

## Periodic Classification of Elements

- Placing similar groups and species together is known as **Classification**. Classification is needed to easily understand the properties of different elements in a periodic table. Elements with similar properties are placed in one group to understand them easily.
- Dobereiner's triad** consider three elements, in which atomic mass of central element is the arithmetic mean to two other elements. **For Example**, Atomic masses of lithium, sodium and potassium are 7, 23 and 39. The arithmetic mean of 7 and 39 gives 23. But disadvantage is the presence of only few triads.

Element	Atomic Mass	Average	Density	Average
Cl	35.5	81.2	1.56	3.25
Br	79.9		3.12	
I	126.9		4.95	
Ca	40.1	88.7	1.55	2.53
Sr	87.6		2.6	
Ba	137.3		3.5	

- Newland's Law of Octave** say that elements are arranged in such a way that every eight element has same properties as in the first element. According to him, only 56 elements are found which is a drawback of Newland Law of Octaves. This was not accepted. It is acceptable only upto calcium. He also placed some unlike elements in the same slot.

sa (do)	re (re)	ga (mi)	ma (fa)	pa (so)	da (la)	ni (ti)
H	Li	Be	B	C	N	O
F	Na	Mg	Al	Si	P	S
Cl	K	Ca	Cr	Ti	Mn	Fe
Co and Ni	Cu	Zn	Y	In	As	Se
Br	Rb	Sr	Ce and La	Zr	—	—

## Mendeleev's Periodic Table

Mendeleev used atomic masses as the basis of arrangement of elements. According to him, elements were arranged in increasing order of their atomic masses. It believes that there was a periodic reappearance in their physical and chemical properties.

## Advantages of Mendeleev Periodic Table

- He left gap for some undiscovered elements. **For Example**, Eka Boron etc.

- This table also accommodate the noble gases
- Also corrected the atomic masses of certain elements.

### Limitations of Mendeleev Periodic Table

- Position of isotopes cannot be explained
- Position of hydrogen is not fixed. It is placed in group 1A, though its some properties matches with those of halogens.

### Modern Periodic Table

D. Mendeleev discovered the modern periodic table in the year 1869. According to modern periodic law, “properties of an element are the periodic function of their increasing atomic number”.

### Anomalies of Modern Periodic Table

- Isotopes are placed at one place in the same group.
- There is no element between hydrogen and helium as atomic masses always comes in whole numbers.
- Atomic number is represented by Z, and it is equal to the number of protons in the nucleus of the atom.
- It also consists of 18 vertical columns known as **Groups** and 7 horizontal rows known as **Periods**.
- Elements having same number of valence electrons are placed in the same group.
- As we go down in a group, number of shell increases.
- Elements having same number of occupied shells are placed in same period.
- Each period has a new electronic shell getting filled.
- Number of elements placed in a particular period depends on the point how electrons are filled into various shell.
- To find out the number of electrons in a shell,  $2n^2$  formula can be used, where n is shell number.

$$\text{K Shell } n = 1 \text{ or } 2n^2 = 2(1)^2 = 2$$

$$\text{L shell } n = 2 \text{ or } 2n^2 = 2(2)^2 = 8$$

- Valence electron also determines the number of bonds which is formed by an element.

### Trends in Modern Periodic Table

- **Valency and Valence Electrons** - On moving left to right in a period, valency increases and then it decreases. But it remains same down in a group. As we move from left to right in a period, valence electron increases and remain same as we go down the group.
- **Atomic Size** - It decreases left to right in a period as the nuclear charge increases due to large positive charges on the nucleus. Atomic size increases down in a group due to decrease in nuclear charges and addition of new shell.
- **Metallic Character** - Ability of atom to lose the electron is known as **Metallic Character**. Metallic character decreases from left to right in a period. This is due to increase in nuclear charge. But non-metallic character increases left to right in a period. And metallic character increases down the group as the size increases it can easily lose electron.
- **Ionization Energy** is the energy required to remove an electron from an isolated gaseous atom. Ionization energy increases as we move left to right in a period. This is due to increase in nuclear charge as we move left to right in a period. But down in a group ionization energy decreases due to decrease in nuclear charge but there are some exceptional cases.
- **Electropositive Character** decreases from left to right in a periodic table and increases down the group. This is due to decrease in metallic character from left to right in a period.

- **Basic Character of Oxides** increases down the group as atomic radius increases and ionization energy decreases. This is due to increase in metallic character or electro positivity of elements. Acidic character of oxides decreases as non-metallic character of elements decreases from top to bottom.

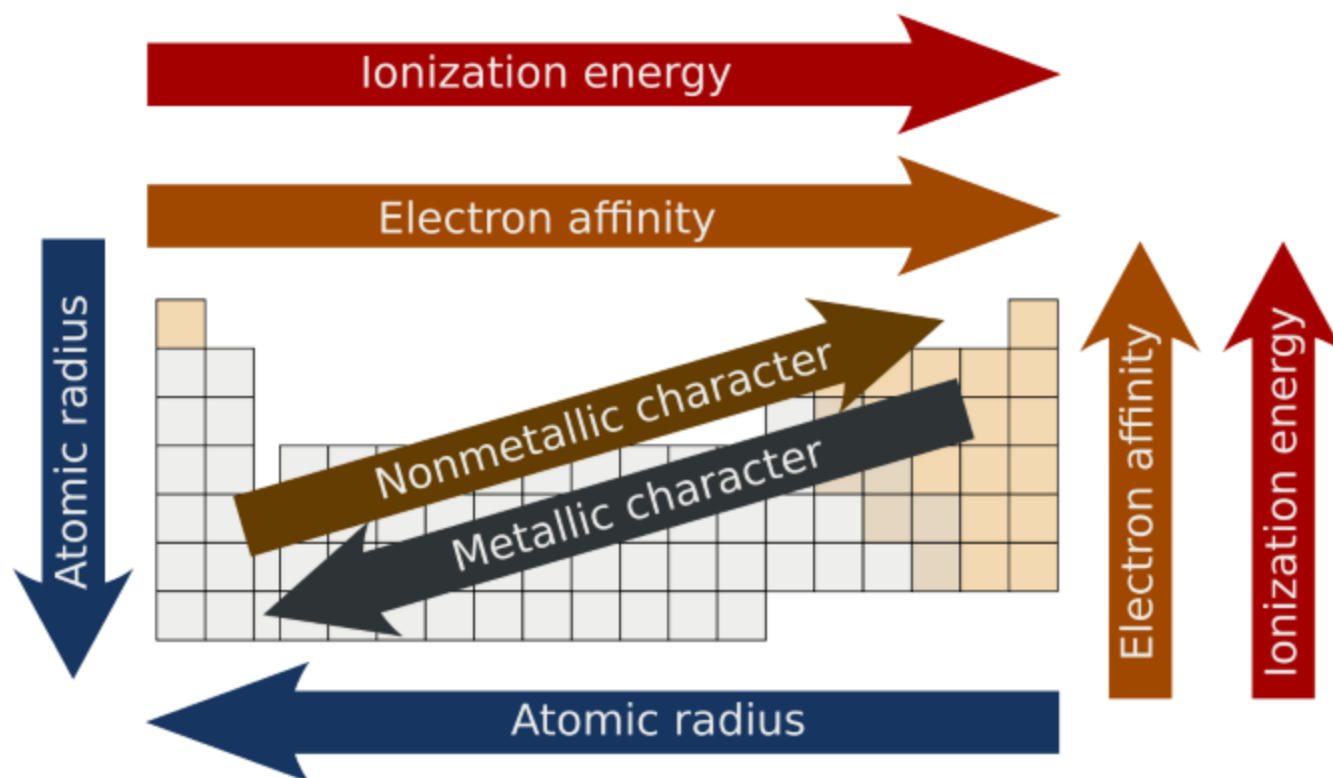


Fig 1. Trends in Periodic Table

# Thank You

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