

CHEMISTRY STUDY MATERIALS FOR CLASS 10

(Based on: Periodic Classification of Elements)

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Merits of the Long Form of the Periodic Table

1. This classification is based on the most fundamental property of the Elements - the atomic number, so it is more accurate.
2. With the atomic number as the basis of this classification, the position of isotopes in one place is justified.
3. The electronic configuration determines the properties of the elements.
4. The position of elements governed by this feature is useful in studying the properties of elements.
5. The position of the elements, which were misfit on the basis of atomic mass is now justified on the basis of atomic number.
6. The lanthanides and actinides have been placed separately due to their properties being different from other groups.
7. The whole table is easy to remember and reproduce in terms of electronic configuration and properties of the elements.

Demerits of the Long Form of the Periodic Table

Although the long form of the period table has been able to help in systematic studying the elements to a great extent, it has some minor defects:

1. Hydrogen resembles both the alkali metals and halogens. But it has been placed with the alkalis not with the halogens.
2. The lanthanides and actinides have not been placed in the main body of the table.

Periodic Properties

1. Valency: Valency is the combining capacity of an element. For metals it is the number of electrons lost during chemical combination while for nonmetals it is the number of electrons gained during chemical combination.

When metals combine with hydrogen, they show a valency corresponding to group number, & nonmetals show a valency equal to $(8 - \text{group number})$.

Thus, valency of an element with respect to hydrogen increases from 1 to 4 and then falls from 4 to 1 across a period.

All elements when combining with oxygen can show a valency corresponding to group number. For example, phosphorus forms phosphorus pentoxide (P_2O_5), where the valency of P is 5 & corresponds to its group number (V A). While combining with hydrogen, phosphorus forms phosphine (PH_3) where it shows a valency of 3 (8- group number)

Thus, valency of an element with respect to oxygen increases from 1 to 7 along a period.

2. Atomic Volume

It is defined as the volume occupied by one mole atoms of the element at its melting point, in solid state.

Variation along the Group – increases on moving down the group.

Variation along the period – decreases along the period, reaches a minimum in the middle and then starts increasing. Alkali metals have maximum atomic volume in a period.

3. Atomic Size (Atomic Radius/ Ionic Radius)

Atomic Radius – The distance between the centre of the nucleus and the electron clouds present in outermost orbit / shell of an isolated atom or ion is called atomic size.

Covalent radius of an element – half the internuclear distance between the two atoms of the element held by a single covalent bond

Metallic radius of an element – half the internuclear distance between the two nearest metal atoms in a metallic crystal.

Atomic radii increases down the group and increases across the period.

4. Ionisation Enthalpy

The minimum energy needed to remove loosely bounded electron(s) from outermost orbit from the neutral atom in the gaseous state.

It increases across a period in general and decreases down the group.

Factors affecting ionization Enthalpy

1. Size of the atom
2. Magnitude of Nuclear Charge
3. Screening Effect of the inner electrons
4. Electronic Configuration
