

Periodic classification of Elements

Father of periodic table—Mendeleev.

The arrangement of the known elements in certain groups in such a way so that the elements with similar properties are grouped together is known as classification of elements.

Genesis of periodic classification :

1. Lavoisier classified the elements into metals and non-metals.

2. **Dobereiner's Triads** : In 1829, Dobereiner, a German chemist arranged certain elements with similar properties in groups of three in such a way that the atomic mass of the middle element was nearly the same as the average atomic masses of the first and third elements.

3. **Newland's law of octaves** : In 1866, John Newland, an English Chemist proposed the law of octaves by stating that when elements are arranged in order of increasing atomic masses, every eighth element has properties similar to the first, just like musical notes.

But this generalization was also rejected because it could not be extended to the elements with atomic mass more than 40.

4. **Lothar's–Mayer's atom volume curve** : In 1869 Lothar Mayer plotted a graph between atomic volume of the elements and their atomic mass and he pointed out that the elements with similar properties occupy similar positions in the curve.

5. **Mendeleev's periodic law** : The physical and chemical properties of the elements are the periodic function of their atomic masses.

Mendeleev's arranged the elements known at that time in increasing order of atomic masses and this arrangement was periodic table.

In periodic table :

Horizontal line is called periods.

Vertical line is called group.

In Mendeleev's periodic table :

Period— 7

Group— 9 (I, II, III, IV, V, VI, VII, VIII, Zero)

6. Modern Periodic law : Modern periodic law was given by Moseley.

According to Moseley : "The physical and chemical properties of the elements are the periodic function of their atomic numbers."

In modern periodic table :

Period— 7 Group— 18

Modern periodic table are classified as :

(i) s-block (ii) p-block

(iii) d-block (iv) f-block

s-block : Alkali & Alkaline earth metals.

p-block : Chalcogen, Pnictogens, Halogens and inert gases.

d-block : Transition elements.

f-block : Inner transition elements.

Periodic properties :

(i) Atomic radii : The distance from the centre of the nucleus to the outermost shell containing electrons called atomic radius.

It is not possible to measure the absolute value of atomic radius of an element. However, it may be expressed in three different forms: covalent radii, metallic radii, Van der Waals radii.

Van der Waals radii > metallic radii > covalent radii.

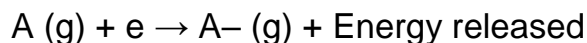
(ii) Ionic radii : The effective distance from the centre of nucleus of the ion up to which it exerts its influence on the electron cloud is called ionic radii.

Anionic radii > atomic radii > cationic radii

(iii) Ionization Potential (I.P.) : The amount of energy required to remove an electron from isolated gaseous atom is called Ionization Potential (I.P.) or Ionization Energy (I.E.)



(iv) Electron affinity (Ea) : The energy released during addition of an extra electron in isolated gaseous atom is called electron Affinity.



Chlorine (Cl) has highest Ea value.

(v) Electronegativity (En) : The relative electron attracting tendency of its atom for a shared pair of electrons in a chemical bond is called electronegativity.

F is the most electronegative atom

$$E_n = IP + E_a / 5.6$$

En value > 1.7 (ionic compound)

En value < 1.7 (polar covalent compound)

En value = 0 (nonpolar compound)

(vi) Lattice Energy : The amount of energy released during formation of one mole of ionic compound from its constituent ions is called Lattice energy.

(vii) Hydration Energy : The amount of energy released during dissolution of one mole of compound into water, is called hydration energy.

If hydration energy > Lattice energy, then compound is soluble in water and if hydration energy < Lattice energy, then compound is insoluble in water.