Trends in Modern Periodic Table

The term periodic properties in elements, refers to the properties that recur at regular intervals. The trend of recurrence of properties is called periodicity. Important periodic properties are:

- Atomic radius
- Ionization energy
- Electron affinity
- Electronegativity
- Metallic and non-metallic character

Atomic radius:

Atomic radius is the distance from the centre of the nucleus to the valence electron in an energy level. Atomic radius is expressed in angstrom units.

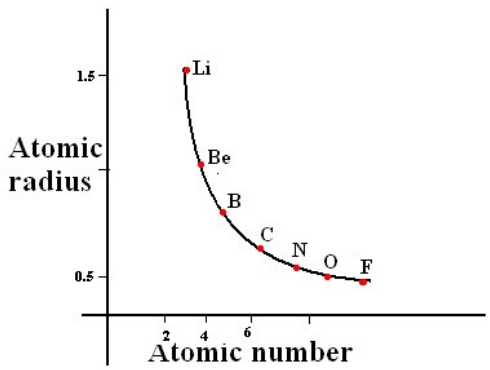
Trend in atomic radius:

The atomic radius decreases across a period due to increase in nuclear charge.

Example:

The graph below shows decreasing order of atomic radius in period:

Li > Be > B > N > O

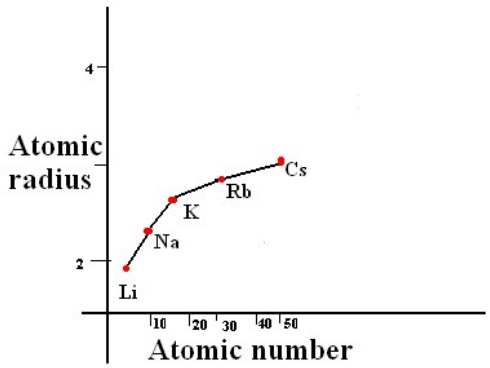


Atomic radius increases down the group due to addition of new shell.

Example:

Following graph shows increasing order of atomic radius in group:

Li < Na < K < Rb



Ionization energy:

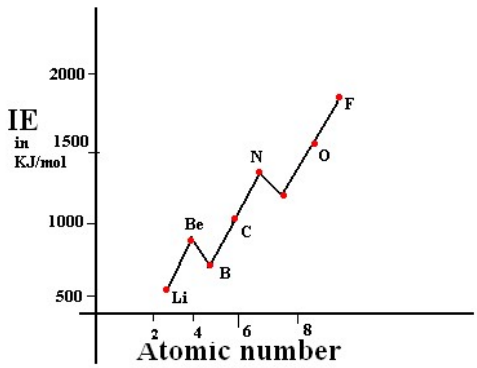
Ionization Energy is the minimum energy required to remove the outermost electron from a gaseous neutral atom to form a cation.

The unit for ionization energy is electron volts or kilo joules per mole.

Trend in Ionization energy:

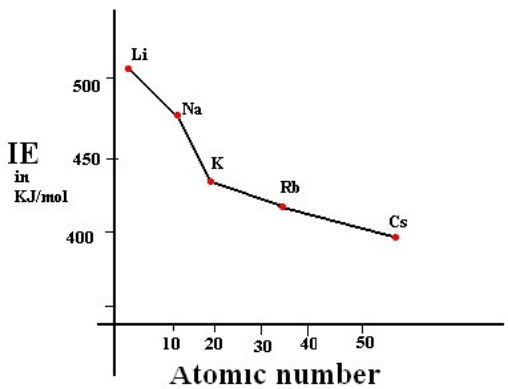
Ionization energy increases across a period due to increase in the nuclear charge.

The following depicts the increase of IE in period.



Ionization energy decreases down the group due increase due to increase in the atomic size (addition of new shell).

The following graph gives decrease of IE in group-1.



Helium has the highest ionization energy in the periodic table while cesium has the lowest ionization energy.

Electron affinity:

The energy released when an electron is added to a neutral gaseous atom is known as electron affinity. The unit for electron affinity is kilo joules per mole.

It depends mainly on two factors. They are atomic size and nuclear charge.

Atomic size: As the atomic size increases the nucler attraction force on the valence shell decreases. Thus electron affinity will be more for smaller atomic size elements.

Nuclear charge:

Electron affinity increases with increase in the nuclear charge. With the increase in nuclear attraction force the electron in the valence shell binds strongly to the atom.

Trend in electron affinity:

The electron affinity increases across a period while it decreases down a group.

The zero group elements have the lowest electron affinity values. Halogens posses' highest electron affinity in the periodic table. In halogens chlorine posses highest electron affinity in the periodic table.

Electronegativity:

The tendency of an atom to attract the shared pair of electrons towards itself is known as electronegativity.

Trend in electronegativity:

Electronegativity increases across a period.

Example:

In second period electronegativity increases from lithium to fluorine.

Electronegativity decreases while moving down the group.

Example:

In group-1 electronegativity decreases while moving from top to bottom.

In the periodic table, halogens have high electronegativity. Among halogens Fluorine has the highest electronegativity of 4.0 than Chlorine, Bromine and Iodine.

In the periodic table alkali metals possess very low electronegativity values. Among alkali metals Cesium has the lowest value of 0.7.

Metallic character:

The tendency of an atom to lose electrons is known as metallic character.

Metallic character decreases across a period and increases down the group.

Metals are highly electropositive in nature.

Non-metallic character:

The tendency of an atom to gain electrons is known as non-metallic character.

Non-metallic character increases across a period and decreases down the group.

Non-metals are more electronegative in nature.

In the periodic table:

- Metals are placed on the left side of the periodic table.
- Non-metals are placed on the right side of the periodic table.
- Metalloids are placed between the metals and the non-metals.