

Chemistry Review Notes

In general, all the reactions that occur in your cells are collectively called metabolism and are divided into two categories

1. catabolic reactions - those in which complex molecules are broken into simpler ones.
2. anabolic reactions - those in which complex molecules are constructed out of simpler ones.

I. Atoms

- A. small particles of matter
- B. composed of three types smaller particles
 1. electrons - negatively charged
 2. protons - positively charged
 3. neutrons - neutral in charge
- C. the center of the atom is called the nucleus and is where the protons and neutrons are found. The electrons "orbit" the nucleus in an "electron cloud."
- D. Protons and neutrons together make up about 99.9% of the mass of an atom but most of volume is occupied by the electron cloud.

II. Elements

- A. pure substances that cannot be broken down into simpler substances by chemical means. The elements are the "chemicals" you see on the periodic table.

III. Molecules

- A. in biology we talk mostly about molecules
- B. a molecule is a unit consisting of two or more atoms of the same or different elements bonded together.

IV. Chemical bonds - Atoms form chemical bonds with one another by sharing or by losing or gaining electrons.

- A. Ionic bonds
 1. when atoms lose or gain electrons they are called ions
 2. an atom that loses one or more electrons becomes a positive ion
 3. an atom that gains one or more electrons becomes a negative ion
 4. ions of opposite charge are attracted to one another and form an ionic bond
- B. Covalent bonds
 1. some atoms share electrons rather than gain or lose them
 2. atoms that share electrons form covalent bonds
 3. a molecule is formed when two or more atoms are joined together by covalent bonds
- C. Polar molecules
 1. in a covalent bond (found in a molecule) when electrons are shared between atoms the sharing is not always equal
 2. the atom that has a larger share of the electrons is slightly negative
 3. the atom that has a smaller share of the electrons is slightly positive
 4. this results in one end of the molecule being negative and the other end being positive
 5. such a molecule is said to be polar
- D. Hydrogen bonds

1. the negative end (in biology, usually a nitrogen or oxygen atom) of one molecule can be attracted to the positive end (in biology, usually a hydrogen atom) of another
2. this weak attraction is called a hydrogen bond

V. Acids, Bases, and Buffers

A. acid - a substance that releases hydrogen ions in solution

B. base - a substance that releases hydroxide ions in solution

C. pH

1. the scale that is used to measure the acidity or basicity of a solution

2. the scale goes from 0 to 14

a. $\text{pH} < 7$ is acidic

b. $\text{pH} > 7$ is basic

c. $\text{pH} = 7$ is neutral

D. buffer - a chemical that neutralizes excess acid or base, thereby preventing a significant change in pH