

LIVING THINGS

- All living things come from other living things.
  - Ex: One single celled organism to another
- DNA is copied & passed to offspring
- The signature molecule of life
  - Ex: embryo- cells continually divide & develop
- **Adaptation**- inherited characteristic that enables an organism to successfully survive & reproduce
  - Individuals with the best adaptations to current environment

Natural selection is one mechanism of evolution

1. Organized in a specific way
2. Need & Acquire energy
3. Maintain internal constancy- homeostasis

EVOLUTION

- Why do some organisms seem suited for their environment
  - Ex: Hummingbird- long beak for nectar in certain flowers
  - Ex: Cheetahs- take down faster prey
- **Evolution**- change in the genetic makeup of a population over time
- **Population**= group of individuals of the same species

4. Reproduce, grow, & develop
5. Evolve

DESIGN A CONTROLLED EXPERIMENT

- Sample size
- Variables
  - Independent (manipulated) variable
  - Dependent (response) variable
  - Standardize variable
- Control- group

SCIENTIFIC METHOD

- Observation
- Frame question that relates
- Prediction
- Design & conduct experiment
- Collect data
- Draw conclusion
- Submit for publication

DIFFERENCE BETWEEN HYPOTHESIS AND THEORY**Hypothesis**

- Preliminary question
- If-then statement
- Can incorporate laws
- Tentative, often narrow explanation regarding the natural world
- Must be testable & falsifiable

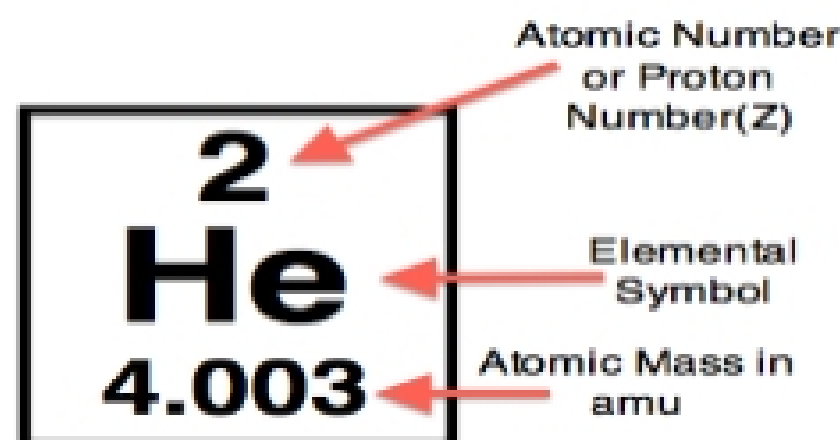
**Theory**

- Unifying explanation
- Diverse lines of evidence
- A well substantiated explanation of some aspect of the natural world
- Broad, ties together existing observations
- Ideas about which we are most certain ex: orange falls to ground

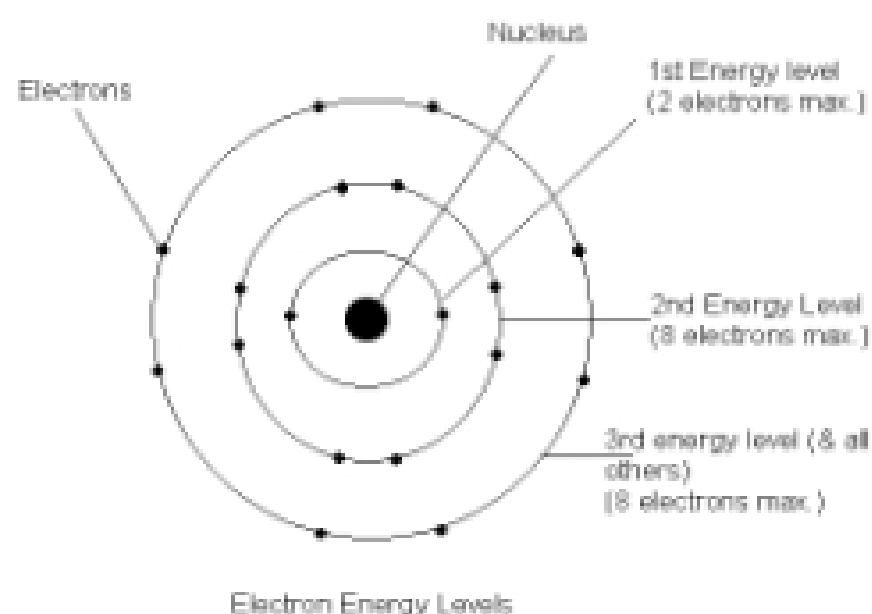
CHEMISTRY OF LIFE

**Elements**- Pure substances that can't be broken down by chemical means ex: Ca, O, Ba

**Atom**- Smallest component of an element; protons, neutrons, & electrons

**Chemical Bonds**- link atoms

- Atoms bond through chemical bonds: forces of attraction that hold atoms together
- **Molecule**= 2 or more chemically bonded atoms ex: H<sub>2</sub>O
- **Electrons**- move around nucleus in energy shells
- **Octet rule**: atoms/ions are most stable when they have 8e<sup>-</sup> in outer (valence) shell

BASIS OF ALL CHEMICAL RECTIONS

- If octet rule is not satisfied, atoms will lose, gain, or share to fill valence
- If stable then it will not react
- **Electro negativity**= Ability to attract electrons
- **Covalent bond**= Sharing bond
  - Non-polar covalent bond= share electrons equally
  - Polar covalent bond= non-equal sharing
- **Ionic bond**=Stealing bond
  - If electro negativity is great enough, one will take an e<sup>-</sup> from another
  - Results from electrical attraction between 2 oppositely charged ions
- **Hydrogen Bonds**= bonds of attraction
  - Weak force of attraction

WATER

Hydrogen bonds result in a property of water called cohesion: water molecules stick together

- Results in high surface tension
- Constantly forming and breaking

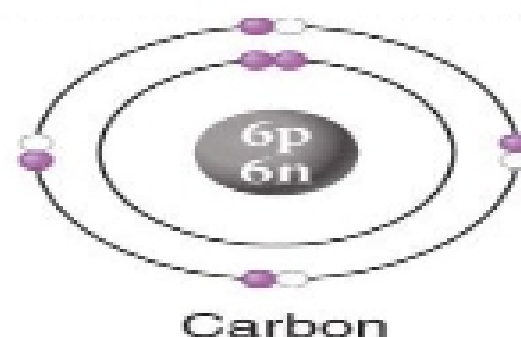
PROPERTIES OF WATER

- Polar substances dissolve in water
- ex: NaCl in water ->> Molecules of water surround each ion, and separate them from one another
- Substances that dissolve in water are hydrophilic
- Substances that do not dissolve in water are hydrophobic
- Ice floats
  - When the temperature drops, water molecules slow down and keep their H bonds longer
  - Locks into a crystalline lattice with its neighbors
  - Less molecules in a given space; the density is now lower

ORGANIC MOLECULES

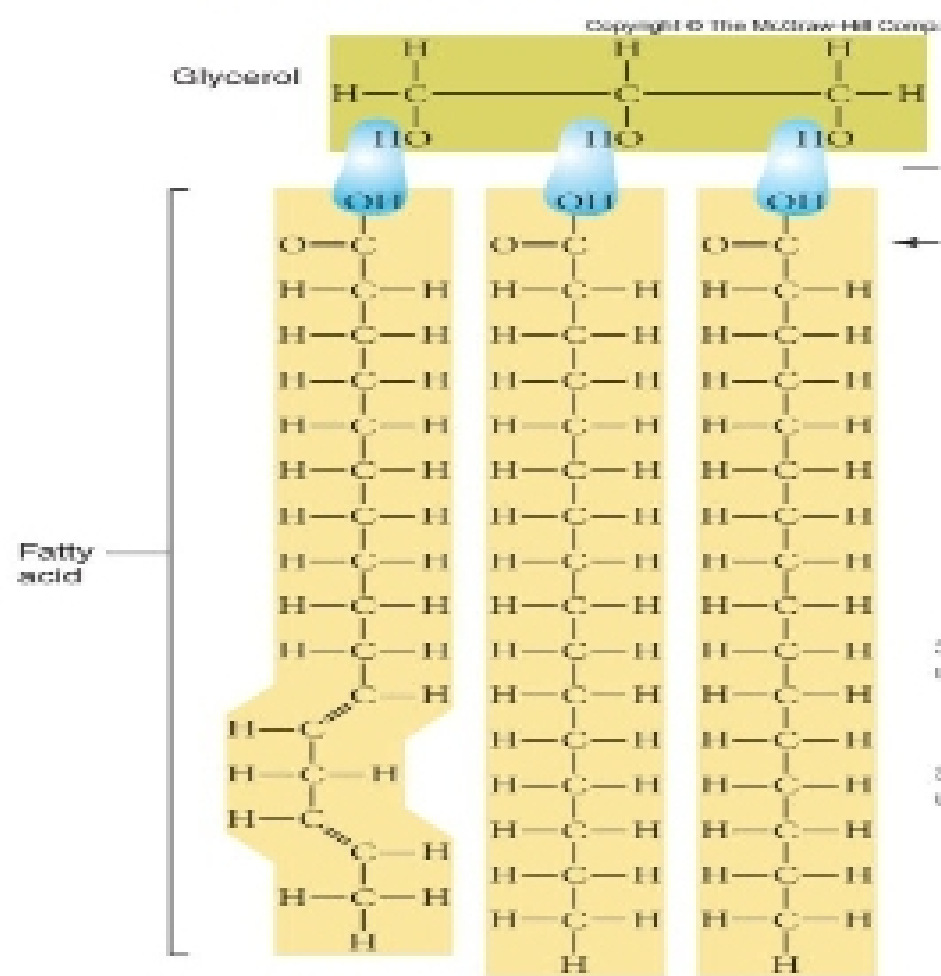
Organic Molecules are compounds containing both carbon and hydrogen

- Carbon has four vacancies
- Many are macromolecules
- **polymers**: chains created by linking subunits called **monomers**

FOUR MAIN TYPES

- **Carbohydrates**: Simplest of the main organic molecules
  - Source of energy: the carbon-hydrogen bond store a great deal of energy and are easily broken
- **Glucose** (blood sugar) molecular bonds are broken down by your cells and release energy. If you do not use this energy, your body stores it and converts into fat (long term...monomer). Glycogen (short term...polymer)
- **Cellulose**- Is a glucose molecule found in plants, dietary fiber-digestive benefits
  - Structural molecules
  - Simple sugars; monomers:
- **Disaccharides**: complex carbs forms by the union of 2 simple sugars
- **Polysaccharides**: complex carbs for by the union of many simple sugars
  - Complex cabs; polymer
- **Lipids**
  - All are insoluble in water (hydrophobic)
  - Rich in energy, good for long-term E storage

- o Lots of C-H bonds
- o Fats; largest part of the cell membrane



- Ex Triglyceride (polymer of a lipid)= 3 fatty acid tails
- Fatty acids are saturated with hydrogen
- Degree of Saturation: measure of fatty acid's H content
- Saturated Fat= each carbon in the hydrocarbon chain is bonded to 2 hydrogen atoms, solid at room temperature, animal derived (butter, cheeses)
- Double bond- site of unsaturation; sharing an electron among each other
- Unsaturated Fat= at least one carbon in the hydrocarbon chain is bonded to just one hydrogen (double bond-kinks in the chain), liquid at room temperature, tend to be plant derived (olive oil, can be found in fish)
- Hydrogenation: is the artificial addition of hydrogen atoms to an unsaturated fat. This can improve a food's taste and shelf life- not good for your health

### PROTEINS: More functions than any other type of molecule

1. The most diverse- more functions in the cell than any other type of molecule
2. Structured- Fold in a 3-D unique shape inside a cell
3. Overall shape determines its function
  - o If the shape of the protein is modified enough to destroy its function it has denatured
  - o Protein= polymer; Amino acid= monomer

### NUCLEIC ACIDS: Stores and transmits genetic information

- DNA: Deoxyribonucleic acid, sugars and phosphates form the "rails" and nitrogenous bases form the "rungs"
- RNA: Ribonucleic acid
- Nucleotides- the monomers of nucleic acids; each nucleotide consists of a 5-C sugar, a phosphate group, and a nitrogenous base

### CELLS

#### Cell theory:

- all organisms consist of one or more cells
- the smallest unit of life that can function on its own
- all cells arise from other cells

#### Common Characteristic:

- Cell membrane as a boundary
- DNA is genetic material
- RNA for protein synthesis
- Ribosomes for protein manufacture
- Cytoplasm

**Cell membrane:** A very thin layer, separates cytoplasm from exterior environment, regulates what passes in and out of the cell, helps maintain homeostasis

- Structure > phospholipid bilayer
- Phospholipids and proteins move laterally within the bilayer