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Day-I (H/S) = Periodic Properties.

Electron gain Enthalpy

&

Electronegativity.

Electron gain Enthalpy
(Electron Affinity.)

Statement:- The amount of energy released when an extra electrons are added in one mole of gaseous atom convert into anions.

ex:- $\frac{1}{2}X_2 + \bar{e} \longrightarrow X^{-}_{(g)} - E.A_1$
(g)

$\frac{1}{2}Cl_2(g) + \bar{e} \longrightarrow Cl^{-}(g) - 86\ kcal/mole$

It means that by addition of extra electron in the Cl(g) atom it convert into Cl^- & released (-ve sign) 86 kcal/mole or about 350 kJ/mole

E.A value depend upon —

(a) Size of atoms → Smaller the size, greater is their E.A value which indicates easily acceptance of extra electron or that atom easily convert into anion.

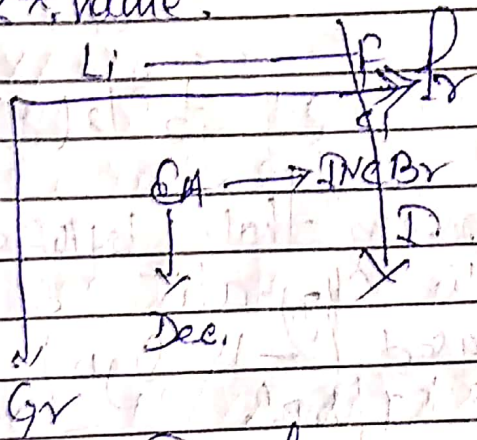
(b) Effective nuclear Charge (Z^*) - higher the Z^* value higher is the E.A. electron easily added.

(c) Nature of Element :- Metals have lower E.A value than non-metals. It has very high value of E.A.

(d) Electronic Config → Stable Config (half filled & full-filled) have less tendency to accept electron & its E.A value is lowest.

Variation of E.A in Periodic Table

(1) In a Period → Moving along the period, the E.A value increase from left to Right in the P. Table due to increasing Z* value.



(2) In a Group → It decrease down the group due to increase size & Metallic character increases. The electron donation tendency increases from top to bottom.

Exception :- The E.A value of halogen down the group is not follow the order

F > Cl > Br > I

but Cl > F > Br > I

Due to small size of F its electron density is very high. So while the addition of extra electron its E.A + Cl > F.

Electronegativity (relative)

Statement → The tendency of bonded atom to attract the bonded pair of electrons towards itself is called E.N.

Different atoms have different tendency to attract the bonding pair of electrons towards themselves. Greater the electronegativity higher the E.A. value.

Ex:- H—Cl

$+\delta$ H — Cl $-\delta$

The E.N of Cl > H.

Pauling introduced the concept of E.N i.e take an arbitary value of 4.0 assign for most E.N-element Fluorine (it has no unit)

Electronegativity of other elements determined by applying formula

$$X_A - X_B = 0.208\left[E_{A-B} - \tfrac{1}{2}(E_{A-A} + E_{B-B})\right]^{\frac{1}{2}}$$

X_A & X_B = EN of A & B.

E_{A-A}, E_{B-B} & E_{A-B} are the bond energy of Molecule A2, B2 & AB in KJ mol.

Mulliken also suggested that it is simple average value of I.P & E.A of that atom.

$$E_N = \frac{I.P + E.A}{2}$$

Remarks:- The E.N of any given element is not fixed but depends upon the following factors

(a) State of hybridisation :- Hybridisation of same atom in a compound may be different.
Thus for example Carbon
EN- $Sp > Sp^2 > Sp^3$

(b) Oxidation State :- By the increase of O.S. the EN-value also increases.
$Fe^{+3} > Fe^{+2}$
EN → (1.96) (1.83)

Importance of EN —
(1) Nature of bond b/w two atoms - It can be explained on the basis of EN-Difference.
Diffrence $X_A - X_B = 0$ - Purely Covalent
$X_A - X_B > 1.9$ 50% Ionic + 50% Co
$X_A - X_B > 2.1$ Purely ionic.

(2) To determine the percentage ionic-Charac in bond.
$\% I.C = 16(X_A - X_B) + 3.5(X_A - X_B)^2$

(3) To determine nature of oxide
$X_O - X_B$ is very large → basic-oxide
$X_O - X_B$ is very low → acidic-oxide
X_O = EN of oxygen
X_B = EN of element

Variation in P.T
(1) In a group — It decrease down the group.
(2) In a period → It increase along Period.
→ Pr
EN → Inc
↓
Gr ↓ Dec.