

Chapter 17: Elements and Their Properties

Section 2: Nonmetals

Nonmetals: elements that are usually gases or solids at room temperature

- Most of your body's mass is made of Oxygen, Carbon, Hydrogen, and Nitrogen
 - Calcium (metal), Phosphorus, Sulfur, and Chlorine are also found in your body
- Not malleable or ductile but are brittle or powdery
- Poor conductors of heat and electricity
- Found on the right side of the stair-step line (except Hydrogen)
- Nonmetals tend to bond with metals
 - Gain electrons from the metals and become negative ions (Chapter 18)
 - Transfer of electrons to make an ionic bond
- Nonmetals will bond with other nonmetals
 - This time the electrons are shared between atoms and the bonding is called a covalent bond
- Diatomic molecules: consists of 2 atoms of the same element in a covalent bond
 - H₂, N₂, O₂, F₂, Cl₂, Br₂, I₂
- Hydrogen
 - Highly reactive
 - 90% of atoms in the universe are H atoms
 - Most of this is found on Earth as water
 - Hydrogen comes from the Greek word *hydro* meaning water

Groups of nonmetals:

- **Halogens:** Group 17

- Very reactive in their elemental form
- Compounds have many uses for everyday life
- The term “salt” refers to a group 1 or 2 metal reacting with a halogen
 - Most common is NaCl = table salt
- Fluorine is the most chemically active nonmetal
 - Used in toothpastes and city water systems to help prevent tooth decay
- Chlorine is used in swimming pools to disinfect the water
 - Also used in industrial bleaches to whiten flour and clothing (obviously not the same ones)
- Bromine is the only liquid nonmetal at room temperature
 - Used to study genetic material such as DNA
- Iodine is essential in your diet to produce the hormone thyroxin and to prevent goiter
- Astatine is radioactive and being investigated into its use of treating cancer

- **Noble gases:** Group 18

- Exist as isolated atoms
- They are chemically stable because they have a full 8 valence electrons
- No naturally occurring compounds but can be made in a laboratory setting
- Helium is safe to use in blimps and balloons because it is less dense than air but does not burn in oxygen
- Neon is used in making brightly colored signs