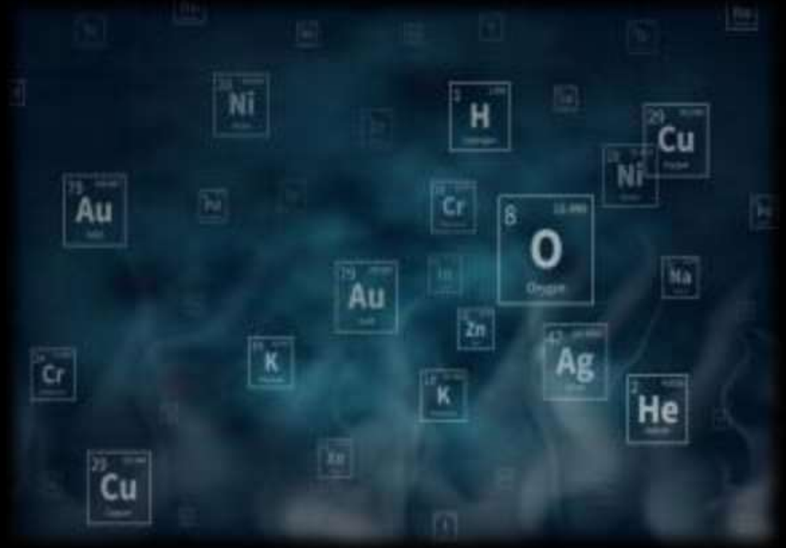
ARJUNA NEET BATCH

Classification of Elements & Periodicity in Properties



LECTURE-01

By:- Ashima Gupta

GOOD THINGS ABOUT IOC:

→ V. Easy
→ V. Scoring
→ Takes V. less time to solve question
→ v. less numericals
→ Conceptual questions are more.

BOOKS TO REFER IN IOC:

→ NCERT → Read line by line.

→ Ques^n Practice : ① NCERT Exercise (Intext + Examples + Back Q.)
② NCERT Exemplar ③ PYQ

POINTS TO REMEMBER WHILE MAKING NOTES OF IOC:

1. If possible, make separate notebook for IOC
2. Paste Modern Periodic Table on the 1st page of your notebook.
3. Write notes along with me.
4. Use coloured pens for notes & use highlighter.
5. Revise notes of previous Class before attending the next class.

(* Exception ; * V. Imp * FAQ)

Objective of today's class

Genesis of Periodic Classification

Introduction:

Q. WHY DO WE NEED TO CLASSIFY ELEMENTS ?

Presently, we have 118 known elements

→ to make the study of these elements easier.

→ those elements which have similar properties are grouped together in a tabular form.

↓

PERIODIC TABLE

- **Historical Development of Periodic Table**

1. Lavoisier Classification:

Elements

- Metals → tendency to lose e^-
  - eg: $Na \longrightarrow Na^+ + e^-$
- Non-metals → tendency to gain e^-
  - eg: $Cl + e^- \longrightarrow Cl^-$

Limitation: He couldn't explain the position of metalloids.

2. Dobereiner's Law of Triads:

→ group of 3 elements → 1. have similar Chemical properties.

2.

A
B
C

↓ inc. atomic mass

$$\text{at. mass of B} = \frac{\text{at. mass of A} + \text{at. mass of C}}{2}$$

① ^{7}Li — 23 — ^{39}K — $Na \longrightarrow x$

Acc. to Döbereiner's triad;

$$x = \frac{7 + 39}{2}$$

$$= 23$$

② ^{40}Ca — 88 — ^{137}Ba — $Sr \longrightarrow x$

$$x = \frac{40 + 137}{2}$$

$$= 88.5$$

③ $^{35.5}Cl$ — 80 — ^{127}I — $Br \longrightarrow x$

$$x = \frac{35.5 + 127}{2}$$

$$= 81.25$$

Other examples:

→ (K, Rb, Cs) ⟶ (S, Se, Te)

→ (P, As, Sb)

Limitation: ① This law was applicable only to certain elements of then known time.

was not a Doberiener's triad

eg ^{14}N, ^{31}P, ^{75}As → x

$$x = \frac{14+75}{2} = \frac{89}{2} = 44.5$$

② This law is not applicable to d- and f- block elements

☆ Ques.

NOTE:

A.E.B. de Chancourtois (in 1862) → arranged elements in ↑sing order of at. mass.

→ Cylindrical table

3. Newlands' Law of Octaves: → 56 known elements

"Acc. to this law, when elements are arranged in ↑sing order of at. mass, then the properties of every 8th element is similar to that of the 1st element".

→ He compared his table with musical notes.

Sa re ga ma pa dha ni

Sa

→ Noble gases were not discovered:

sa re ga ma pa dha ni

H He Li Be B C N O

F Ne Na Mg Al Si P S

Cl Ar K Ca Cr

1st 8th 1st 8th

metals → Co & Ni

Br

→ properties were not similar.

Limitation: (Imp.)

(1) This law was applicable only for lighter elements (i.e. upto Ca)

(2) He said that only 56 elements existed in nature & no new elements would be discovered further.

(3) He placed two elements in the same slot & that too with dissimilar properties.

(4) When noble gases were tried to place in his table, his periodic law changed

4. Lothar Meyer's Curve:

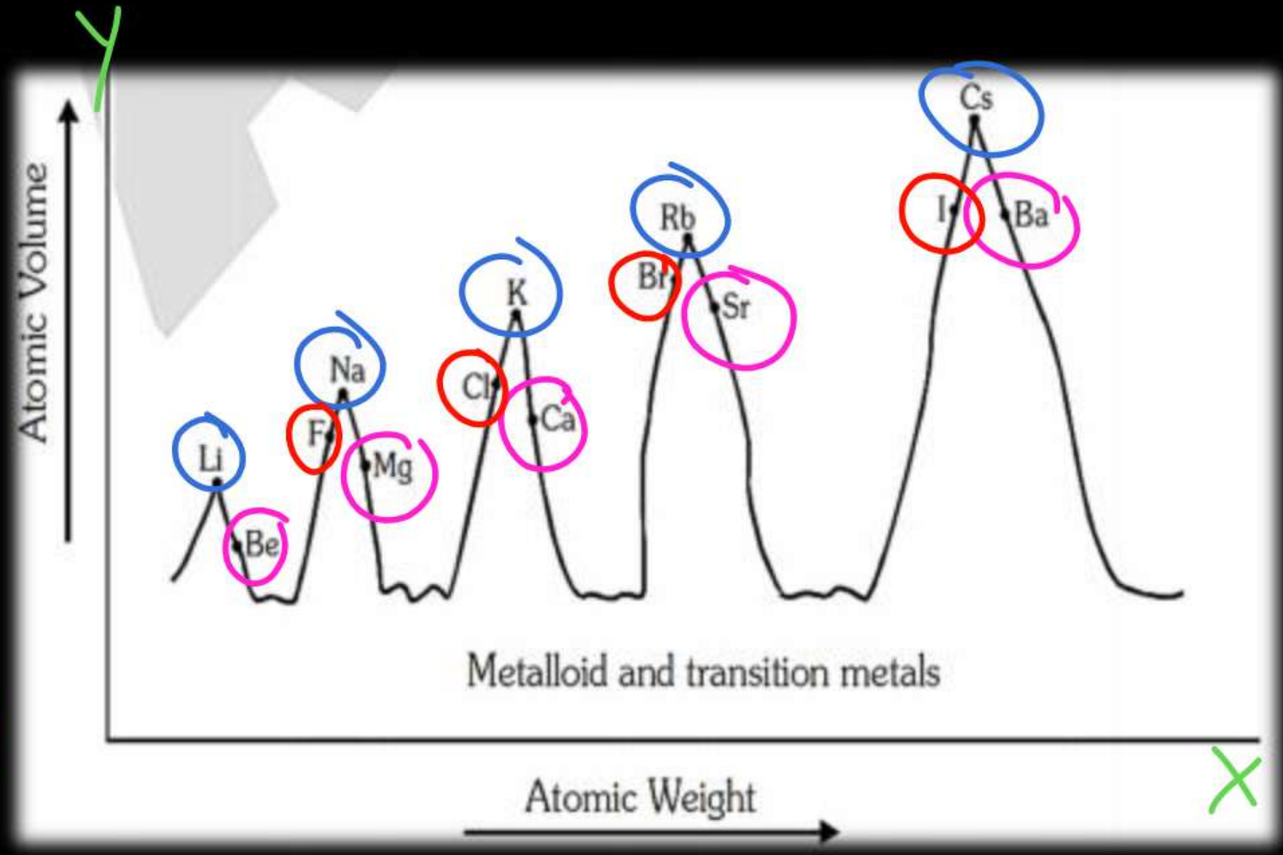
→ He plotted curves of atomic weight v/s atomic volume of different elements.

$$V = \frac{4}{3}\pi r^3$$

$r \uparrow, V \uparrow$

Observations:

Q. ① Peaks → Alkali metals (highly electropositive)

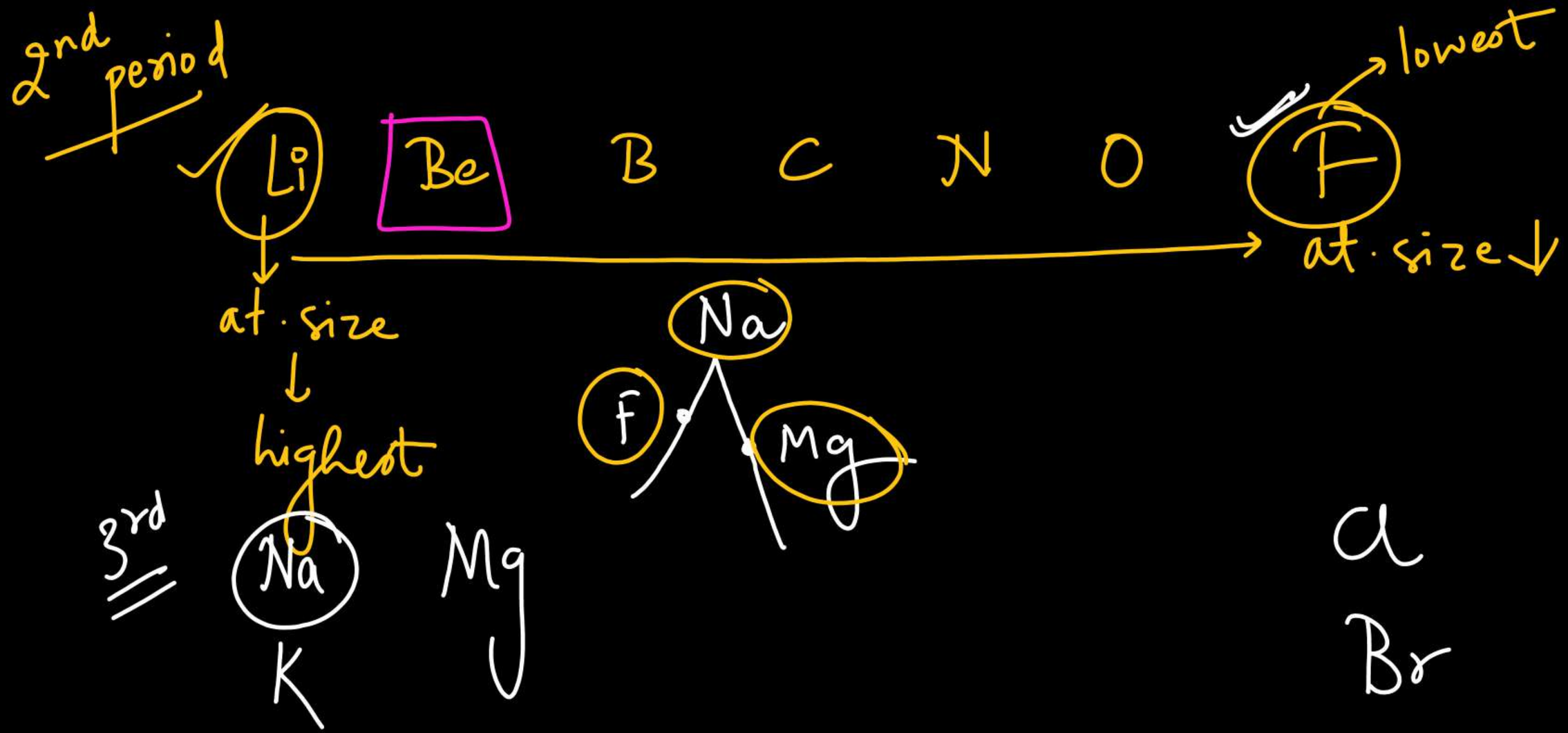


② Descending portion of graph → occupied by "Alkaline Earth Metals".

③ Ascending portion of graph → occupied by "Halogens".

Conclusion:

Elements with similar properties were occupying similar positions in graph.


2nd period
Li
Be
B
C
N
O
F
lowest
at. size ↓
at. size
↓
highest
3rd
Na
Mg
K
Na
F
Mg
Cl
Br

5. Mendeleev's Periodic Table:

→ 63 Known elements
→ He studied chemical properties (H & O)

Mendeleev's Periodic Law: "The properties of elements are the periodic function of their atomic masses."

Characteristics:

(1) There were 8 vertical columns i.e. 8 Groups

Except Group VIII; each group is subdivided into two subgroups.

Group

Subgroup A → Normal / Representative elements

Subgroup B → Transition elements

(2) There were seven horizontal rows i.e. 7 periods

(3) In Group VIII, he placed 3 elements in each 3 rows

9 elements total

Group VIII

A	B	C
D	E	F
G	H	I

Merits:

1. Systematic Study of Elements
2. He left spaces for undiscovered elements & predicted their properties.

Eka-Boron : Scandium (Sc)

Eka-Aluminium : Gallium (Ga)

Eka-Silicon : Germanium (Ge)

Eka-Manganese : Technetium (Tc)

Al

E_2O_3

E ← Eka-Aluminium | Gallium

At. mass	68	68.—
Oxide	E_2O_3	Ga_2O_3
Chloride	ECl_3	$GaCl_3$

formula of

Oxide

Chloride

hydride

Eka - Al (Ga)

Ga_2O_3

$GaCl_3$

GaH_3

Ga H

3 1

Eka - Si (Ge)

GeO_2

$GeCl_4$

GeH_4

Si ⟶ 4

Ge ⟶ 4

Ge O

4 2

2 1

GeO_2

③ He corrected doubtful at. masses.

Li Be B C N
7 9 11 12 14

eg Be → 13.5 u

At. mass = Eq. mass × Valency

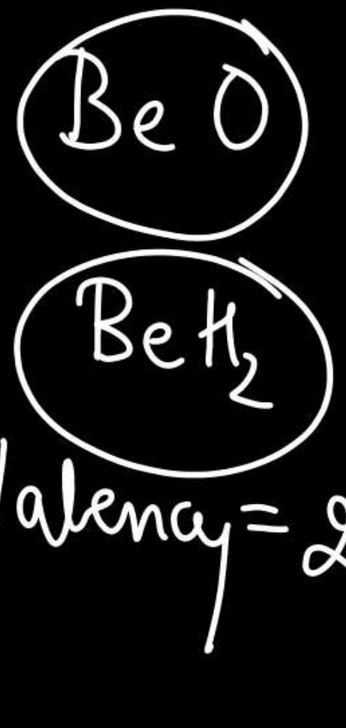
= 4.5 × 3

= 13.5 ✗

New calculⁿ

∴ At. mass = 4.5 × 2

= 9u (corrected)



④ Noble gases were easily placed in his table

→ Group Zero

Q Why noble gases were discovered so late?

Ans. ① less reactive

② present in v. low conc^{n} in atmosphere

Thank You