

Properties of Water

Polarity:
 - allows cohesion, adhesion, surface tension

High Specific Heat:
 - resists temp change
 - high heat of vaporization
 - allows evaporative cooling (high energy particles vaporize)

Universal Solvent:
 - dissolves hydrophilic/repels hydrophobic

Properties of Carbon

tetravalence	4 bonds->complex molecules
hydrocarbons	C and H, release energy
structural isomer	differs in covalent arrangement of atoms
geometric isomer	differs in spatial arrangements around double bonds
enantiomer	mirror image of 4 molecules attached to asymmetric carbon

Functional Groups

-OH	hydroxyl	polar/hydrophilic
-CH3	methyl	nonpolar/hydrophobic
-COOH	carboxyl	polar/hydrophilic
-COH	carbonyl	polar/hydrophilic
-NH2	amino	polar/hydrophilic
-SH	sulfhydryl	nonpolar/hydrophobic
-PO4	phosphate	polar/hydrophilic

Acids and Bases

Acid	increases H ⁺ in solution
Base	reduces H ⁺ in solution (accepts H ⁺ or donates OH ⁻)
pH	=-log[H ⁺]
Buffer	accepts/donates H ⁺ to stabilize pH

Metabolism

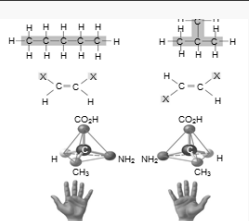
metabolic pathway	a specific molecule that is altered in defined steps catalyzed by enzymes that result in a certain product
catabolic pathway	releases energy by breaking down complex molecules
anabolic pathway	consumes energy to build more complex molecules
energy	the capacity to cause change or rearrange matter

Isomers

- **Structural**

- **Geometric**

- **Enantiomers**



Laws of Thermodynamics

1st Law of Thermodynamics
 energy can be transferred and transformed but not created or destroyed

2nd Law of Thermodynamics
 every energy transfer/transformation increases the entropy of the universe; a process must increase entropy to be spontaneous

Free Energy

Gibbs free energy- $\Delta G = \Delta H - T\Delta S$
 energy in a temp/pressure constant system that can perform work

exergonic
 has a net release of free energy (- ΔG)

endergonic
 absorbs free energy (+ ΔG)

ATP
 ribose, adenine, 3 phosphate groups hydrolyzed to ADP+P_i
 phosphorylated molecules=more reactive

Large Biomolecules

Carbohydrates
 -monosaccharides held by glycosidic linkages
 -energy storage, structure, protection

Lipids

-fatty acids held by ester linkages
 -hydrophobic, saturated/unsaturated, hormones

Nucleic Acids

-nucleotides held by phosphodiester H-bonds
 -enable reproduction, controls protein synthesis

Proteins

-amino acids held by peptide bonds
 -follow varied instructions from DNA

Enzymes

Enzymes
 these macromolecules act as catalysts that lower activation energy barriers by forming an induced fit w/substrate in the active site

Enzymes (cont)

Enzyme Activation

- gene regulation= enzymes produced when needed
- activators=cofactors (inorganic) and coenzymes (organic) make up and help enzymes function

Enzyme Inhibition

- competitive=inhibitor molecule binds to active site to block substrate
- allosteric=inhibitor molecule binds to allosteric site to cover or change shape of the active site

Optimal Conditions

- enzymes have optimal temp+pH
- cofactors+coenzymes bind to enzyme or substrate



By **hlewsey**
cheatography.com/hlewsey/

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Page 2 of 2.

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