PERIODIC TABLE

↳ Screening Constant and effective nuclear charge.
→ Ionic Radii and Ionisation energy.
→ Electron Gain Enthalpy.
→ Electronegativity.

① Doberiner's Law of Triads

CBI Ke (Cl, Br, I) PAS (P, As, Sb) SaSTi (S, Se, Te)

Li PStick hoti hai jo wo Co SaB Ko degi.
(Li, Sodium, Potassium) (Ca, Sr, Ba)

→ Elements arranged in increasing atomic mass in traids.. Mid element's mass is average of two.

② Newland's Law of Octaves

① Arranged elements in increasing atomic Mass.
② Property of every 8th element is similar.

~~H~~ Li Be B C N O
~~F~~ Na Mg..

Limitation → Valid only upto 20th element

③ Lother Meyer's Classification

① Peak of the Curve occupied by Alkali metals → Li, Na, K, Rb, Cs
② Ascending part of Curve → Halogens
↳ F, Cl, Br, I.
③ Descending part of Curve → alkaline earth Metals → Be, Mg, Ca, Sr, Ba
④ Bottom → D block elements
→ In increasing atomic Mass (Graph)

④ Mendeleef's Classification

→ Atomic Mass → fundamental property
→ Classified 63 elements. (Inert gases not present)

→ Seven Horizontal rows → periods.
Eight Vertical colums → Groups.
→ Left Vacant Spaces for gases Undiscovered
↳ eka-aluminium, eka-Silicon
↓ Ga ↓ Ge

Problems :→
① Position of Hydrogen → Uncertain.
② No separate position for Isotopes.
③ No separate group → Lanthanides and actinides
④ Although no resemblance except valency of subgroups A and B putted in same group.
⑤ Order → Not strictly followed.
e.g. → Ar (wt 39.9) before K (wt 39).
→ Co (58.9) before Ni (58.6)
→ Anamalous Pairs.

⑤ Moseley's Work

→ Frequency depends on atomic number

⑥ Mordern Periodic Law.

→ Properties of elements depend upon atomic number.
→ Vertical Columns → Groups → 18
→ Horizontal rows → Periods → 7

⑦ Nomenclature of Elements with Atomic Numbers > 100

Digit	Name	Abbreviation
0	nil	n
1	un	u
2	bi	b
3	tri	t
4	quad	q
5	pent	p
6	hex	h
7	sept	s
8	oct	o
9	enn	e

e.g. → 114 = at no 114 = Ununquadium
Symbol = Uuq

NEET SLAYER

Prediction of Group, Period and Block of a Given Element

Block → Last e^- enters.
S-subshell → s-block
p-subshell → p-block
d-subshell → d-block
f-subshell → f-block

Group → s-block = no. of Valence e^- = group

② p-block = no. of Valence e^- + 10

③ d-block elements = $ns^2 + (n-1)d^{x}$
n = outermost shell

④ f-block elements = Group no 3

Period → Outermost shell

Effective Nuclear Charge and Shielding / Screening Effect

↳ Shielding Effect → Inner shell electrons repel outer one.

$s > p > d > f$ ← shielding effect increases

↑↑ Shielding Effect → ↑↑ screening (σ) Constant

→ Calculation of Shielding Constant (σ)
↳ Slater's Rules

→ for s-block or p-block elements

σ = 0.35 × no. of e^- in last shell except test e^-
+ 0.85 × no. of e^- in 2nd last shell
+ 1 × no. of e^- left.

e.g. → $_{7}N \rightarrow 1s^2 2s^2 2p^3$

Sol^n → σ = 0.35 × 4 + 0.85 × 2 = 3.1

→ for d or f-block elements
↳ Electric Configuration represented as →
(1s) (2s, 2p) (3s, 3p) (3d) (4s, 4p) (4d) (4f)
(5s, 5p) (5d) (5f) (6s, 6p) (6d) (7s, 7p)

Que) $_{26}Fe \rightarrow 1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^6$

↳ Fe → $(1s^2)(2s^2, 2p^6)(3s^2, 3p^6)(3d^6)(4s^2)$

σ for d and f block element = 0.35 × no. of e^- in d subshell except test e^- + 1 × all e^- at left hand side.

↓ same for f bas d ki jagah f.

= 5 × 0.35 + 1 × 18 = 19.75

Effective Nuclear Charge (Z^*)

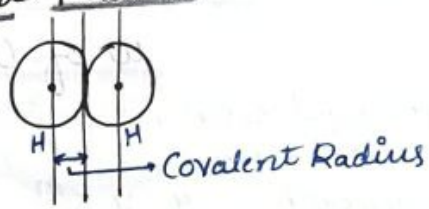
e^- → Force of attraction ↑, Nuclear Charge ↑

nucleus

$Z^* = Z - \sigma$ → shielding constant
↓
atomic no.

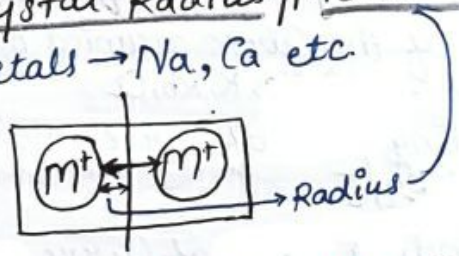
Atomic Radii

① Covalent Radius
↓
H–H
H–Cl



② Vander Waal's Radius
↳ He, Ne, Ar etc..
H_2 → Covalent, Vander Waal radius.

③ Crystal Radius / Metallic Radius
↳ Metals → Na, Ca etc.



Vander Wall's Radius > Metallic Radius > Covalent Radius
← Radius increase

④ Ionic Radius

① Cation → $Na \rightarrow Na^+ + 1e^-$
↓ ↓
11p 11p
11e⁻ 10e⁻ → More Z^*, Size decrease

② Anion → $Cl + 1e^- \longrightarrow Cl^-$ → Z^* less, Size more

	parent atom	Anion
	17p	17p
	$17e^-$	$18e^-$

Calculation of ion for Isoelectronic Species.

↳ Same no. of e^-: more no. of proton, ↳ Higher atomic no. ↳ Lesser Size

	P	e^-
Mg^{2+}	12	10
Al^{3+}	13	10
F^-	9	10

NEET SLAYER

Factors Affecting Atomic Radii

M → Multiplicity of Bonds $\propto \frac{1}{\text{radii}}$

No. of bonds b/w atoms ↳ C-C > C=C > C≡C. (Radius Decreases)

I → % of Ionic Character $\propto \frac{1}{\text{radius}}$.

N → No. of Shells $\propto$ radii.

E → Effective Nuclear Charge (Z^*) $\propto \frac{1}{\text{radius}}$

Variation of atomic Radii in a Period →

Z^* increases from left to right.
atomic radii Decrease.

→ Noble Gases have max. radii in their period, because we measure V.W. radius for noble gases.

Variation of atomic Radii in a Group →

↓ no. of shells ↑↑ Size ↑↑

(Que) Ga < Al size?

Sol:→ ↓ Ga present after d-block elements which have weak sheilding effect → size ↓↓.

Ionisation Enthalpy (ΔH)

↓

NIGA → Atom

N → Neutral, I → Isolated, G → Gaseous, A → Atom

amount of energy required to remove e^- from NIGA.

$Mg_{(g)} \rightarrow Mg^+_{(g)} + 1e^- \longrightarrow 1^{st}$ I.E.

$Mg_{(g)} \rightarrow Mg^+_{(g)} + 1e^- \longrightarrow 2^{nd}$ I.E.

Factors affecting Ionisation Enthalpy.

S → Screening Effect $\propto \frac{1}{\text{I.E.}}$ | $Z^* \propto$ I.E.

H → Half filled and fully filled orbitals ↳ stable.

A → Atomic Radii $\propto \frac{1}{\text{I.E.}}$

or

P → Penetration Effect $\propto$ I.E.
S > p > d > F.

Variation of IE in a Period →

atomic radius decrease, I.E. Increase

* Be > B } I.E. exception
* N > O }

Variation of IE in a Group →

atomic Radius increase.
I.E. decrease.

* Ga has higher IE than Al

Electron Gain Enthalpy ($\Delta_{eg}H^-$) and Electron Affinity (EA) →

↓

NIGA (Neutral Isolated Gaseous Atom)

$Cl_{(g)} + 1e^- \longrightarrow Cl^-_{(g)}$ (ΔH_{eg} = (-)ve ↳ electron gain enthalpy)

→ Jiski -ve me, value zyada → EGE zyada. (ΔH_{eg})

Electron Gain Enthalpy ∝ Electron Affinity

$\Delta_{eg}H^-$	Electron Affinity
any temperature	Zero Kelvin

↳ Sign opposite rehti hai.

$\Delta_{eg}H^-$ → zyada → e^- wants to come.

NEET SLAYER

Factors on which $\Delta_{eg}H^-$ Depends →

E → Effective nuclear charge $\propto \Delta H_{eg}$.

y

E → Ellipticity of Subshell

↓

Penetrating effect $\propto \Delta H_{eg}$

E → Electronic Configuration → Stable in half and fully filled. $\propto \frac{1}{\Delta H_{eg}}$

S → Size $\propto \frac{1}{\Delta H_{eg}}$

Variation of ΔH_{eg} in period →

Size ↓↓, ΔH_{eg} ↑↑

→ C > N ; Be < B

↓ ↓

ΔH_{eg} less ΔH_{eg} less

Variation of ΔH_{eg} in Group →

↓ Size ↑↑

↓ ΔH_{eg} ↓↓

* Cl > F > Br > I

↓

due to small size and high $e^- - e^-$ repulsion

* S > Se > Te > Po > O.

ΔH_{eg} ↑↑ ← O has small size and high $e^- - e^-$ repulsion

Electronegativity

Sharing electrons me Jo zyada kheech le, Vo zyada electronegative aur (-).

H^+Cl^-, Na^+Cl^-.

Factors affecting Electronegativity

H → Hybridisation →

↑↑ % of s-character $\propto$ E.N.

$sp > sp^2 > sp^3$

← s-character increase, E.N ↑↑

O → Oxidation state

(+ve) $\propto$ E.N. (-ve) $\propto \frac{1}{E.N}$

S → Size $\propto \frac{1}{\text{ElectroNegativity}}$

E → Effective Nuclear charge $\propto$ E.N.

Variation of EN in a Period

→

Size ↓↓, EN ↑↑

Variation of EN in a Group

↓ Size ↑↑

↓ E.N. ↓↓

Applications of Electronegativity

1. $|\chi_A - \chi_B| = 0$ = 100% Covalent
2. $|\chi_A - \chi_B| < 1.7$ = Bond More Covalent and less ionic.
3. $|\chi_A - \chi_B| = 1.7$ = Bond 50% Covalent 50% Ionic
4. $|\chi_A - \chi_B| > 1.7$ = Bond → ↑↑ Ionic, ↓↓ Covalent
5. %age of Ionic Character →

$= 16(\chi_A - \chi_B) + 3.5(\chi_A - \chi_B)^2$

Nature of Oxides.

$H-O-Cl + H_2O \rightarrow H^+ + OCl^-$

$|\chi_O - \chi_H| > |\chi_O - \chi_M|$ → Acid.

$NaOH + H_2O \rightarrow Na^+ + OH^-$

$|\chi_O - \chi_H| < |\chi_O - \chi_M|$ → Base

Amphoteric Oxides.

Bhai Sab ZAP Karo

↓ → SnO → PbO

Beryllium Oxide → ZnO → Al_2O_3

Neutral Oxides

CO, N_2O, NO, H_2O.

NEET SLAYER