

# **CHEMISTRY STUDY MATERIALS FOR CLASS 10**

**(Based on: Periodic Classification of Elements)**

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## **Metallic and Non-metallic Character**

The tendency of an element to lose electrons and form positive ions (cations) is called electropositive or metallic character. For example, alkali metals are the most electropositive elements.

"The tendency of an element to accept electrons to form an anion is called its non-metallic or electronegative character." For example, chlorine, oxygen and phosphorous show greater electronegative or non-metallic character.

In each period, metallic character of elements decreases as we move to the right. Elements to the left of the periodic table have a pronounced metallic character while those to the right have a non-metallic character. Conversely, non-metallic character increases from left to right.

In the third period, sodium on the extreme left is most metallic. The metallic character decreases towards magnesium and aluminium, which are to the right. Silicon is midway between metals and non-metals. From phosphorus to sulphur to chlorine, non-metallic character gradually increases, chlorine being the most non-metallic in behaviour. In the 18 or zero group, argon does not exhibit either metallic or non-metallic character.

The elements to the left of the periodic table have a tendency of losing electrons easily as compared to those to the right. As we move from left to right of the period, the electrons of the outer shell experience greater pull of the nucleus. This greater force of attraction is because the nuclear charge increases and the size of the atom decreases from left to right. Thus, electrons of the elements to the right of the table do not lose electrons easily so are non-metallic in nature.

Metals usually have 1, 2 or 3 electrons in the outermost shell and ionize by giving out these electrons. Thus they gain positive charges equal to the number of electrons lost. Germanium, tin and lead with four electrons each in the valence shell are also included among the metals.

Non-metals usually have 5, 6 or 7 electrons in the outermost shell and ionize by accepting electrons. Thus they gain a negative charge equal to the number of electrons gained. Although carbon and silicon have four electrons each in the valence shell, they are included in the non- metals. Boron is an exception; it has three electrons in the outermost shell but is still included among non-metals.

As we move down the group the number of shells increases. This causes the effective nuclear charge to decrease due to the outer shells being further away: in effect the atomic size increases. The electrons of the outermost shell experience less nuclear attraction and so can lose electrons easily thus showing increased metallic character.

## **REASONING**

### **From left to right in a period (Across the period):- 2<sup>nd</sup> period**

<b>Element:-</b>	<b>Li</b>	<b>Be</b>	<b>B</b>	<b>C</b>	<b>N</b>	<b>O</b>	<b>F</b>	<b>Ne</b>
Atomic No.:-	3	4	5	6	7	8	9	10
Electronic Confi <sup>n</sup>	2/1	2/2	2/3	2/4	2/5	2/6	2/7	2/8
Valence Electron:-	1	2	3	4	5	6	7	8
Valency:-	1	2	3	4	3	2	1	0

From above observations;

1. Atomic number/ No. of protons/ nuclear charge (+vely charge) increases.
2. No. of Valence electron (-vely charge) increases.
3. No. of shell/ orbit (distance between nucleus and valence electron) same.

Force of attraction between nuclear charge and valence electron increases. So atom is contracted / squeezed. Hence atomic size decreases across the period. When atomic size decreases then reducing nature / metallic character / ionic nature / melting point and boiling point decrease across the period.

And ionization enthalpy / electronegativity / electron gain enthalpy increases across the period.

**From top to bottom in a group (Down a group):- 1<sup>st</sup> group**

<b>Element:-</b>	<b>Li</b>	<b>Na</b>	<b>K</b>	<b>Rb</b>	<b>Cs</b>
Atomic No.:-	3	11	19	37	55
Electronic Conf <sup>n</sup>	2/1	2/8/1	2/8/8/1	2/8/18/8/1	2/8/18/18/8/1
Valence Electron:-	1	1	1	1	1
Valency:-	1	1	1	1	1

From above observations;

1. Atomic number/ No. of protons/ nuclear charge (+vely charge) increases.
2. No. of Valence electron (-vely charge) same.
3. No. of shell/ orbit (distance between nucleus and valence electron) increases.

Force of attraction between nuclear charge and valence electron decreases. So atom is expanded. Hence atomic size increases down a group. When atomic size increases then reducing nature / metallic character / ionic nature / melting point and boiling point increase down a group.

And ionization enthalpy / electronegativity / electron gain enthalpy decreases down a group.

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