



ARJUNA NEET BATCH



Classification of Elements & Periodicity in Properties

LECTURE-03

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Quick Revision:



① Limitations of Mendeleev's Classification

② Modern Periodic Table

③ IUPAC names of at. no. > 100

↳ Henry Moseley
↑ seq. at. no. (Z)

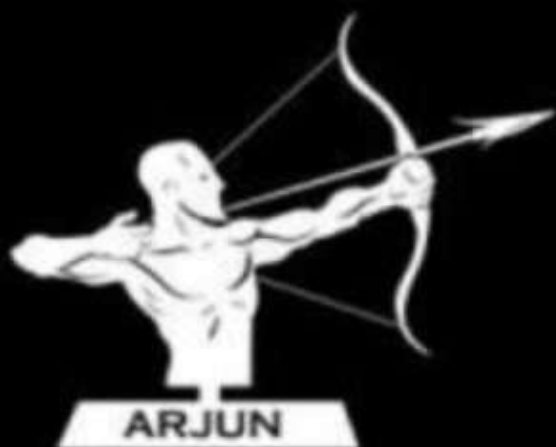
↳ 18 Groups & 7 periods

Advantages of Modern Periodic Table over Mendeleev's Table

① Posⁿ of isotope : solved

② $^{27}_{27}\text{Co}$ & $^{28}_{28}\text{Ni}$ was solved

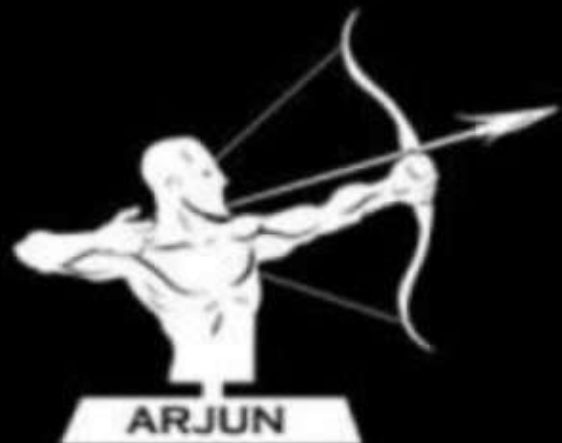
③ Easy to remember & reproduce



Objective of today's class



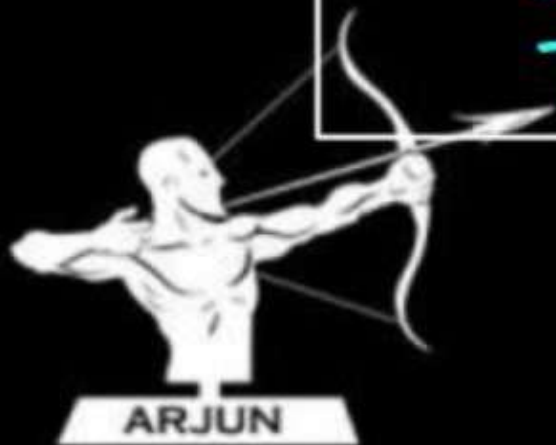
Block, Groups & Periods



PERIODS → (7)



Period No.	1 st element	Last Element	No. of elements	Name of period
1	H	He	2	Very short period
2	Li	Ne	8	Short period
3	Na	Ar	8	" period
4	K	Kr	18	Long period
5	Rb	Xe	18	"
6	Cs	Rn	32	Very Long Period
7	Fr	Og	32	V. Long Period or Complete Period





Representative elements		Representative elements										Noble gases	
GROUP NUMBER		GROUP NUMBER										18	
1 2												0	
I A II A												2	
3	4											10	He
Li	Be											Ne	$1s^2$
2s ¹	2s ²											2s ² 2p ⁶	
11	12	3	4	5	6	7	8	9	10	11	12	18	Ar
Na	Mg	III A	IV A	V A	VIA	VII A	VIII			I B	II B	3s ² 3p ⁶	
3s ¹	3s ²												
19	20	21	22	23	24	25	26	27	28	29	30	36	Kr
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	4s ² 4p ⁶	
4s ¹	4s ²	3d ¹ 4s ²	3d ² 4s ²	3d ³ 4s ²	3d ⁴ 4s ¹	3d ⁵ 4s ²	3d ⁶ 4s ²	3d ⁷ 4s ²	3d ⁸ 4s ²	3d ⁹ 4s ¹	3d ¹⁰ 4s ²	4s ² 4p ⁶	
37	38	39	40	41	42	43	44	45	46	47	48	54	Xe
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	5s ² 5p ⁶	
5s ¹	5s ²	4d ¹ 5s ²	4d ² 5s ²	4d ³ 5s ¹	4d ⁴ 5s ¹	4d ⁵ 5s ²	4d ⁶ 5s ¹	4d ⁷ 5s ¹	4d ⁸	4d ⁹ 5s ¹	4d ¹⁰ 5s ²	5s ² 5p ⁶	
55	56	57	72	73	74	75	76	77	78	79	80	86	Rn
Cs	Ba	La*	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	6s ² 6p ⁶	
6s ¹	6s ²	5d ¹ 6s ²	4f ¹⁴ 5d ² 6s ²	5d ³ 6s ²	5d ⁴ 6s ²	5d ⁵ 6s ²	5d ⁶ 6s ²	5d ⁷ 6s ²	5d ⁸ 6s ¹	5d ⁹ 6s ¹	5d ¹⁰ 6s ²	6s ² 6p ⁶	
87	88	89	104	105	106	107	108	109	110	111	112	118	Og
Fr	Ra	Ac**	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn		
7s ¹	7s ²	6d ¹ 7s ²											

S-block ← d-block → p-block

f- Inner transition elements

f-block

Lanthanoids
 $4f^1 5d^0 6s^2$

** Actinoids
 $5f^1 6d^0 7s^2$

58	59	60	61	62	63	64	65	66	67	68	69	70	71
Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
4f ¹ 5d ⁰ 6s ²	4f ² 5d ⁰ 6s ²	4f ³ 5d ⁰ 6s ²	4f ⁴ 5d ⁰ 6s ²	4f ⁵ 5d ⁰ 6s ²	4f ⁶ 5d ⁰ 6s ²	4f ⁷ 5d ⁰ 6s ²	4f ⁷ 5d ¹ 6s ²	4f ⁹ 5d ⁰ 6s ²	4f ¹⁰ 5d ⁰ 6s ²	4f ¹¹ 5d ⁰ 6s ²	4f ¹² 5d ⁰ 6s ²	4f ¹⁴ 5d ⁰ 6s ²	4f ¹⁴ 5d ⁰ 6s ²
90	91	92	93	94	95	96	97	98	99	100	101	102	103
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr
5f ¹ 6d ⁰ 7s ²	5f ² 6d ⁰ 7s ²	5f ³ 6d ⁰ 7s ²	5f ⁴ 6d ⁰ 7s ²	5f ⁵ 6d ⁰ 7s ²	5f ⁶ 6d ⁰ 7s ²	5f ⁷ 6d ⁰ 7s ²	5f ⁷ 6d ¹ 7s ²	5f ⁹ 6d ⁰ 7s ²	5f ¹⁰ 6d ⁰ 7s ²	5f ¹¹ 6d ⁰ 7s ²	5f ¹² 6d ⁰ 7s ²	5f ¹⁴ 6d ⁰ 7s ²	5f ¹⁴ 6d ⁰ 7s ²



Division of Elements into Various Blocks

① s-block : Elements in which last e⁻ enters into s-subshell

General outer : ns^{1-2}
E.C.

Group : 1 & 2

Gp 1 (ns^1)

Li : $1s^2 \underline{2s^1}$

Na : $1s^2 2s^2 2p^6 \underline{3s^1}$

K : $1s^2 2s^2 2p^6 3s^2 3p^6 \underline{4s^1}$

Rb :
Cs
Fr

$\underline{5s^1}$
 $\underline{6s^1}$

Exception $^2\text{He} : 1s^2$

Gp 2 (ns^2)

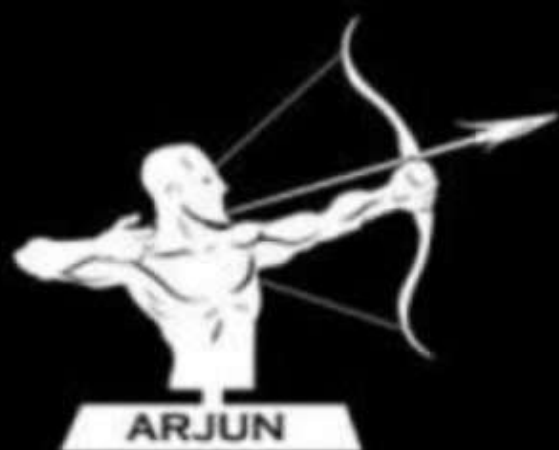
Be : $1s^2 \underline{2s^2}$

Mg : $1s^2 \underline{2s^2 2p^6} \underline{3s^2}$

Ca
Sr
Ba
Ra

$\underline{4s^2}$
 $\underline{5s^2}$

↳ p-block
↳ Group 18
↳ Noble gas



② p-block: elements in which last e^- enters into p-subshell

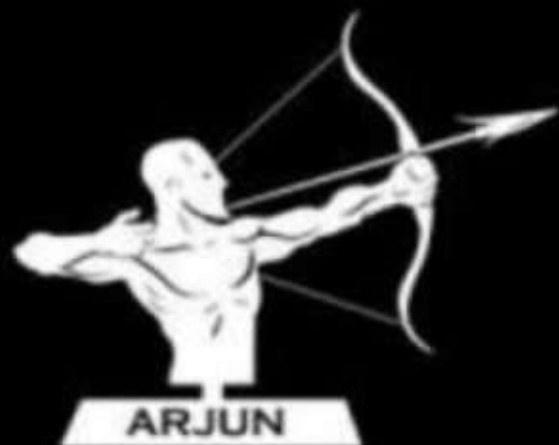


→ 6 Groups are present.

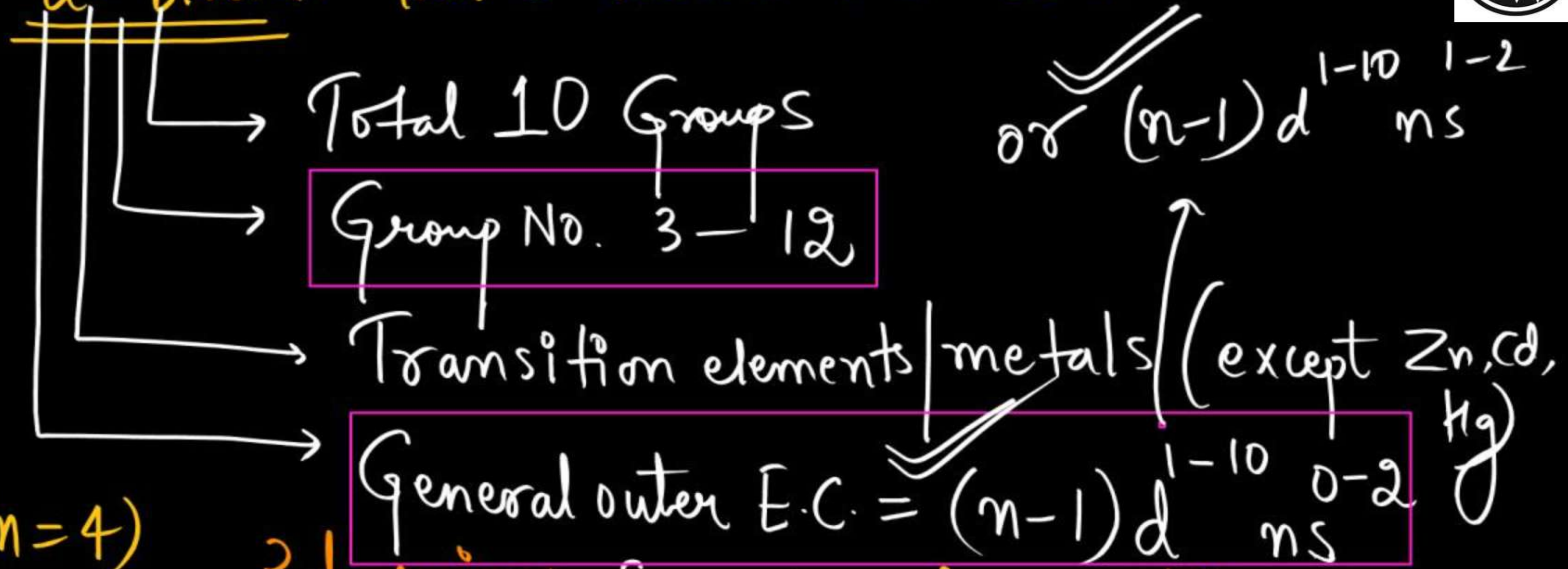
Gp 13, 14, 15, 16, 17, 18



→ General outer E.C. = $ns^2 np^{1-6}$
{ $n \rightarrow$ Principal Q. No. }



③ d-block: last e^- enters into d-subshell



($n=4$)

3d series

4d series

5d series

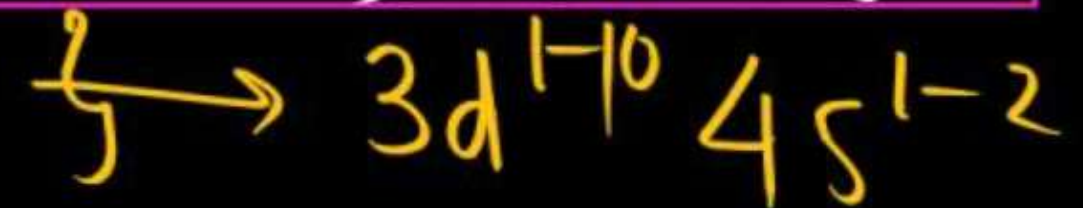
6d series

Sc — Zn

Y — Cd

La — Hg

Ac — Cn




④ f-block: elements in which last e enters into f-subshell

+ 14 elements \leftarrow Lanthanoids : $(n-2)f^{1-14}(n-1)d^{0-1}ns^2$
 $(_{58}\text{Ce} - _{71}\text{Lu})$ or 4f $5d^{0-1}6s^2 (n=6)$

+ 14 elements \leftarrow Actinoids : $(n-2)f^{0-14}(n-1)d^{0-2}ns^2$
 $(_{90}\text{Th} - _{103}\text{Lr})$ 5f $6d^{0-2}7s^2 (n=7)$

Total = 28 elements



p -BLOCK

	13	14	15	16	17	18
						He
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	Nh	Fl	Mc	Lv	Ts	Og

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



How to identify Block, Group & Period No.?

① Write the E.C. of the given element.

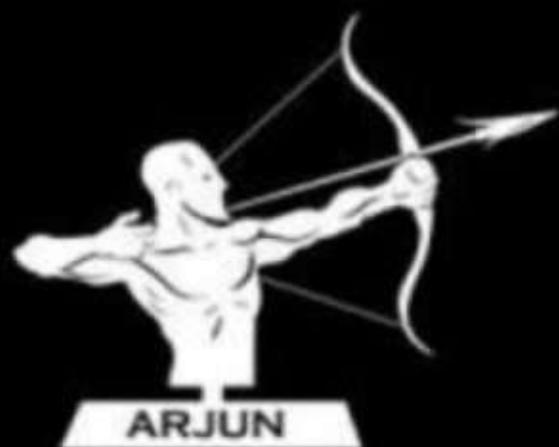
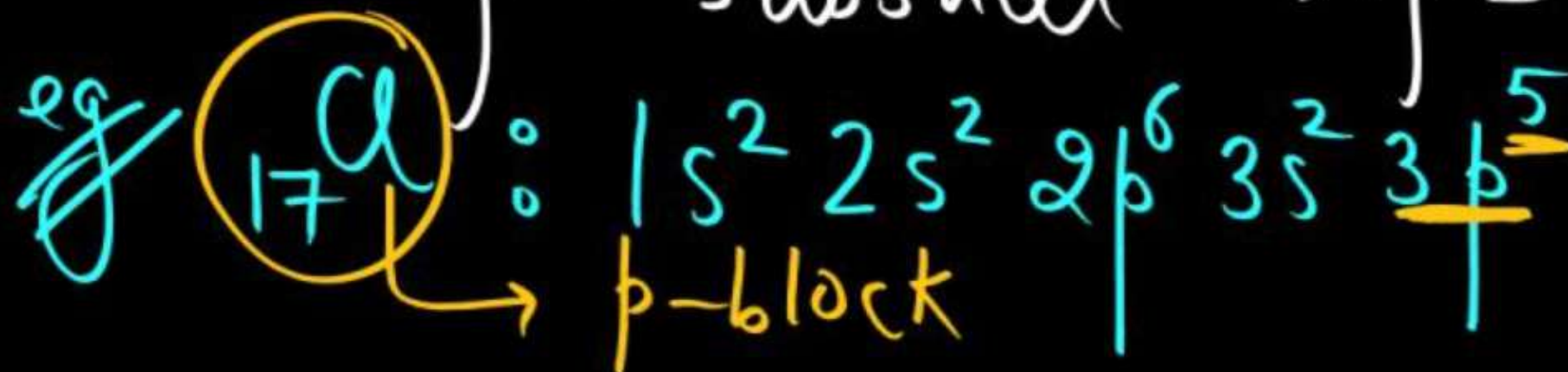
• BLOCK

Last $e^- \longrightarrow s$ -subshell $\longrightarrow s$ -block

Last $e^- \longrightarrow p$ -subshell $\longrightarrow p$ -block

Last $e^- \longrightarrow d$ -subshell $\longrightarrow d$ -block

Last $e^- \longrightarrow f$ -subshell $\longrightarrow f$ -block



• GROUP:

(i)

If the element has at. no. (Z) = 104-118

Gp. No. = Last two digits

eg $\underline{113}^{\text{Nh}}$

(ii)

If the element belongs to s-block:

Group $\rightarrow 13$

Gp. No. = No. of valence electrons

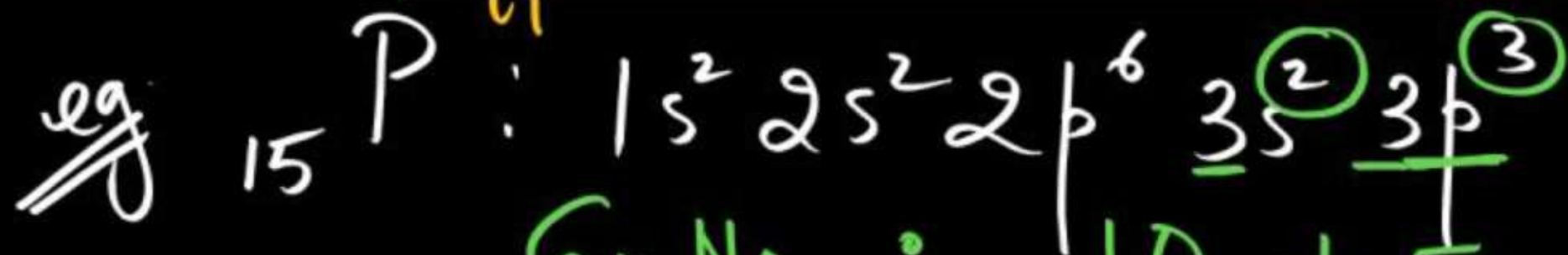
eg (1) $_{20}\text{Ca}: 1s^2 2s^2 2p^6 3s^2 3p^6 \underline{4s^2}$: Group 2

(2) $_3\text{Li}: 1s^2 \underline{2s^1}$: Group 1

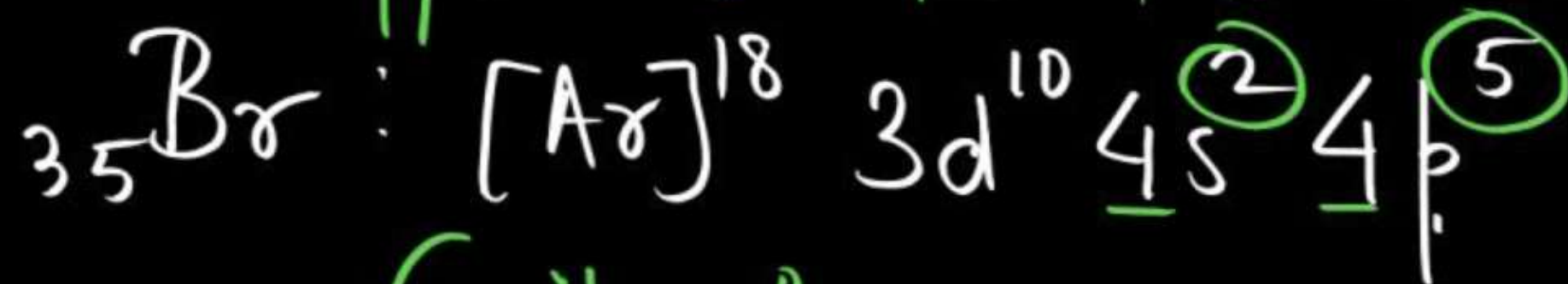


(iii) If the element belongs to p-block:

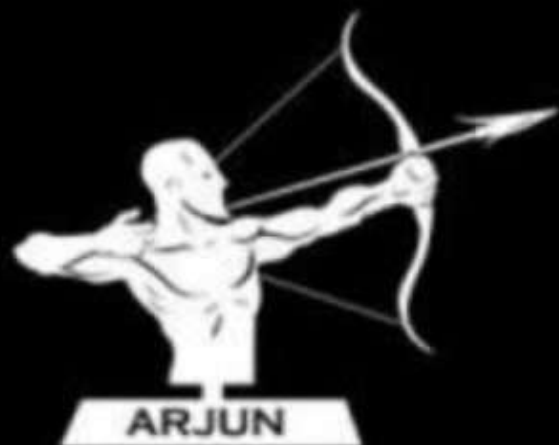
$$\text{Gp. No.} = 10 + \text{Valence } e^-s$$



$$\text{Gp No.} : 10 + 5 = 15$$

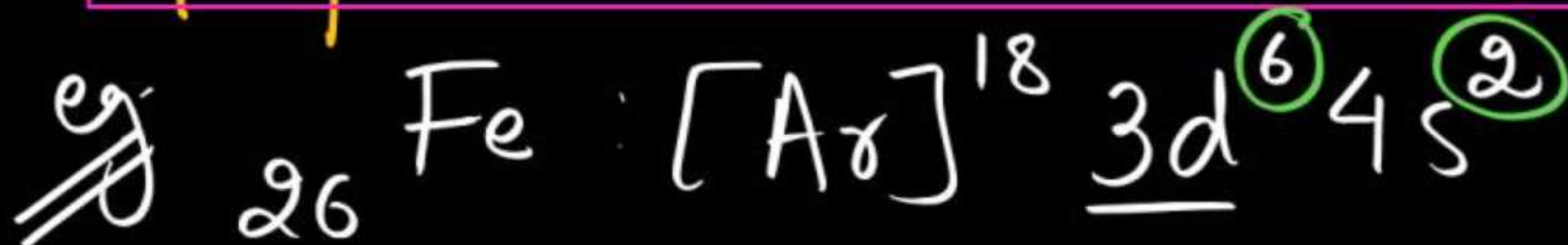


$$\text{Gp No.} : 10 + 7 = 17$$

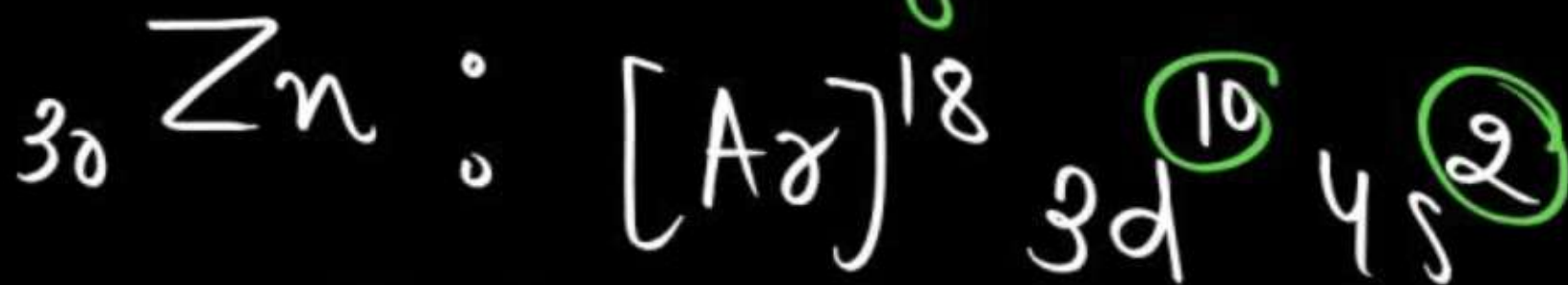


(iv.) If the element belongs to d-block:

$$\text{Group No.} = (n-1)d \text{ electrons} + ns \text{ Electrons}$$



$$\begin{aligned} \text{Grp No.} &= 6 + 2 \\ &= 8 \end{aligned}$$



$$\begin{aligned} \text{Grp No.} &= 10 + 2 \\ &= 12 \end{aligned}$$



(v) If the element belongs to f-block:
Lanthanoids: $(_{58}^{Ce} - _{71}^{Lu})$
Actinoids: $(_{90}^{Th} - _{103}^{Lr})$

Group 3 / III A



• PERIOD:

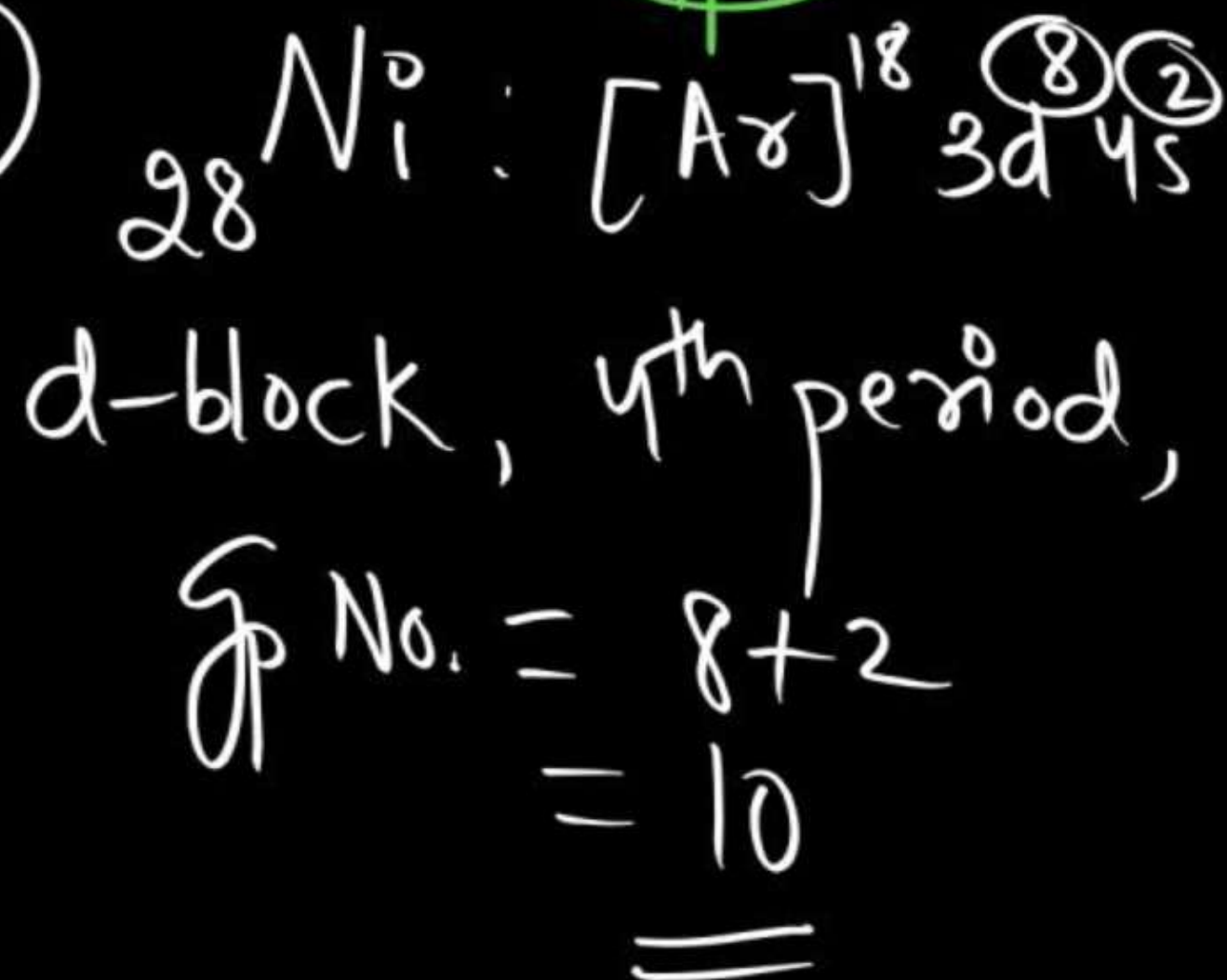
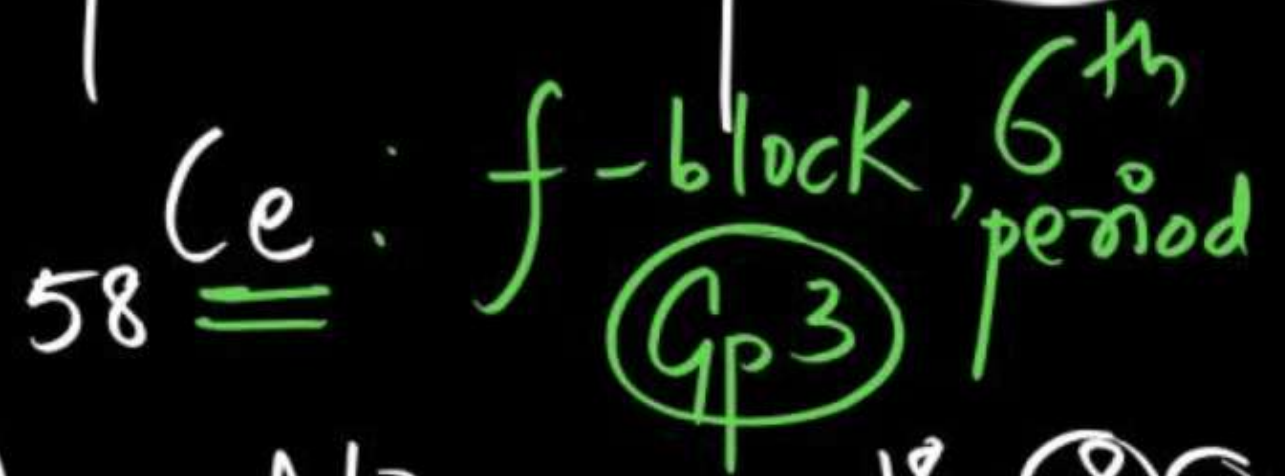
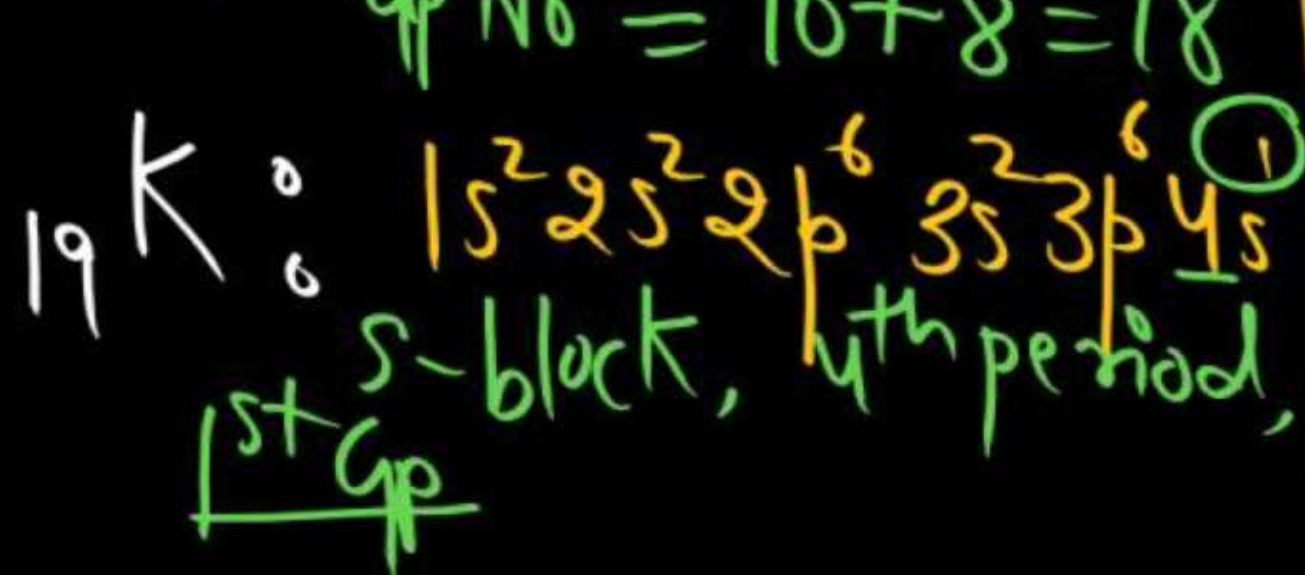
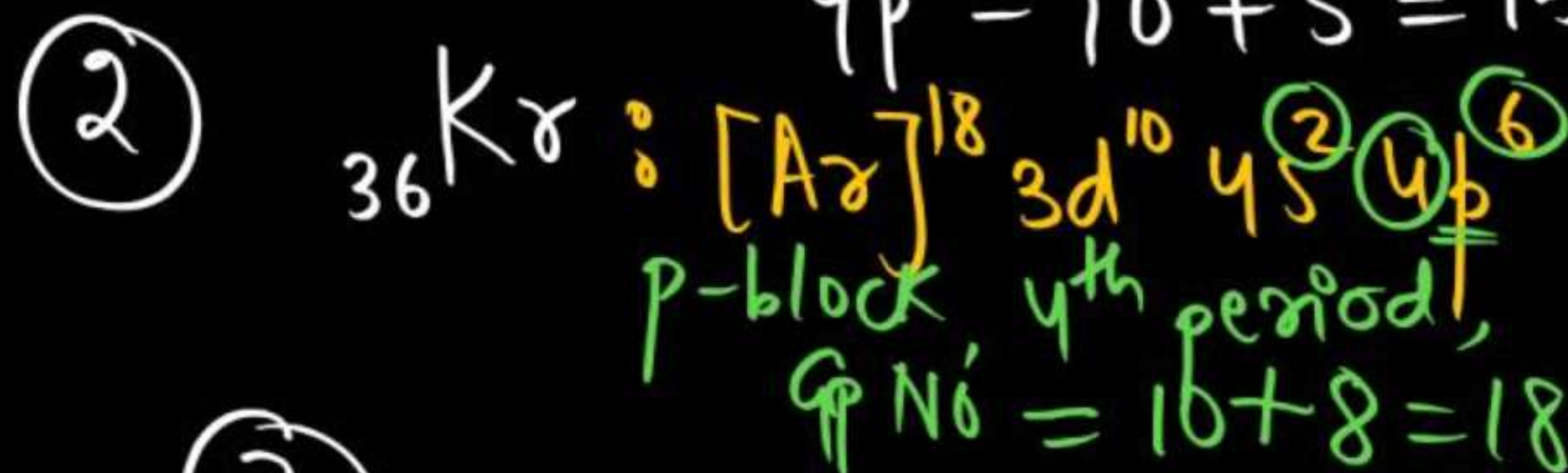
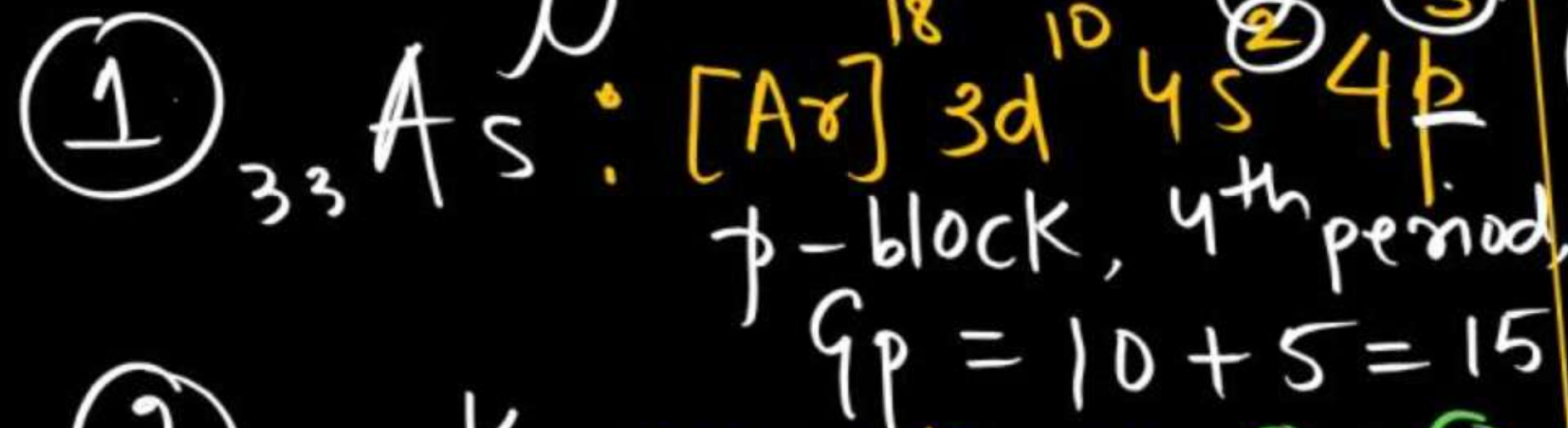
Period No. = Highest Principal Q. No.⁽ⁿ⁾

eg || Na : $1s^2 2s^2 2p^6 \underline{3s^1}$ (3^{rd} period)

Questions



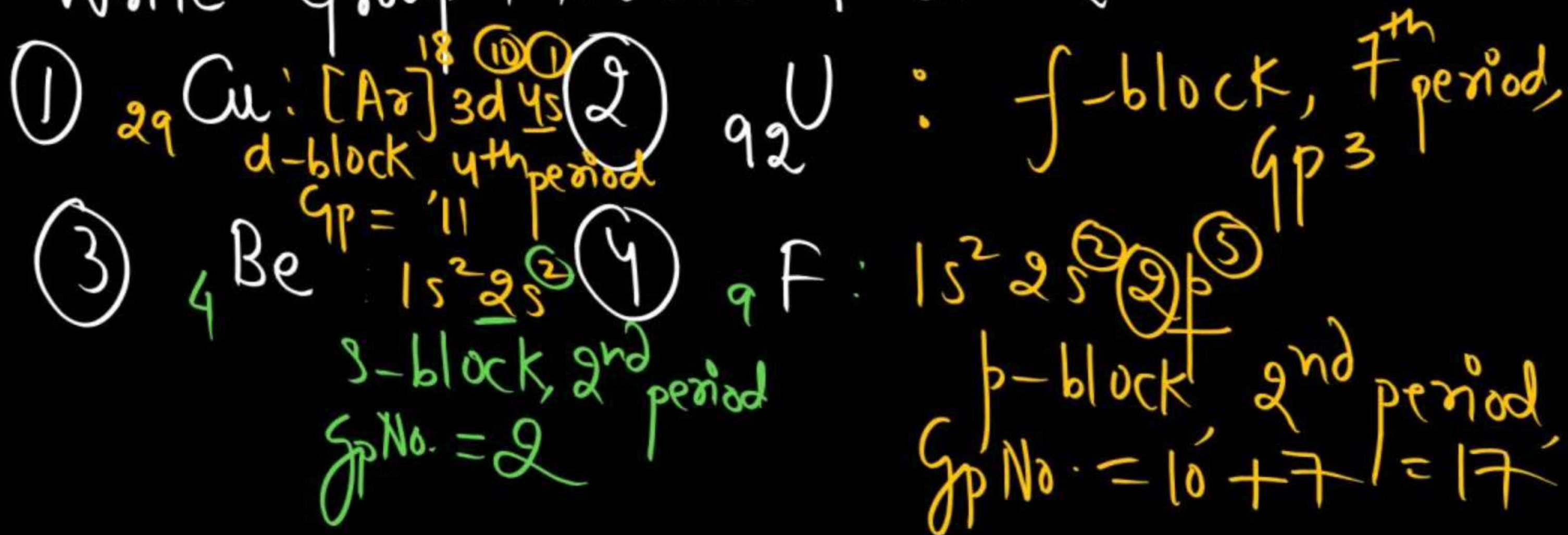
Q1 Identify block, group & period no. of:



Q2. An element has $Z = 107$. Write its group no., period no. & IUPAC name.

Gp No. = 7, 7th Period, Unnilseptium (Uns)

Q3. Write Group, Period & Block:



Some Important Points

$$\text{Ionic potential} = \frac{\text{Charge}}{\text{Size}} \quad \text{PW}$$

(ϕ)

1. Diagonal Relationship :

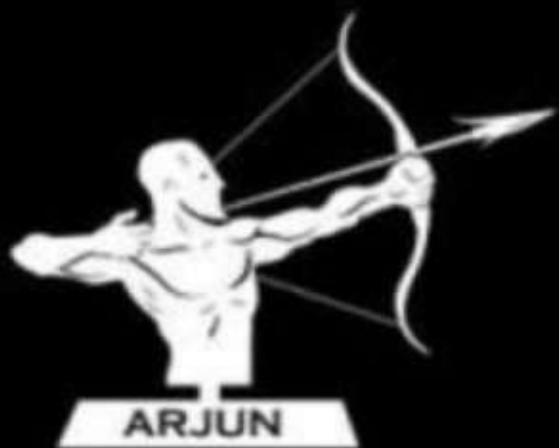


} due to similar charge/size ratio

2 Liquid metal (at Room temp) : Mercury (Hg)

Liquid non-metal (at Room temp) : Bromine
↳ 25°C / 298K

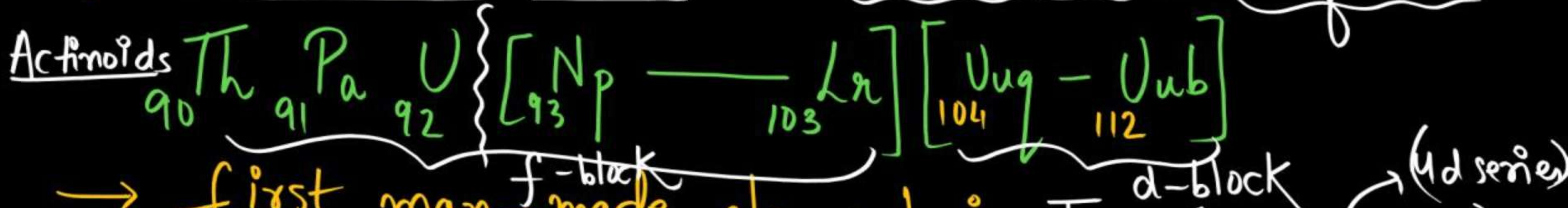
3. Two metals that melt on Palm
Gallium (Ga) & Caesium (Cs)
M.P. ~ 30°C





4. Elements having at. no. (Z) > 92 are known as Transuranic elements.

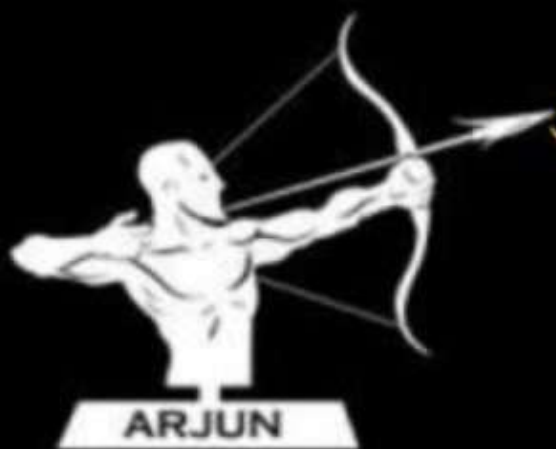
→ All transuranic elements are radioactive & artificial



→ first man-made element is Tc (Technetium)

→ first man-made Lanthanoid is Pm (Promethium)

→ All actinoids are radioactive but all Lanthanoids



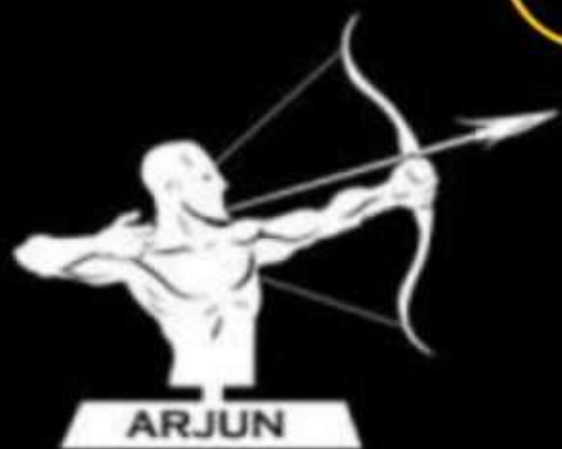
are not artificial/man-made.
(except Pm)



⑤ Elements of 3rd Period (except Noble gases): Typical elements

⑥ No. of gaseous elements: 11 (H, O, N, F, Cl + Noble gases (He, Ne, Ar, Kr, Xe, Rn))
No. of liquid elements: 6 (Hg, Br, Ga, Cs, Rb, Fr)

⑦ 2nd period → max no. of gaseous elements
gp 18 → All gases (N, O, F, Ne) → ④





(8) Densest metals : Osmium (Os) & Iridium (Ir)

(9) Normal Elements E.C. $\rightarrow ns^2 np^{1-5}$
valence shell \rightarrow incompletely filled

(10) 3rd Group (Largest Group)
 \downarrow
32 elements

$4 + 14 + 14$
 $= 32 \text{ elements}$

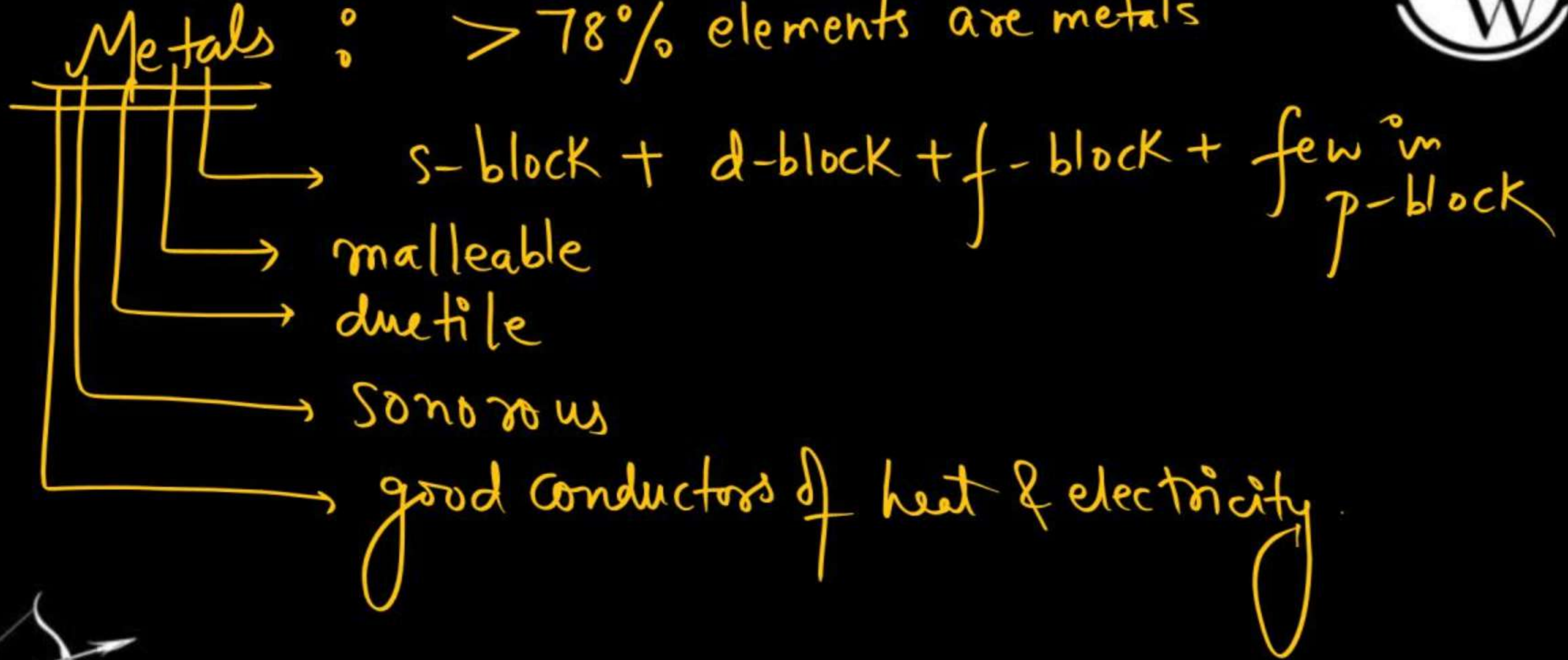
Sc
Y
La
Ac

(Ce-Lu) $\rightarrow 14$

(Th-Lr) $\rightarrow 14$

Metals, Non-metals & Metalloids

Metals : $> 78\%$ elements are metals

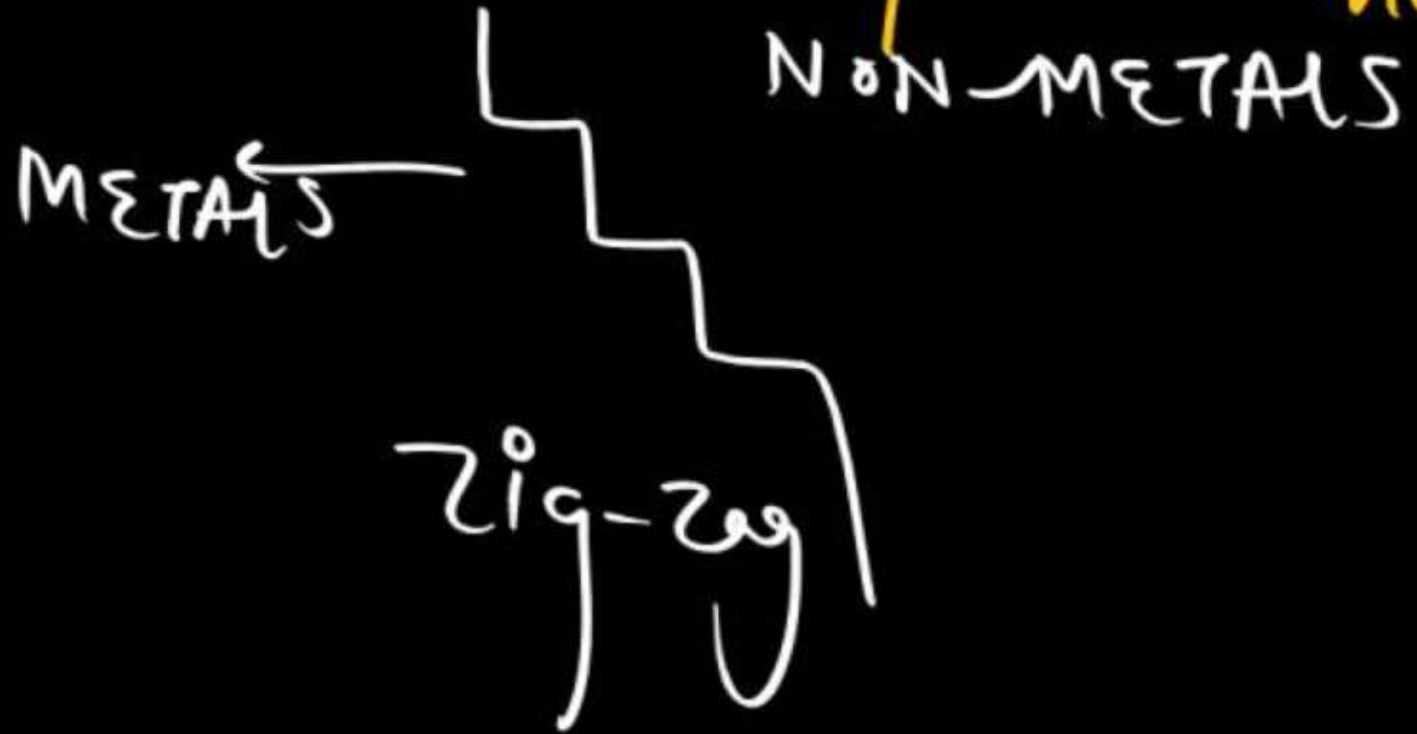




Non-metals : very less

→ top right corner of table
(p-block)

Metalloids : properties in b/w of metals & non-metals
or Semi-metals





Thank You