

Chemical Properties & Periodic Trends

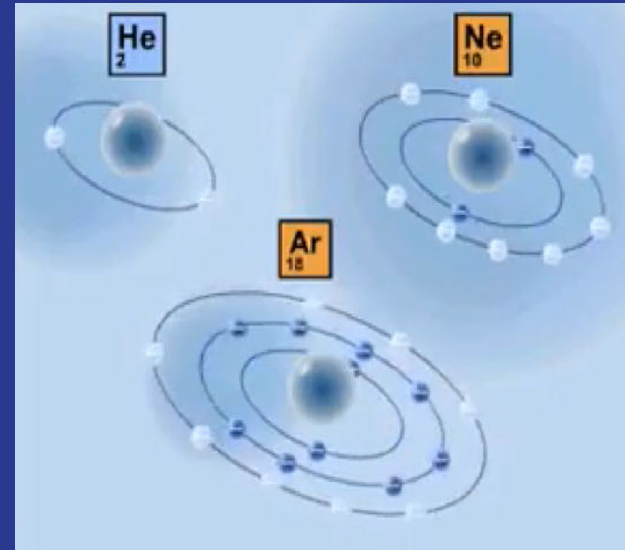


Gaining Stability

Atoms gain stability when their valence orbital is full

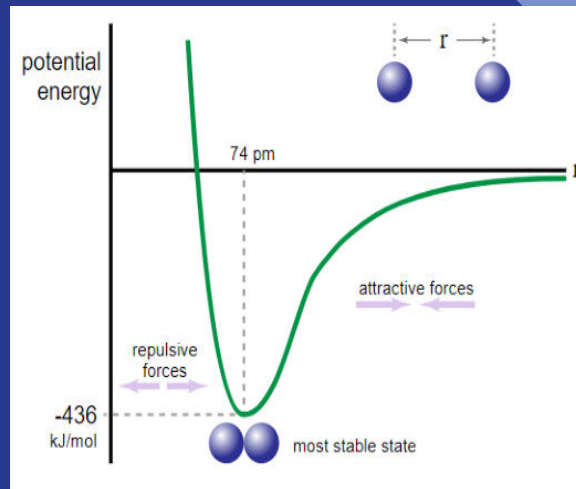
According to the octet rule, the maximum amount of electrons a valence orbital can hold is 8.

A helium atom can only hold 2.



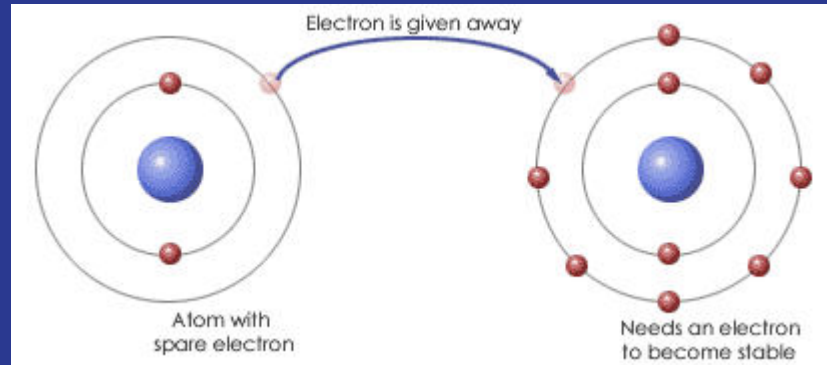
Atomic Radius & Shielding

- If the valence orbital is not full, atoms will bond with other atoms to achieve stability.
- In order to form a bond, the nucleus of one atom must attract the valence electrons of another atom.
- Bigger atoms have a harder time attracting electrons because their nuclei are so far away from the valence orbital.



Ionic Bonding

Atoms can achieve stability through **IONIC BONDING** by transferring valence electrons from metal atoms to nonmetal atoms.



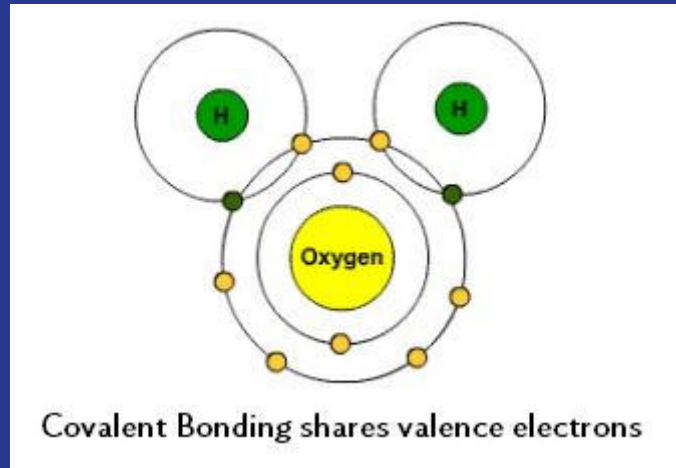
Ionization Energy

- The amount of energy required to remove an electron from the valence orbital is less for atoms with more shielding.
- This means **larger** metals will react with **smaller** nonmetals more quickly.



Covalent Bonding

Atoms can achieve stability through **COVALENT BONDING** by sharing electrons between two nonmetal atoms.



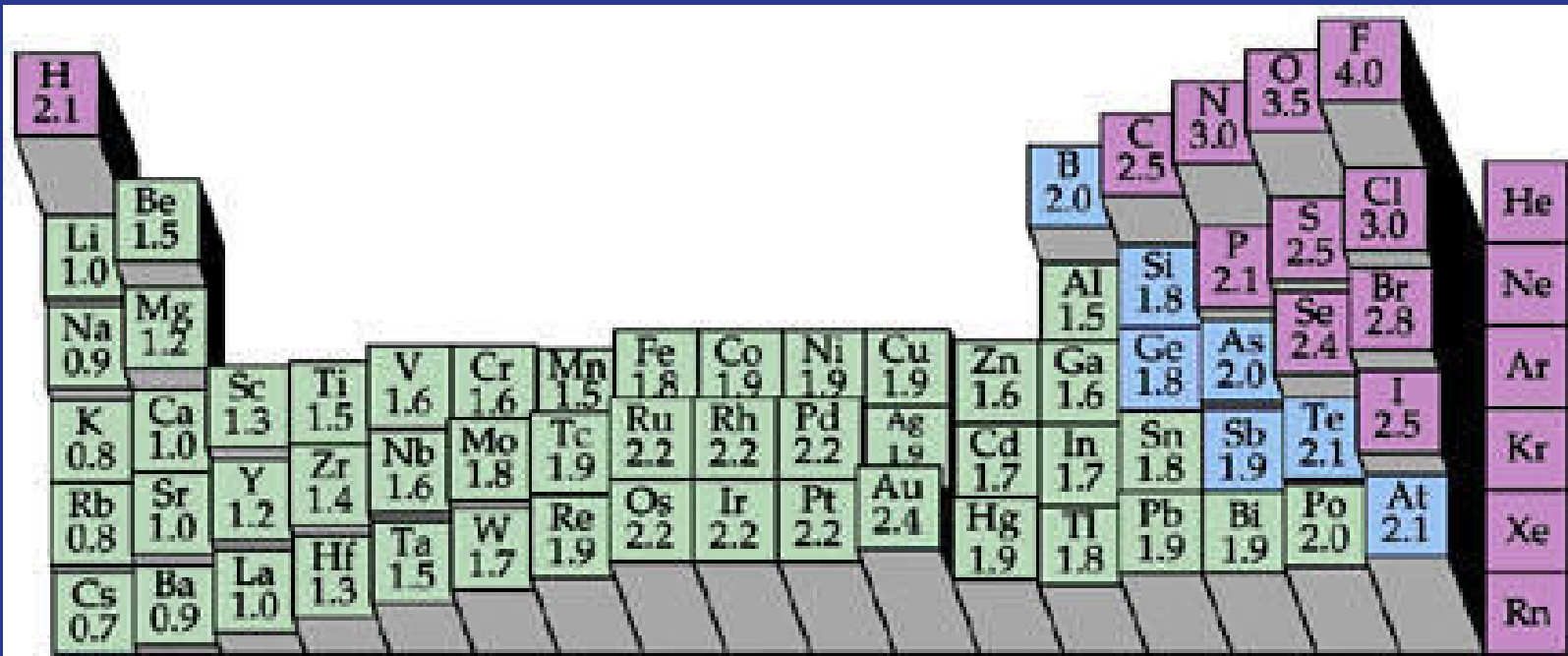
Electronegativity

The electronegativity difference between two atoms determines the type of bonding.

- >0.4 Nonpolar Covalent
- $0.5 - 1.5$ Polar Covalent
- > 1.6 Ionic



Electronegativity



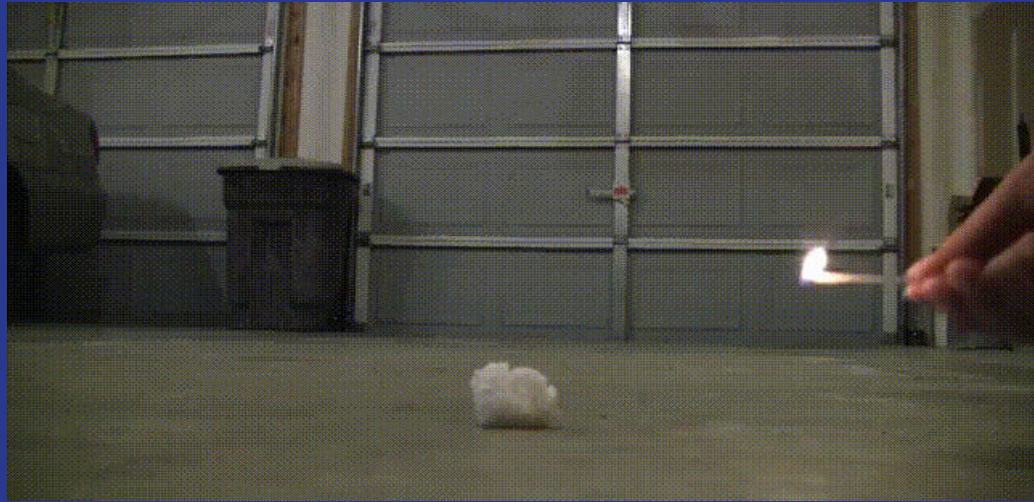
Chemical Properties

The characteristics of a substance that is observed during a reaction in which the chemical composition or identity of the substance is changed.

Example: Flammability and Combustion
 Oxidation, Rust, and Tarnish
 Fermentation
 Acidity and Alkalinity

Flammability/ Combustion

Hydrocarbons react with oxygen to form carbon dioxide and water.



Oxidation/Rust/Tarnish



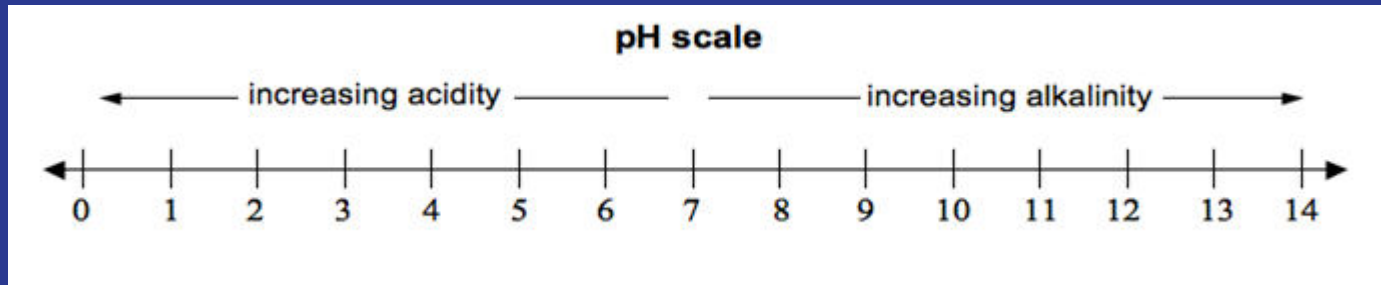
Metals react with oxygen to form metal oxides.

Fermentation

Yeast reacts with sugar to produce carbon dioxide.



Acidity/ Alkalinity



Valence Electrons

- Valence electrons determine the chemical properties of an atom.
- The number of valence electrons determines the type of bonding – whether ionic or covalent

Periodic Table Main Group Elements 1 - 26							
Hydrogen 1 H							Helium 2 He
Lithium 3 Li	Beryllium 4 Be	Boron 5 B	Carbon 6 C	Nitrogen 7 N	Oxygen 8 O	Fluorine 9 F	Neon 10 Ne
Sodium 11 Na	Magnesium 12 Mg	Aluminum 13 Al	Silicon 14 Si	Phosphorus 15 P	Sulfur 16 S	Chlorine 17 Cl	Argon 18 Ar
Potassium 19 K	Calcium 20 Ca	Gallium 31 Ga	Germanium 32 Ge	Arsenic 33 As	Selenium 34 Se	Bromine 35 Br	Krypton 36 Kr