Chemistry Study Materials for Class 10
(NCERT Based Revision Notes of Chapter - 05)

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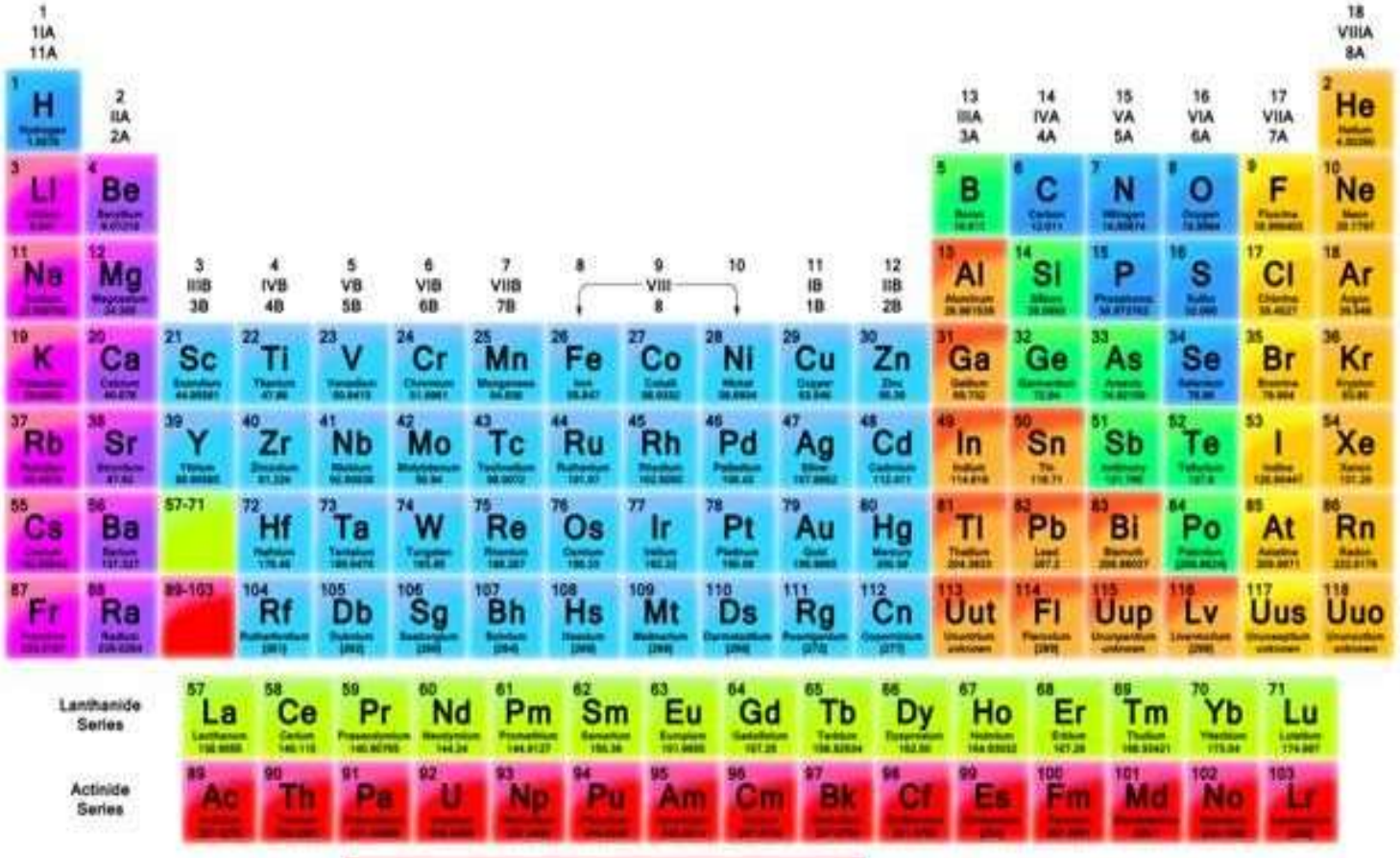
Periodic Classification of Elements

Modern Periodic Table

In 1913, Henry Moseley proved that the atomic number is the fundamental property rather than its atomic mass.

Modern Periodic Law: Properties of elements are a periodic function of their atomic numbers.

The periodic table, based on the Modern Periodic Law is called the Modern Periodic Table.



Modern Periodic Table

Position of Elements in the Periodic Table

Periods

1. The horizontal rows in the Modern Periodic Table are called periods.
2. The Modern Periodic Table consists of seven periods which are numbered from 1st to 7th.
3. In each period, a new shell starts filling up. The period number is also the number of shell which starts filling up.
4. The elements in a period have consecutive atomic numbers, and the number of elements in each period is given below

- First period contains 2 elements and is called a very short period.
- Second and third periods contain 8 elements and are called as short periods.
- Fourth and fifth periods are long periods and contain 18 elements each.
- Sixth and seven periods are the longest and contains 32 elements.

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The number of elements present in each period is given in the following table.

Period	Valence shell	Type of period	No of elements	Atomic No of the elements
1st Period	n = 1	Short period	2	Atomic number 1 and 2
2nd Period	n = 2	Short period	8	Atomic number 3 to 10
3rd Period	n = 3	Long period	8	Atomic number 11 to 18
4th Period	n = 4	Long period	18	Atomic number 19 to 36
5th Period	n = 5	Long period	18	Atomic number 37 to 54
6th Period	n = 6	Longest period	32	Atomic number 55 to 86
7th Period	n = 7	Longest period	32	Atomic number 87 to 118

The number of elements in these periods is based on the way electrons are filled into various shells. The maximum number of electrons that can be accommodated in a shell depends on the formula $2n^2$ where 'n' is the number of the given shell from the nucleus.

Groups

1. The vertical columns are called groups and consist of eighteen groups numbered from 1 to 18.
2. Elements having the same number of valence electrons are present in the same group.
3. Elements present in the same group show the same chemical properties.
4. Group 1 contains alkali metals and these elements contain 1 electron in their outermost shell.
5. Group 2 contains alkaline earth metals and these elements contain 2 electrons in their outermost shell.
6. Groups 3 to 12 have their two outermost shells incomplete.
7. Groups 13 to 18 group contain 3 to 8 electrons in their outermost shell.
8. Group 18 elements have complete outermost shells. So they are called noble elements or noble gases.
9. The element hydrogen has been placed at the top of group 1 because its electronic configuration is similar to alkali metals.

Cause of Periodicity of Elements

The modern periodic table is based on the electronic configuration of the elements. The properties of an element are determined largely by the electrons in its outermost or valence shell. Valence electrons interact with other atoms and take part in all chemical reactions, while inner shell electrons have little influence on the properties of elements. When elements are placed in the order of their increasing atomic number, the elements having the same number of valence shell electrons is repeated in such a way, so as to fall under the same group. Since, the electronic configuration of the valence shell electrons is same they show similar properties. Members of the same group have similar electronic configuration of the valence shell and thus show same valency.

Magic Numbers

When the elements are arranged in the order of increasing atomic number, it is observed that the elements with similar properties recur after intervals of either 2 or 8 or 18 or 32 elements. These numbers(2,8,18,32) are called magic numbers.

Position of Elements in the Modern Periodic

On the basis of electronic configuration, the elements of the periodic table are classified into:

1. Noble gases
2. Normal elements
3. Transition elements
4. Alkali metals
5. Halogens
6. Inner-transition elements

Noble Gases

Noble gases are also known as inert gases and do not take part in chemical reactions. They have their outermost shell complete and thus remain stable. They do not generally combine with other substances, nor are they affected by oxidising agents or by reducing agents. They are placed in the 18 or VIIIA group. Since, the outermost shell is complete, the valency is zero, and hence VIIIA group is also referred to as zero group.

Normal Elements

In the case of these elements, all shells except the outermost shell are completely filled. Elements belonging to 1 (IA), 2 (IIA), 3 (IIIA), 4 (IVA), 5 (VA), 6 (VIA) and 7 (VIIA) are normal elements. Elements of the second period are known as typical elements [Li (Z = 3) to Ne (Z = 10)] because each element is placed in a group whose number matches with the number of valence electrons. The elements of the IIIrd period are representative elements [Na (Z = 11) to Ar (Z = 18)] as each of them is a representative of its group. Groups 1 (IA) and 2 (IIA) are strongly metallic and are called group of 'alkali metals and alkaline earth metals', while group 7 (VIIA) are halogens.

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