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. Dobereinier's Triads : In 1829, Dobereiner, a German mist a anged certain elements with similar properties in groups of three n suc a way that the atomic mass of the middle element was nearly the sa e s the ave age atomic masses of the first and third elements.

3. Newland's law of octaves : In 1866, John Newlan An English Chemist proposed the law of octaves by stating that When leme ts are arranged in order to increasing atomic masses, every ghth element has properties similar to the first, just like musical notes.

But this generalization was also rejec d because it could not be extended to the elements with atomic mass mo than 4

4. Lother's–Mayer's atom volume urve : In 1869 Lother mayer plotted a graph between atomic volum of the elements and their atomic mass and he pointed that the elements with s milar properties occupy similar position in the curve.

5. Mendeleev perio ic law : The physical and chemical properties of the elements re t e periodic function of their atomic masses.

Mende ev's a anged the elements known at that time in increasing order of atomic m ses a d 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 modem periodic table :

Period— 7 Group)— 18

Modem 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, Picogens, Halogens nd inert gases.

d–block : Transition elements.

f–block : Inner transition lements.

Periodic properties :

(i) Atomic radii : T e distanc from the centre of the nucleus to the outermost shell containin elec ons cal d atomic radius.

It is not p sib e to measure the absolute value of atomic radius of an element. However, it y be expressed in three different form covalent radii, metallic radii, Van der wall ra ii

Van der wall adii > metallic radii > covalent radii.

(ii) Ionic radii : he effective distance from the centre of nucleus of the ion upto 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.)

A (g) – e + Energy required (I.P.) → A+ (g)

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

A (g) + e → A– (g) + Energy released

Chlorine (Cl) has highest Ea value.

(v) Electronegativity (En) : The relative electron attrac ng te dency of its atom for a shared pair of electrons in a chemical bond i alled ele tronegativity.

F is the most electronegative atom

En = IP + Ea / 5.6

En value > 1.7 (ionic compound)

En value < 1.7 (polar covalent comp nd)

En value = 0 (nonpolar omp und)

(vi) Lattice Energy : The amount of en rgy released during formation of one mole of ionic compou d om it constituent ions is called Lattice energy.

(vii) Hydration Ene gy : The amount of energy released during dissolution of one mole of compou d into water, is called hydration energy.

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