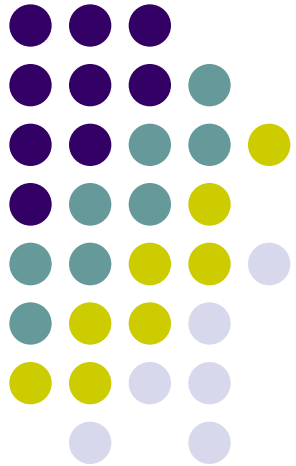
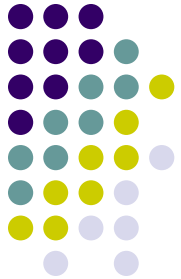
Carbon Compounds

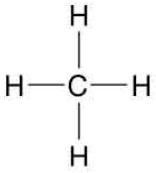
Chapter 2-3



Organic Chemistry

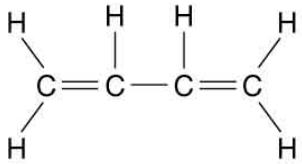


- Study of carbon compounds
- Carbon has 4 valence electrons
- Each carbon atom can form 4 covalent bonds
- Bonds with many elements
- Can bond to other carbon atoms
- Forms long chains, rings, branching structures
- No other element can form as many different types of molecules

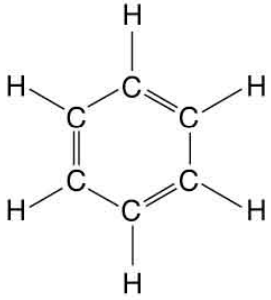


Methane

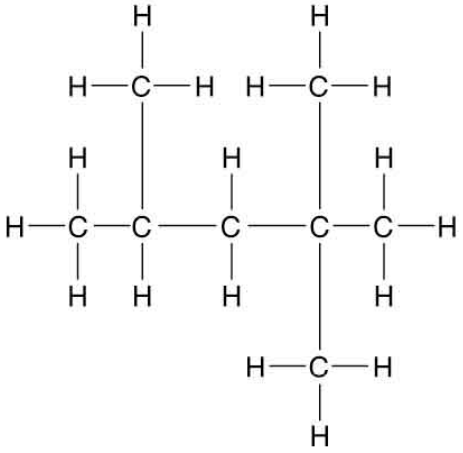
Acetylene



Butadiene



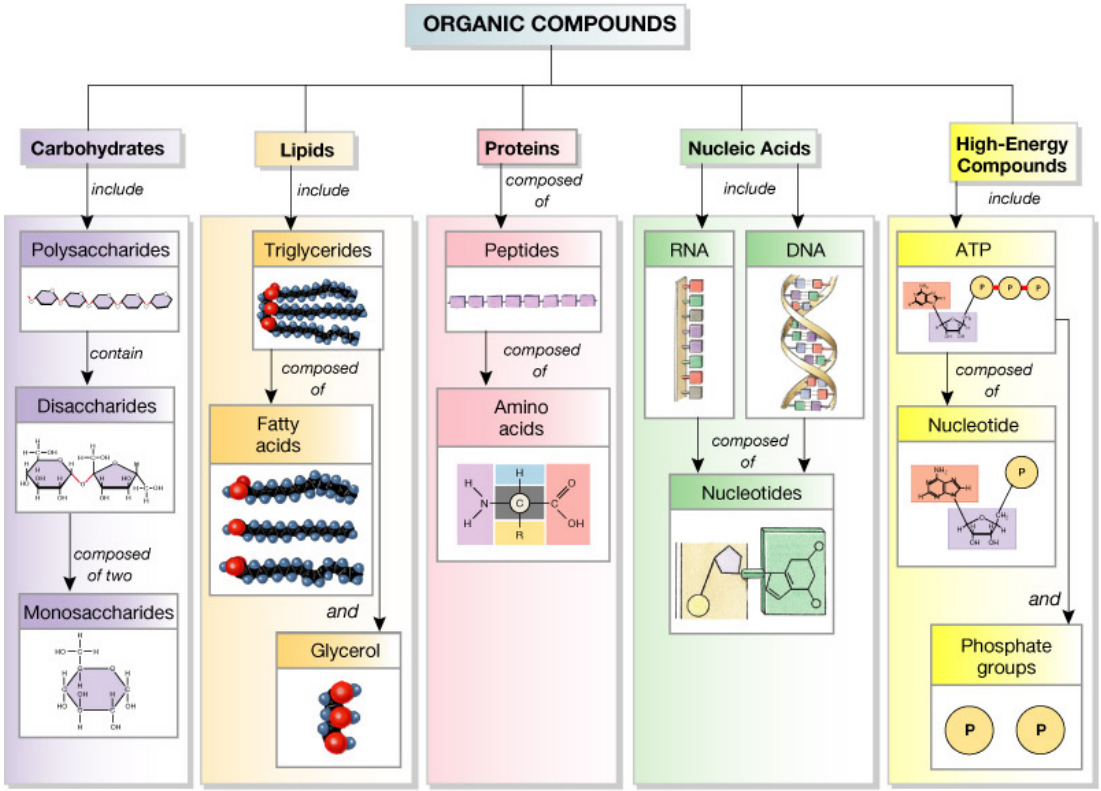
Benzene



Isooctane

Macromolecules

- Very large molecules
- Formed from thousands of smaller molecules



Polymerization

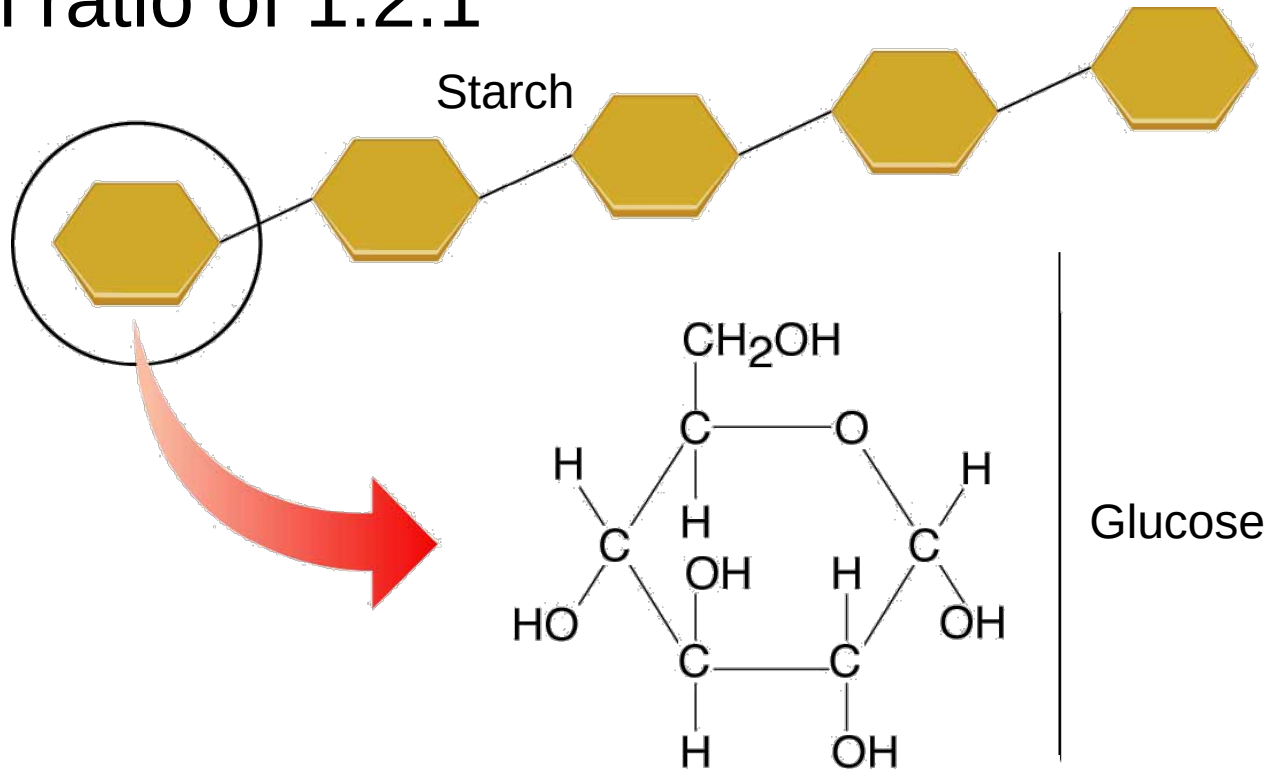
- Process in which smaller molecules are joined together to make bigger molecules
- Monomers – smaller units
  - Like the beads on a necklace
- Polymers – chain of monomers
  - Like the entire necklace

Organic Macromolecules

- 4 major groups
- Carbohydrates
- Lipids
- Nucleic acids
- proteins

Carbohydrates

- Made of carbon, hydrogen and oxygen
- Usually in ratio of 1:2:1



Simple Carbohydrate

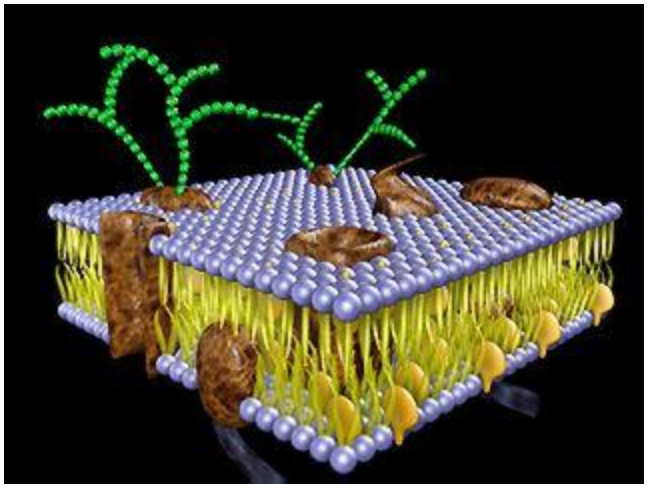
- Sugar monomer (glucose, fructose, sucrose)
- Monosaccharide
- Main source of energy for all living things
- Immediate energy

Complex Carbohydrate

- Polysaccharides
- Polymer of sugar molecules
- Excess sugar is stored as starch
- Long term sugar storage
- Cellulose gives plants strength and structure
  - Wood, fiber

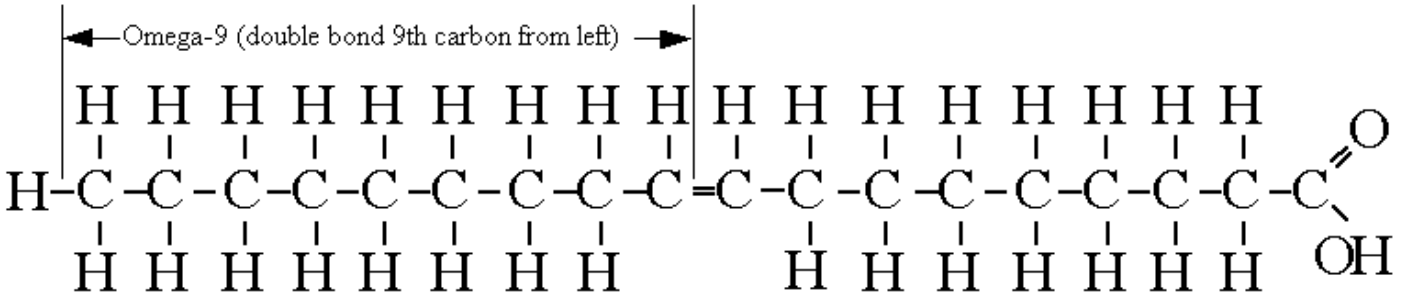
Lipids

- Fats, oils, waxes
- Carbon and hydrogen
- Store energy
  - Excess carbohydrates are changed into lipids
- Cell membranes

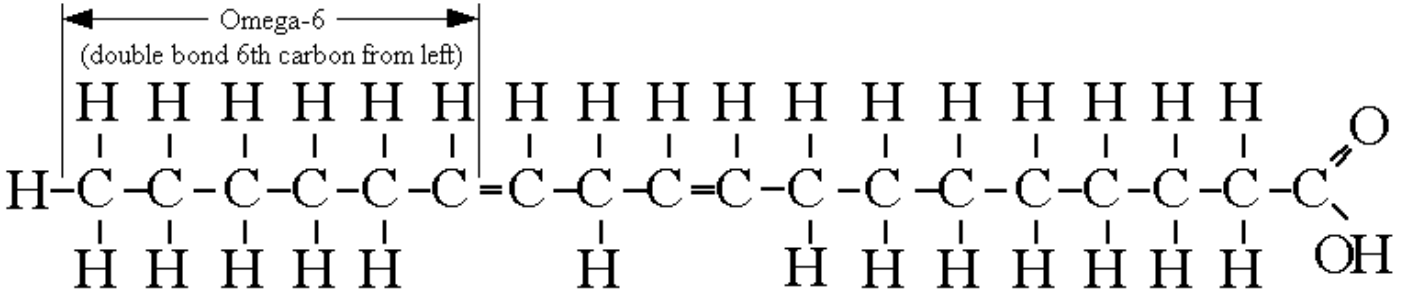


Lipid Polymer

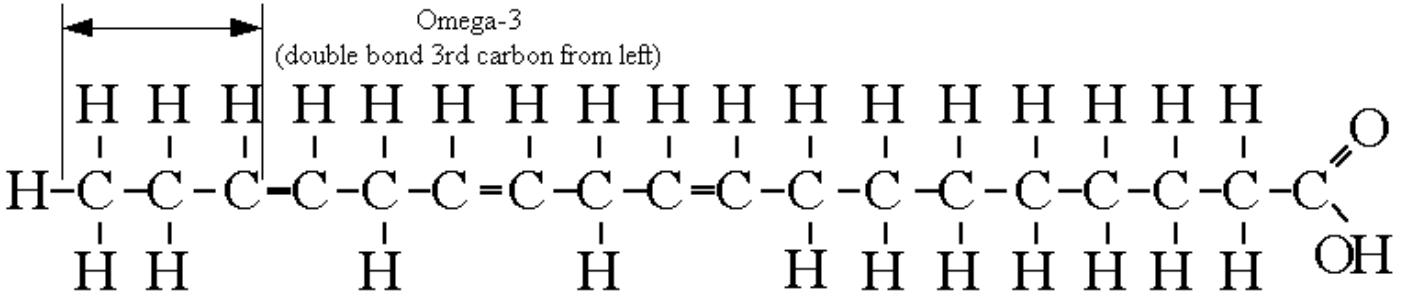
- Made from glycerol molecule and fatty acid chains
- Saturated
  - completely filled with hydrogen atoms
  - Tend to be solid at room temp
- Unsaturated
  - double bond
  - Liquid at room temp.



Oleic Acid (OA), monounsaturated = single carbon double bond



Linoleic Acid (LA), polyunsaturated = more than one double bond
An essential fatty acid



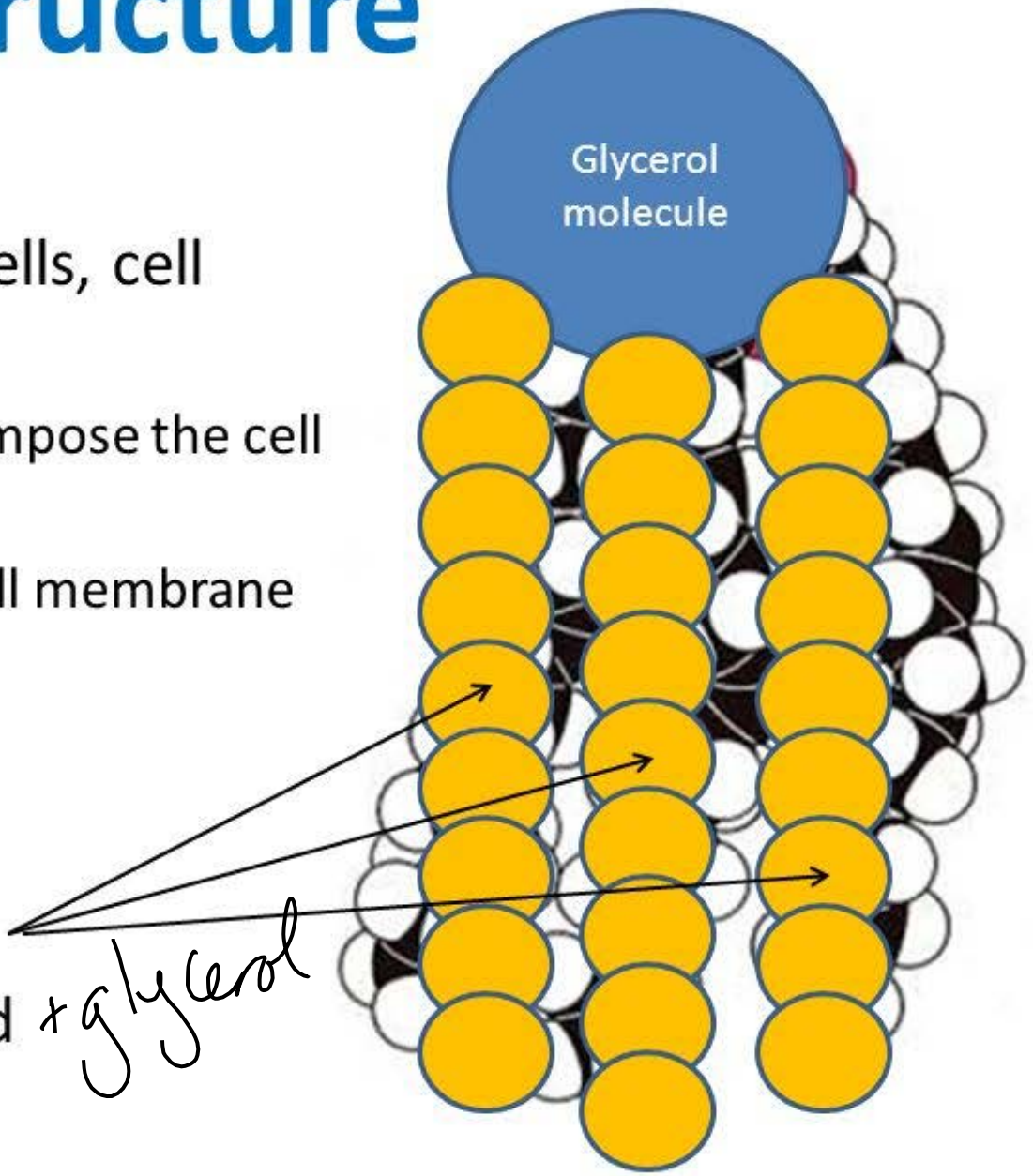
Alpha-linolenic Acid (LNA), polyunsaturated = more than one double bond
An essential fatty acid

H = Hydrogen Atom C = Carbon Atom O = Oxygen Atom

— = Single bond = = Double bond

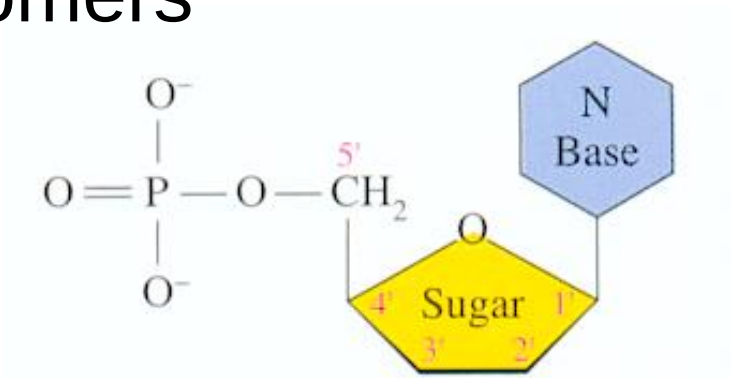
Lipid Structure

- Fats, Oils, Waxes
- Provide energy for cells, cell structure, insulation
  - Lipids & Proteins compose the cell membrane
  - Cholesterol: gives cell membrane flexibility
- Structure (2 parts):
  - "Head" = glycerol
  - "Tails" = fatty acids
- Monomer: Fatty Acid + glycerol
- Polymer: Lipid

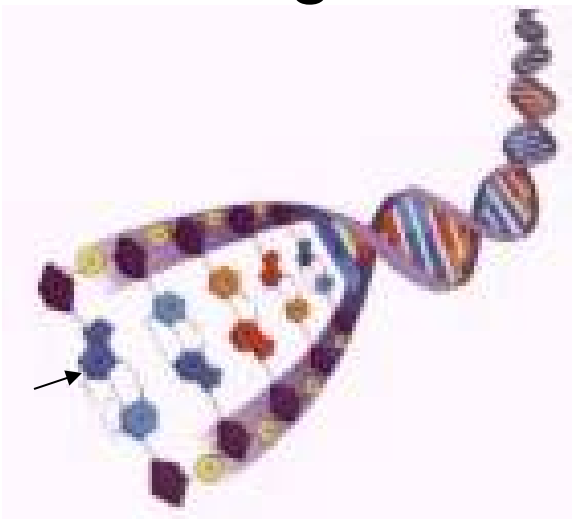


Nucleic Acids

- Made of nucleotide monomers
  - 5-carbon sugar
  - Phosphate group
  - Nitrogenous base



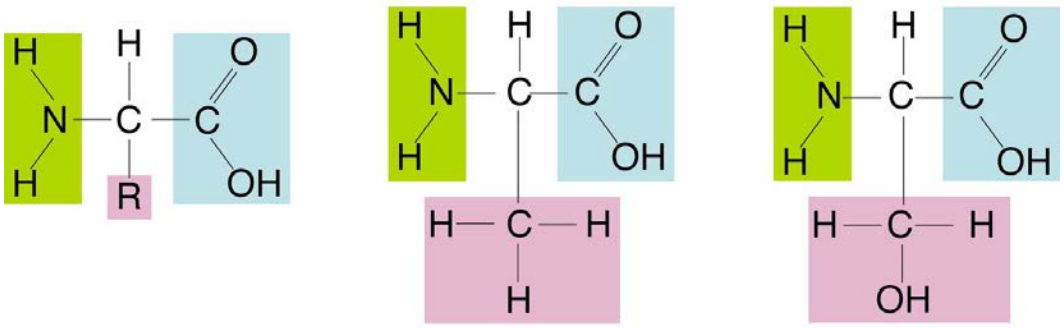
- Store and transmit genetic information
  - DNA
  - RNA



Nucleotides

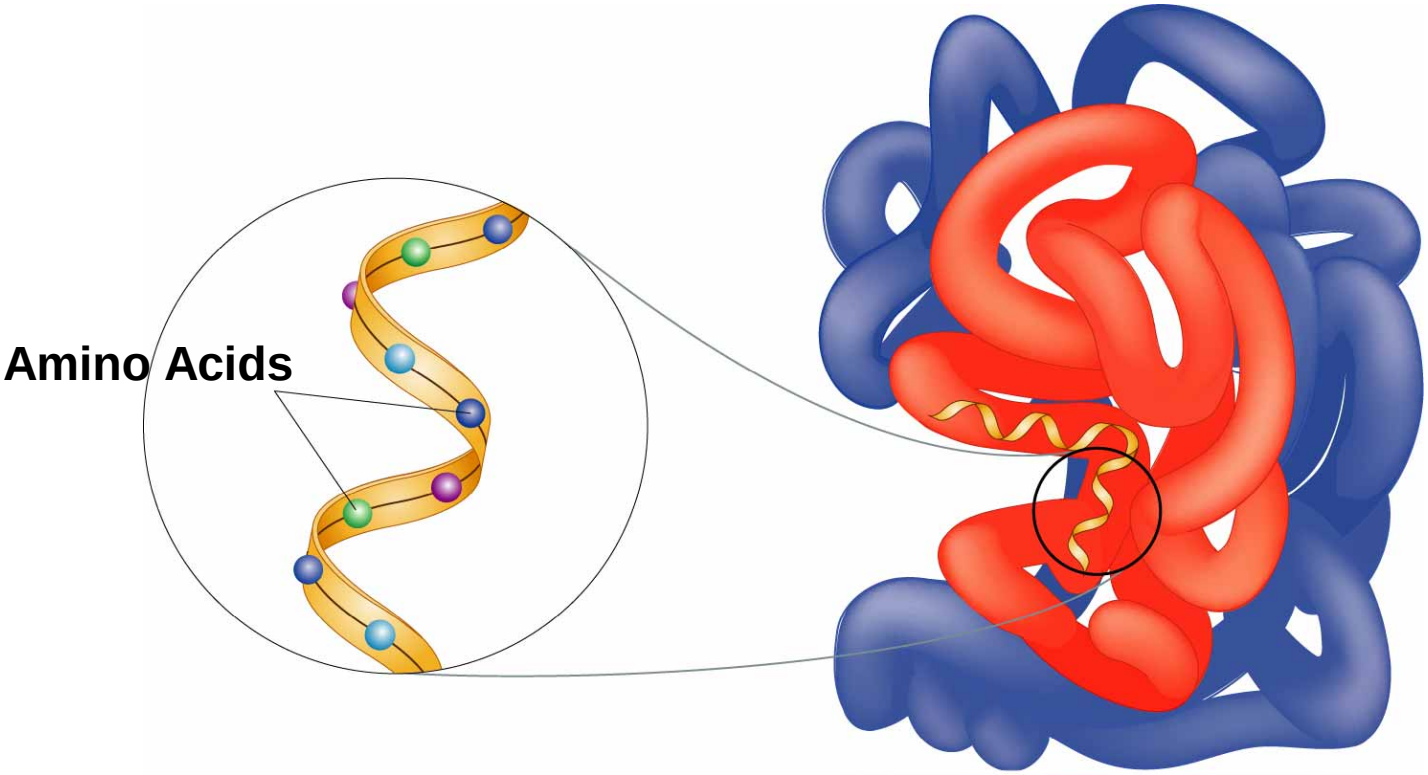
Proteins

- Made from amino acid monomers
- Control rate of reactions
- Regulate cell processes
- Form bones and muscles
- Transport substances in and out of cells
- Fight Disease



Protein Structure

- Primary – chain of amino acids
- Secondary – amino acids can be twisted
- Third – chain can be folded
- Fourth – Two or more proteins combined



Protein Structure