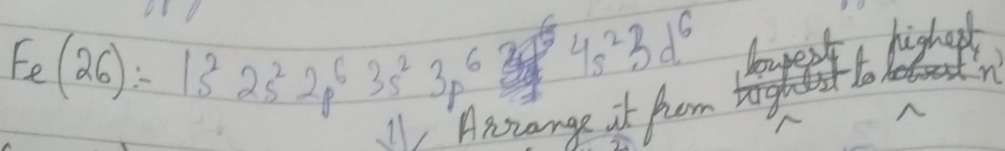


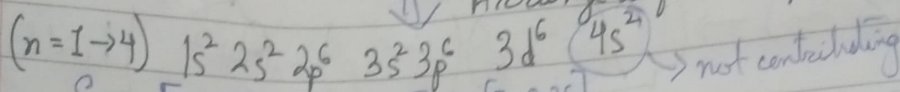
For transition metals:-

\swarrow 1s
 \swarrow 2s 2p
 \swarrow 3s 3p 3d
 \swarrow 4s 4p 4d 4f
 (Order of filling)

1. Find Z_{eff} for 3d e in Fe



lowest to highest n



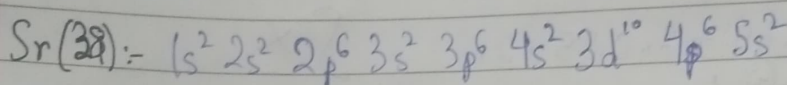
$$S = [2 \times 1 + 8 \times 1 + 8 \times 1] + [5 \times 0.35]$$

$$\Rightarrow S = 18 + 1.75 \Rightarrow S = 19.75$$

$$Z_{eff} = 26 - 19.75 = 6.25$$

\swarrow 1s
 \swarrow 2s 2p
 \swarrow 3s 3p 3d
 \swarrow 4s 4p 4d 4f
 \swarrow 5s

2. Find Z_{eff} for a 5s e in Sr



$$S = [2 + 8 + 8 + 10] + [8 \times 0.35] + [1 \times 0.35] = 35.15$$

$$\therefore Z_{eff} = 38 - 35.15 = 2.85$$

* When we are finding for s/p e-'s S value, then $n \rightarrow 0.35, n-1 = 0.85, n-2 = 1$
 d/f e-'s S value, then $n \rightarrow 0.35, n-1 = 1, n-2 = 1$
 \therefore We took 0.35 for n & 0.85 for (n-1) ... in Sn

Since, $Z_{eff} = 2.85$, That means 5s ~~will~~ cannot see anything from center (nucleus)

This is because we have so many orbitals blocking its view (5s is very far away from nucleus)

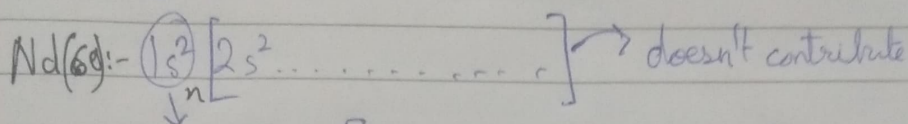
* S → Shielding constant

It represents the degree to which inner electrons reduce Z_{eff} felt by outer electrons

Exception:-

If you are asked for Z_{eff} of a $1s$ e^- , the total shielding is 0.3 (S)

3. Find Z_{eff} for $1s$ e^- in Nd



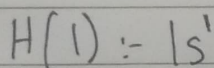
$$S = (1 \times 0.3) \quad [S = 0.3 \text{ (net 0.35)}]$$
$$= 0.3$$

$$\therefore Z_{\text{eff}} = Z - S$$
$$= 60 - 0.3$$

$$\Rightarrow Z_{\text{eff}} = 59.7$$

$Z_{\text{eff}} = 59.7, \therefore 1s$ e^- sees almost all of the protons (in front of nucleus)

4. Find Z_{eff} for $1s$ e^- in H



$$S = 0 \times 0.35 = 0$$

$$\therefore Z_{\text{eff}} = Z - S$$
$$= 1 - 0 = 1$$

Updated S-table :-

	<u>Same group</u>	<u>Same $n < l$</u>	<u>$n-1$</u>	<u>$\leq n-2$</u>
$[1s]$	0.3	—	—	—
$[ns, np]$	0.35	—	0.85	1
$[nd] \text{ \& } [nf]$	0.35	1	1	1

Note:- $n \rightarrow$ outermost shell (based on question)
 $n-1 \rightarrow$ shell just before n -shell
 $n-2 \rightarrow$ shells lower than $(n-1)$