Electronegativity - I

Course on Periodic Table for Class IX 2023

Vishal joshi • Lesson 1 • July 22, 2021

E.N

$$\overset{-\delta}{A} \longleftarrow \overset{+\delta}{B}$$

E.N of A > E.N of B

$$\overset{+\delta}{A} \longrightarrow \overset{-\delta}{B}$$

E.N of A < E.N of B

H 2.1						
Li	Be	B	C	N	O	F
1	1.5	2	2.5	3	3.5	4
						Cl
						3

Different scales for calculation of electroneg.

Pauling scale →

(I) X_A (E.N of A) $-$ X_B (E.N of B) $\propto \sqrt{\Delta}$

Δ = Ionic resonance energy

$$\Delta = E_{A-B} - \sqrt{E_{A-A} \times E_{B-B}}$$

A – A

E_{A-B} is bond energy of A–B bond

E_{A-A} is bond energy of A–A bond

E_{B-B} is bond energy of B–B bond

Theortical bond energy of A–B bond is equal to geometrical mean of E_{A-A} and E_{B-B} using of 100% Covalent bond.

* Δ is measure of partial ionic character of bond

$$\Delta = (\text{Actual bond energy} - \text{Theoretical bond energy})$$

(1) Pauling Scale is based on bond energy.

When a bond is formed, energy is released which is called bond energy (B.E = -ive)

The energy req. for breaking a bond is bond dissociation energy

(B.D.E = +ive)

$$\boxed{B.D.E = -B.E}$$

$\overset{-\delta}{A} \leftarrow \overset{+\delta}{B}$

Partial Ionic

Charcter

Δ measure partial Ionic Charcter

$A - A$

$\overset{-\delta}{A} \longleftarrow \overset{+\delta}{B}$

$A - A$		$B - B$
A_2	B_2	
4	5	
2	2.5	
$A - B$	$B - B$	

D) Mulliken Scale :→ (i) e^- losing tendency
(ii) e^- accepting tendency

$$E.N = \frac{I.E + E.A}{2} \text{ eV} \quad \{I.E \text{ and } E.A \text{ in eV}\}$$

$$E.N = \frac{I.E + E.A}{2 \times 96.4} \text{ eV} \quad \{I.E \text{ and } E.A \text{ in kJ/mole}\}$$

$$E.N = \frac{I.E + E.A}{2 \times 23.1} \text{ eV} \quad \{I.E \text{ and } E.A \text{ in kCal/mole}\}$$

$$\boxed{X_p = \frac{X_m}{2.8}}$$

Allred rochow scale :→

$$F = \frac{Z_{eff}\, e^2}{r^2_{cov.}}$$

r_{cov} = radius [Å]

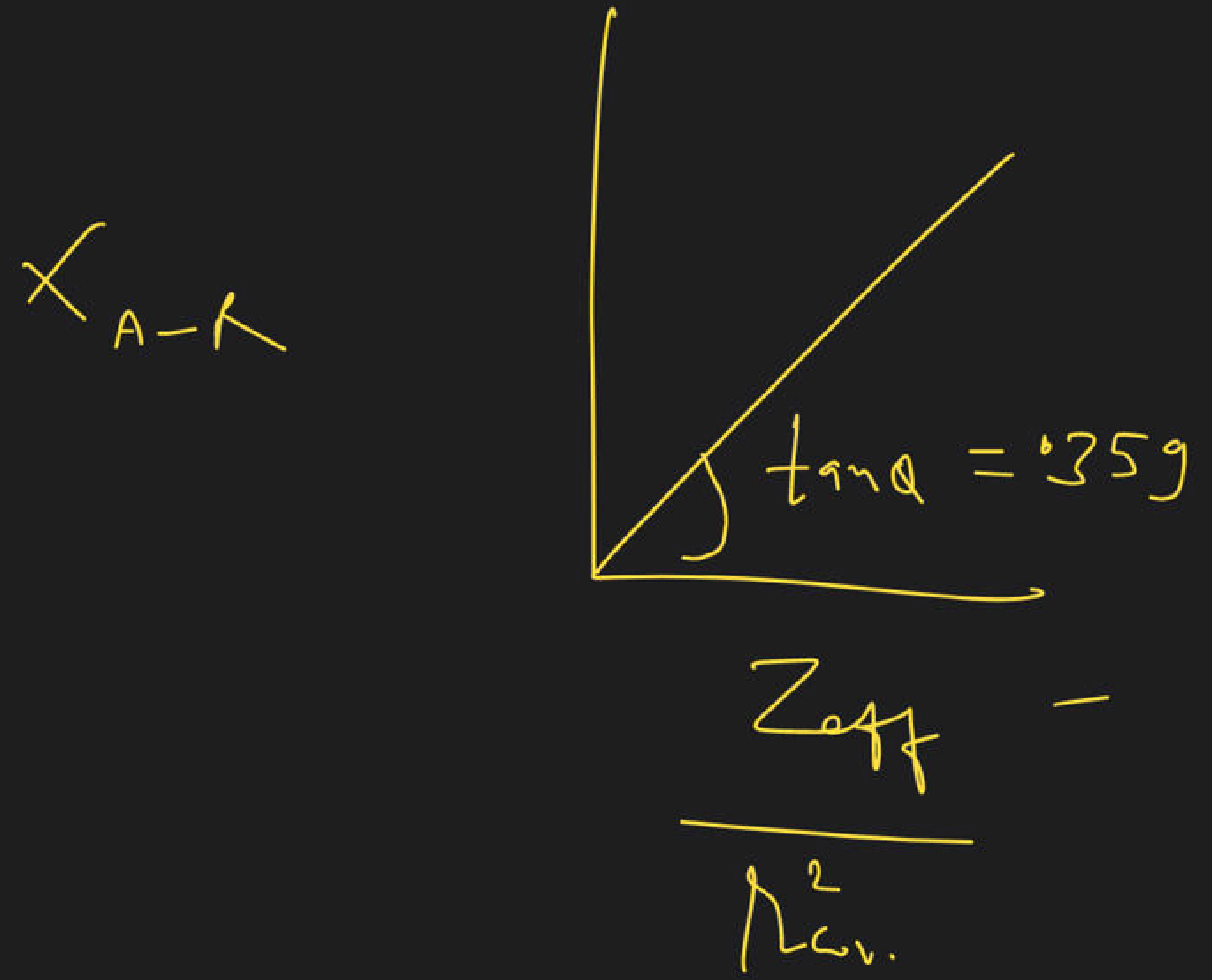
Z_{eff} = effective nuclear charge

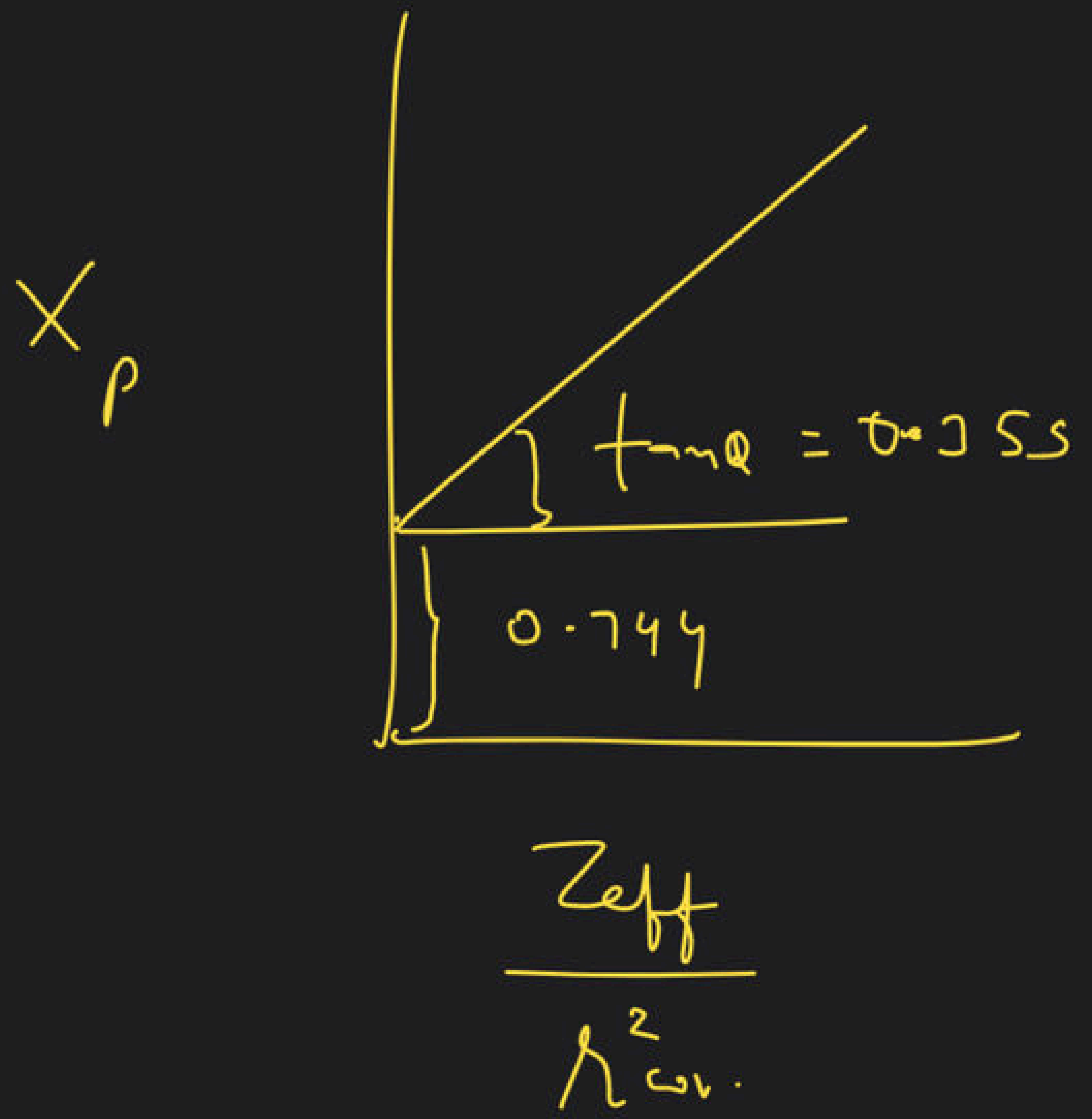
e = charge (in C)

$$Y = mx$$

$$\boxed{X_{A-R} = 0.359 \frac{Z_{eff}}{r^2_{cov.}}}$$

Note = In this scale all electrons contribute towards σ


X_{A-R}
$\tan\theta = .359$
$\frac{Z_{eff}}{r^2_{cov.}}$

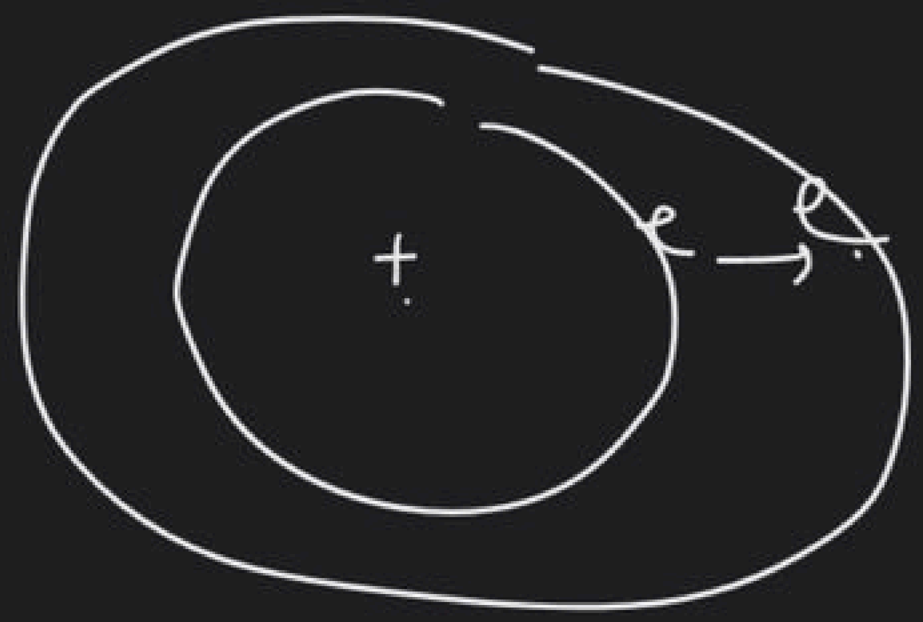

X_P
$\tan\theta = 0.355$
0.744
$\frac{Z_{eff}}{r^2_{cov.}}$

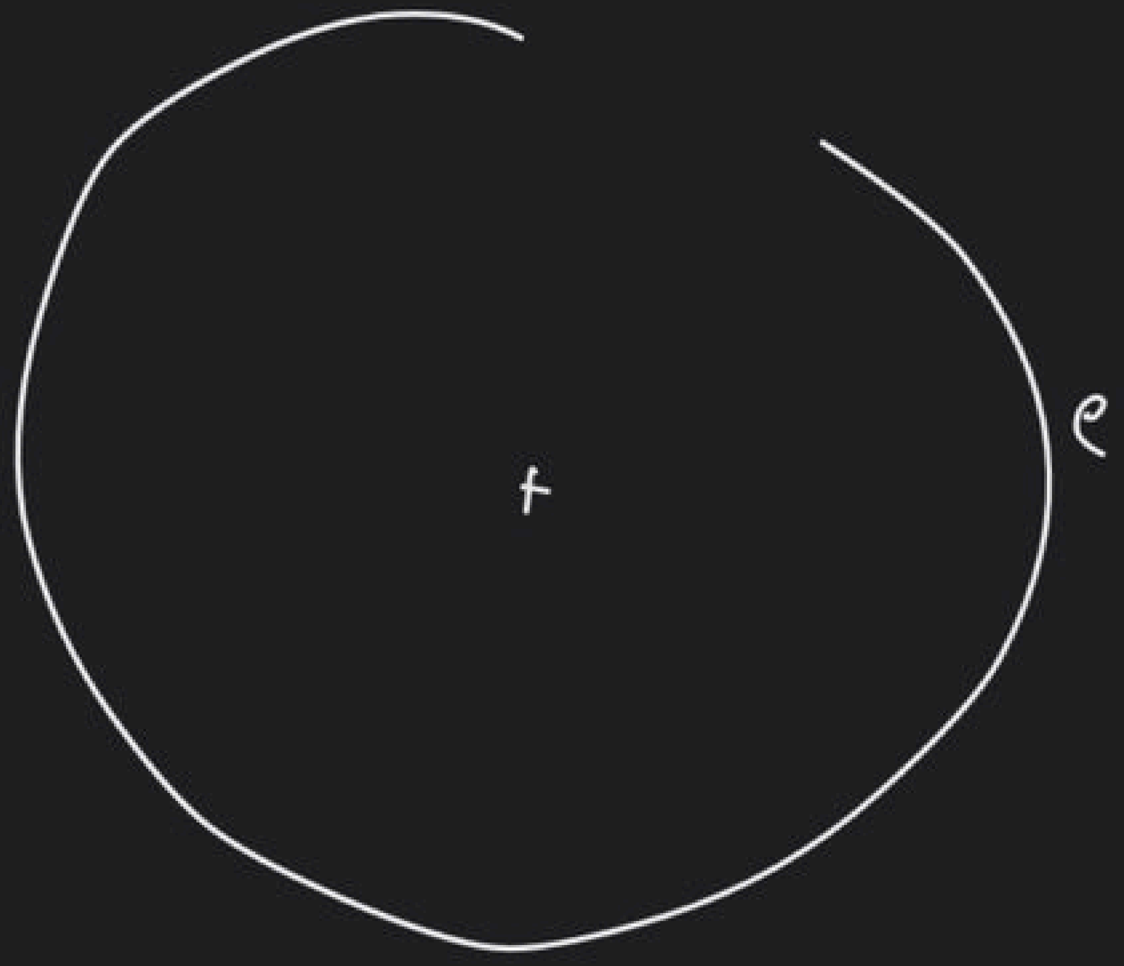
$Z \uparrow \quad E.N \uparrow$

$Z_{eff} \uparrow \quad E.N \uparrow$

$\sigma \uparrow \quad \varepsilon . N \downarrow$

$\eta \uparrow \quad \varepsilon . N \downarrow$



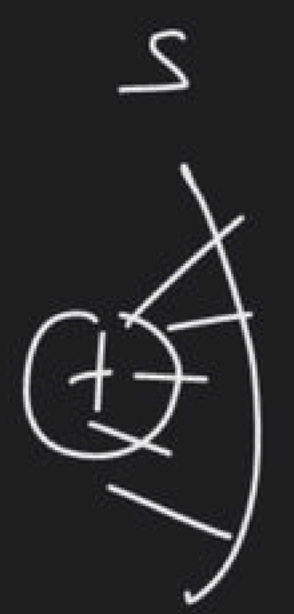


(5) % s character of hybrid orbital

	sp	sp^2	sp^3
% of s character	$\frac{1}{2} \times 100$	$\frac{1}{3} \times 100$	$\frac{1}{4} \times 100$
	50%	33.33%	25%

s% ↑ att. ↑ E.N ↑

order of E.N $sp > sp^2 > sp^3$



$$\boxed{X_p = X_{A-R} + 0.744}$$

Higher the E.N diff, higher will be the value of partial ionic ch. and higher will be the value of Δ.

$1\,eV/atom = 96.4\ KJ/mole$

$$\boxed{\begin{aligned} X_A - X_B &= 0.208\sqrt{\Delta} \quad \text{in Kcal/mole} \\ X_A - X_B &= 0.102\sqrt{\Delta} \quad \text{in KJ/mole} \end{aligned}}$$

<u>Note</u> = Actual bond energy is more than theortical because of partial ionic charcter which results in more attraction and hence more actual bond energy

$A - A$

$\overset{-\delta}{A} \leftarrow \overset{+\delta}{B}$

partial ionic character

$\overset{+}{Na}\,Cl^{-}$