• The study of “organic” chemistry involves the study of compounds containing bonds between carbon (C) atoms

• Why is carbon worth studying?
  – Carbon atoms have four valence electrons allowing it to form strong covalent bonds with many elements (i.e. hydrogen, oxygen, nitrogen)
  – Carbon atoms can bond to each other forming unlimited chains
    • Single, double, or triple covalent bonds may form
2.3: Macromolecules

- Many organic compounds in living things are so large, they are known as **Macromolecules**
  - Macromolecules are composed of many smaller molecules

- Macromolecules are formed by a process known as **Polymerization**

- Small compounds called **monomers** form together into larger units called **polymers**

2.3: Macromolecules

- There are 4 major groups of macromolecules found in living things:
  - Carbohydrates
  - Lipids
  - Nucleic Acids
  - Proteins
Carbohydrates:

- Carbohydrates provide a main source of energy for living things, providing immediate energy for cell activity.
- Organisms store extra sugar as complex carbohydrates known as starches.
- Monomers found in starch polymers are sugar molecules, such as glucose.

Simple Sugars:

- Single sugar molecules are also known as Monosaccharides.
- Examples include: glucose, galactose, fructose.
- When two single sugar molecules are joined together, this is known as a Disaccharide.

Ex: Glucose + Fructose $\rightarrow$ Sucrose
Carbohydrates:

- Complex Carbohydrates:
  - The large macromolecules formed from monosaccharides are known as polysaccharides.
  - Excess sugar is stored as a polysaccharide called glycogen.
Lipids:

- Large group of molecules whose primary function is to store energy
- Formed from the combination of glycerol molecules and compounds called **fatty acids**
- 3 categories of lipids are:
  - Fats
  - Oils
  - Waxes

2.3: Macromolecules

- 3 types of lipids are:
  - **Saturated**: Each carbon atom in the lipid chain is connected with another carbon atom by a single bond
  - **Unsaturated**: Results when a carbon – carbon double bond is present
  - **Polyunsaturated**: Results from multiple carbon – carbon double bonds
Nucleic Acids:
- Macromolecules that capture and transfer hereditary, or genetic, information.
- Nucleic acids are polymers assembled from monomers of Nucleotides.
- Nucleotides are monomers consisting of three parts:
  - a 5-carbon sugar
  - a phosphate group
  - a nitrogenous base

2.3: Macromolecules
Nucleic Acids:
- There are two types of nucleic acids:
  - Deoxyribonucleic acid (DNA)
    - Contains the sugar Deoxyribose.
    - It is a polymer formed from monomers of Nucleotides.
    - Considered to be the genetic “blueprint” for living things.
Nucleic Acids:

- There are two types of nucleic acids:
  - Ribonucleic acid (RNA)
    - Contains the sugar Ribose
    - Critical for DNA synthesis (manufacturing)

Proteins:

- Proteins are macromolecules assembled from monomers of amino acids
- Amino acids are compounds joined together by bonds called peptide bonds, resulting in the formation of polypeptides
2.3: Macromolecules

**Proteins:**

- Four primary functions of proteins in the body are to:
  - Control rate of chemical reactions (i.e. hormone production)
  - Regulate cell processes
  - Transport substances into or out of cells
  - Help to fight diseases (i.e. Antibodies)