

2. Classification of Elements & Periodicity in Properties

STUDY NOTES

1) PERIODIC TABLE

TWO PROMINENT PERIODIC LAWS:

Mendeleev's Periodic Law is as per 'Atomic masses' of elements.

Moseley's Modern Periodic Law is as per 'Atomic numbers' of elements.

MODERN PERIODIC TABLE FORMAT:

[It's like 7 Floor- 18 Tower- 4 Block Building]

7 periods: 7 horizontal rows from P1 to P7

18 Groups: 18 vertical columns from G1 to G18

4 blocks: s-block, p-block, d-block, f-block.

CLASSIFICATION of elements as per Electronic Configuration and Positional Status:

(1) s-block elements (G1, G2) (2) p-block elements (G13 to G18)

s & p block elements are called **Representative elements**.

(3) d-block elements (G3 to G12) [Transition Elements]

(4) f-block elements [Inner-Transition Elements]

Classification as per Metallic character:

(1) Metals (2) Semi metals (Metalloids) (3) Non-metals

SPECIAL NAMES OF GROUPS & PERIODS

Group1: Alkali Metals; Group2: Alkali Earth Metals

Group16-Chalcogens; Group17-Halogens; Group18-Noble gases / Inert gases

Period1 (H, He): Shortest period with only 2 elements.

Period2 [Li(3) to Ne(10)] & Period3 [Na(11) to Ar(18)]: Short periods with 8 elements.

Period4 [K(19) to Kr(36)] & Period5 [Rb(37) to Xe(54)]: Long periods with 18 elements.

Period6 [Cs(55) to Rn(86)]: Longest period with 32 elements.

Period7 [Fr(87)]: Incomplete period.

f-block with 4f series [Ce(58) to Lu(71)]: **Lanthanides** (Rare-earth elements).

f-block with 5f series [Th(90) to Lr(103)]: **Actinides** (Radio-active elements).

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Two Basic Rules:

[1 LAQ]

Rule 1: Periodic Table Building లో పైన పై అంతస్తుల్లో చిన్న పిల్లలు, మధ్యలో యువకులు, పెద్దవారు పైకి ఎక్కలేరు కావున 'కింద' నివసిస్తుంటారు. అందుకే Groupలో Top నుండి Bottom కి దిగే కొద్దీ Atomic Size Increase అవుతుంది. Elements లోకెల్లా బాహుబలి Big Boss Mr. Francium G1 Bottom లో ఉంటాడు.

Rule 2: Left side s-block లో పైన చిట్టి తమ్ముళ్ళు ఉంటే, Right side p-block లో పైన చిట్టి చెల్లెళ్ళు ఉంటారు. అందుకే Periods లో Left to Right కి జరిగే కొద్దీ Atomic Size Decrease అవుతుంది. అందరిలోకి చిట్టి తల్లి He చివర్లో ఉంటుంది.

Note: 'Same group elements' have 'same valency' and hence have 'similar chemical properties'!

మీ కాలేజీలో మీకు (ఇతర Sections కు కూడా) వచ్చే మీ 6 Subject Lecturers ను 8 Periods లో

Time Table లో Adjust చేయడం మీ Principal గారికి పెద్ద Challenging Task!

అలాగే 100కి పైగా Elements తో ప్రస్తుతం మీరు నేర్చుకుంటున్న Periodic Table ని Set చేయడానికి మహామేధావులైన వందలాది Scientist లకు వంద సంవత్సరాలకు పైగా సమయం పట్టిందని మీకు తెలుసా?

Father of Periodic Table: Mendeleev

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II) PERIODIC(Recurring & Repeating) PROPERTIES

Periodic Properties are gradual 'increasing or decreasing properties' of elements down a Group from Top to Bottom and across a Period from Left to Right.

1) ATOMIC RADIUS

'Atomic Radius' of elements **Increases** down a Group from Top to Bottom.

'Atomic Radius' of elements **Decreases** across a Period from Left to Right.

2) ELECTRO POSITIVITY

It's the tendency of atoms **to donate/lose** electrons easily/ readily to become positive ions.

It increases down a group and decreases across a period.

3) IONISATION ENTHALPY (I.E)/ IONISATION POTENTIAL (I.P)

It's the tendency of free atoms to retain their valence electrons.

It's the amount of **energy supplied to remove** the loosely bounded valence electron.

Right side p-block non-metals have high IE. Because they **tightly** hold their electrons.

Elements with highest IE are **Helium, Fluorine.**

That means **He, F** demand lot of energy to **expell** electrons from them.

Left side s-block Metals have low IE. They readily loose electrons.

4) ELECTRON GAIN ENTHALPY/ELECTRON AFFINITY (E.A)

It's the tendency of free atoms to gain / accept / add / like / welcome electrons.

It's the amount of **energy released** when an electron is added to 'neutral isolated gaseous atom'.

Right side non-metals have high E.A. and Left side metals have low E.A.

Elements with **highest** E.A are **Chlorine, Fluorine.**

5) ELECTRONEGATIVITY (EN)

It's the tendency of atoms in a molecule **to attract** the 'shared pair of electrons' towards themselves in a covalent bonded molecule.

Halogens have **high EN** and **Alkaline** Group elements have **low EN** .

Elements with highest E.N are **Fluorine, Chlorine.**

Universal Mega Sisters :

Miss Clean Celebrity **Chlorine**; Miss Fast action Fevi Queen **Fluorine**

Useful TIPS to remember the Periodic Properties easily!

TIP 1: ఒక్క Atomic Radius(size) అనే Property యొక్క Periodicity ని సరిగ్గా అర్థం చేసుకొని గుర్తుంచుకొంటే మిగిలిన Periodic Properties అన్నీ దానితో Linkup చేసుకొని గుర్తుంచుకోవచ్చు.

TIP 2: Periodic Table లో Left side లోని s-Block లో ఉండే Male like Metals పెద్దవిగా ఉంటాయి. Right side లోని p-Block (G-17,G-18)లో ఉండే Female like Non-metals చిన్నవిగా ఉంటాయి.

TIP 3: Groups లో Top to Bottom కు Increase అయ్యే Properties అన్నీ కూడా Periods లో Left నుండి Right కు Decrease అవుతుంటాయి.

TIP 4: పరస్పరం విరుద్ధంగా ఉండే రెండు రకాల Periodic Properties:

1) Male like Metallic Properties: Atomic radius, Electro positivity, Basic, Reducing nature

2) Female like Non-metallic Properties: I.E, E.A,E.N, Acidic, Oxidising nature

Periodic Properties in Daily Life, Physics, Maths

- 1) In your College, your **classes** in your Time Table have 'Periodic Property'.
First Period, Second Period,... are arranged repeatedly at a Time period of 50 min. (or) 1 hr,...
- 2) Day and Night in a Day; Seasons in Year; **Oscillations** in SHM have Periodic Property.
- 3) In Maths, all the **6 T'c Functions** are Periodic Functions. Period of $f(x)=\sin x$ is 2π . That means, values of $\sin x$ repeat the same values even after the addition of 2π . $\therefore \sin 30^\circ = \sin 390^\circ = 1/2$

Chemistry of Human Beings!

Chemistry of Human Beings!

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WOW! SIMILARITIES BETWEEN ATOMIC ELEMENTS AND HUMANS

CHARACTER	ATOMIC ELEMENTS	HUMANS
1) Assets & Income	Fixed Assets: Protons, Neutrons Variable Income: Electrons	Houses, Lands Monthly Income
2) Money Transactions	Electrons	Currency-Cash
3) Gender Classification	Metals & Non-metals, Semi Metals	Males & Females, Transgenders
4) Residential Status	Metals reside in left s-block Non-metals reside in right p-block	In classrooms, Boys sit left and Girls sit right side.
5) Hierarchy of Seating	Small elements stay Top, Big elements go Bottom	Small Students sit in Front rows, Big Students sit back.
6) Male Characters: <ul style="list-style-type: none"> • Size • Metallic Character • Electro Positivity • Reducing Agents 	Metals are Big in size High M.P, Good conductors of Heat, E... Want to donate electrons Offer electrons- Positive cations	Males are Big in size Strong, Good friendly & helping nature Gentlemen's Positive attitude Gents - Money spenders
7) Female Characters: <ul style="list-style-type: none"> • Size • Non-Metallic Char. • Electro Negativity • Ionisation Potential • Electron gain Enthalpy • Oxidising Agents 	Non-Metals are small in size Low M.P, Poor conductors of Heat... Attract shared electron pair Hold electrons more tightly Release energy on e ⁻ gain Accept electrons-Negative anions	Females are small in size Flexible, moulds easily Wives want to keep income with them Females fix money in F.Ds. Ladies celebrate parties Grandly Ladies- Money savers.

s-BLOCK	
1	2
1s	H
2s	Li Be
3s	Na Mg
4s	K Ca
5s	Rb Sr
6s	Cs Ba
7s	Fr Ra

The ALPHABET of Universe

d-BLOCK											
3	4	5	6	7	8	9	10	11	12		
3d	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	
4d	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	
5d	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	
6d	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Uuu	Uub	

p-BLOCK						18
13	14	15	16	17		
2p	B	C	N	O	F	Ne
3p	Al	Si	P	S	Cl	Ar
4p	Ga	Ge	As	Se	Br	Kr
5p	In	Sn	Sb	Te	I	Xe
6p	Tl	Pb	Bi	Po	At	Rn
7p	-	Uuq	-	Uuh	-	-

f-BLOCK														
4f	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
5f	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Ml	No	Lr

☞ It's just a general comparison; might have some exceptions and excuses!