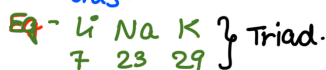


PERIODIC CLASSIFICATION OF ELEMENT

DOBERNIER TRIADS:-

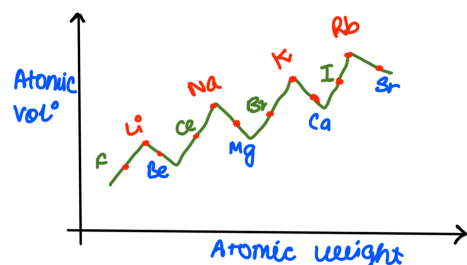
- Arranged elements in the group of 3.
- Atomic mass of middle element is average of atomic mass of other two elements.



Drawbacks;

all known elements were not grouped.

Lothar Meyer's Curve:-



- Alkali metals → top position
- Alkaline earth metals = descending
- Halogen → ascending position.

MODERN PERIODIC TABLE:-

- long form of periodic table
- Based on Moseley law; $\sqrt{f} = Z = a(Z-b)$
- Periodic properties are periodic function of their atomic number.

Periodicity = Repetition of similar properties of elements after regular interval of time.

Cause of periodicity :- due to similar e⁻ configuration.

Transition elements; they have incompletely filled d-orbitals in their ground state.

Zn, Cd, Hg → are not transition elements because of completely filled d-orbitals. (Pseudo transition elements).

Representative Element :- Combined elements of s and p block are known as representative elements.

NEWLAND'S OCTAVE RULE:-

- When elements are arranged in increasing order of atomic mass, then every 8th element starting from first will show same property.



Drawbacks:-

1. Valid upto calcium only
2. No position of inert gases
3. Not worked on heavier elements.

MENDLEEV'S PERIODIC

- Periodic property of elements are periodic function of their atomic masses.

Merits:-

- Simplified study
- Some vacant space was left for the elements which were not known at that time.

Eka aluminium → Ga

Eka silicon → Ge

- Corrected atomic mass of element

Drawback;

- (a) Position of Hydrogen was not fixed
- (b) Could not explain periodicity.

MODERN PERIODIC TABLE:-

18 groups and 7 periods.

4-Blocks

S-Block = G_1 and $G_2 = ns^{1-2}$

P-Block = $G_{13} - G_{18} = ns^2 np^{1-6}$

D-Block = $G_3 - G_{12} = (n-1)d^{1-10} ns^0-2$

f Block = lanthanoid = $Z = 58 - 71$

G_3 and P_6

actinoids = $Z = 90 - 103$

G_3 and P_7

Diagonal Relation;



Nomenclature;

0 → nil
1 → un
2 → bi
3 → tri
4 → quad
5 → pent
6 → hex
7 → sept
8 → oct
9 → inn
Suffix = ium
105 unnilpentium

EFFECTIVE NUCLEAR CHARGE

$Z_{\text{eff}} = Z - \sigma$

Trends = Period → $Z_{\text{eff}} \uparrow$

Group → Z_{eff} almost remains same. or $Z_{\text{eff}} \downarrow \downarrow$

Shielding → $s > p > d > f$

→ more +ve charge, more is Z_{eff} .

→ more -ve charge, less in Z_{eff} .

IONISATION ENERGY

- Energy required to remove an electron from an isolated gaseous atom.



$IE = IE_1 < IE_2 < IE_3 \dots$

Trends:- Z_{eff} & IE

Period - $Z_{\text{eff}} \uparrow = IE \uparrow$

Group - $Z_{\text{eff}} \downarrow = IE \downarrow$

$G_{16} = B > Al > Ga > In$

$G_{14} = C > Si > Ge > Pb > Sn$

Period 2:-



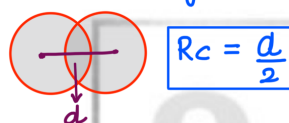
ATOMIC RADIUS:-

- Distance b/w nucleus and electron of outermost shell.
- But it's impossible to find exact atomic radius.

Reason-1 = atom is too small

-2 = atom doesn't have any boundary

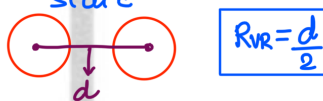
* **Covalent Radius**:- Half of the inter-nuclear distance b/w 2 atoms bonded by covalent bond.



* **Metallic Radius** → Half of the inter-nuclear distance b/w 2 atoms bonded by a metallic bond.



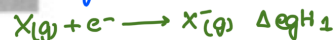
* **Vanderwaal Radius**:- Half of the inter-molecular distance b/w 2 nearest molecules in non-bonded state



Trends; Atomic Radius & Z_{eff}
Period → $Z_{\text{eff}} \uparrow = \text{Atomic Radius} \downarrow$
Group → $Z_{\text{eff}} \downarrow = \text{Atomic Radius} \uparrow$
Ionic Radius → $R_{\text{cation}} < R_{\text{neutral}} < R_{\text{anion}}$

ELECTRON GAIN ENTHALPY:-

- Energy required or released when an e⁻ is added to outermost orbit of an isolated gaseous atom is known as Electron gain enthalpy.



Note:- In majority cases $\Delta_{\text{eg}} H_2$ is -ve (exothermic)

Exception = B
N

Noble gas } $\Delta_{\text{eg}} H_1 = +ve$
due to stable configuration

Note:- Successive electron gain enthalpy is always +ve.

TRENDS; $\Delta_{\text{eg}} H$ & Z_{eff}

Period - $Z_{\text{eff}} \uparrow \Rightarrow \Delta_{\text{eg}} H \uparrow$

Group - $Z_{\text{eff}} \downarrow \Rightarrow \Delta_{\text{eg}} H \downarrow$

$G_{16} = S > Se > Te > Po > O$

→ due to small size Reason!

→ e⁻e⁻ repulsion.

Atomic size Exception:-



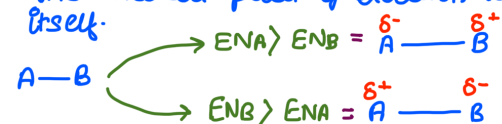
due to d-Block contraction



Reason:- due to van der Waals Radius

ELECTRONEGATIVITY:-

→ Tendency of an atom to attract the shared pair of electron toward itself.



TRENDS:- EN $\propto$ Zeff

Along a period:- Zeff $\uparrow$ = EN $\uparrow$

Along a group:- Zeff $\downarrow$ = EN $\downarrow$



INERT PAIR EFFECTS:-

→ due to poor screening effects of d and f orbitals.

Zeff $\uparrow$ → ns² becomes inert

→ down the group, ns² pair becomes inert.

↳ stability of lower OS $\uparrow$ down the group

↳ stability of higher OS $\downarrow$ down the group.

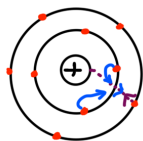
D-BLOCK AND F-BLOCK:-

→ Screening effect



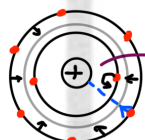
Poor screening effect

→ Poor screening effect → Zeff $\uparrow$ → size $\downarrow$ (contraction)



High screening effect

→ large size

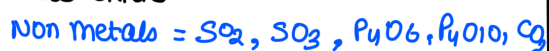


low screening effect

→ small size.

NATURE OF OXIDE

Acidic Oxide =

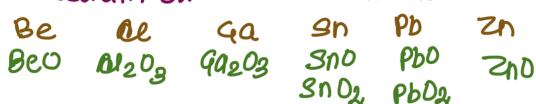


Basic Oxide =



Amphoteric Oxide =

which shows both basic and acidic medium on the environment.



Neutral oxide =



Note = higher the % of oxygen, more is acidic strength.

Acidic oxides →



Acidic strength:-



Trends;

Period - Non-metallic $\uparrow$ = Acidic $\uparrow$ → Basic $\downarrow$

Group - metallic $\uparrow$ = Basic $\uparrow$ → Acidic $\downarrow$

2

SQUARE