

CONCEPT MAP

CLASSIFICATION OF ELEMENTS AND PERIODICITY IN PROPERTIES

Modern periodic law

By Moseley (1912)
The physical and chemical properties of the elements are periodic functions of their atomic numbers.

Long form of the periodic table

Based upon modern periodic law. Also called Bohr's table - follows Bohr's scheme for the arrangement of various electrons around the nucleus. Elements are arranged in order of increasing atomic numbers.

Division into groups and periods

Groups : 18 vertical columns contain elements having similar outer electronic configurations.

Periods : 7 horizontal rows. Period number corresponds to the highest principal quantum number (n) of the elements.
Periods 1 to 6 contain 2, 8, 8, 18, 18, 32 elements respectively.
Period 6 \rightarrow 14 elements (lanthanoids)
Period 7 \rightarrow 14 elements (actinoids)

Division into blocks

s-Block : ns^{1-2} ($n=1-7$)
It contains 2 groups.
Group 1 : Hydrogen and alkali metals.
Group 2 : Alkaline earth metals

p-Block : $ns^2 np^{1-6}$ ($n=2-7$), groups 13 to 18.
Group 15 : pnictogens,
Group 16 : chalcogens,
Group 17 : halogens,
Group 18 : noble gases

d-Block (transition elements) :
 $(n-1)d^{1-10} ns^{0-2}$ ($n=4-7$)
contains 4 series

f-Block (Inner transition elements) :
 $(n-2)f^{0-14} (n-1)d^{0-2} ns^2$
($n=6-7$), contains 2 series
I series : lanthanoids or rare earth elements
II series : actinoids

Periodic Trends in Properties of Elements

Trends in physical properties

- Atomic radii
 - \rightarrow Along a period, decreases
 - \rightarrow Within a group, increases
- Ionic radii
 - \rightarrow Along a period, increases
 - \rightarrow Within a group, increases
- Ionisation enthalpy
 - \rightarrow Along a period, increases
 - \rightarrow Within a group, decreases
- Electron gain enthalpy
 - \rightarrow Along a period, increases
 - \rightarrow Within a group, decreases
- Electro-negativity
 - \rightarrow Along a period, increases
 - \rightarrow Within a group, decreases

Trends in chemical properties

- Valence electron or oxidation state
 - \rightarrow Along a period, increases from 1 to 8
 - \rightarrow Within a group, same
 - Strength of oxy-acids of non-metals
 - \rightarrow Along a period, increases
 - \rightarrow Within a group, decreases
 - Acidity of hydrides
 - \rightarrow Along a period, increases
 - \rightarrow Within a group, increases
 - Acidity of oxides
 - \rightarrow Along a period, increases
 - \rightarrow Within a group, increases
- Anomalous behaviour of the elements of II period
Diagonal relationship : Some elements of II period show similarities with the III period elements placed diagonally to each other, though belonging to different groups.
e.g., Li and Mg, Be and Al