Biol 1441 - Dr Westmoreland  
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Chapter 2:  

**Matter** is anything that takes up space and has mass.  

**Element** is a substance that cannot be broken down chemically to other substances by chemical reactions.  

A **compound** is a substance consisting of two or more different elements combined in a fixed ratio.  

**Essential Elements of Life:** Carbon, oxygen, hydrogen, and nitrogen make up approximately 96% of living matter.  

An **atom** is the smallest unit of an element.  

An atom has a nucleus made up of positively charged protons and uncharged neutrons, as well as a surrounding cloud of negatively charged electrons.  

**Atomic Number and Atomic Mass**  

### Isotopes  

#### Electron Configuration and Chemical Properties  

**Valence electrons** are outer electrons  
**Valence shells** are the outermost electron shell  

Chemical behavior depends on the number of valence electrons. An atom with an incomplete valence shell is reactive.  

**Chemical bonds**  

**Covalent Bonds:** is the sharing of a pair of valence electrons by 2 atoms.
Electronegativity: is the attraction of a particular kind of atom for the electrons of a covalent bond

Nonpolar covalent bond: the electrons of the bond are shared equally. Ex: \( \text{N}_2 \)

Polar covalent bond: the electrons of the bond are not shared equally. Ex: \( \text{HCl} \)

Ionic Bonds:
Two atoms are so unequal in their attraction for valence electrons that the more electronegative atom strips an electron completely away from its partner.

Ion: a charged atom (or molecule)
Cation: a positive ion
Anion: a negative ion

The transfer of an electron is not the formation of a bond; rather, it allows a bond to form because it results in two ions. Any two ions of opposite charge can form an ionic bond.
Weak Chemical Bonds

A **hydrogen bond** forms when a hydrogen atom covalently bonded to one electronegative atom is also attracted to another electronegative atom.

**Chemical reactions** is making and breaking of chemical bonds, leading to changes in the composition of matter.