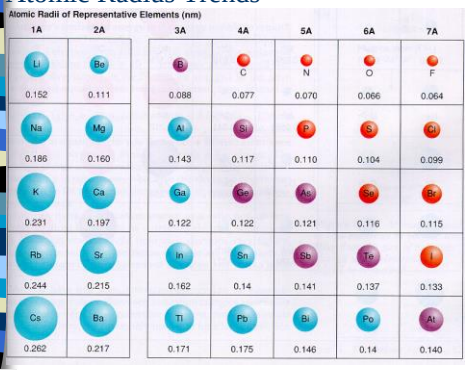
Atomic Radius Trends



Periodic Trends

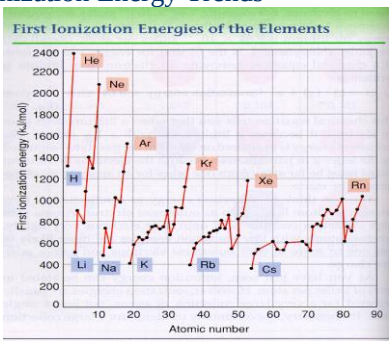
Trends:

1) Atomic radius increases down a group.

2) Atoms get smaller as you move across the period.

- Explanation of (2) - As you move left to right across the period, there are more protons which give a stronger pull on the outermost electrons.

Ionization Energy Trends



Ionization Energy Trends

Energy required to remove one of the atom's electrons.

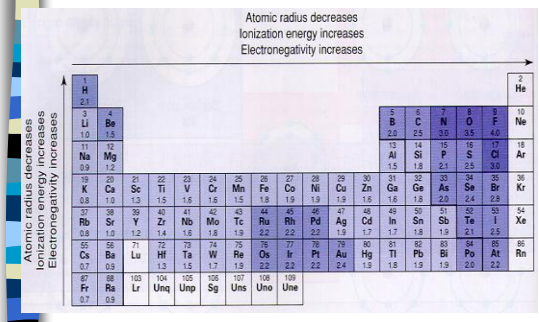
- Ionization energies decrease as you move down a group.
- Ionization energies increase as you move left to right across the period.

Ionization Energies

TABLE 7.2 Successive Values of Ionization Energies, I, for the Elements Sodium Through Argon (kJ/mol)

Element	I_1	I_2	I_3	I_4	I_5	I_6	I_7
Na	496	4560					
Mg	738	1450	7730		(Inner-shell electrons)		
Al	578	1820	2750	11,600			
Si	786	1580	3230	4360	16,100		
P	1012	1900	2910	4960	6270	22,200	
S	1000	2250	3360	4560	7010	8500	27,100
Cl	1251	2300	3820	5160	6540	9460	11,000
Ar	1521	2670	3930	5770	7240	8780	12,000

Trends

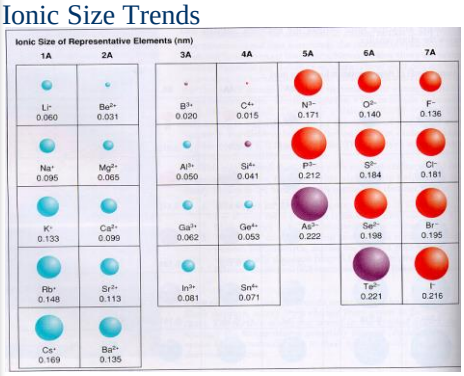


Electronegativity Trends

Atoms ability to pull electrons towards it.

- Electronegativity decreases as you move down a group.
- Electronegativity increases as you move left to right across the period.

Ionic Size Trends



Ionic Size Trends

- When atoms lose electrons, their radius decreases.
- When atoms gain electrons, their radius increases.
  - Atoms within the same group form the same ions.

Metal Properties

- Metals have a luster, conduct heat & electricity, are malleable and most are solid at room temperature.
- Compounds of metals and nonmetals tend to be ionic compounds
- Metal oxides react with water to form bases.
- Metal oxides can be used to neutralize acids.
- Alkali & Alkali Earth metals react with water to form bases and hydrogen gas

Nonmetal Properties

- Nonmetals do not have a luster, do not conduct heat & electricity, are not malleable and are in any state of matter at room temperature.
- Compounds of metals and nonmetals tend to be ionic compounds
- Compounds of only nonmetals are molecular substances
- Nonmetal oxides react with water to form acids.
- Nonmetal oxides can be used to neutralize bases.

Origins of the Periodic Table

- In 1869, approximately 62 elements were known to exist. Scientists wanted a convenient way to look at these elements. Dmitri Mendeleev proposed a periodic table of elements. It was arranged by increasing mass number and similar properties.
- Later, Henry Mosley working with X-ray radiation discovered that the amount of positive charge in the atom (protons) was the proper way to order the elements.

The Periodic Law

- Periodic Law - when elements are arranged in order of increasing atomic number, their physical and chemical properties show a periodic pattern.

Groups

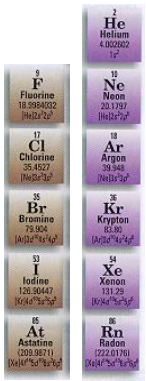
Alkali Metals:
- highly reactive due to single s-orbital electron.
- Forms a +1 charge
- Reacts with oxygen & water rapidly, must be stored in oil.
- Soft metal, very abundant

Alkali Earth Metals:
- Very reactive, but not as much as alkali metals.
- Soft metal, very abundant
- Forms +2 charge

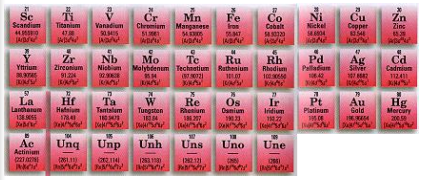
Groups

Halogens:
- Nonmetals with high reactivity.
- Very common in compound form
- Gas or liquid at room temp.
- Forms a -1 charge.

Noble Gases:
- Gases with a full p-orbital.
- Very few compounds of noble gases made because of stable p-orbital.
- Commonly used in gas tubes for neon-type signs.



Groups



Transition Metals: (d-orbital)

- Metals found throughout the Earth, sometimes in elemental form.
- Varying charges, most commonly form +2 charge.
- Most applications of industry from these elements

Groups

Inner Transition Metals: (f-orbital)

- Group of highly unstable elements used in nuclear reactions, and lighting.
- Instability due to size of atoms.