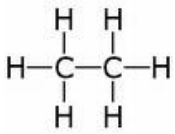
Biological Chemistry Review

Covalent bond - equal sharing of electrons (example: C—C)
Ionic Bond - created when one atom donates an electron to another (example: Na^+Cl^-)
Hydrogen Bond - is created between polar molecules due to the unequal sharing of electrons (example: H_2O =the H are partially + and the O is partially negative)

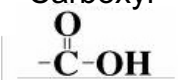
Molecular Formula **Structural Formula**

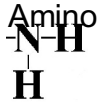
C_2H_6



Functional Groups:

Hydroxyl Carboxyl Amino Sulfhydryl





Polar vs Non-Polar

Why do molecules with a hydroxyl side group dissolve in water?

Polymers - are large molecules made by joining smaller subunits (monomers)
anabolism - building up polymers by dehydration synthesis (removing H_2O)
catabolism - breaking down polymers by hydrolysis (adding H_2O)

CARBOHYDRATES

- short term energy storage
- monomers are monosaccharides
- disaccharides are double sugars

- **Maltose** = 2 α glucose molecules
- **Polysaccharides**
- Storage - starch in plants
  - glycogen in animals (stored in muscle and liver)
- Structural - cellulose in plants (cell walls)
  - chitin in animals (exoskeleton of arthropods)

LIPIDS

- long term energy storage
- hydrophobic behaviour based on molecular structure (non-polar)
- **Tryglicerides** - 3 fatty acids + glycerol
- **saturated** fatty acids (no double bonds) pack tightly together; solid at 20°C
- **unsaturated** fatty acids (with double bonds) have kinks that prevent them from packing close together; liquid at 20°C
- **Phospholipids** - have two fatty acids (non-polar tails) and a hydrophillic head
- **Steroids** - consist of 4 carbon rings - cholesterol and sex hormones
- **hydrogenation** - adding Hydrogen to covert unsaturated to saturated fats

NUCLEIC ACIDS

- polymers of **nucleotides** (monomers)
- The sugar and phosphate form the backbone of DNA and RNA

DNA	RNA
- is double stranded - double helix - ATCG	- is single stranded - structure is determined by DNA - AUCG

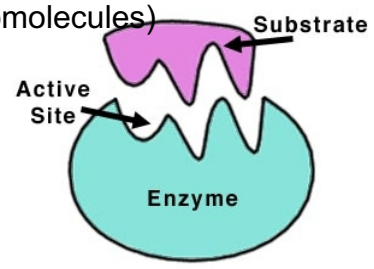
- Complimentary base pairs A-T C-G

ATP (Adenosine Triphosphate)

- 3 phosphate groups = high energy bonds; ATP provides the energy for the cell
- the release of energy —>exergonic reaction
- ex. muscle cells break down ATP to ADP providing energy for movement
- to replace the ATP, cells break down glucose to supply energy for ADP—>ATP

PROTEINS

- Monomers consist of an amino group, carboxyl group and an R side chain
- enzymes join **amino acids** by condensation synthesis forming a peptide bond
- **Protein Structure**
  - **Primary** - order of amino acids
  - **Secondary** - α helix, β sheet created by hydrogen bonding
  - **Tertiary** - folding over of secondary structures - bonding between side chains (hydrogen, ionic, non-polar interactions)
  - **Quaternary**- 2 or more polypeptides join (example. Hemoglobin has 4 subunits)
- **Protein Function**
  - Structural - collagen (tendons and ligaments)
  - Storage - ovalbumin (egg white)
  - Transport - hemoglobin (transports Oxygen)
  - Hormonal - insulin (controls blood sugar)
  - Enzymatic - digestive enzymes (breaks down macromolecules)



ENZYMES (are proteins)

- functions to lower the **activation energy** and to speed up the reaction.
- The specificity of an enzyme is based on its shape
- The **Active site** === binds to the substrate
- "lock and key"
- **Factors Affecting Enzyme Funcion**
  - Temperature (disruption of bonds; optimal T 35 —> 40°C
  - pH (trypsin and pepsin)
  - Salt - Na^+Cl^- ions interfere with the ionic bonds within the protein

-A **competitive inhibitor** mimics the substrate and competes for the active site.

-A **noncompetitive inhibitor** binds away from the active site and causes a shape change in the active site (no longer functional)