Section 2.3
Carbon Compounds

Your homework assignment:
Take notes on this PowerPoint
Pay attention to the diagrams
Vocabulary words are highlighted
I can...

- **LS 1.2** I can describe the four macromolecules and evaluate their structure, function, and location within a cell.

- **LS 1.2** I can investigate the role different macromolecules play within specific cell structures.
Key Questions

1. What elements does carbon bond with to make up life’s molecules?

2. What are the functions of each of the four groups of macromolecules?
The Chemistry of Carbon

• Carbon atoms have 4 valence electrons...allowing carbon to form strong covalent bonds with other elements, such as
  • C- Carbon
  • H- Hydrogen
  • O- Oxygen
  • P- Phosphorus
  • N- Nitrogen
  • S- Sulfur
The Chemistry of Carbon

• Carbon atoms can bond to each other, forming *chains* and *rings*.
• Carbon-carbon bonds can be single, double, or triple covalent bonds.
• No other element matches the versatility or the size of molecules that carbon can build.
Macromolecules

• Large organic molecules found in living things
• “giant molecules”
• Formed in a process called *polymerization*- larger compounds are built by joining smaller ones together

• **Monomers**- smaller units that join together to form *polymers*
• Monomers in a polymer may be identical or different
Macromolecules

- Four major groups of macromolecules in living things:
  - Carbohydrates
  - Lipids
  - Nucleic acids
  - Proteins
Carbohydrates

• Atoms- CHO

• Monomer- sugar (monosaccharide)

• Categories-
  1. Simple carbs = sugars = monosaccharides
  2. Complex carbs = starches = polysaccharides
Carbohydrates

• **Function** -
  1. Main source of energy
    • the breakdown of sugars, such as glucose, supplies immediate energy for cell activities
  2. Provide structural support in plants and some animals

• **Fun Facts** -
  • CHO are found in a 1:2:1 ratio
Carbohydrates

• Animals:
  • Store excess sugar in a polysaccharide called glycogen
  • Glycogen is broken down into glucose and released into blood when blood glucose levels are low
  • Glycogen stored in muscles supplies energy for muscle contraction

• Plants:
  • Store excess sugar as starch
  • Another important polysaccharide is cellulose...gives plants their strength and rigidity
Lipids

• **Atoms**- CHO (small amount of oxygen)

• **Monomer**- glycerol and fatty acids

• **Categories**-
  - F- Fats
  - O- Oils
  - W- Waxes
  - S- Steroids (steroid hormones function as chemical messengers)
Lipids

• Function-
  1. Store energy
  2. Part of our biological membranes (phospholipid bilayer)
  3. Waterproof coverings (lipids are not soluble in water)

• Fun Facts-
  • Saturated fats- single bonds, solid at room temperature
  • Unsaturated fats- at least one double bond, liquid at room temperature
  • Polyunsaturated fats- more than one double bond
Nucleic Acids

• **Atoms** - CHOPN

• **Monomer** - nucleotide

  • Nucleotides have 3 components:
    1. 5-carbon sugar
    2. Phosphate group
Nucleic Acids

• **Categories**-
  1. DNA- double helix and contains the sugar *deoxyribose*
  2. RNA- single helix and contains the sugar *ribose*

• **Function**- store and transmit genetic information (heredity)

• **Fun Facts**-
  • The sequence of nitrogenous bases in DNA and RNA contains info use by the cell to build other molecules, such as proteins
Proteins

- **Atoms**: CHON

- **Monomer**: amino acid
  - Covalent bonds called *peptide bonds* link amino acids together to form a *polypeptide*.

- Amino acids have 3 components:
  1. Amino group (NH$_2$)
  2. Carboxyl group (COOH)
  3. R-group (different group for each amino acid)
Proteins

• **Function**-
  1. Control rate of reactions (enzymes)
  2. Regulate cell processes
  3. Form muscles and bones
  4. Transport substances in/out of cells
  5. Help fight disease
Protein Level of Organization

1. Primary structure- sequence of amino acids
2. Secondary structure- folding or coiling of the polypeptide chain
3. Tertiary structure- 3D arrangement of the polypeptide chain
4. Quaternary structure- proteins with more than one polypeptide chain
The End 😊