AP Bio Unit Reviews

The Chemistry of Life

@apbiopenguins

AP Biology students are penguins because they are Dressed for Success!

You are now an AP Bio Penguin!

Resource Reminders:

Daily Review on IG stories

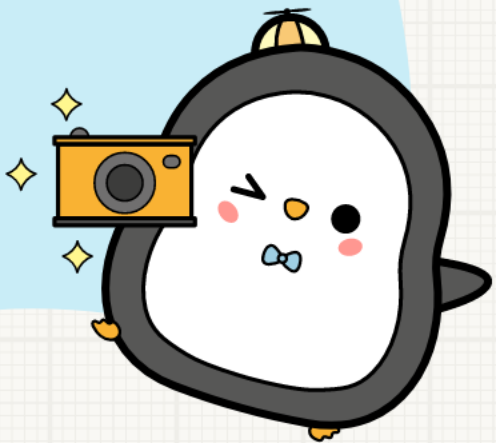
374 page Review Guide on Weebly

Recorded FRQ Fridays on YouTube

120+ Quizizz Games on Weebly

Review PowerPoints on Weebly

Weebly: www.apbiopenguins.weebly.com



Today's Plan

Macromolecules

Water Properties

Practice Questions

Unit 1 Q&A

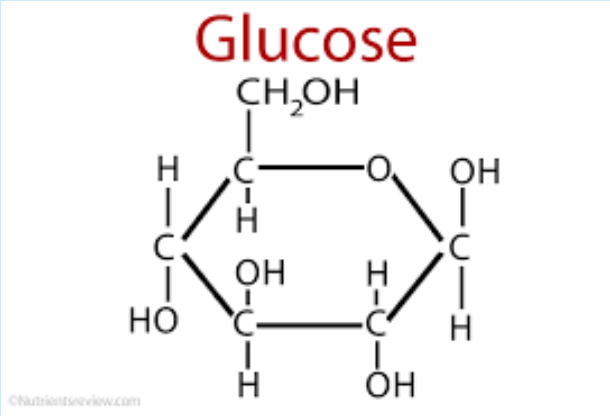
Macromolecules

Carbohydrates
Proteins
Nucleic Acids
Lipids

Carbohydrates

Composed of C, H, & O – Ratio: 1:2:1

Monomer: Monosaccharide



Examples: Glucose, Fructose, Galactose

Disaccharides: Two monosaccharides

Bond: Glycosidic Linkage

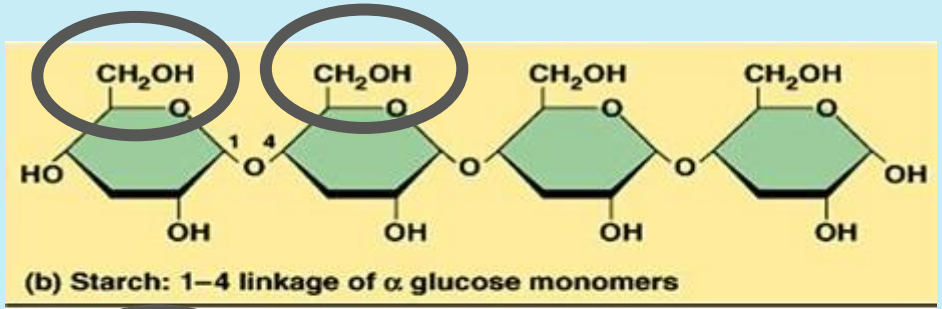
Examples: Sucrose, Lactose, Maltose

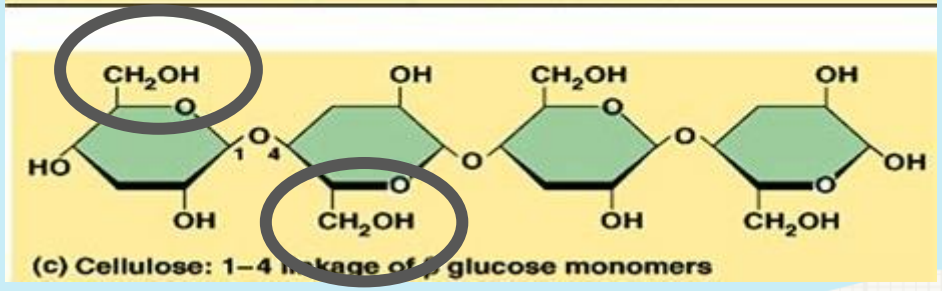
Structural:

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

Storage:

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

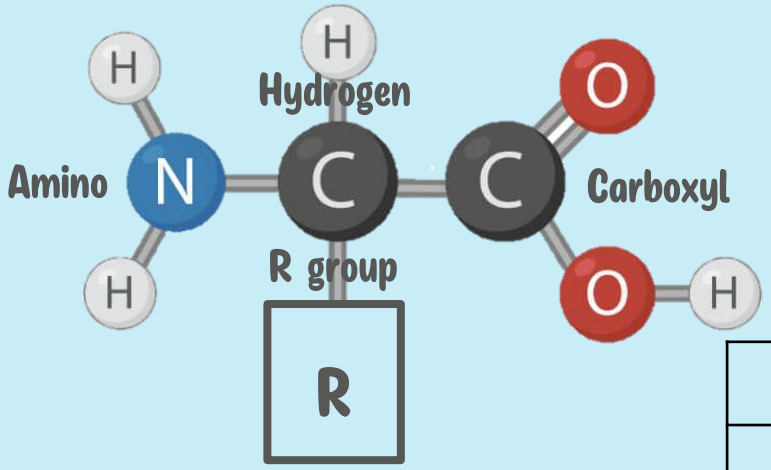




Proteins

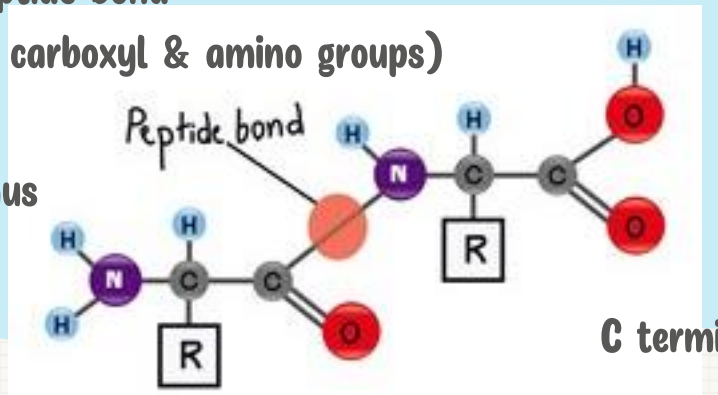
Composed of C, H, O, N, & S

Monomer: Amino Acid



R group	Fold
Hydrophilic	Exterior
Hydrophobic	Interior
Charged	Exterior

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, ...) between R groups
- Structure: final 3D structure

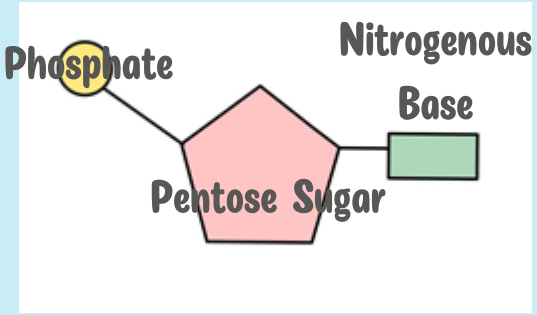
Quaternary :

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

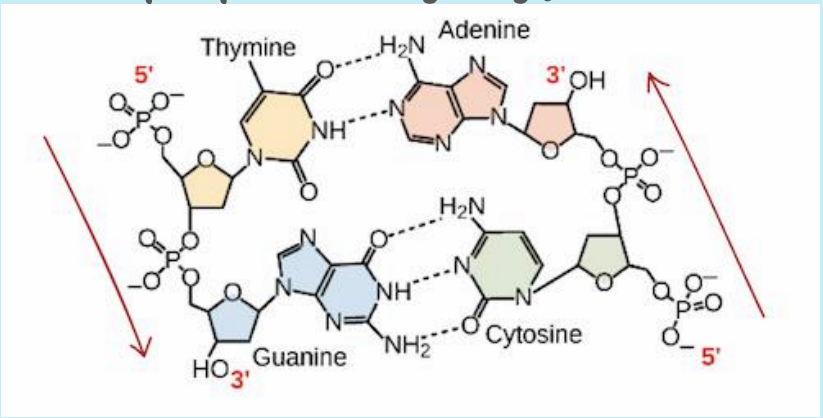
Nucleic Acids

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

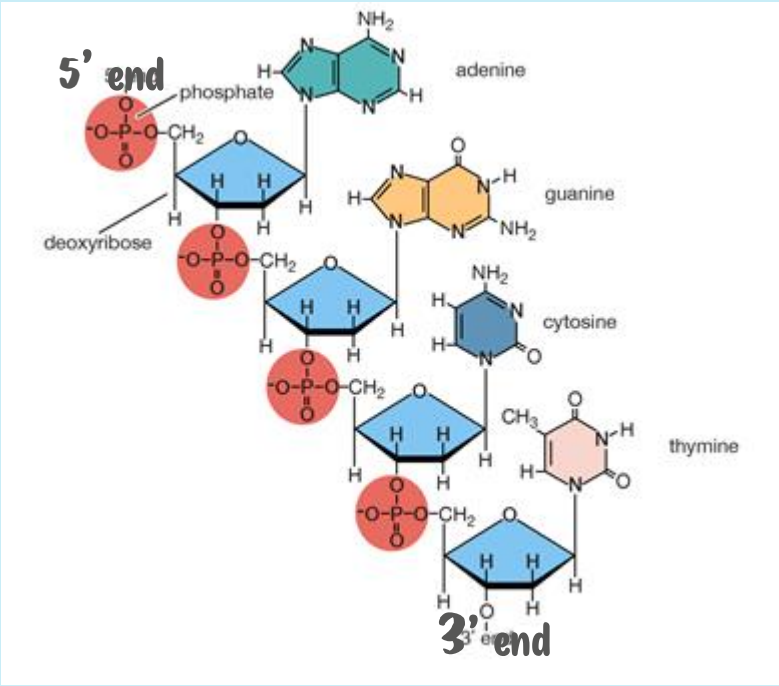
Monomer: Nucleotide



Bond: Phosphodiester linkage
(between phosphate and hydroxyl)



Directionality: 5' → 3'; antiparallel



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
Nitrogenous Bases	A, T, C, G	A, U, C, G
Sugar	Deoxyribose	Ribose
Strandedness	"double"	"single"

Lipids

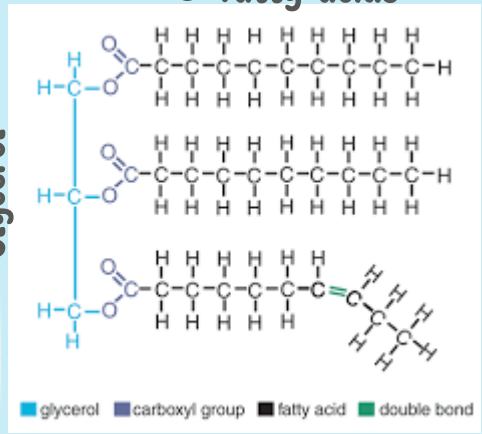
Composed of C, H, O, & P (in phospholipids)

All of the lipids are NONPOLAR!!

Monomer: N/A

Fats

3 fatty acids



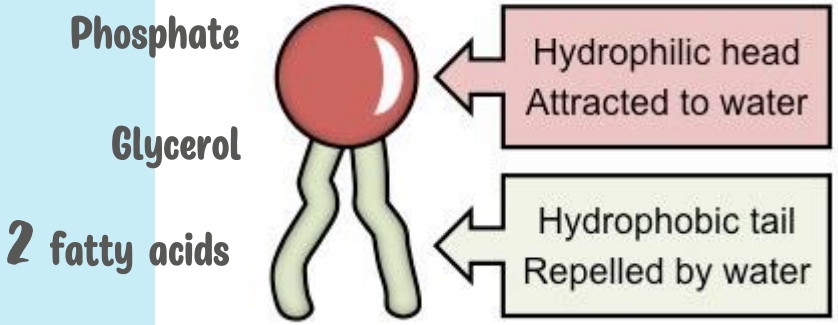
Saturated fatty acid

- ALL single bonds
- Each carbon is SATURATED by hydrogen

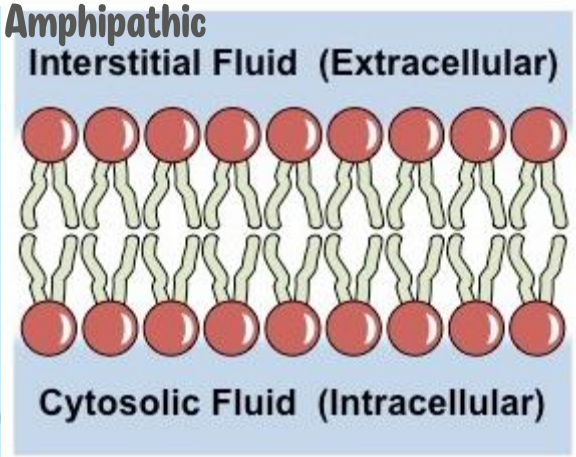
Unsaturated fatty acid

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

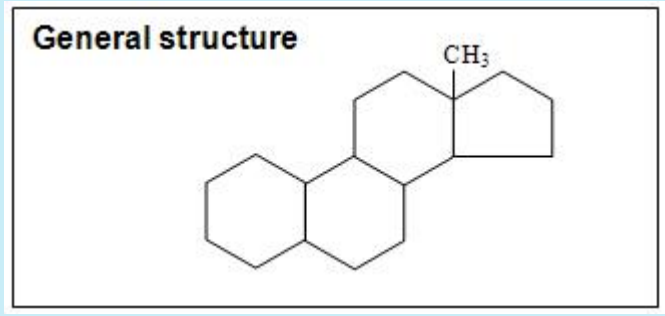
Phospholipids



Amphipathic



Steroids



Four fused rings

Ligand:

- Intracellular Reception

Water Properties

Polar

Cohesion/Adhesion

Universal Solvent

Surface Tension

High Specific Heat

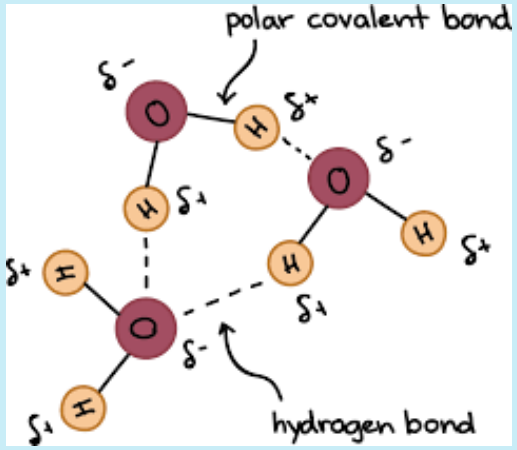
Less Dense as Solid

pH

Polar

Polar covalent bonds between oxygen & hydrogen **IN** the water molecule

Hydrogen bonds between oxygen & hydrogen **BETWEEN** water molecules

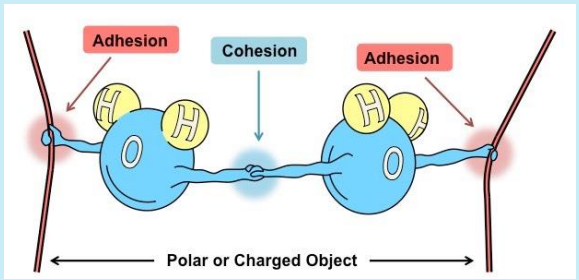


Universal Solvent

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)

Cohesion/Adhesion



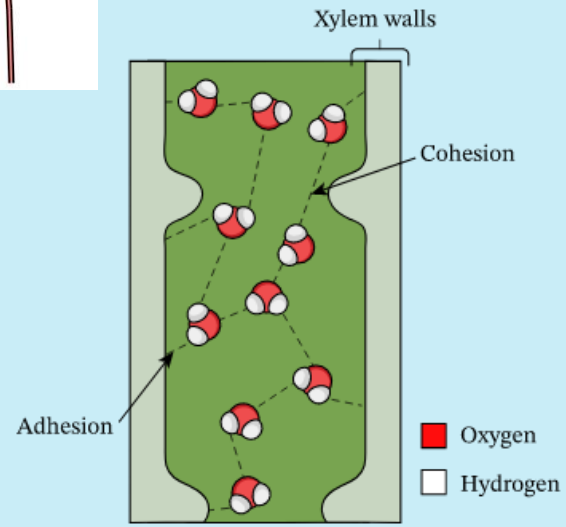
Cohesion:

- Water molecules attracted to other **WATER** molecules

Adhesion:

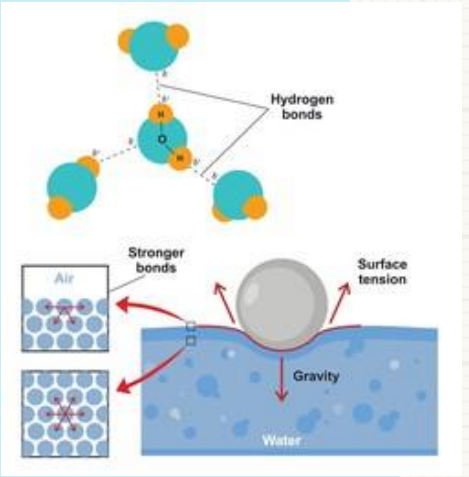
- Water molecules attracted to other **POLAR** substances

Together leads to Capillary Action



Surface Tension

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

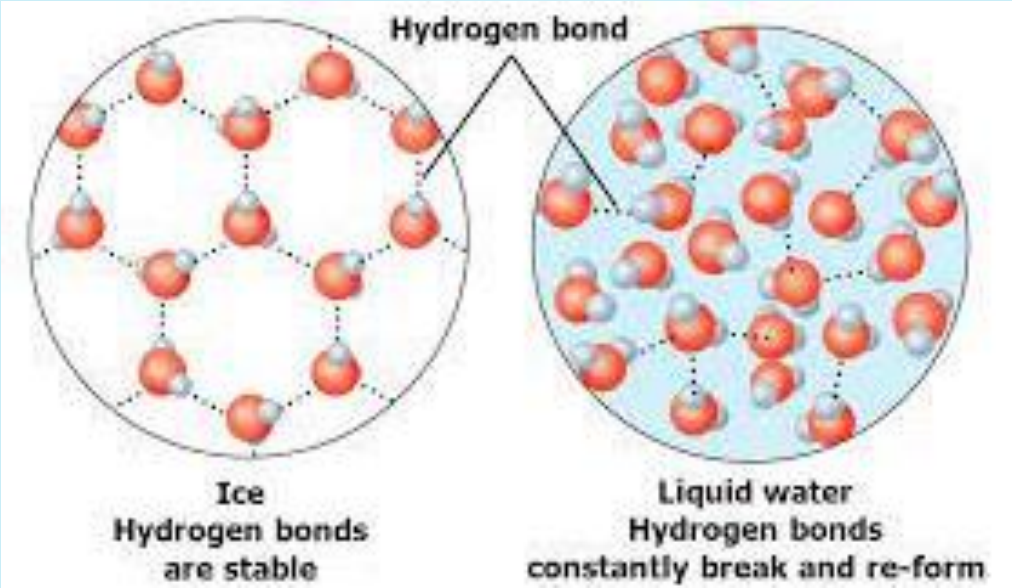


Allows you to skip rocks or water striders to walk on water

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

$pH = -\log [H^+]$

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

Multiple Choice Practice:

Scientists examined the folded structure of a purified protein resuspended in water and found that amino acids with nonpolar R groups were primarily buried in the middle of the protein, whereas amino acids with polar R groups were primarily on the surface of the protein. Which of the following best explains the location of the amino acids in the folded protein?

a. Polar R groups on the surface of the protein can form ~~ionic~~ hydrogen bonds with the charged ends of the water molecules.
b. Polar R groups are too bulky to fit in the middle of the protein and are pushed toward the protein's surface.
c. Nonpolar R groups that cannot form hydrogen bonds with water are pushed into the middle of the protein.
d. Nonpolar R groups from different parts of the protein form covalent bonds with each other to maintain the protein's structure. Hydrophobic interaction due to attractive forces

Multiple Choice Practice:

Rosalind Franklin's x-ray diffraction images taken in the 1950s most directly support which of the following claims about DNA?

a. The ratios of base pairs are constant.

b. The nucleotide sequence determines genetic information.

c. The two strands of DNA are antiparallel.

d. The basic molecular structure is a helix.

Free Response Practice:

Geneticists investigated the mode of inheritance of a rare disorder that alters glucose metabolism and first shows symptoms in adulthood. The geneticists studied a family in which some individuals of generations II and III are known to have the disorder. Based on the pedigree (Figure 1), the geneticists concluded that the disorder arose in individuals II-2 and was caused by a mutation in mitochondrial DNA.

(a) The disorder alters glucose metabolism. Describe the atoms AND types of bonds in a glucose molecule.

The disorder alters glucose metabolism. **Describe** the atoms AND types of bonds in a glucose molecule.

- The atoms are carbon, hydrogen, and oxygen (C, H, and O) and are held together by covalent bonds.

Free Response Practice:

During meiosis, double-strand breaks occur in chromatids. The breaks are either repaired by the exchange of genetic material between homologous nonsister chromatids, which is the process known as crossing over (Figure 1A), or they are simply repaired without any crossing over (Figure 1B). Plant breeders developing new varieties of corn are interested in determining whether, in corn, a correlation exists between the number of meiotic double-strand chromatid breaks and the number of crossovers.

(a) The double-strand breaks occur along the DNA backbone. Describe the process by which the breaks occur.

The double-strand breaks occur along the DNA backbone. **Describe** the process by which the breaks occur.

Accept one of the following:

- (Enzymatic) hydrolysis occurs between the sugars and phosphates/nucleotides.
- The covalent bonds between the sugars and phosphates/nucleotides are broken.

Q & A

@apbiopenguins

@apbiopenguins

AP Bio Insta-Review

Follow us on your favorite social media channels!