

Unit 1:

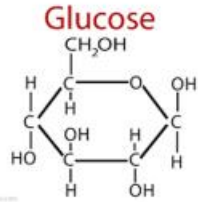
Chemistry of Life

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# Carbohydrates

Composed of C, H, & O – Ratio: 1:2:1

Monomer: Monosaccharide



Examples: Glucose, Fructose, Galactose

Disaccharides: Two monosaccharides

Bond: Glycosidic Linkage

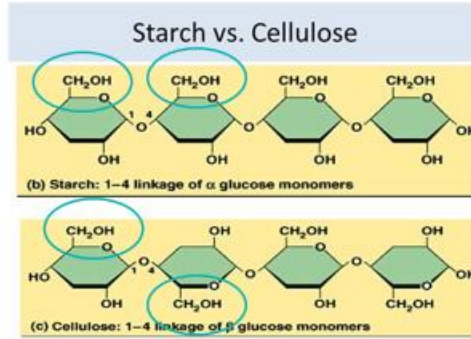
Examples: Sucrose, Lactose, Maltose

Structural:

- Cellulose: found in plant cell walls
- Chitin: found in fungi cell walls & exoskeleton of arthropods

Storage:

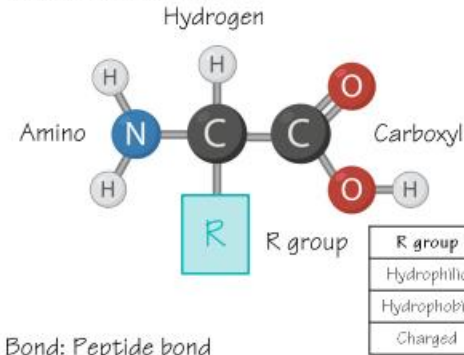
- Starch: found in plants
- Glycogen: found in animals



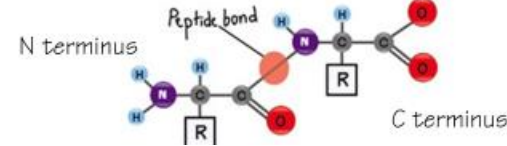
# Proteins

Composed of C, H, O, N, & S

Monomer: Amino Acid



Bond: Peptide bond  
(between carboxyl & amino groups)



Levels of Protein Structure:

Primary:

- Bond: peptide bonds between amino acids
- Structure: string of amino acids

Secondary:

- Bond: hydrogen bonds between backbone
- Structure: alpha helix or beta pleated sheet

Tertiary:

- Bond: ANY (hydrogen, covalent, ionic, ...)
- Structure: final 3D structure

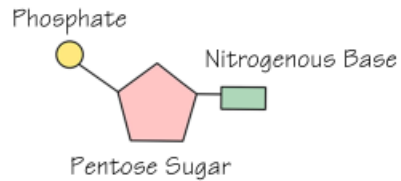
Quaternary:

- Bond: ANY (hydrogen, covalent, ionic, ...)
- Structure: between R groups of different polypeptides

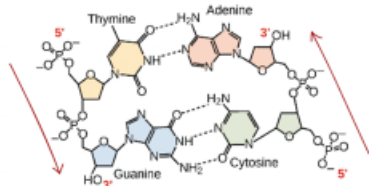
# Nucleic Acids

Composed of C, H, O, N, & P

Monomer: Nucleotide

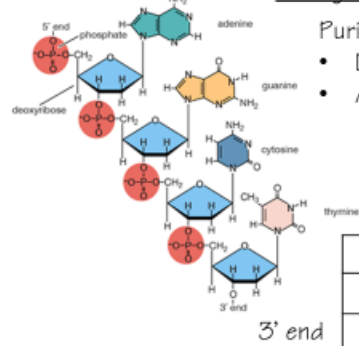


Bond: Phosphodiester linkage  
(between phosphate and hydroxyl)



Directionality: 5' → 3'; antiparallel

5' end



Nitrogenous Bases

Purine:

- Double Ring
- A & G

Pyrimidine:

- Single Ring
- C, U, T

Base Pairing	H bonds
A & T	2
C & G	3

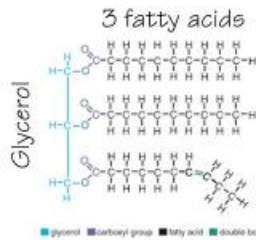
	DNA	RNA
<u>Nitrogenous Bases</u>	A, T, C, G	A, U, C, G
<u>Sugar</u>	Deoxyribose	Ribose
<u>Strandedness</u>	"double"	"single"

Composed of C, H, O, & P (in phospholipids)

All of the lipids are NONPOLAR!!

Monomer: N/A

## Fats



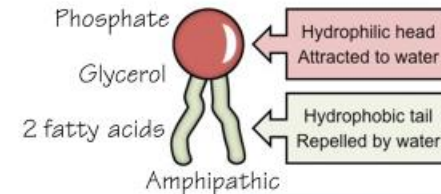
Saturated fatty acid

- ALL single bonds
- Each carbon is SATURATED by hydrogen

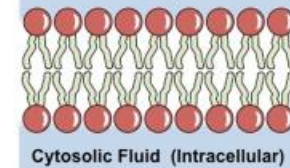
Unsaturated fatty acid

- At least one double bond
- Not all carbons are SATURATED by hydrogen

## Phospholipids

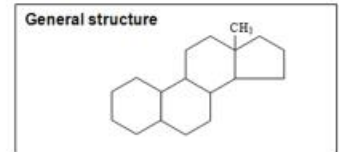


Interstitial Fluid (Extracellular)



Cytosolic Fluid (Intracellular)

## Steroids



Four fused rings

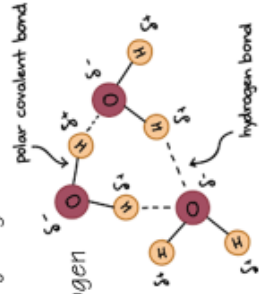
Ligand:

- Intracellular Receptor

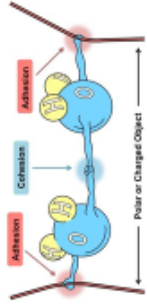
## Polar

Polar covalent bonds between oxygen & hydrogen  
IN the water molecule

Hydrogen bonds between oxygen & hydrogen  
BETWEEN water molecules



## Cohesion/Adhesion



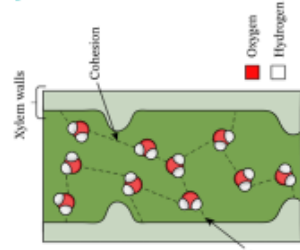
Cohesion:

- Water molecules attracted to other WATER molecules

Adhesion:

- Water molecules attracted to other POLAR substances

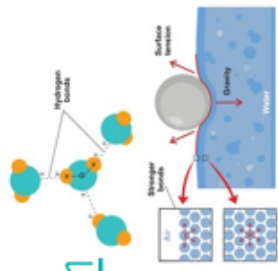
Together leads to Capillary Action



## Universal Solvent

Partial negative oxygen binds with other polar molecules (partial positive end) & to positively charged ions (cations)

Partial positive hydrogen binds with other polar molecules (partial negative end) & to negatively charged ions (anions)



## Surface Tension

Cohesion develops a "surface" based on the interaction of hydrogen bonds

Allows you to skip rocks or water striders to walk on water



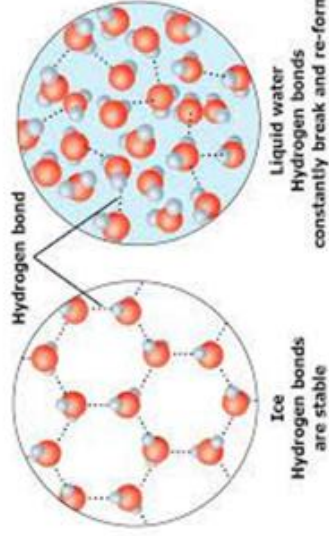
## Less Dense when Solid

Hydrogen bonds inhibit compaction

Ice floats: temperature buffer

## High Specific Heat

Water must absorb or release A LARGE amount of energy to change 1 gram of water by 1°C.



Evaporative Cooling

Release water on surface of organism to absorb heat energy from body (and break the bonds cooling down the organism)

Temperature Buffer

- Coastal Regions
- Body Temperature

## pH

$$\text{pH} = -\log [\text{H}^+]$$

As the concentration of hydronium/hydrogen ion increases, the pH decreases

