Periodic Classification of Elements
Electronic Configuration

ELECTRONIC CONFIGURATION:

The electron configuration of an element describes how electrons are distributed in its atomic orbitals. Electron configurations of atoms follow a standard notation in which all electron-containing atomic subshells (with the number of electrons they hold written in superscript) are placed in a sequence. For example, the electron configuration of sodium is $1s^2 2s^2 2p^6 3s$

Writing Electron Configurations

Shells:

The maximum number of electrons that can be accommodated in a shell is based on the principal quantum number (n). It is represented by the formula $2n^2$, where 'n' is the shell number. The shells, values of n, and the total number of electrons that can be accommodated are tabulated below.

Shell and 'n' value	Maximum electrons present in the shell
K shell, n=1	$2*1^2 = 2$
L shell, n=2	$2*2^2 = 8$
M shell, n=3	$2*3^2 = 18$
N shell, n=4	$2*4^2 = 32$

Subshells:

- The subshells into which electrons are distributed are based on the azimuthal quantum number (denoted by 'l').
- This quantum number is dependent on the value of the principal quantum number, n. Therefore, when n has a value of 4, four different subshells are possible.
- When n=4. The subshells correspond to l=0, l=1, l=2, and l=3 and are named the s, p, d, and f subshells, respectively.
- The maximum number of electrons that can be accommodated by a subshell is given by the formula $2*(2l + 1)$.
- Therefore, the s, p, d, and f subshells can accommodate a maximum of 2, 6, 10, and 14 electrons, respectively.

All the possible subshells for values of n up to 4 are tabulated below.

Principle Quantum Number Value	Value of Azimuthal Quantum Number	Resulting Subshell in the Electron Configuration
n=1	l=0	1s
n=2	l=0	2s
	l=1	2p
n=3	l=0	3s
	l=1	3p
	l=2	3d
n=4	l=0	4s
	l=1	4p
	l=2	4d
	l=3	4f

Thus, it can be understood that the 1p, 2d, and 3f orbitals do not exist because the value of the azimuthal quantum number is always less than that of the principal quantum number.

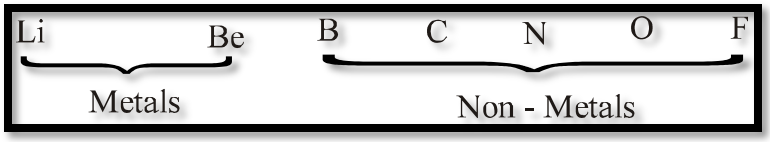
METALLIC AND NON-METALLIC CHARACTER.

Generally, **Metals** poses 1, 2 or 3 electrons in their respective valence shells and thus have a strong tendency to lose these electrons to form positive ions. Therefore, metals are also called **electropositive elements** and the metallic character is also called **Electropositive Character.**

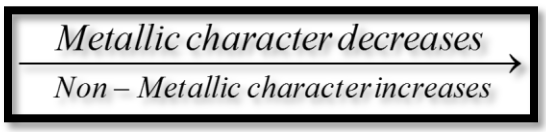
Non-Metals, on the other hand, generally have 4 to 8 electrons in their respective outermost shells and thus have a tendency to gain electrons to form negative ions. Therefore, non-metals are also called **Electronegative elements** and the non-metallic character is also called **electronegative character.**

Variation in a period: On moving from left to right in a period, the metallic character decreases while the non-metallic character increases.

Second period elements



Nature of elements



Thus, in the second period, lithium is the most metallic element followed by beryllium. The non-metallic character starts with boron and keeps on increasing. Thus, fluorine is the most nonmetallic element of the second period.

The change from metallic to non-metallic character is more striking among the elements of the third period as shown below:

Third period elements

In general, the most metallic element lies on the extreme left-hand side while most nonmetallic element lies on the extreme right-hand side of any period.

Variation in a group. On moving down in a group, the metallic character or electropositive character increases.

Elements of Group 1

Element	**Symbol**	**Metallic character**
Lithium	Li	Least metallic element
		↓ Metallic character increases down the group
Sodium	Na	
Potassium	K	
Rubidium	Rb	
Cesium	Cs	
Francium	Fr	Most metallic element

Conversely, on moving down a group, the nonmetallic character or electronegative character decreases.

Elements of Group 2

Element	Symbol	Metallic character
Fluorine	F	Most nonmetallic element
		Non-Metallic character or electronegative character decreases on moving down the group
Chlorine	Cl	
Bromine	Br	
Iodine	I	
Astatine	At	Least non-metallic element

Division of elements into Metals and Non-metals:

In the long form of the periodic table, the elements have been broadly divided into metals and non-metals by the zig-zag line funning diagonally across the periodic table. Those elements which lie on the left-hand side of this line are Metals and those which lie on the right-hand side of this line are non-metallic. However, the elements silicon, germanium, arsenicm, antimony and tellurium which lie along the border of this line show the properties of both metals and non-metals. These elements are called semi metals or metalloids.

The metallic/nonmetallic character also helps us to predict the nature of oxides formed by the elements. In general, the oxides of metals are basic while those of non-metals are acidic in nature.

An element behaves as a metal or a non-metal is directly related to its ionization energy. The elements having low values of ionization energies are metals whereas elements having high values of ionization energies are non-metals.