**Macromolecules**

**Biochemistry** – the study of the chemistry of life

**Matter** – composes all physical substances

* Smallest unit of matter = atom
  + Atoms are made of 3 types of subatomic particles
    - Protons – positive charge – located in nucleus
    - Neutrons – neutral charge – located in nucleus
    - Electrons – negative charge – located in orbit/cloud
* **Element** – basic building block of all matter that cannot be broken down
  + - Over 118 in the periodic table
    - About 26 are found in living things
    - Represented by symbols often tied to Latin
      * Calcium = Ca
      * Iron = Fe (for ferrum = Iron)
* **Compound** – 2 or more atoms chemically combined
  + When in a compound, the elements change properties
    - Ex: NaCl
      * Na – explosive metal
      * Cl – poisonous gas
  + **Molecule** – smallest unit of a compound
  + Chemical bonding – electrons join atoms
    - Covalent – share electrons
    - Ionic – give/take electrons

**Physical Science** – the study of matter’s composition and structure

* Water is the most abundant compound and is very important!
  + Universal solvent
  + Makes up large % of body mass
  + Needed for reactions and health

**pH Scale**

* Acids – low pH (<7) = excess H+ = taste sour = example: lemons
* Neutral – pH 7 = equal parts H+ and OH- = example: water
* Bases – high pH (>7) = excess OH- = taste bitter = example: broccoli
* Buffers – used to neutralize small amounts of acids/bases

**Organic Molecules**

* **Polymers** – a molecule which is a chain of many parts
  + The subunits are important for the function of the molecule.
* **Monomer** – subunit of a polymer
* There are three organic polymers: carbohydrates, proteins, and nucleic acids
  + Lipids cannot be broken down into individual parts, and are **not** polymers.

Anything that is organic contains **carbon**.

**The 4 Macromolecules**

1. **Carbohydrates** – sugars = provide quick energy
   1. Monomers: monosaccharides
   2. Examples:
      1. Glucose – simple sugar found in many places
      2. Cellulose – rigid, makes up cell walls
      3. Starches – complex polysaccharides
      4. Glycogen – the animal version of starch, used for storage
2. **Lipids** – fats, oils, and waxes = long term energy storage
   1. Examples:
      1. Phospholipids – make up membranes
      2. Steroids – unique composition
3. **Proteins** = growth and repair
   1. Monomers: amino acids
   2. Examples:
      1. Insulin – used to control blood sugar
      2. Enzymes – catalysts to speed up reactions
      3. Hemoglobin – carries oxygen in blood
   3. Shape determines function
4. **Nucleic Acids** – DNA and RNA = carry genetic info
   1. Monomers: nucleotides
      1. Examples:
         1. Deoxyribonucleic Acid – DNA – stores genetic info
            1. ATCG
         2. Ribonucleic Acid – RNA – transfers genetic info
            1. AUCG

**Proteins**

* Considered an extremely important molecule.
* Functions: grow and repair tissues, gene expression, enzymes
* **Enzymes**: special proteins that carry out specific functions
  + Biological catalysts (speed things up) by lowering energy needs
  + Bind to a molecule called a **substrate** at the **active site**
  + Are specific: only bind to one type of substrate
  + Are reusable
    - Denature (break apart) under high heat or strong pH.