

By SK Gupta

Dept of Chemistry

Maanohar College, Dibrugarh

Day - 11th. Periodic Properties.
Topics - Periodicity in Chemical Properties.

① Valency: - It is defined as the no. of electrons loss, gain or shared during bond formation of that element.

It is also defined as the number of unpaired electrons in either ground or excited state electronic configuration.

generally, Valency can be decided by their Outermost electrons present in their valence shell.

Valency of representative elements vary from 1 to 8 (S-VI).

Shows Variable Valency. The common Valence of transition metal are 2 or 3.

Variation of Valency in P. Table

Variation in a period: - In case of representative element the number of VE vary from one to seven.

Group	1	2	13	14	15	16	17
Valency	1	2	3	4	5	6	7
Valency with respect to H	1	2	3	4	5	6	7
to form	LiH, NaH	MgH ₂	AlH ₃	SiH ₄	PH ₃	H ₂ S	HCl
Valency with respect to O	1	2	3	4	5	6	7
oxide	Na ₂ O	MgO	Al ₂ O ₃	SiO ₂	P ₂ O ₅	SO ₃	Cl ₂ O ₇

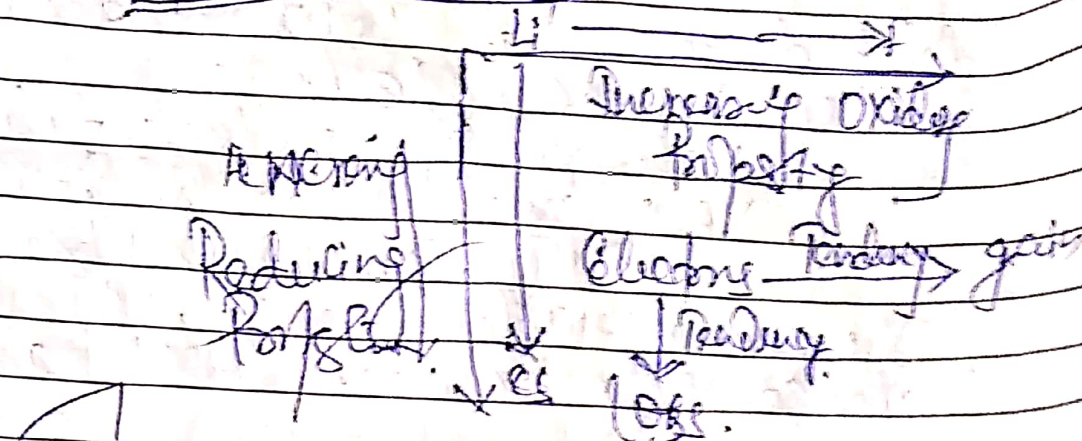
Variation in a Group — In a group
 all the elements have same number of
 valence electron, thus have same valency

② Oxidising & Reducing behaviour

Oxidising agent :- Those species which
 have a tendency to accept electron
 & it oxidise others but itself gets reduced

Reducing agent - are those
 which loses electron itself oxidise
 & reduce others.

Trends in P.T.



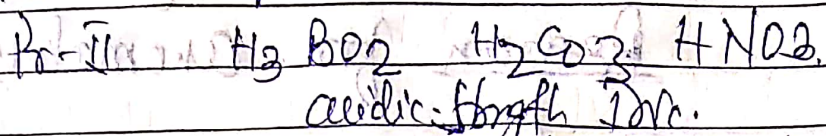
Thus Na is R.A & F is O.A.

③ Nature of Oxide → Moving from
 left to right in
 a period, the nature of oxide varies
 from basic to acidic behaviour.
 Group no. increases

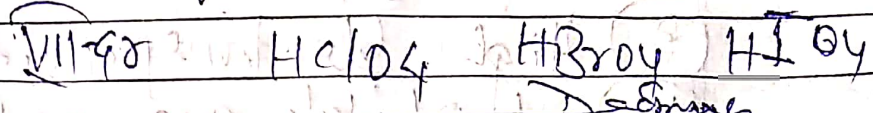
	I	II	III	IV	V	VI	VII
<u>Nature</u>	basic	basic	amphoteric	acidic	acidic	acidic	acidic
	Na ₂ O	MgO	Al ₂ O ₃	SiO ₂	P ₂ O ₅	SO ₃	Cl ₂ O ₇
	strongly basic	basic	amphoteric	weakly acidic	acidic	strongly acidic	strongly acidic

(4) Nature of oxy-acid — In a period the strength of oxy-acids of non-metals increases from left to right.

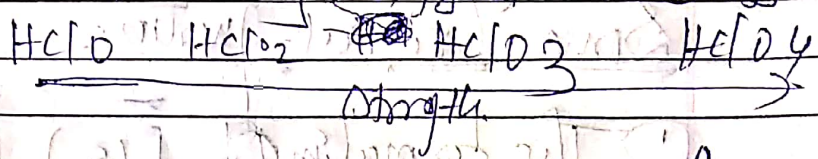
Ex: —



In a group — the strength of oxy-acid of non-metal decreases.



Those non-metal which form various oxy-acids, its strength increases. It is due to increase in oxygen percentage.



(5) Anomalous properties of second period element

We know that element belongs to same group shows similar physical & chemical properties.

But the first member of each group element differ in many respects from the other members of their respective groups. It was observed that some elements of the second period show similarities with the elements of third period placed diagonally with each other.

Diagonal Relationship

Group-I	II	III	IV
Per-II Li	Be	B	C
Per-III Na	Mg	Al	Si

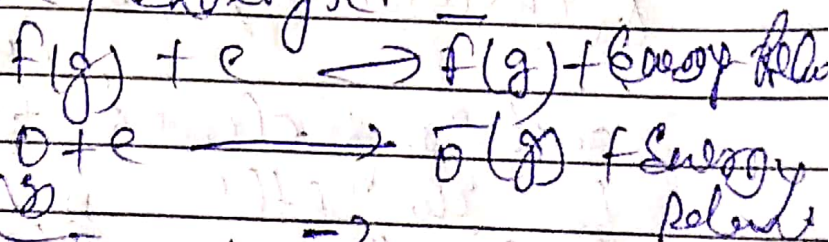
Reason for anomalous behaviour

- (1) Small size of the atom & its ion.
- (2) Charge/Radius - Ratio is very high.
- (3) High-electronegativity.
- (4) d-orbitals are not available.
- (5) Tendency to form multiple bond by π , π & σ .

Some Critical Question

- (1) The formalism of $F(g)$ from $F(g)$ is exothermic. but $O_2(g)$ from $O(g)$ is Endothermic.

Ans — we know that addition of an electron to a neutral atom is exothermic/exoergic.



But $O(g) + e \rightarrow O^{2-}(g)$ is very difficult due to same charge produce electronic repulsion. The energy being put-like required to overcome this repulsion ΔE & it becomes endothermic.