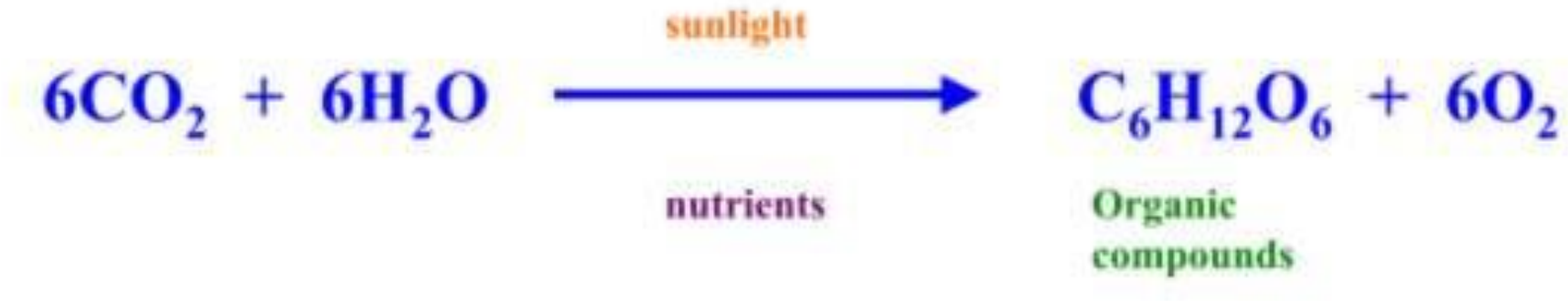
Carbohydrates

Structure and Function

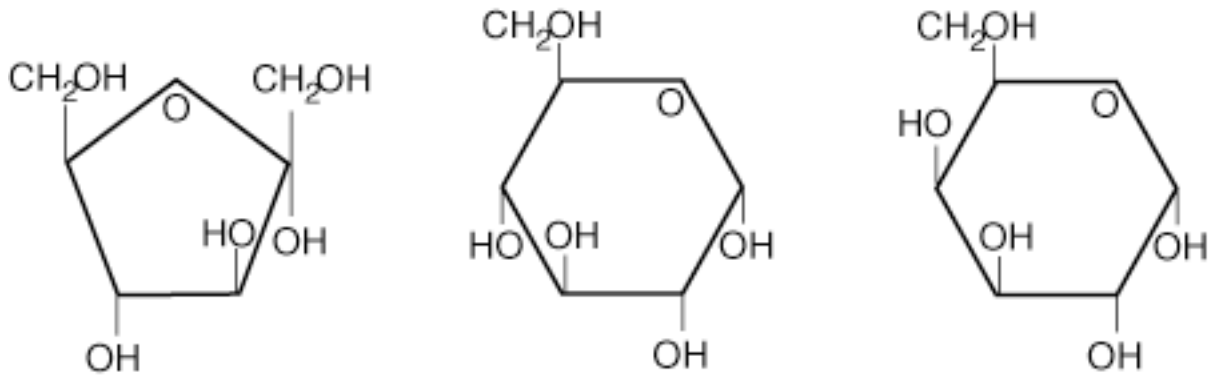
- Carbohydrates are composed of carbon, hydrogen and oxygen molecules
- The main function of carbohydrates is quick energy.
  - Can be converted to glucose quickly to be used by the body.
- Carbohydrates that are not used by our body are converted to fats.
- Glucose and glycogen are the carbohydrates that are predominantly found in the body

Where Does Glucose Come From?

- Photosynthesis
  - Energy is produced by the sun and absorbed by plants.
  - Plants also absorb Carbon Dioxide and Water from the environment
  - 6 Carbon Dioxide and 6 Water molecules are converted using energy to form 1 glucose molecule.



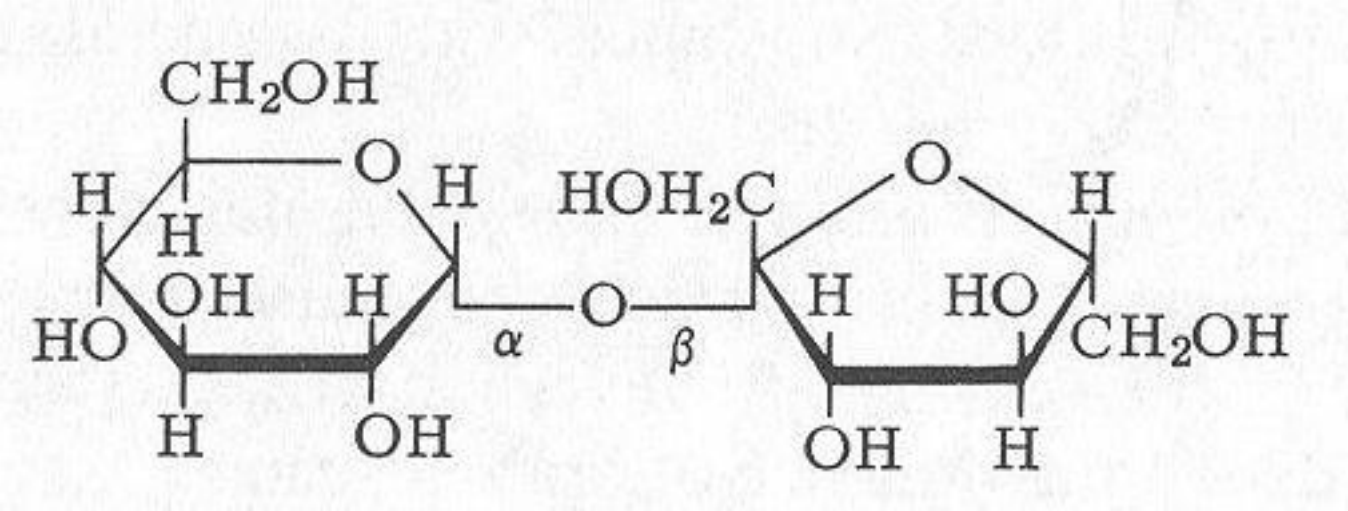
Monosacharides



Fructose Glucose Galactose

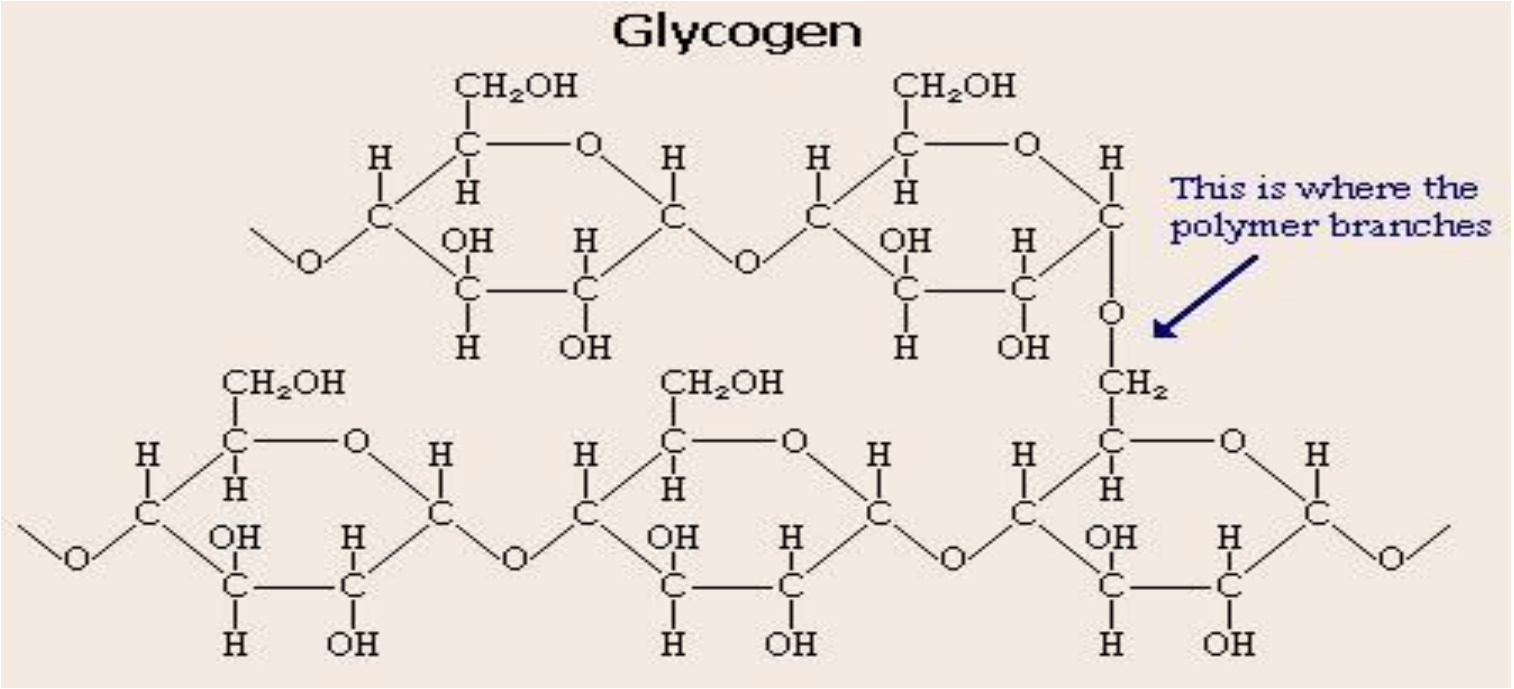
- Simplest carbohydrates – Consists of one sugar molecule.
- All carbohydrates break down into this form of energy
- Can be used immediately by our body
- Examples: Glucose, fructose and galactose

Disaccharides



- Simple carbohydrates – Consists of two sugar molecules.
- Small in nature and easy to digest.
- Found in fruits, vegetables, honey and maple syrup
- Examples: Sucrose, lactose, and maltose

Polysaccharides



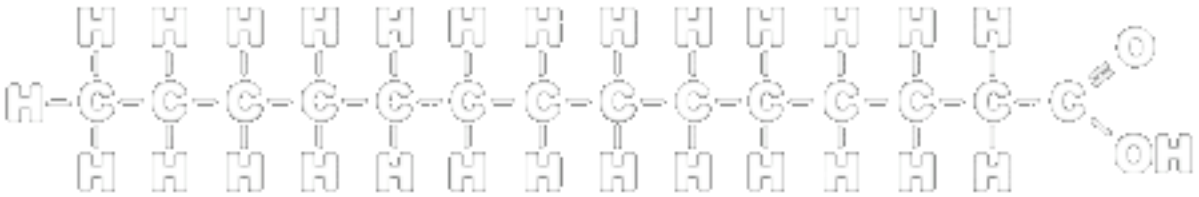
- Complex carbohydrates – Consists of many sugar molecules
- They are straight chains or branches of monosaccharides
- Take the longest to break down into monosaccharides
- Examples: Cellulose, glycogen, and starch

Fats and Oils

What are Fats?

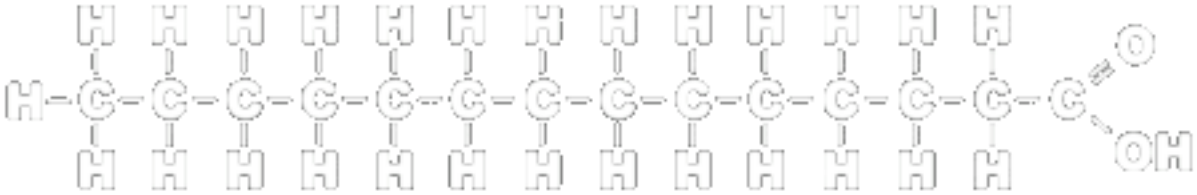
- Fats in the blood stream are known as Lipids and are a major cause of cardiovascular disease.
  - Eg. Triglycerides, cholesterol and phospholipids
- In a nutrition context, fats are energy containing nutrients in food.
- Fat is also used to describe the body's long term storage sites for fats, however the correct term for these sites is Adipose tissue.

Structure and Function



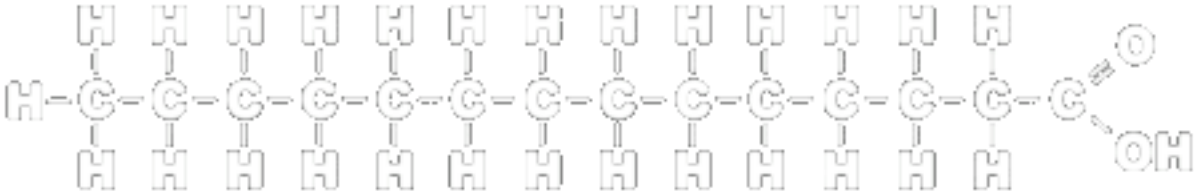
- Fats are chains of <u>carbon</u> molecules.
- The main function of fats is **<u>Stored Energy</u>.**
  - The human body stores fat so that we have a source of energy if we use all available carbohydrates.

Fatty Acids



- Chain of carbon and hydrogen ending with a **carboxyl** group (COOH) and the other end is a **methyl** or **omega** group (CH_3)
- Can have anywhere from 2-22 carbon atoms
- There are three types of fatty acids
  - 1.Saturated
  - 2.Monounsaturated
  - 3.Polyunsaturated

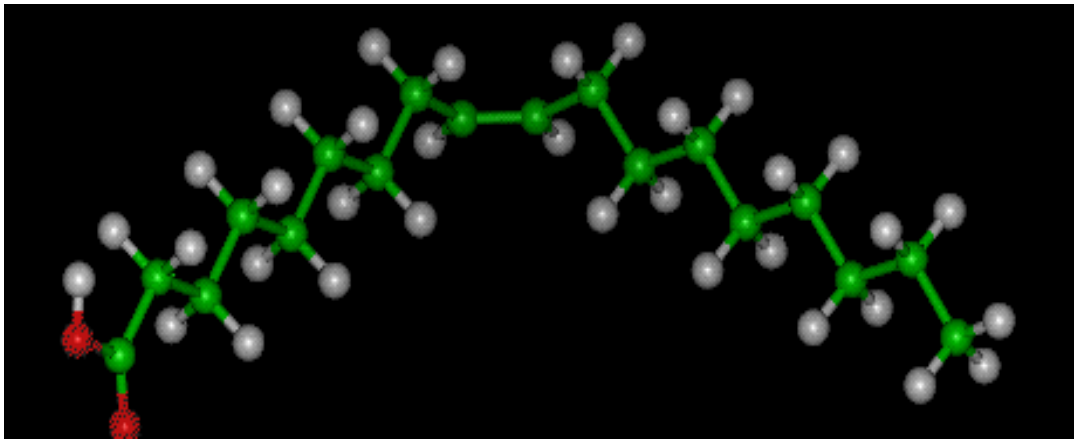
Saturated



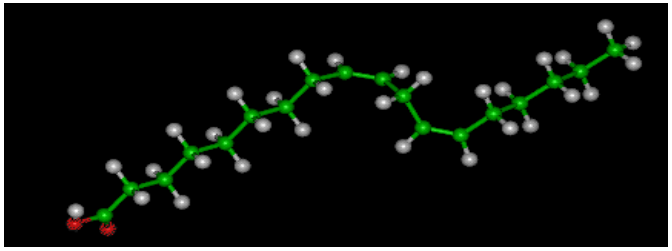
- Hydrogen is bonded to all the open binding sites
- Does not contain any double bonds
- Usually solid at room temperature
- Eg. Palmitic Acid

Monounsaturated

- One (mono) double bond between carbons
- Reduces the number of hydrogen atoms that can be bound to the molecule
- Unsaturated fatty acids are usually liquid at room temperature
- Eg. Oleic acid



Polyunsaturated



- More than one (poly) double bonds between carbons
- Can form up to 6 double bonds
- Number of hydrogen atoms that can bond is even less than monounsaturated.
- Eg. Linoleic acid (omega-6) and alpha-linoleic acid (omega-3)

Polyunsaturated

- Polyunsaturated fats can further be classified by how far the double bond is away from the methyl or omega end of the fatty acid.
  - Omega-3: double bond between the 3rd and 4th carbon
  - Omega-6: double bond between the 6th and 7th carbon

Transfatty Acids

- Created by a process called hydrogenation
- Hydrogenation:
  - Converts unsaturated (liquid) fatty acids into saturated (solid) fatty acids.
  - Scientists break double bonds between carbons so they can add more hydrogen
- Why? To increase the shelf life of the product! $$$!

Triglycerides

- Nearly 95% of all fat consumed is in the form of triglycerides
- Composed of 3 fatty acids and a glycerol
- Can contain saturated, and unsaturated fatty acids so they are grouped according to the predominant fatty acid.
  - Eg. If a triglyceride is 62% saturated then it is a saturated triglyceride.

Proteins

Structure and Function

- Proteins are groups of Amino Acids that are bonded together by a peptide bond.
- Contain hydrogen, oxygen, carbon and **nitrogen**
- The main function of proteins is to build and maintain tissues.
- Can also be used for energy but ONLY if carbohydrate and fat stores are depleated.

Amino Acids

- Amino acids are the building blocks of protein.
- There are 20 different amino acids.
- 2 types
  - Essential Amino Acids
  - Non-essential Amino Acids
- Essential amino acids are the acids that you must consume in your diet
  - 8 amino acids
- Non-essential amino acids are the ones your body can produce
- 12 amino acids

Kinds of Proteins

- Transport – located in cell membranes
- Enzymes – break/put molecules together
- Antibodies – help fight diseases
- Contractile – help cells move (flagella)
- Hormones – regulate other molecules (insulin)
- Extra Storage – reserve of metal ions and amino acids (egg whites)
- Receptors – cell communication
- Structural – cytoskeleton, keratin

Nutrition

- Over half of the nutrients in our diet, should be proteins.
- Sources of proteins:
  - Meat
  - Fish
  - Eggs
  - Nuts
  - Beans