

PERIODIC CLASSIFICATION OF ELEMENTS

⇒ Early attempts for Periodic Classification

1) Dobereiner's Triads

⇒ According to this law, when elements are arranged in order of increasing atomic masses, group of 3 elements [called Triads], having similar chemical properties are obtained.

⇒ The atomic mass of the middle element of the triad being equal to the arithmetic mean of atomic masses of the other two elements.

⇒ Example ⇒ The Alkali Metal Group

⇒ Lithium, potassium, sodium

Arithmetic mean of mass

$$\Rightarrow \frac{7+39}{2} = \frac{46}{2}$$

$$= 23$$

$$\Rightarrow \text{Na} = 23$$

Elements	Atomic mass
1. Li	7
2. K	39
3. Na	23

2) Newland's law of Octaves
↳ music fan

⇒ According to this law, when elements are arranged in order of increasing atomic masses, the property of every 8th element [starting from given element] are a repetition of the properties of the first element.

⇒ बिल्कुल वैसे ही जैसे,

स, रे, ग, म, प, ध, नि, स
① _____ ⑧

same

⇒ Limitations:-

1) This law was only applicable upto Calcium (Ca).

2) Newland assumed that only 56 elements existed in nature and no more elements would be discovered in future, but later on many new elements were discovered that do not fit into the Newland law.

⇒ Limitations of Dobereiner's Triads

- 1) It failed to average all the then known elements in the form of triads of elements having similar chemical properties.
- 2) His classification was not that much successful because he only identified 3 triads from the elements known at that time.

3) In order to fit elements into his table, newland even adjusted two elements in the same slot and also put two different kind of elements in the same note

⇒ He placed Cobalt and Nickel in same slot.

⇒ He even placed Fluorine, Chlorine, Bromine having different properties in the same column.

4) Iron which resembles Cobalt and Nickel in properties was placed far away in Table.

⇒ MENDELEEV'S PERIODIC TABLE [At that time → 63 element]

- He examined the relationship between the Atomic masses of the elements and their Physical and chemical properties.
- For studying chemical properties, he concentrated on the compounds formed by Hydrogen and Oxygen because Hydrogen and Oxygen are very reactive and forms compound with most of the elements.

• His law states that - "The properties of Elements are the periodic function of their atomic masses."

→ In the classification, Mendeleev was guided by 2 factors-

a) Increasing Atomic masses.

b) grouping together the elements having similar properties.

⇒ Achievements of Mendeleev's Periodic Table - [Merits]

- 1) Mendeleev law predicted the existence of some elements that have not been discovered at that time and for those predicted elements, Mendeleev left proper gaps in his table.

2) Mendeleev's periodic table could predict the properties of several elements on the basis of their positions in the periodic Table.

3) Mendeleev's periodic Table could accommodate noble gases when they were discovered.

⇒ Limitations of Mendeleev's periodic Table

1) The position of Isotopes could not be explained.

[Isotopes → Atoms of the same element having similar
↓
chemical properties but different atomic masses.]
[discovered after Mendeleev Per. Table]

2) Wrong Order of Atomic Masses of some elements could not be explained.

3) A correct position could not be assigned to Hydrogen in the Periodic Table.

⇒ The MODERN PERIODIC TABLE [on basis of Atomic number].

⇒ Modern Periodic law states that - 'Properties of Elements are a periodic function of their atomic number.'

⇒ Explanation of Modern Periodic law: When the elements are arranged according to increasing atomic numbers, then the elements having same number of valence electrons occurs at regular intervals. Since the number of valence electrons in the elements shows regular repetition, the chemical properties also shows regular repetition (Periodicity).

⇒ This law also solved the 3 problems of Mendeleev's Periodic Table.

⇒ Periods → Horizontal rows of elements in Periodic Table.

⇒ Groups → Vertical Columns in a periodic Table.

⇒ Position of the Elements in the Periodic Table -

⇒ There are 18 groups and 7 Periods.

⇒ The Elements in a Period have ^{consecutive} ~~same~~ atomic number.

⇒ All the Elements in a group have similar electronic configuration and shows similar properties.

⇒ Group 18 → Noble gases [Valence shell completely filled]

⇒ In periodic table, Metals have been separated by Non-metals by some elements called Metalloids.

⇒ Grp 17 → Halogen Group

⇒ Group 1 & Group 2 → Alkali metals and Alkaline Earth metals

⇒ Trends in the Periodic Table

1) Valency: The number of electrons lost or gained (or shared) by one atom of an element to achieve the nearest noble gas configuration, gives us the valency of that element.

⇒ On moving left to Right in Period - the valency of elements increases from 0 to 4 and then again decreases to zero.

⇒ On moving down the Group - the valency of elements remains the same.

2) Atomic Size: This term refers to the radius of an Atom.

⇒ On moving left to Right in Period - the atomic size decreases due to increase in Nuclear charge which tends to pull down electron strongly.

⇒ On moving Down the Group - the Atomic size increases because on moving down the group, number of shells increases which gradually increases the Atomic Size.

⇒ Mettalic and Non-Mettalic Properties

⇒ We know that Metals are Electropositive and Non-metal are Electronegative.

⇒ Note: Remembers there is a zig zag line of metalloids in Periodic Table which separates Metals and Non-Metals.

⇒ On Moving left to seight in a period - The mettalic Character of Element decreases [but the Non-mettalic character increases].

OR

⇒ On Moving left to Right in a period - The Electropositive Character decreases and electronegative Character increases.

⇒ On Moving down the group - The mettalic Character of Element increases.

OR

⇒ On Moving down the Group - the mett. Electropositive Character of Element increases.

⇒ Note: a) Generally All Mettalic Oxides → Basic in Nature
b) Generally All Non-Mettalic Oxides → Acidic in Nature.

By - UTKARSH STUDY

SERIES

ALL THE BEST