6.3 Life Substances

CARBON
- All organisms are _____________.!
- Carbon forms ___ covalent _______ (because it has 4 valence electrons)
- Because of this, Carbon can form a wide _______ of structures.
- All __________________ are _________-based.

Formation of Macromolecules
- ________ Molecules
- Formed from _________________ (monomers)
- __________ bonded together make __________
  
  ______________ reactions join monomers together
- ________ is removed, allowing bonds to form)
- Draw a simple example...

__________ breaks down polymers into monomers. (water is added, ____________ bonds)

The 4 most important types of biological Macromolecules

Carbohydrates
- Elements: __________
- 2:1 ratio of _________ to _________.
  
  Functions/ uses
- _________ storage and release
- structure (ex. Cellulose/plant fiber)

- Monomer/Subunit=
- Monosaccharides (Simple Sugars):
  
  empirical formula= CH₂O
- __________ (C₆ H₁₂ O₆)—blood sugar, made by plants in ________________
• \( \text{[C}_6\text{H}_{12}\text{O}_6] \) — sugar
• galactose (\( \text{C}_6\text{H}_{12}\text{O}_6 \)) --- part of milk sugar

Disaccharides ...formula = \( \text{C}_{12}\text{H}_{22}\text{O}_{11} \) (why?)
• \( \text{[C}_6\text{H}_{12}\text{O}_6] \) = glucose and fructose
• maltose= glucose and glucose
• \( \text{[C}_6\text{H}_{12}\text{O}_6] \) = glucose and galactose

Polysaccharides (formed by dehydration synthesis)
• \( \text{[C}_6\text{H}_{12}\text{O}_6] \) = food storage in plants
• glycogen= food storage in \( \text{[C}_6\text{H}_{12}\text{O}_6] \), highly branched
• \( \text{[C}_6\text{H}_{12}\text{O}_6] \) = plant cell walls, plant \( \text{[C}_6\text{H}_{12}\text{O}_6] \)
• chitin = exoskeletons in insects etc.

**Lipids**

- Elements: _________
- A lot more C and H than carbs, not much O
- Examples: _________, steroids like cholesterol, phospholipids, waxes
- Important property:
  - nonpolar/
  - insoluble in water (they ________________ with water)

**Lipids (example 1) Fats and oils**

- Functions: ________________, organ cushioning, _________
- glycerol and 3 ________________ tails (chains of C and H)
- saturated fats. No double bonds. Saturated with _________
- unsaturated fats (oils). Have double bonds.

**Lipids (Example 2) Phospholipids**

- glycerol with 2 fatty acid tails and one _________.
- Function: Make up ________________ !
- fatty acid tails= ________________
- phosphate head = ________________

**Lipids (Example 3) steroids**

- _________
- _________ like testosterone and estrogen

**PROTEINS**

- Elements: C, H, O, N (and sometimes S)
- Monomer/subunit: ________________
• ____ amino acids
• each one has a different ________—(variable group)

• A Protein is also called ________________.

Functions:
• Proteins are essential to life
• _________—keratin= hair, nails, horns, hoofs etc, collagen...
• _________ contraction
• _________ (ex. Hemoglobin)
• Transport across ________________
• immune system (___________________)
• Enzymes...
• Etc.

Enzymes
• _____________ that speed up chemical reactions
• ________________ in a reaction
• Needed for ________________
• ________________ = substance that the enzyme acts on.
• Fits into ________________ of enzyme
• ________________ (substance that is produced in the reaction.)

• Enzymes lower ________________
• This makes it _________ for reactions to occur!

Nucleic Acids

• _____ and ______

Functions:
• _____________ material
• used as ________________ for making _____________

Structure:
• Elements: ___________________
• Monomer/ subunit = ________________
  3 parts of nucleotide:
    o
    o
    o
• adenine pairs with _________ (or _________ in RNA)
• guanine pairs with _________
• nitrogen bases that pair up are called ________________