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Ch-3- Classification of elements and periodicity in properties :-

* 1800 → 31 elements were known
  1865 → 63 " "

* Dobereiner's Triads :-

→ He gives group of 3 - elements.
→ All the previous arrangement are based on atomic mass.
→ The mass of middle element is the arithmetic mean of 1^{st} & 3^{rd} elements.

eg :- Li = 7	Cl = 35.5	Ca = 40
Na = 23	Br = 80	Sr = 88
K = 39	I = 127	Ba = 137
$\Rightarrow \frac{7+39}{2} = \boxed{23}$	$\Rightarrow \frac{35.5+127}{2} = 81.25$	$\Rightarrow \frac{40+137}{2} = 88.5$

* Newland's octave rule (Atomic Mass)

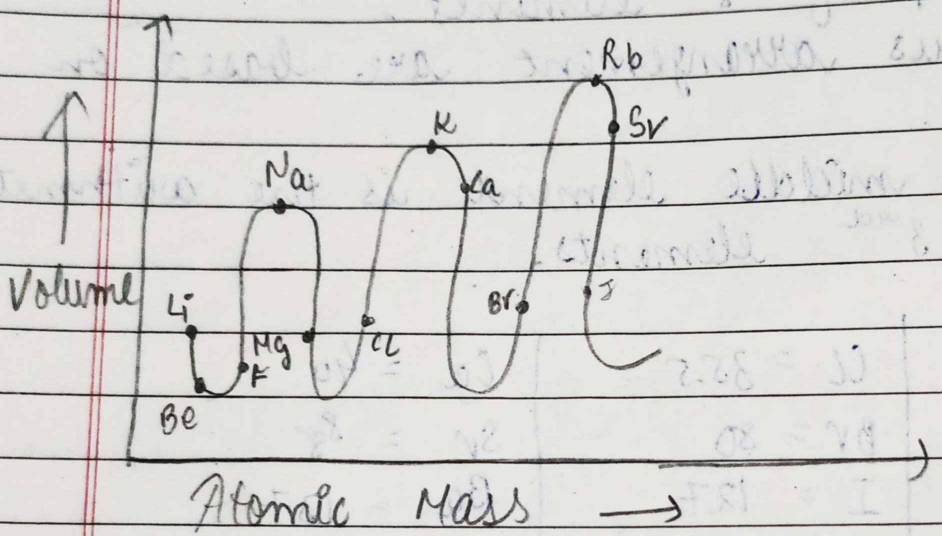
→ Gives elements in the form of musical notes.
→ In which the properties of 1^{st} and 8^{th} element are nearly same.
→ Sa re ga ma pa dha ni sa.
→ At that time nobel gases were not discovered.

Sa	Re	ga	ma	pa	dha	ni
Li	Be	B	C	N	O	F
(7)	(9)	(11)	(12)	(14)	(16)	(19)
Na	Mg	Al	Si	P	S	Cl
(23)	(24)	(27)	(29)	(31)	(32)	(35.5)
K	Ca					
(39)	(40)					

→ This law is applicable till Ca, after that d-block & it's properties are different.

* Lother Meyer's Curve (1869)

→ He plot graph between physical properties of elements - Melting point, Boiling point, volume V/s Atomic mass.



→ Most Reactive (most electropositive) are found at peak of graph.

- Alkaline metal : Li, Na, K, Rb, Ca.

→ Less electropositive metal like Be, Mg, Ca, Sr, are in descending order.

→ Most electronegative elements like, F, Cl, Br, I.

* Mendeleev's periodic Law :-

→ "The physical & chemical properties of elements are periodic function of their atomic mass".

→ He gives vertical and horizontal arrangement.

→ At a time 63 element were known.

→ group : 8 , period : 7

→ He leaves the space for unknown elements.

→ At the time gallium (Ga) & germanium were not discovered.

→ Gallium → Eka Aluminium
Germanium → Eka Silicon.

o **Limitation :-**

1. Does not gives about the position of H-atom.
2. Does not gives position of isotopes.
   $^{1}_{1}H$ $^{2}_{1}D$ $^{3}_{1}T$
3. Does not gives information about Lanthanoids and Actinoids.
4. He arranged dissimilar elements in the same group and some similar elements arranged in different group.

* Modern Periodic Law : (1923)

→ Henry Moseley
"The physical & chemical properties of elements are periodic function of their atomic no."

→ He used X-ray spectrum.

→ plot graph b/w "$\sqrt{v}$" v/s Atomic no.

→ The graph is in the straight line.

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→ Most fundamental properties of element is atomic no. not atomic mass.
→ Total group : 18
→ " period : 7
→ Vertical lines are : group
Horizontal lines are : period.
→ Most important role played by : Aufbau principle & quantum model.
→ There are 4 block : s, p, d, f
→ Metal, Non-metals, metalloids.
→ 78% metal are found LHS of periodic table.

- period elements : Name

period	elements	Name
n=1	2	very short period
n=2	8	short period
n=3	8	short period
n=4	18	long period
n=5	18	long period
n=6	32	very long period
n=7	32	very long period

* Nomenclature of element above 100 :-
→ By IUPAC.

$\boxed{Z=104}$

American → Rutherfordium

Soviet → Kurchatovium.

eg. :- 101 → Un + nil + Un + ium
= Unnilunium

→ 0 → nil
1 → un
2 → bi
3 → tri
4 → quad
5 → pent
6 → hex
7 → sept
8 → oct
9 → enn

★ Electronic configuration of element & periodic table :-

→ The arrangement of e^- into orbital of atom is called e^- configurations.

→ n = principal quantum no.
→ Azimuthal & Magnetic.

① Block : s (Alkali metal) : pH > 7

(i) Group: 1 (Alkali metal)
(ii) Group : 2 (Alkali earth metal)

→ They all are highly reactive metal, so never found in the pure form.

(i) Group 1 : (Alkali metal)

→ general e^- $conf^n$: ns^1

	No.	Name	e^- $conf^n$
n=2	$_3Li$	Lithium	$1s^2 2s^1$
n=3	$_{11}Na$	Sodium	$1s^2 2s^2 2p^6 3s^1$
n=4	$_{19}K$	Potassium	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$
n=5	$_{37}Rb$	Rubidium	. . . . $5s^1$
n=6	$_{55}Cs$	Caesium	. . . . . . $6s^1$
n=7	$_{87}Fr$	Francium	. . . . . . $7s^1$

→ In group : Top to ↓ Bottom } metallic character Increases.

→ In period: Left ⟶ right Metallic character decreases.

(ii) Group : 2 : (Alkali earth metal) (ns^2)

No.	Name	e^- conf^n
$_4Be$	Beryllium	$1s^2 2s^2$ or $[He] 2s^2$
$_{12}Mg$	Magnesium	$1s^2 2s^2 2p^6 3s^2$ or $[Ne] 3s^2$
$_{20}Ca$	Calcium	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$ or $[Ar] 4s^2$
$_{38}Sr$	Strontium	$[Kr] 5s^2$
$_{56}Ba$	Barium	$[Xe] 6s^2$
$_{88}Ra$	Radium	$[Rn] 7s^2$

(2) P- Block electronic config. :

→ As one goes left to right, metallic character decreases and non-metallic character increases.

→ General e^- conf^n : $ns^2 np^{1-6}$

→ Total group : 13 to 18.

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group	group:13	group:14	group:15	group:16	group:17	group:18
No. of valence e^-	3	4	5	6	7	8
ele. config^n	ns^2np^1	ns^2np^2	ns^2np^3	ns^2np^4	ns^2np^5	ns^2np^6

eg :- $_{13}Al$ = $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^1$ $_9F$ = $1s^2\ 2s^2\ 2p^5$

$_6C$ = $1s^2\ 2s^2\ 2p^2$

$_7N$ = $1s^2\ 2s^2\ 2p^3$ $_{10}Ne$ = $1s^2\ 2s^2\ 2p^6$

$_8O$ = $1s^2\ 2s^2\ 2p^4$

3) D - block (transition elements)

→ group : 3 to 12
→ This block, all are metal.
→ They are characterized by filling inner d-orbital e^-.
→ General e^- configuration is $(n-1)d^{1-10}\ ns^{0-2}$
→ They show coloured ions & variable valency
MnO_2, Mn_2O_3, CrO_3, Cr_2O_3
→ They are used as catalyst. eg :- V_2O_5 (Vanadium pentroxide)

eg :- $SO_2 \xrightarrow{V_2O_5} SO_3$

~~NH_3~~ also $KMnO_4$

→ Zn, Cd, Hg are not considered as d-block element $(n-1)d^{10}\ ns^2$

* F-Block (Inner Transition elements).

→ General e^- conf^n : $(n-2)F^{1-14}\ (n-1)d^{0-1}\ ns^2$

→ Lanthanoid : $_{58}Ce$ to $_{71}Lu$

Actinoid : $_{90}Th$ to $_{103}Lr$

→ After $_{92}U$ is called trans Uranium.

* Metals, Non-metals & Metalloids :-

→ They are alkali metals & Alkaline earth metal. (g-1) (g-2)

→ Most of the (78%) of metal are found LHS of periodic table.

→ Metals are solid at room temperature.

→ Exception : (Hg).

→ Melting point & Boiling of metals are very high.

→ exception : gallium (303K) (g-13) & caesium (302K) (g-1) having lower melting point.

→ They are good conductor of heat & electricity.

* Non-Metals :-

→ They are found in p-block.

→ They are found in solid or gas at room temperature.

→ Br_2 is liquid at room temperature.

→ They are poor conductor of heat and electricity. exception :- graphite

→ They have low M.P. & B.P.

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* **Metalloids :-**

→ Bade Sidhe Ganesh Aasha Sb Ko Teen Po ate.

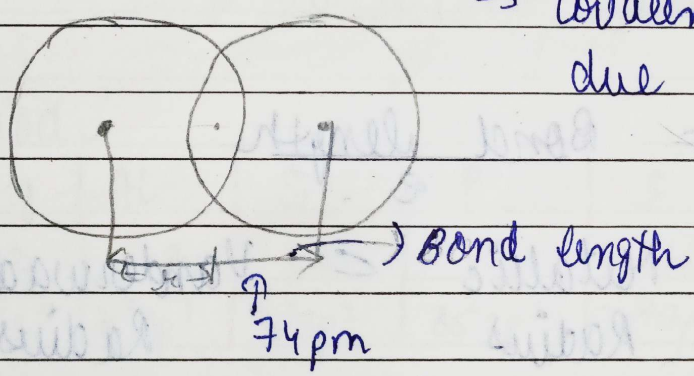
→ Boron, silicon, germanium, Arsenic, Antimony, Tellurium, pollonium, astatine.

* **Radius :-**

→ Types:-

1) covalent radius (Non-metal)
2) Metallic radius (Metal)
3) Vander Waal's radius (Non-metal).
4) Ionic radius.
   - Cationic, - Anionic.

(1) Covalent Radius :-



→ Covalent radius is formed due to overlapping.

→ $r_{covalent} = \frac{\text{Bond length}}{2}$

→ $r_{covalent} = \frac{74}{2} = 37\ pm$.

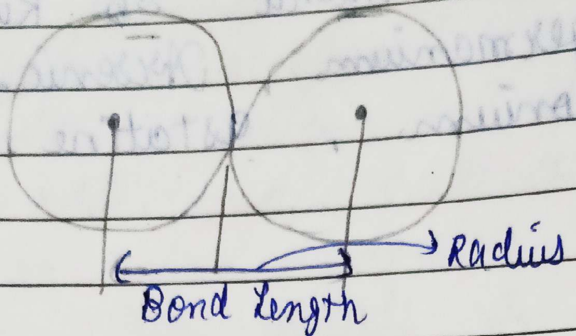
→ $\boxed{\text{Bond length} \propto \frac{1}{\text{Bond Strength}}}$

② Metallic Radius (Metal).

$r_{metallic} = \frac{\text{Bond length}}{2}$ *

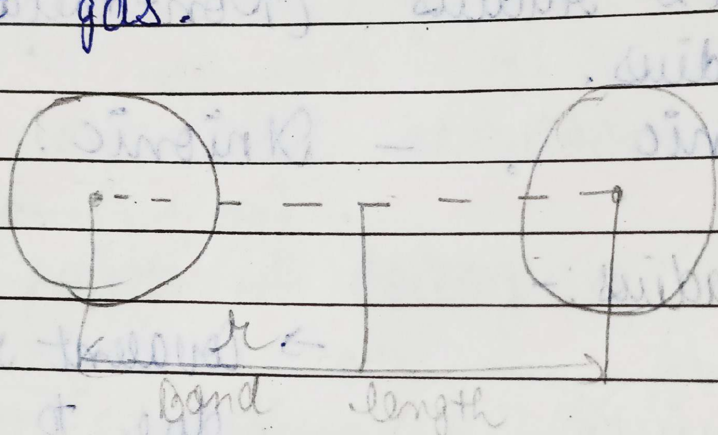
$= \frac{256 \text{ pm}}{2}$

$= 128$ pm.



③ Vanderwaal's Radius (Non metals).

→ Inert gas.



✓ $\text{Radius} = \frac{\text{Bond length}}{2}$.

Covalent radius < Metallic Radius < Vanderwaal's Radius

✓ Bond length $\propto \frac{1}{\text{Bond Strength}}$

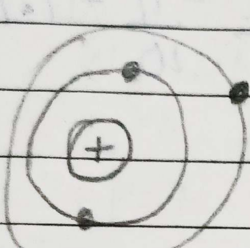
* Trends in Atomic Radius :-

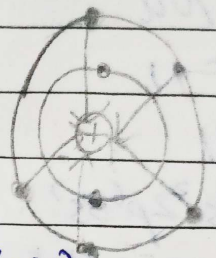
→ In Period.

→ 2^{nd} Period :

2nd Period	Li	Be	B	C	N	O	F
p^+ or Z	3	4	5	6	7	8	9
e^- conf^n	$1s^2 2s^1$	$1s^2 2s^2$	$1s^2 2s^2 2p^1$	$1s^2 2s^2 2p^2$	$1s^2 2s^2 2p^3$	$1s^2 2s^2 2p^4$	$1s^2 2s^2 2p^5$

Ex :- $_3Li$: $1s^2 2s^1$ $\qquad$ $_6C = 1s^2 2s^2 2p^2$





$p^+ = 6$
$e^- = 6$.

→ Effective Nuclear charge (Z_{eff})
→ charge of ($p^+ + n^0$)

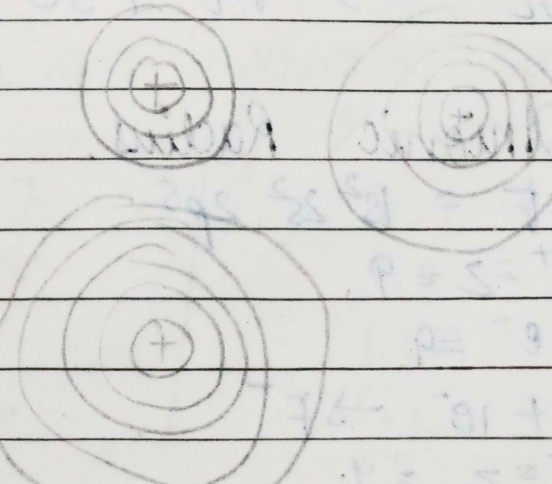
→ 3^{rd} Period.

	Na	Mg	Al	Si	P	S	Cl
Z	11	12	13	14	15	16	17
e^- conf^n	$3s^1$	$3s^2$	$3s^2 3p^1$	$3s^2 3p^2$	$3s^2 3p^3$	$3s^2 3p^4$	$3s^2 3p^5$

→ As we goes left to right in the periodic table : Atomic radius is decreased.

* In Group :-

$_3Li$ = ... $2s^1$
$_{11}Na$ . . . . . . $3s^1$
$_{19}K$ . . . . . $4s^1$
$_{37}Rb$ . . . . . . $5s^1$
$_{55}Cs$ - - . . . . $6s^1$
$_{87}Fr$. - . . $7s^1$



→ As we go top to bottom in periodic table, radius increases.
→ Principle quantum no. also increase.
→ We did not consider the radius of inert gas bcoz Vanderwaal's Radii.

(6) Ionic Radius :-

(i) Cationic radius

(1) ex :- Na.

$Z = p = 11$
$e^- = 11$

ele⁻ :- $1s^2 2s^2 2p^6 3s^1$

$Na \rightarrow 1e^- + Na^+$ / $Na > Na^+$

Na^+
$p = Z = 11$
$e^- = 10$

$\Rightarrow \frac{Z}{e} = \frac{11}{10} = 1.1$

(2) Mg.

$Z = P = 12.$
$e^- = 12e^-.$

Ele ⇒ $1s^2 2s^2 2p^6 3s^2$.

$Mg \rightarrow 2e^- + Mg^{+2}.$
Mg^{+2}
$\Rightarrow p = Z = 12$
$e^- = 10.$

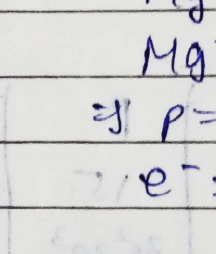
$\frac{Z}{e} = \frac{12}{10} = 1.2$

(3) $_{13}Al$

$P = Z = 13.$
$e^- = 13.$

Ele. ⇒ $1s^2 2s^2 2p^6 3s^2 3p^1$.

$Al \longrightarrow Al^{+3} + 3e^-$



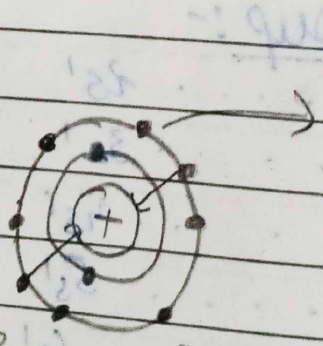
$Al^{+3} \Rightarrow p^+ = Z = 13$
$\rightarrow e^- = 10.$

$Al^{+3} < Al.$

(ii) Anionic Radius.

⇒ $_9F = 1s^2 2s^2 2p^5$.
$p^+ = Z = 9.$
$e^- = 9.$

$F + 1e^- \rightarrow F^-$
$p^+ = Z = 9.$
$e^- = 10-$



→ Z_{eff} is decreased.

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ex:- $_{17}Cl = 1s^2 2s^2 2p^6 3s^2 3p^5$

⇒ $-2.18 \times 10^{-18} \frac{Z^2}{n^2}$ (radius).

→ $Cl < Cl^-$
$F < F^-$

Ques:- ① $Mn^{+2} > Mn^{+5} > Mn^{+7}$.
② $I^- > I > I^+$

cationic radius < atomic radius < Anionic radius.

⇒ $Mg > Mg^{+2}$.
$N^{-3} > Ne$.
$Z = p = 7$ $\quad$ $Z = p = 10$
$e^- = 10$. $\quad$ $e^- = 10$
⇒ $\frac{7}{10} = 0.7$ $\quad$ $= \frac{10}{10} = 1$

Size of cation $\propto \frac{1}{\text{charge of magnitude of atom}}$.

* Atomic Radius of iso-electronic species :-

Iso-electronic species = same no. of e^-

ex:-

	S^{-2}	Cl^-	Ar	K^+	Ca^{+2}
$Z = p =$	16	17	18	19	20
$e^- =$	18	18	18	18	18

⇒

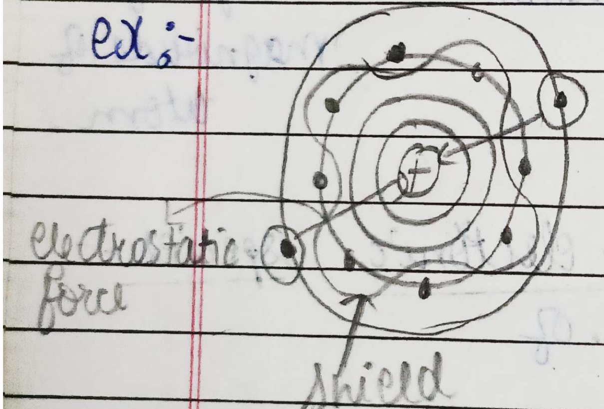
element	Value of e^-	Value of Z	ratio of Z/e
S^{-2}	18	16	$16/18 = 0.89$
Cl^-	18	17	0.9
Ar	18	18	1.0
K^+	18	19	1.05
Ca^{+2}	18	20	1.1.

→ Smaller the ratio of (z/e) higher the atomic radius.

element	e^-	z	z/e
ex:- $_7N^{-3}$	10	7	0.7
$_8O^{-2}$	10	8	0.8
$_9F^-$	10	9	0.9
$_{10}Ne$	10	10	1
$_{11}Na^+$	10	11	1.1
$_{12}Mg^{+2}$	10	12	1.2
$_{13}Al^{+3}$	10	13	1.3

→ Atomic radius is not accurate in 3d - series.

ex:-



$_{21}Sc = 1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^1$
$_{22}Ti = - - - - - - 3d^2$
$_{23}V = - - - - - - 3d^3$
$_{24}Cr = - - - - - - 4s^1 3d^4$
$_{25}Mn = - - - - - - 4s^2 3d^5$

Case : 1.

From :- Sc > Ti > V > Cr > Mn

Zeff > Shielding or screening

effective nuclear charge → electrostatic force Increase → Radius is decreased.

- Case : 2 :- Fe, Co, Ni.

  Fe = Co = Ni

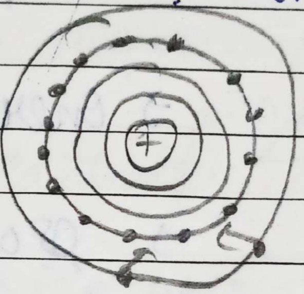
  → Radius same. $F = \frac{Gm_1m_2}{r^2}$

→ Z_{eff} = shielding.

- Case : 3 :- $Cu < Zn$

→ $_{29}Cu$: $[Ar]\,4s^1 3d^{10}$ ∴ Z_{eff} < shielding.

$_{30}Zn$: $[Ar]\,4s^2 3d^{10}$



- ex :- group 13 :-

B
↑
Al
↑
Ga
↑
In
↑
Tl

Radius of Al : 143 pm

of Ga : 135 pm

Al > Ga

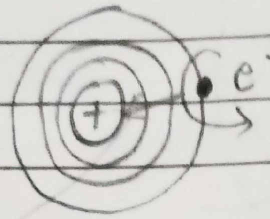
→ As we go top to bottom ; metallic character is increased.

→ As we go left to right, metallic character decreases.

* **Ionization enthalpy :-**

→ The minimum energy required to remove an e^- from orbital of gaseous ionized isolated atom.

Solid → electrostatic force is maximum.



→ energy is required to remove an e^-.

→ So, the process is endothermic (+ve)

$F = \frac{k q_1 q_2}{r^2}$

→ energy unit → kJ/mol or eV/atom.

$1\ eV = 1.6022 \times 10^{-19}\ J$

→ Removed e^- goes into infinite (∞)

esc :- infinite = 2cm

$M \rightarrow 1e^- + M^+ : IE_1$

$M^+ \rightarrow 1e^- + M^{+2} : IE_2$

• Trends of ionisation enthalpy in group & period :-

→ In group :-

Group I :-

$_3Li = 2s^1$

$_{11}Na = 3s^1$

$_{19}K = 4s^1$

$Rb = 5s^1$

$Cs = 6s^1$

$Fr = 7s^1$

$$\boxed{I.E \propto \frac{1}{\text{Atomic Radius}}}$$

Maximum ionization enthalpy at 1^{st} shell
Minimum " " " 7^{th} shell

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- In Period :-

→ Period :- 2

	Li	Be	B	C	N	O	F
$p^+ = Z =$	3	4	5	6	7	8	9
ele. conf^n =	$2s^1$	$2s^2$	$2s^2 2p^1$	$2s^2 2p^2$	$2s^2 2p^3$	$2s^2 2p^4$	$2s^2 2p^5$

→ As we go left to right atomic radius is decreased.
→ ∴ Ionization enthalpy increases.

elements :- Li < $\boxed{Be > B}$ < C < $\boxed{N > O}$ < F < Ne
Z :- 3 4 5 6 7 8 9 10
e^- conf^n :- $1s^2 2s^1$ $2s^2$ $2s^2 2p^1$ $2p^2$ $2p^3$ $2p^4$ $2p^5$ $2p^6$

→ Zeff↑ ⟶ Atomic radius is decreased ⟶ Ionization E. is increased

1. Be } B
= $1s^2 2s^2$ } → $1s^2 2s^2 2p^1$
→ Requires more energy } → Requires less energy

→ due to higher stability of completely half filled or fully filled orbital. require more energy to remove an e^-.

2. $_7N$ } $_8O$
→ $1s^2 2s^2 2p^3$ } → $1s^2 2s^2 2p^4$
[↑↓] [↑|↑|↑] } [↑↓] [↑↓|↑|↑]

• Period :- 3

elements	Na < Mg > Al < Si			< P > S	< Cl	< Ar	
elements	Na	Mg	Al	Si	P	S	Cl	Ar
Z	11	12	13	14	15	16	17	18
e^- conf^n.	$3s^1$	$3s^2$	$3s^2 3p^1$	$3s^2 3p^2$	$3s^2 3p^3$	$3s^2 3p^4$	$3s^2 3p^5$	$3s^2 3p^6$

Mg	Al
$3s^2$	$3s^2 3p^1$
requires more energy	requires less energy

Reason :-

→ p^3/p^6

→ d^5/d^{10}

→ f^7/f^{14}

⇒ 2nd Ionization Enthalpy :-

1st I.E.

$_4Be$	$_5B$
$1s^2 2s^2$	$1s^2 2s^2 2p^1$

2nd I.E. : After the removal of $1e^-$:-

$_4Be$	$_5B$
→ $1s^2 2s^1$	$1s^2 2s^2$

→ So, here 1st I.E. is higher in Be.
But second I.E. is higher in B.

ex :-	$_7N$	$_8O$
I I.E.	:- $1s^2 2s^2 2p^3$	= $1s^2 2s^2 2p^4$
2nd I.E.	:- $1s^2 2s^2 2p^2$	= $1s^2 2s^2 2p^3$

ex :-	$_{15}P$	$_{16}S$
I I.E.	$1s^2 2s^2 2p^6 3s^2 3p^3$	= $1s^2 2s^2 2p^6 3s^2 3p^4$
2nd I.E.	$3s^2 3p^2$	= $3s^2 3p^3$

P < S.

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→ Factor affecting I.E. :-
① atomic radius
② Zeff
③ Shielding / screening
④ penetration power (s>p>d>f)
⑤ completely half filled / completely fully filled orbital.
(p^3/p^6) & (d^5/d^{10}) & (f^7/f^{14})

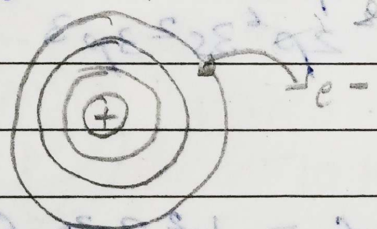
* electron Gain enthalpy :-

→ It is defined as 'The energy is released when isolated gaseous atom accept an extra electron'.

$$X_{(g)} + 1e^- \longrightarrow X^-_{(g)} \quad \Delta H = \text{Enthalpy}$$
$$\Delta H = -ve$$

→ So, the process may be exothermic or endothermic.

energy released.

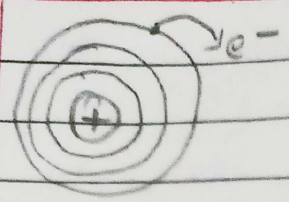


→ Maximum the energy released. So, maximum the e^- gain enthalpy.

→ Unit : KJ/mol or eV/atom
ex :- −20 KJ/mol

→ (+) = endothermic , (−) : exothermic

→ 1^{st} e^- gain enthalpy is not always negative (−) i.e. process is exothermic.



→ ~~enoti~~ endothermic
→ stability of orbital affect
→ completely half filled & fully filled.

→ ex :- $_7N = 1s^2 2s^2 2p^3$
→ It does not require an extra e^-.
→ For that, extra energy is required.
→ So, the process is endothermic.

ex:- Group : 2
→ General e^- confⁿ :- ns^2
→ $Be = 1s^2 2s^2$
→ $Mg = 3s^2$
→ $Ca = 4s^2$

ex :- group : 15
$_7N = 1s^2 2s^2 2p^3$
$_{15}P = 1s^2 2s^2 2p^6 3s^2 3p^3$

ex :- Group : 18
$He = ns^2 np^6 = 1s^2 2s^2 2p^6 3s^1$
$Ne = ns^2 np^6$
$Ar = np^6$

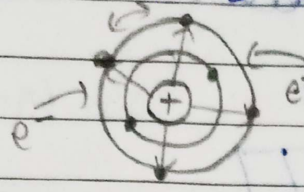
→ 2^{nd} e^- gain enthalpy is positive.

ex :- 1^{st} e^- gain enthalpy.
$O_{(g)} + 1e^- \longrightarrow O^-_{(g)}$: $\Delta H = -41$ KJ/mol
$O^-_{(g)} + 1e^- \longrightarrow O^{-2}_{(g)}$
exothermic
$\Delta H = +790$ KJ/mol
endothermic

⑤ $S_{(g)} + 1e^- \longrightarrow S^{-1}_{(g)}$ ∴ $\Delta H = -200$ kJ/mol

$S^- + 1e^- \rightarrow S^{-2}_{(g)}$ ∴ $\Delta H = +580$ kJ/mol

ex :- ${}_8O = 1s^2\, 2s^2\, 2p^4$ | ${}_8O^{-2} = 1s^2\, 2s^2\, 2p^6$



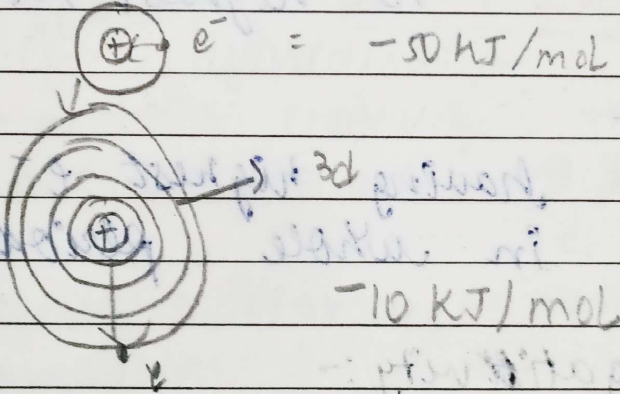
→ electrostatic force towards the nucleus will be decreased.

→ Repulsion is increased.

• **Trends of e⁻ gain enthalpy :-**

① In Group :-

→ As we go down in the group, atomic radius is increased.



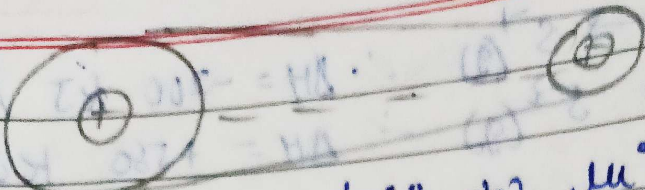
→ electron gain enthalpy in group is decreased.

→ Reason :- Distance b/w nucleus & e⁻ from last orbital is increased i.e. electrostatic force is decreased.

② In Period :-

→ As we go left to right atomic radius is decreased.

→ Reason : $Z_{eff} \uparrow$



→ As we go left to right e^- gain enthalpy is increased.

Ex:- Be > B.

$1s^2 2s^2$ $1s^2 2s^2 2p^1$

[↑↓] [↑↓]   [↑↓] [↑ | |]

Ex:- N > O

$1s^2 2s^2 2p^3$ $1s^2 2s^2 2p^4$

● Extra:-

→ Group : 16.

↓ O

S → e^- gain enthalpy is highest in group.

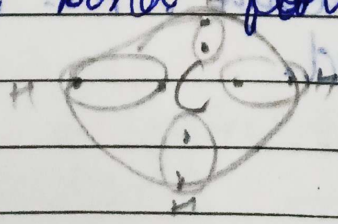
→ Group:-17

→ Cl is having highest e^- gain enthalpy in whole periodic table.

* electronegativity:-

→ It is tendency of an atom to pull e^- towards it, in covalent bond.

→ Covalent bond formed due to sharing of e^-.



→ Nature of C–X bond:-

↳ group 17 : halogen group

→ F, Cl, Br, I.

$C \; : \; Cl$

e^- donating $\qquad$ e^- withdrawing tendency

$C^{+\delta} \; : \; Cl^{-\delta}$

$C^+ \quad Cl^-$

→ $F > O > N > Cl$

- **How to calculate electronegativity :-**

① Mulliken method

$$X = \frac{\Delta H_{I.E.} + \Delta H_{E.g.}}{2} \quad \text{Unit :- eV}$$

$$X = \frac{\Delta H_{I.E.} + \Delta H_{eg}}{540} \quad \text{unit :- kJ/mol}$$

* Factor affecting electronegativity :-

① Type of hybridisation :-

(i) sp^3 → % s character → 25 %

(ii) sp^2 → % s character → 33.33 %

(iii) sp → % s character = 50 %

→ more the % s character more the substance is electronegative.

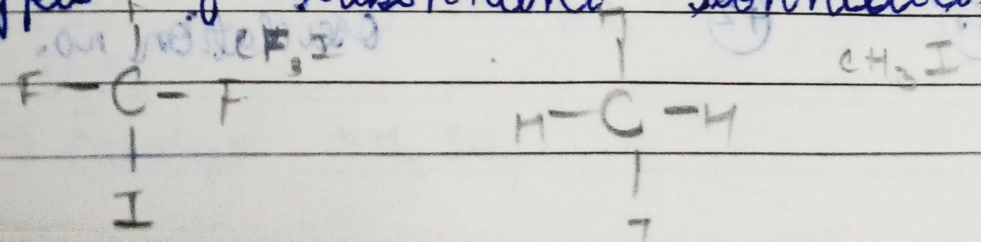
② Oxidation no.

→ More the positive charge more the electronegativity

→ $Cu^+ < Cu^{+2}$, $Fe^{+2} < Fe^{+3}$

→ $Al^{+2} < Al^{+3}$, $Mn^{+2} < Mn^{+5} < Mn^{+7}$

③ Types of substituent connected. (molecule or atom)



(4) charge on anion
N^{-1}, N^{-2}, N^{-3}

→ electrongativity $\propto \dfrac{1}{\text{charge on anion}}$

* Trends of electronegativity in period :-

⇒ Period : 2

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

⇒ Period : 3

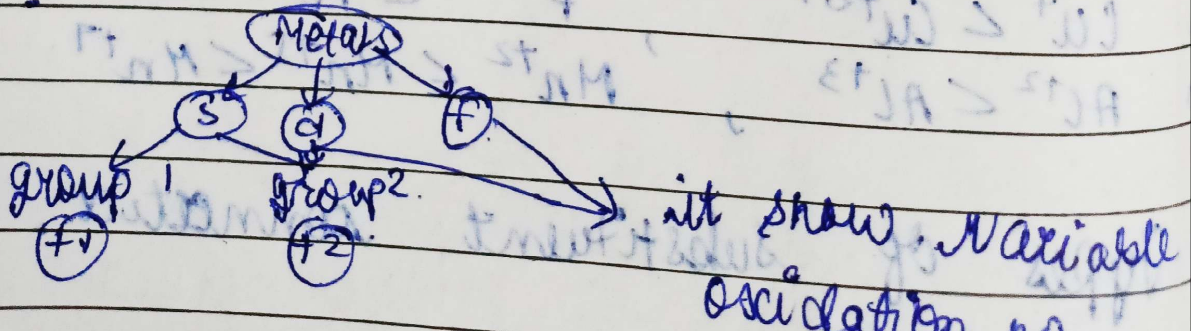
Na	Mg	Al	Si	P	S	Cl
0.9	1.2	1.5	1.8	2.1	2.5	3

→ As we go left to right in the periodic table electronegativity is increased.

→ As we go down in the group, electronegativity is decreased.

* Acidic & Basic character of elements :-

1) Metallic oxide & Hydroxide are basic in nature.



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ex :- $\overset{+1}{Na_2}\overset{-2}{O} + H_2O \rightarrow 2NaOH$ → pH = 14.
Most Basic

→ $MgO + H_2O \rightarrow Mg(OH)_2$
$CaO + H_2O \rightarrow Ca(OH)_2$ → Basic

(2) Higher oxidation state of metal are acidic in nature.

ex :- Cr_2O_7 → Acidic
$2x + (-2\times7) = 0$
$2x = 14$
$\boxed{x = +7}$

Cr_2O_3
$x + (-2\times3) = 0$
$\boxed{x = +6}$

Mn_2O_3
$2x + (-2\times3) = 0$
$\boxed{x = +3}$ → Basic

(3) Non-Metallic oxides are acidic in nature.

$N_2O = +1$ → higher positive charge greater the acidic
$NO_2 = +4$
$N_2O_3 = +3$
$N_2O_5 = +5$
$NO = +2$

(4) Amphoteric oxide :-
Acid Base

Zana Be Ali sab ke samne Aese Punjabi Song mat gaya karo verna.

group 2

→ ZnO BeO Al_2O_3 Sb_2O_3
SnO SnO_2 As_2O_3 PbO
PbO_2 MnO_2 Ga_2O_3 Cr_2O_3
V_2O_5
→ catalyst → H_2SO_4

(5) Neutral oxide:-
→ CO, NO, N_2O
Most Basic (...) Na_2O.
Most acidic (...) Cl_2O_7

* Valency & valence e^-:-

- Valency :- Combining capacity of element is known as valency.
- Valence e^- :- element → last shell & remaining orbital e^-.

group	1	2	3	4	5	6	7	8
e^- confⁿ	ns^1	ns^2	ns^2np^1	ns^2np^2	ns^2np^3	ns^2np^4	ns^2np^5	ns^2np^6
valence e^-	1	2	3	4	5	6	7	8
valency	1	2	3	4	5, 3	6, 2	7, 1	8, 0

→ $\boxed{\text{Co-valency = No. of bond formed.}}$

$[AlCl(H_2O)_5]^{+2} \Rightarrow x + (-1) + 0 = +2 \Rightarrow x = +3$

eg:- BF_4^-
$x + (-1 \times 4) = -1$
$B = +3$
Covalency $= 4$

$K_4[Fe(CN)_6]$
$(+1 \times 4) + x + (-1 \times 6) = 0$
$x - 2 = 0$
$\boxed{x = +2}$ → oxidation no.
Covalency = 6.

eg:-

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* Anamalous properties or diagonal relationship.

Li Be B ⇒ period : 2 ⇒ ns^2np^{1-6} -
Na Mg Al ⇒ period = 3 ⇒ 3s, 3p, 3d.

group ⇒ 1, 2, 13, 14, 15, 16, 17, first element are covalent in nature & other are ionic in nature.