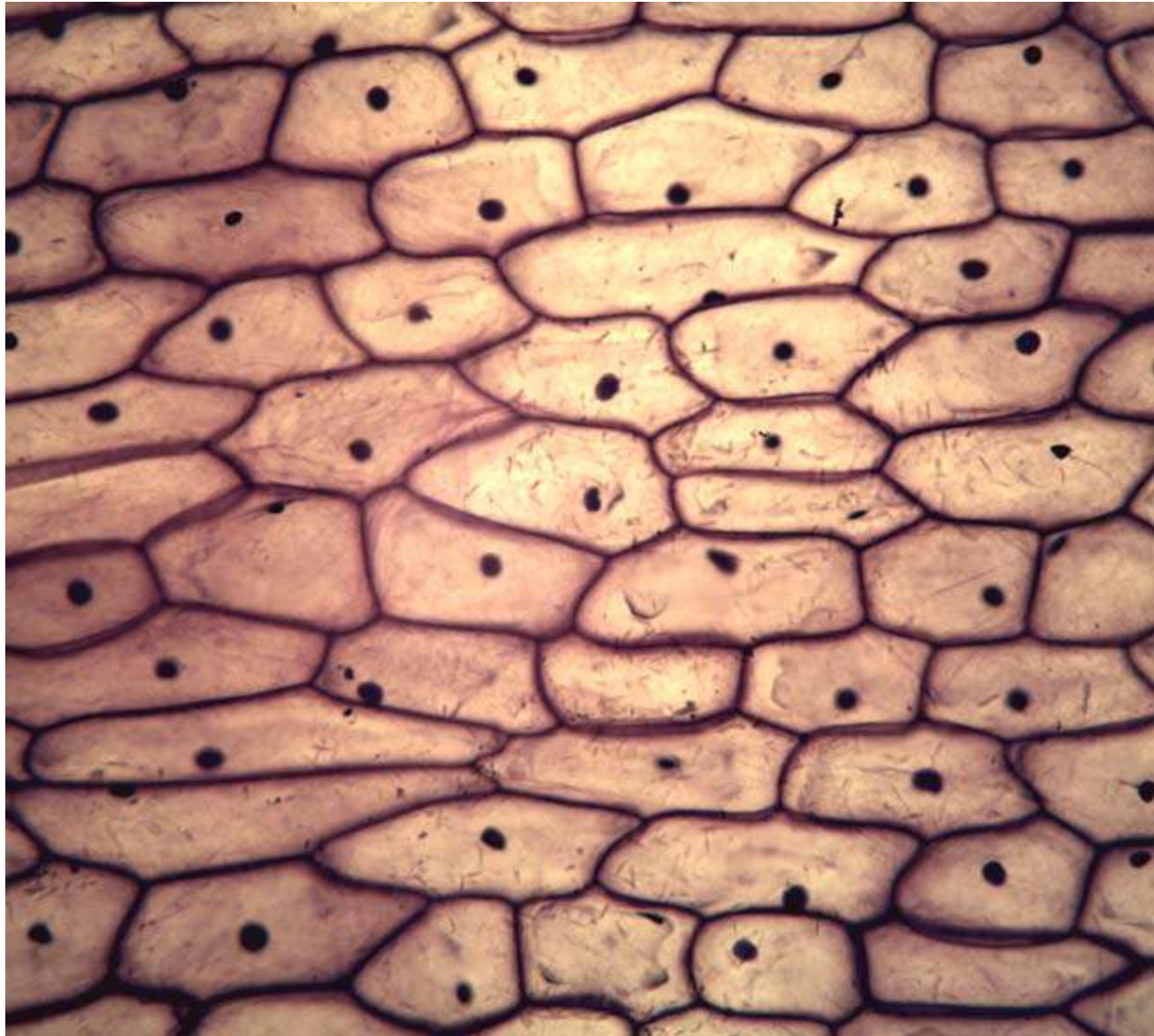


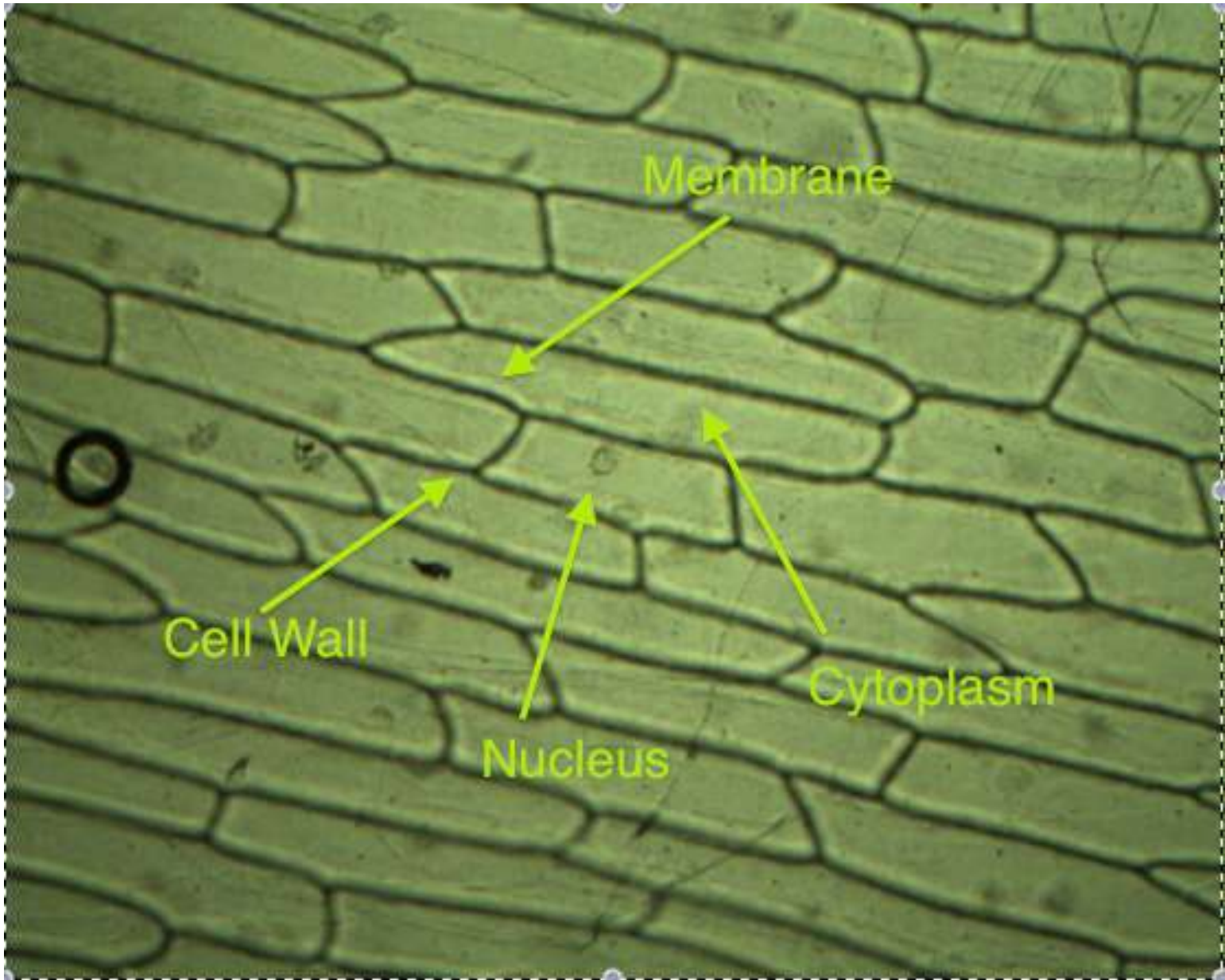


Any Questions?







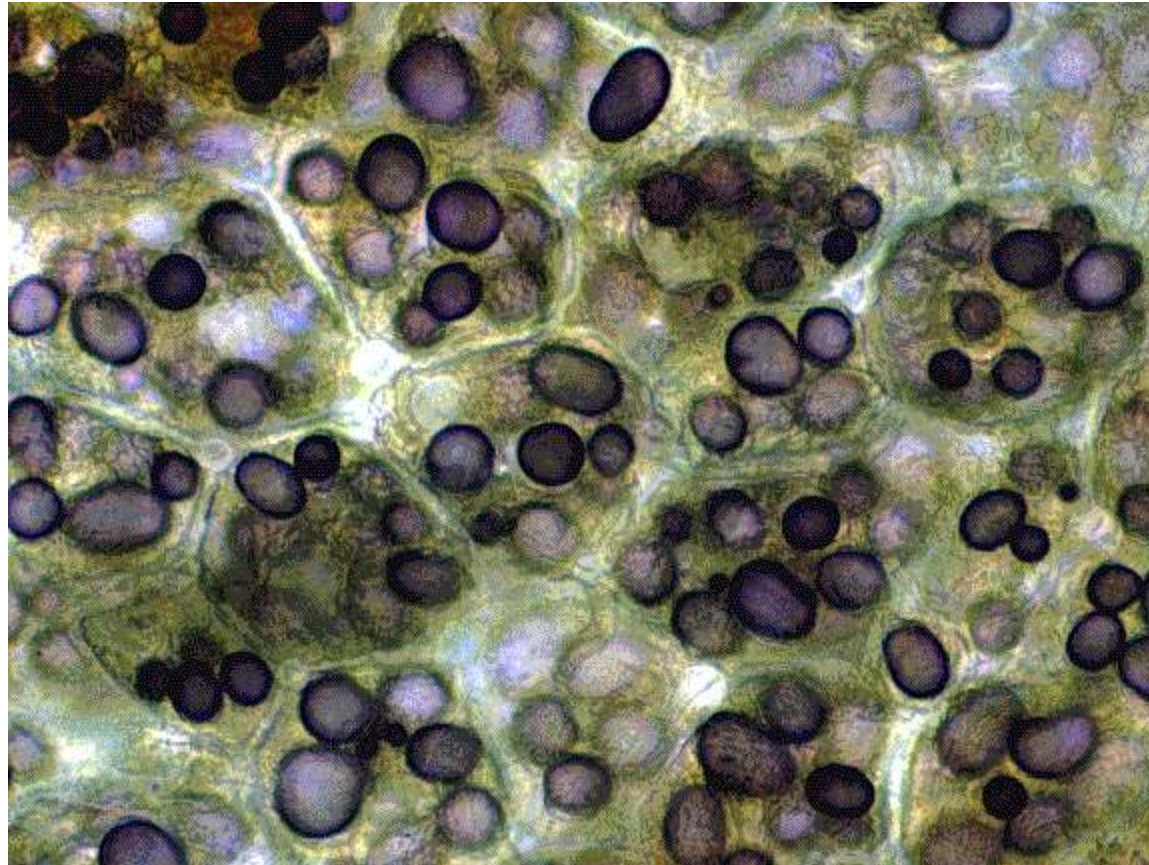


Membrane

Cell Wall

Nucleus

Cytoplasm



Starch Grains

