

CBSE Class 10 Science
Revision Notes
CHAPTER – 5
PERIODIC CLASSIFICATION OF ELEMENTS

Elements : Substances containing atoms of only one type. e.g Na, Au, Mg etc. There are around 118 elements known to us. The first classification of elements was into Metals and Non-metals. Elements are classified to make the study easy.

Dobereiner's Triads : When the elements were written in order of increasing atomic masses the atomic mass of the middle was the average of the atomic mass of the other two elements.

Elements Atomic Mass

Ca 40.1

Sr 87.6

Ba 136.3

Limitations : Only three triads were recognised from the elements known at that time.

Atomic mass of an element is the relative mass of its atom as compared with the mass of a Carbon-12 atom taken as 12 units

Newland's Law of Octaves

- Based on increasing atomic mass of elements.
- Law of Octaves : When elements are arranged it was found that every eighth element had properties similar to that of the first. e.g properties of sodium and Lithium are the same.

Limitations

- Applicable only upto Calcium
- Properties of new elements couldn't fit in it.
- In some cases properties of the elements were not same as defined by octave. eg: Fe was placed far away from Co and Ni.
- Worked well only with lighter elements.

Mendeleev's periodic table

Mendeleev's Periodic Law : The properties of elements are the periodic function of their atomic mass.

Mendeleev's periodic table based on the chemical properties of elements. It contains vertical columns called groups and horizontal rows called periods.

For classifying he focussed on the oxides and hydrides formed by these elements. He arranged them according to their atomic mass. It was observed that not only the chemical but physical properties recurred at equal intervals.

Achievements of Mendeleev's Periodic table

- Elements with similar properties could be grouped together
- Some gaps were left for the undiscovered elements.
- Noble gases could be placed without disturbing the existing order.

Limitations

- No fixed position for hydrogen
- No place for isotopes
- No regular trend in atomic mass.
- Co was placed before Ni.

IV. Modern Periodic Table

Modern Periodic Law : Given by Henry Moosley in 1913.

Properties of elements are a periodic function of their atomic number.

- Atomic Number – denoted by Z and equals to the no. of protons in the nucleus of an atom.
- Modern periodic table contains 18 vertical columns known as groups and 7 horizontal rows known as periods.
- Elements in a group have the same number of valence electrons
- No. of the shells increases as we go down the group.
- Elements in a period have same number of shells.
- Each period marks a new electronic shell getting filled.
- No. of elements placed in a particular period depends upon the fact that how electrons are filled into various shells.

- Maximum no. of electrons that can be accommodated in a shell depend on the formula $2n^2$ where n is the no. of the given shell. e.g. K shell – $2 \times (1)^2 = 2$ elements in the first period L shell – $2 \times (2)^2 = 8$ elements in the second period.
- Position of the element in the periodic table tells about its reactivity.

TRENDS IN THE MODERN PERIODIC TABLE:

- **VALENCY** : No. of valence electrons present in the outermost shells. Valency remains the same down a group but changes across a period.
- **ATOMIC SIZE** : Atomic size refers to radius of an atom.
- Atomic size or radius decreases in moving from left to right along a period due to increase in nuclear charge
- Atomic size increases down the group because new shells are being added as we go down the group.

METALLIC CHARACTER : Metallic character means the tendency of an atom to lose electrons.

- Metallic character decreases across a period because the effective nuclear charge increases that means the tendency to lose electrons decreases.
- Metals are electro-positive as they tend to lose electrons while forming bonds.
- Metallic character increases as we go down a group as the effective nuclear charge is decreasing. Non metals are electro-negative. They tend to form bonds by gaining electrons.
- Metals are found on the left side of the period table while non-metals are towards the right hand side of the periodic table.
- In the middle we have semi-metals or metalloid because they exhibit some properties of both metals and non metals.
- Oxides of metals are basic in nature while oxides of non-metals are acidic in nature.

Gradation in Periodic Properties

S. No.	Property	Variation across period	Reason	Variation along group	Reason
					due to addition of new shells distance between

1.	Atomic size	Decreases	Due to increase in nuclear charge	Increase	outermost electron and nucleus increases due to addition of new shells.
2.	Metallic Character	Decreases	Due to increase In effective nuclear charge, tendency to lose valence electrons decreases.	Increases	decrease in effective nuclear charge experienced by valence electrons Tendency to lose electron s (metallic character) increases.
3.	Non-Metallic Increases Character (electro-negativity)	Increase	due to increase in effective nuclear charge tendency to gain electrons increases	Decreases	due to decrease in effective nuclear charge experienced by valence electron (due to addition of new shell), tendency to gain electrons decreases.

What you have learnt

- Elements are classified on the basis of similarities in their properties.
- Dobereiner grouped the elements into triads and Newlands gave the Law of Octaves.
- Mendeleev arranged the elements in increasing order of their atomic masses and according to their chemical properties.
- Mendeleev even predicted the existence of some yet to be discovered elements on the basis of gaps in his Periodic Table.
- Anomalies in arrangement of elements based on increasing atomic mass could be removed when the elements were arranged in order of increasing atomic number, a fundamental property of the element discovered by Moseley.
- Elements in the Modern Periodic Table are arranged in 18 vertical columns called groups and 7 horizontal rows called periods.
- Elements thus arranged show periodicity of properties including atomic size, valency or combining capacity and metallic and non-metallic character.