

Electronegativity :-

- * It is a qualitative measure of the ability of an atom in a chemical compound to attract shared electrons to itself.
- * Unlike ionisation enthalpy and electron gain enthalpy, it is not a measurable quantity. However, a number of numerical scales of EN of element viz., Pauling scale, Mulliken-Jaffe scale, Allred-Rochow scale have been developed. The one which is the most widely used is the Pauling Scale. He assigned arbitrarily a value of 4.0 to fluorine, the element considered to have the greatest ability to attract electrons.

Atom (Period II)	Li	Be	B	C	N	O	F
Electronegativity	1.0	1.5	2.0	2.5	3.0	3.5	4.0
Atom (Period III)	Na	Mg	Al	Si	P	S	Cl
Electronegativity	0.9	1.2	1.5	1.8	2.1	2.5	3.0

Atom (Group I)	Electronegativity Value	Atom (Group 17)	Electronegativity Value
Li	1.0	F	4.0
Na	0.9	Cl	3.0
K	0.8	Br	2.8
Rb	0.8	I	2.5
Cs	0.7	At	2.2

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- * Electronegativity of any given element is not constant. It varies depending on the element to which it is bound.

- * E.N. generally increases across the period from left to right & decreases down a group in the periodic table.

Factors affecting EN :-

- Effective nuclear charge :- Higher effective nuclear charge, higher EN.
- screening effect :- More screening effect, less EN
- Size of atom :- size increases EN decreases
- oxidation state :- higher ox. state, higher EN
- Hybridisation :- s-char. increases, EN increases
 $sp > sp^2 > sp^3$

Applications of EN

- In deciding nature of bond

$$\% \text{ ionic character of bond} = [16 (\chi_A - \chi_B) + 3.5 (\chi_A - \chi_B)^2]$$

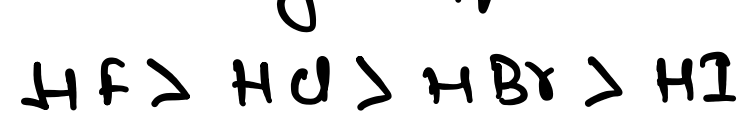
$$\chi_A = \text{EN of A} \quad \chi_B = \text{EN of 'B' element}$$

- $\chi_A - \chi_B = 0$ A-B $\rightarrow$ 100% covalent, non-polar bond
 $\chi_A - \chi_B \approx 1.7$ A-B $\rightarrow$ 50% - 11%, polar bond
 $\chi_A - \chi_B < 1.7$ A-B is more covalent, less ionic
 $\chi_A - \chi_B > 1.7$ A-B is more ionic, less covalent.

(s-f $\Rightarrow$ ionic (max. value of $\Delta\chi$))

- strength of bond :- increases in differences in EN, makes the bond more strong.

eg Bond strength of H-X



- color of salt :- compound containing bond which is $> 20\%$ ionic is generally colorless if % ionic character is less than 20% compound will be coloured eg.

	% ionic character	color
AgCl	80%	white
AgBr	24%	light yellow
AgI	15%	yellow
Ag ₂ S	4%	black.

- To decide whether X-OH molecule act as acid or base in aqueous solution.

- when X-O-H molecules act as base

$$\chi_O - \chi_X > \chi_O - \chi_H$$

eg. Na-O-H

- when X-O-H compound act as acid

$$\chi_O - \chi_X < \chi_O - \chi_H$$

eg. H-O-H

Generally, non-metal hydroxides are acids.

*** $HI > HBr > HCl > HF$ (Acid strength)

- * EN is directly related to that non-metallic properties of elements..

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