Slater's Rule :-

1. Z_{eff} for 2s electron in Be

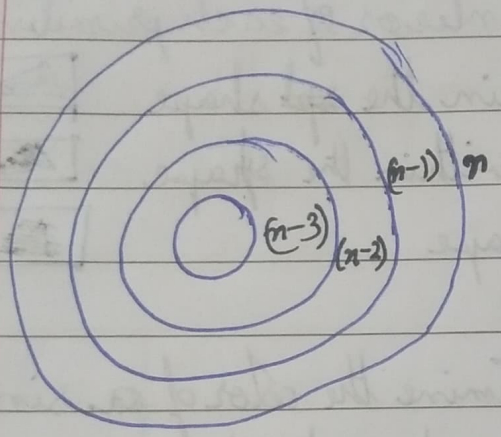
Sol :- Be :- $1s^2\ 2s^2$ $\quad \therefore S = 1 \times 0.35 + 2 \times 0.85 = 2.05$ $\quad \therefore Z_{eff} = 4 - 2.05 = 1.95$

(0.85) (n) (0.35)

For S value :- lower group $(n-1) \rightarrow 0.85$

$n \rightarrow 0.35$

$(n-2) \rightarrow 1.00$



e⁻ in orbital	per e⁻ in orbital		
	n	n-1	(n-2) (n-3) etc
s or p	0.35	0.85	1.00
d or f	0.35	1.00	1.00

↳ same value

∴ We do not consider $1s^2$ for Z_{eff} and include it in $(n-2)$ calculation

Slater's rule questions

1. Li :- $\underset{n-1}{\underline{1s^2}}\ \underset{n}{\underline{2s^1}}$ ∴ We want to find out $2s^{①}$ → e^-'s S value, it contributes nothing

$\therefore S = 2 \times 0.85 = 1.7$

$\therefore Z_{eff} = Z - S$

$= 3 - 1.7$

$\therefore Z_{eff} = 1.3$

2. B :- $1s^2\ 2s^2\ 2p^{①}$ → doesn't contribute to S's value
$\therefore S = 2\times0.35 + 2\times0.85 \Rightarrow S = 2.4$
$\therefore Z_{eff} = Z - S = 5 - 2.4$
$= 2.6$

3. Ti :- $(Z = 22) \rightarrow (1s^2)(2s^2\ 2p^6)(3s^2\ 3p^6)\ 3d^{②}\ 4s^2$ [Find Z_{eff} for 3d]
18 $(n=3)$ ② contributes nothing
$(n=2)/(n=1)$
contributes nothing
$\therefore S = 1\times0.35 + 18\times1$
$\Rightarrow S = 18.35$
$\therefore Z_{eff} = Z - S = 22 - 18.35$
$= 3.65$

4. F :- $1s^2\ 2s^2\ 2p^{⑤}$ [Find Z_{eff} for 2p]
$n-2\ (2)$ $n-1\ (2)$ $n\ (4)$
$\therefore S = 4\times0.35 + 2\times0.85 + 2\times$ } ×
$2s^2$ & $2p^{⑤}$ → $n = 2$ ∴ They are in same shell ∴ $(2+4)\ e^- \times 0.3$
$\therefore F = 1s^2\ 2s^2\ 2p^{⑤}$
$(2)^{n=1}$ $n\ (2+4=6)$
$\therefore S = 6\times0.35 + 2\times0.85 \Rightarrow S = 3.8$
$\therefore Z_{eff} = Z - S = 9 - 3.8$
$= 5.2$

5. K :- $1s^{②}\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^1$ [Find Z_{eff} for 1s]
① contribute nothing
2 (n)
$\therefore S = 1\times0.35$
$\therefore Z_{eff} = 19 - 0.35$
$= 18.65$