

Source: [KBiologyMasterIndex](#)

# 1 | Bio-Molecules Quiz Review

#disorganized

## 1.1 | Paul's Review Sheet

... is here

### 1.1.1 | Carbohydrates

- Set 1, carbs. See Luke De's video + [KBhBIO101Carbs](#)
  - *Glucose vs. fructose* — both monosaccharides, one is a 6-carbon ring and one is a 5-carbon ring
  - *Mono vs. di. vs. polysaccharide* — carbohydrates made out of a single, double, and multiple monomer (single-unit) carbohydrates
  - *Starch vs. glycogen vs. cellulose* — lots of alpha glucose in less branches, lots of alpha glucose in more branches, lots of beta glucose in organized lattice respectively.
    - Starch — plant food reserve
    - Glycogen — animal energy reserve
    - Cellulose — cell wall in plants
- Set 2, lipids. See Luke De's video + [KBhBIO101Lipids](#)
  - *Triglyceride vs. fatty acid vs. phospholipid* see [KBhBIO101StructuresofCarbs](#)
    - Glycerol => a fatty acid
    - Triglyceride => three of 'em above
    - Phospholipid => two fatty acid + phosphate head
  - *Saturated vs unsaturated fatty acids* see also [KBhBIO101StructuresofCarbs](#)
    - Saturated Fats => no double bonds in the carbon chain of fatty acids — think! butter
    - Unsaturated Fats => double bonds in the carbon chain of fatty acids — think! olive oil
- Identify functional groups
  - Amino acid groups — see [KBhBIO101AminoAcids](#)
    - carboxyl —  $\text{O}=\text{C}-\text{R}-\text{OH}$
    - carboxylic acid —  $\text{H}-\text{O}-\text{C}=\text{O}$  (left side of backbone)
    - carbonyl —  $\text{C}=\text{O}$  — part of carboxyl
    - amide —  $\text{RC}(=\text{O})\text{NR}'\text{R}''$  (frequently shown in side chains of amino acids — see Amine)
    - amino/amine —  $\text{H}_3\text{N}^+$  (right side of backbone)
    - hydroxyl —  $\text{OH}$  group. Need I say more?
    - ester — take a carboxylic acid and replace the hydrogen with a  $\text{R}-\text{O}$  group #ASK
    - ether —  $\text{R}-\text{O}-\text{R}$  structure. Commonly shown as an alcohol group ( $\text{H}-\text{O}-\text{C}$ ) as part of the carboxyl
- Monomers vs Polymers [KBhBIO101StructuresofCarbs](#)
  - Monomer — single molecule (such as a monosaccharide) that could be chained together to make polymers
  - Polymers — complex molecules built from monomers
  - Building polymers — dehydration reaction — taking out water molecules
  - Destructing polymers — hydration reaction — adding in water molecules

### 1.1.2 | Cell Structures

- Prokaryotic vs. Eukaryotic
  - Prokaryotic cells — often in single-cellular cells, has a cell wall, and contained in capsules
  - Eukaryotic cells — in multicellular cell elements, contains a plasma membranes and nucleus
- Compare and contrast a typical animal cell with a typical plant cell. Be able to label diagrams of each. (See... problem set 1)
  - Animal Cell
    - No cell wall
    - No chloroplast
    - Has Cytoplasm
    - Has Ribosomes
    - Has Mitochondria
    - No plastids — organelle pigments
    - Has Cilia — Hair-like items on the outer surface
  - Plant Cell
    - Has cell wall
    - Has chloroplast — photosynthesis
    - Has cytoplasm
    - Has Ribosomes
    - Has Mitochondria
    - Has plastids — organelle pigments
    - Mostly has no Cilia
- Endosymbiotic theory
  - Endosymbiotic theory states that organelles within our current eukaryotic cells — the mitochondria and chloroplasts — are originally prokaryotic cells in their own right. This is because they divide independently through binary fission, and also contains circular DNA that is independent of the main cell itself.
- Organizing organelles based on membranes #ASK
  - Membranous organelles — possess own plasma => regulates own macromolecule consumption, hormones, etc. Perhaps original prokaryotic cells
    - Endoplasmic reticulum => forms the network of transferring proteins and other elements
    - Golgi body/Golgi apparatus => packs, sorts, and modifies proteins and other elements throughout the cell
  - Non-membranous organelles — does not possess own plasma => mostly part of the cytoskeleton of a cell
    - Ribosomes => protein synthesizer in the cell
    - Centrosome => forms flagella, cilia, and handles cells divisions
    - Lysosomes => digesting large nutrients and changing them to what cells could process and work on energy metabolism
    - Mitochondria => store ATP and extract energy from ATP
    - Vacuoles => storing water, nutrients, waste
    - Plastids => creates colours displayed in the chromoplasts
- Cell Components. Basically all of these exist only in Eukaryotic cells
  - chloroplast and mitochondria
    - Chloroplast — found in plants + does photosynthesis
    - Mitochondria — found in animals + store ATP and extract energy from ATP
  - cell wall and plasma membrane

- Cell Wall — found in plants => surround the cell: hard
- Plasma membrane — found in animals => surround the cell: soft [KBhBIO101Lipids](#)
- rough endoplasmic reticulum (ER) and smooth ER
  - Rough ER — covered by ribosomes and folds [KBhBIO101Proteins](#)
  - Smooth ER — not covered by ribosomes and makes [KBhBIO101Lipids](#)
- cytosol, cytoplasm and cytoskeleton
  - Cytosol => liquid found inside cells; the “cytoplasm” floats within it
  - Cytoplasm => all the stuff within the cell
  - Cytoskeleton => complex network of proteins + fibres that organize the rest of the cell
- nucleus and nucleolus
  - nucleus => centre of the cell, stores DNA
  - nucleolus => largest part of the nucleus that makes ribosomes
- lysosomes and food vacuoles
  - Lysosomes => vesicles that contains enzymes that breaks down biomolecules
  - Food Vacuoles => vesicles that stores food and other resources
- cytoskeleton and microtubules
  - Cytoskeleton => complex network of proteins + fibres that organize the rest of the cell
  - Polymers of tubulin protein that provides the main structure of eukarotic cells
- flagella and cilia
  - Flagella => a bacteria's tail — allow them to move and also act as an sensory organ
  - Cilium => a cell's “hair” — provides sensory



## 1.2 | Helpful review items

Bonding in organic compounds, a review.

Common nonpolar bonds

Carbon-carbon  
Carbon-hydrogen  
Carbon-sulfur

Common dipole interactions

Carbon-nitrogen  $\delta^+ - \delta^-$     Carbon-oxygen  $\delta^+ - \delta^-$   
Nitrogen-oxygen  $\delta^+ - \delta^-$     Hydrogen-oxygen  $\delta^+ - \delta^-$

Common ionic interactions

they come from acid-base interactions.

However, sometimes they are permanent. Look at the amino acid chart for those.

Why hydrogen bonding is excellent

Hydrogen bonding allows stronger dipole-dipole bonds than dipole-dipole bonds. They are still good ol covalent bonds.

These bonds basically combines Hydrogen w/ the most electronegative atoms.



Reading a line-angle representation.



In this type of representations, start with a line. End the line at every carbon.



Now, it is assumed that carbon is not going to just be happy with  $\text{C}-\text{C}-\text{C}-\text{C}$ .



So, we still the missing orbitals with hydrogen.

$\text{C}-\text{C}-\text{C}-\text{C}$  ← need 3

↑ need 2

Figure 1: Screen Shot 2020-10-09 at 11:58:55 AM.png