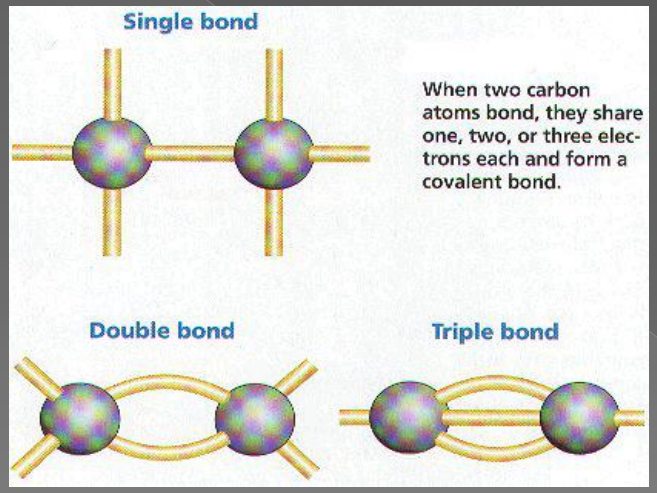
# Organic Compounds

Chapter 6 section 3

# I. Carbon

- Organic chemistry is the study of carbon compounds
- Most compounds that have carbon in them are organic (made by living things)
- Why Carbon?
  - 6 electrons – 2 in first energy level and 4 in second ***these are shared with other elements to form covalent bonds

# Bonds Carbon can make

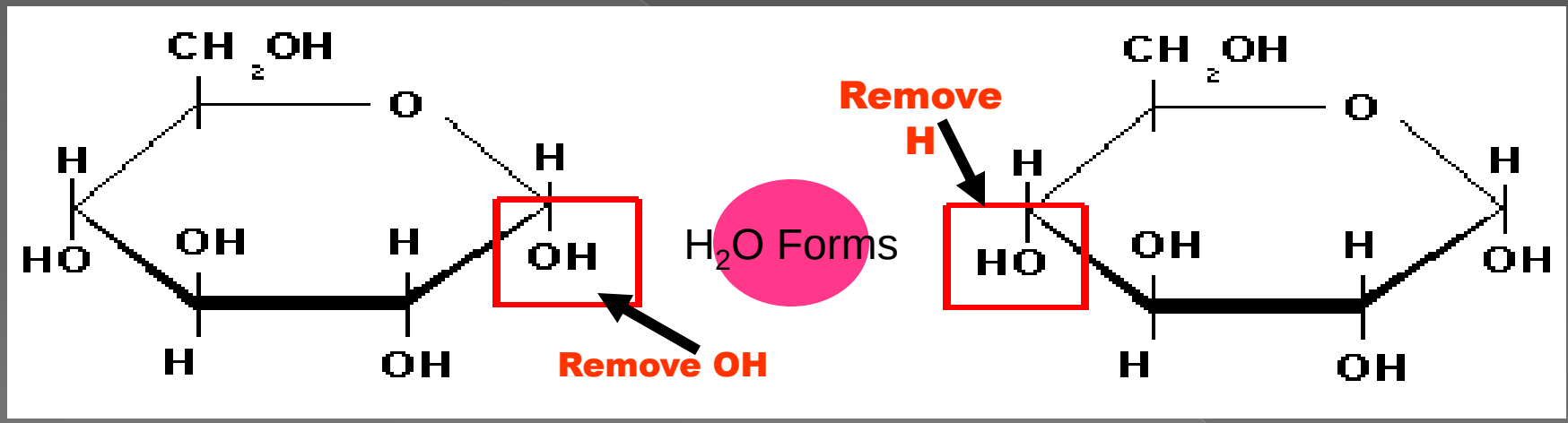


# II. Main Organic Molecules (4)

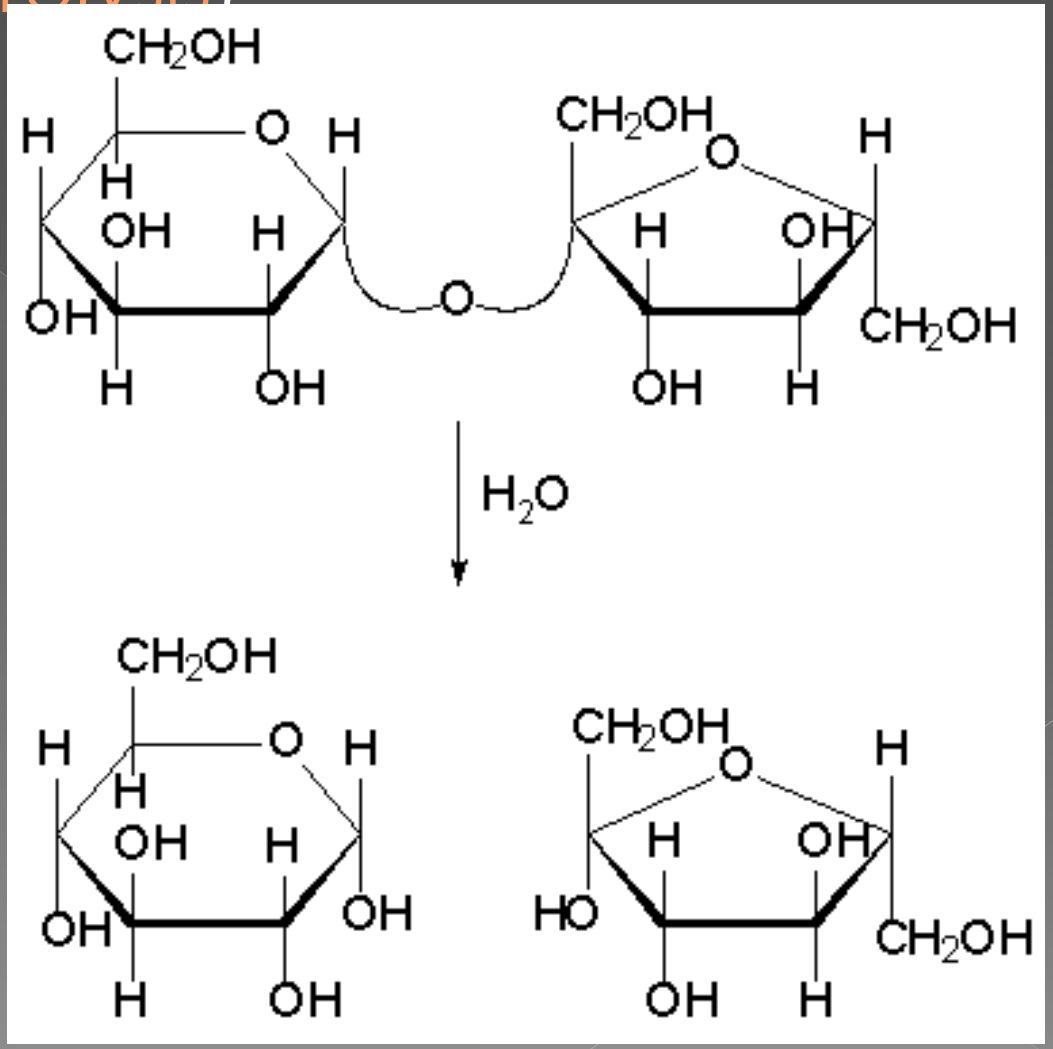
- Carbohydrates, Lipids, Proteins, and Nucleic Acids
- Some of these molecules are simple and some are complex
  - Monomers – simple, small molecules used as "building blocks" to make large molecules Examples: glucose and amino acids
  - Polymers – complex, large molecules made by monomers

# III. Making and Breaking Polymers

- Making polymers- water is removed between two monomers (Dehydration Synthesis)

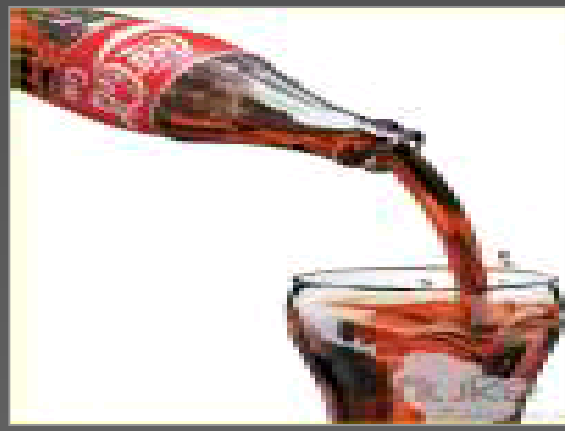


- Breaking down polymers – water is added to break bond between monomers (Hydrolysis)



# IV. Carbohydrates

- made of Carbon, Hydrogen (2) and Oxygen
- 1st choice of energy for the body
- Not stored in the body (converted to fat)



Include:

- Small sugar molecules in s drinks
- Long starch molecules in and potatoes

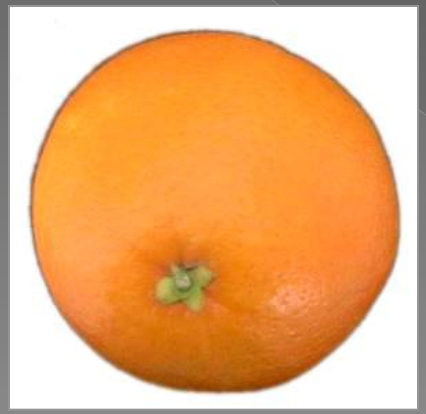
# Monosaccharides: Called simple sugars

- **Include glucose, fructose, & galactose**

**Glucose is found in sports drinks**


**Honey contains both glucose & fructose**

**Fructose is found in fruits**



**Galactose is called "milk sugar"**

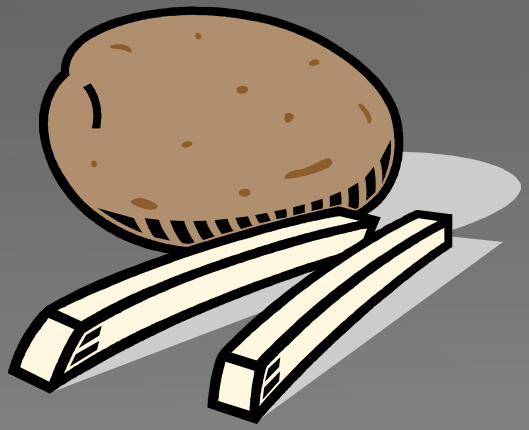
- Disaccharides: A disaccharide is a polymer (2 sugars)
  - They're made by joining two monosaccharides (dehydration)

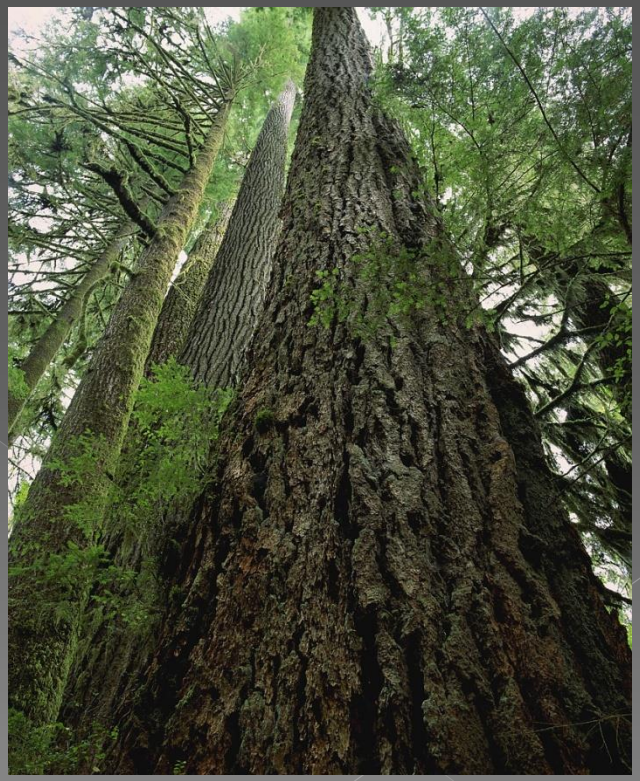
**Sucrose (table sugar)**

**Lactose (Milk Sugar)**

- **Polysaccharides:** Composed of many sugar monomers linked together
  - Complex carbohydrates

**Starch**





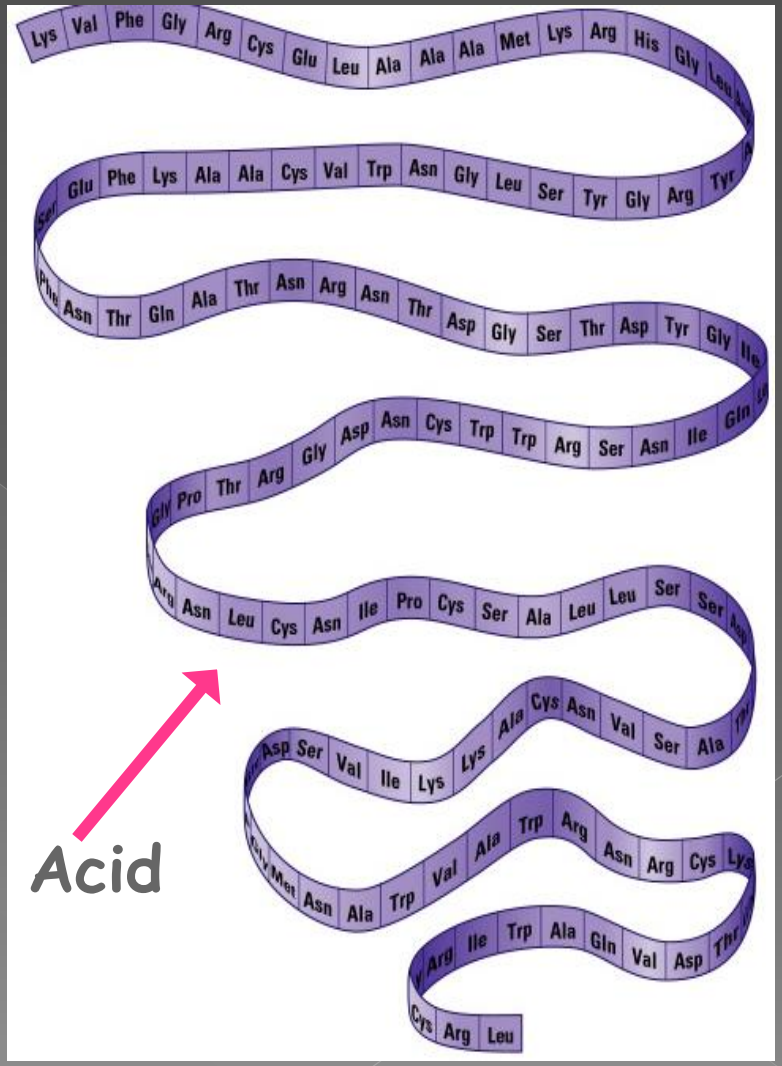
**Cellulose**

# V. Proteins

- Made of carbon, hydrogen, oxygen and nitrogen
- Polymers made of monomers called amino acids
  - All proteins are made of 20 different amino acids linked in different orders
- Proteins are used to build cells, make hormones & enzymes

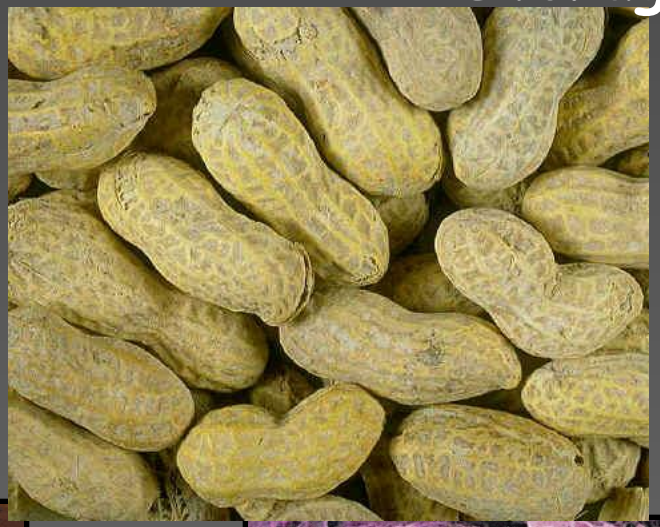
# Primary Protein Structure

The primary structure is the specific sequence of amino acids in a protein



# Four Types of Proteins

Storage



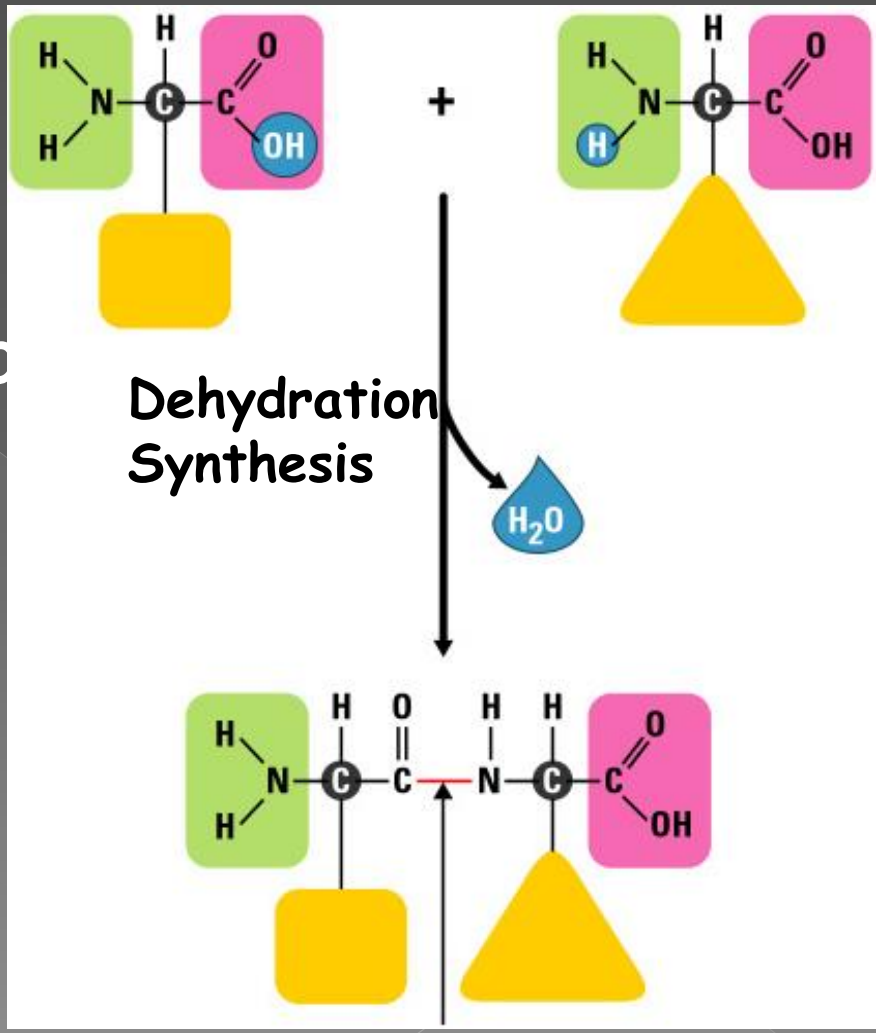
Structural

Contractile

Transport

# Linking Amino Acids

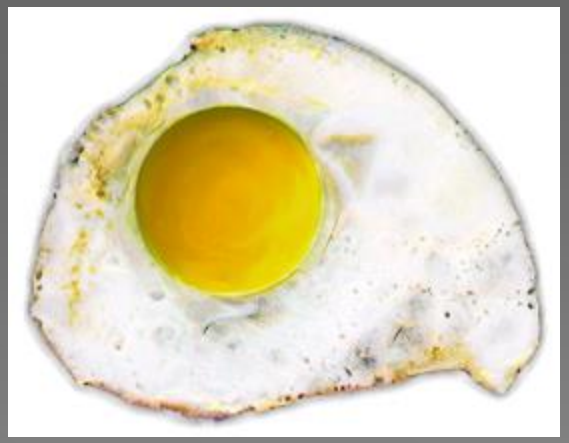
- Cells link amino acids together to make proteins
- **Peptide bonds** form to hold the amino acids together



# Denaturating Proteins

**Changes in** temperature & pH can denature (unfold) a protein so **it no longer works**

**Cooking denatures protein in eggs**



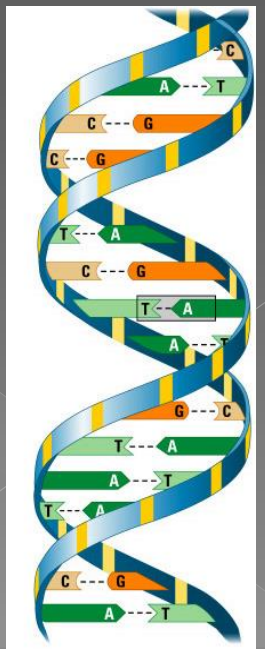
**Milk protein separates into curds & whey when it denatures**

# VI. Lipids

- Made of Carbon, Hydrogen and oxygen
- Fats, oils, waxes and steriods
- Do NOT dissolve in water
- Used for energy storage, cell membranes, steroids and waterproofing (birds and plants)
- Triglyceride is the monomer


# VII. Nucleic acids

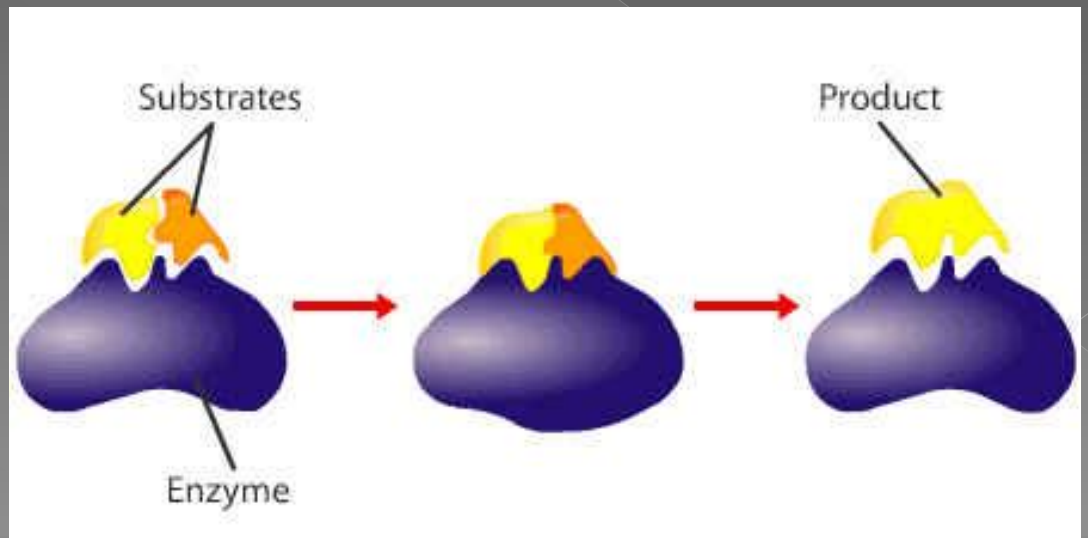
- Made of Carbon, Hydrogen, oxygen, Nitrogen and Phosphorus
- Hereditary information
- Monomer is a nucleotide (sugar, nitrogen base and phosphate)
- DNA and RNA



# VIII. Other Important Factors

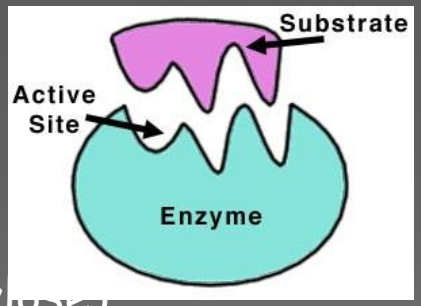
- Water is crucial for life
  - 3 uses: cooling, chemical bonds and removing waste
- Vitamins and Minerals
  - Vitamins used for growth and tissue repair
    - Example: Vitamins A,B and C
  - Minerals used to form different cell parts
    - Examples: Iron, Magnesium, Iodine and Sodium

- Enzymes are an important class of catalysts (speed up chemical reactions) in living organisms
  - Mostly protein
  - Thousands of different kinds
  - Each specific for a different chemical reaction (Lock and key)
  - Enzymes are reusable (not used up in rxn)!



# Enzymes, contd

- REQUIRED by all CHEMICAL PROCESSES in organisms (respiration, growth, photosynthesis, movement, etc.)
- They CONTROL the rate of METABOLIC (chemical reactions) in the body
- They lower ACTIVATION ENERGY (energy needed to start a reaction)
- They act on reactants called SUBSTRATES
- ACTIVE SITE is where the substrate TEMPORARILY fits into the active site during the metabolic reaction
- INHIBITORS like poisons can BLOCK ACTIVE SITES
- MANY have an –ASE ending
  - Sucrose (table sugar) – SUCRASE
  - Lipids (fats & oils) – LIPASE
  - Proteins – PROTEASES
  - AMYLASE in human saliva breaks down starch (amylose)



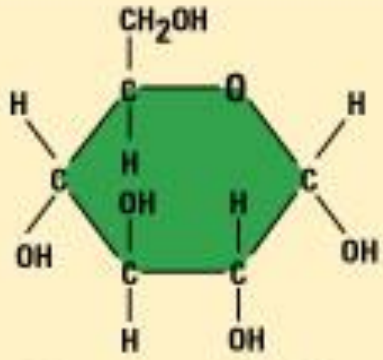
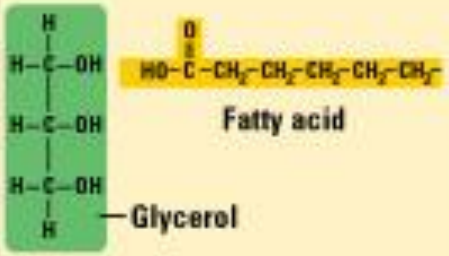

- PRODUCED NATURALLY by ALL organisms (bacteria, protists, fungi, plants, and animals)
- WITHOUT ENZYMES, OUR INTESTINES WOULD TAKE WEEKS TO DIGEST OUR FOOD, OUR MUSCLES, NERVES AND BONES WOULD NOT WORK PROPERLY, AND SOON DEATH WOULD RESULT!

# Biochemical Reactions

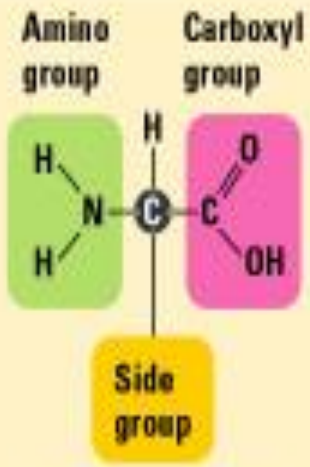
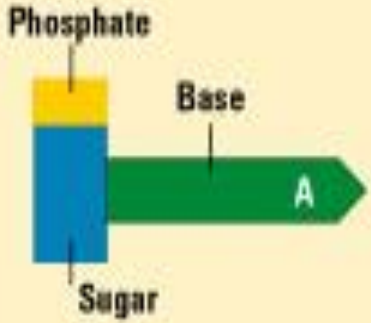
- 3 factors to affect biochemical reactions
  - **pH**- small changes in pH can disrupt cell processes
  - **Temperature-** gaining or losing heat energy
  - Enzymes

# Summary of Key Concepts

# Macromolecules

| Biological macromolecule | Function | Monomer | Examples |
|---|---|---|---|
| Carbohydrates | Dietary energy; storage; plant structure |  Monosaccharide | Monosaccharides: glucose, fructose. dissaccharides: lactose, sucrose. Polysaccharides: starch, cellulose. |
| Lipids | Long-term energy storage (for fats); hormones (for steroids) |  Components of a fat molecule | Fats, oils, steroids |

# Macromolecules

| | | | |
|---|---|---|---|
| **Proteins** | **Enzymes, structure, storage, contraction, transport, etc.** |  **Amino acid** | **Lactase (an enzyme), hemoglobin** |
| **Nucleic acids** | **Information storage** |  **Nucleotide** | **DNA, RNA** |