

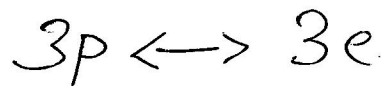
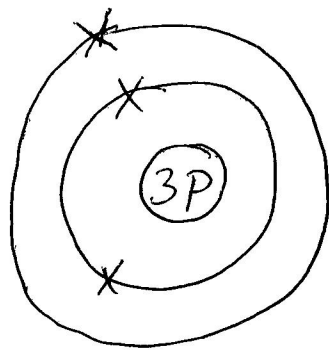
CHE 2015

Periodic Trends & Properties

IP, EA, Eff. Nu. charge
Electronegativity

Eff nu charge, Z_{eff}

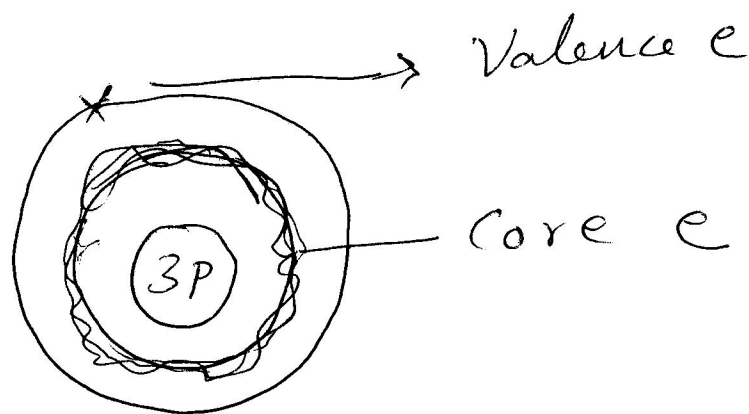
Net nuclear charge felt by
the valence electron



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But the attractive force of nucleus on the valence electron will be lessened by shielding effect.

The electrons in the inner shell act as a screen between nucleus and valence e.



Valence e experience only less attraction

s orbital (spherical) is
good at shielding

$$s > p > d > f$$

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

Z = total no. of nuclear charge

S = Shielding constant

(extent of shielding)

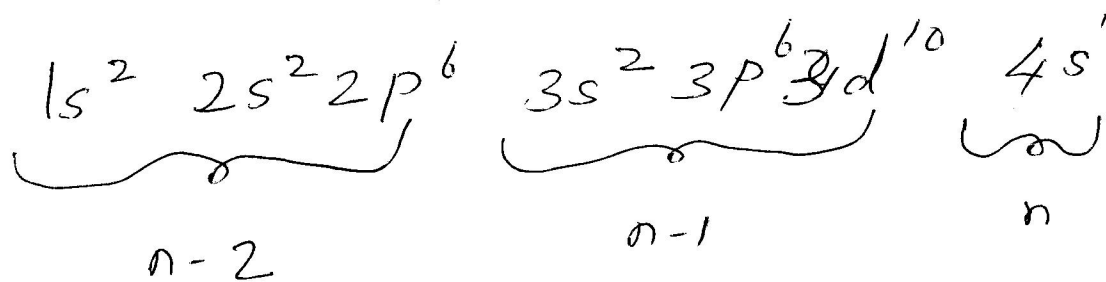
S can be computed using
Slater's rules.

2 sets of rules i) s or p electron
ii) d or f electron

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Calculate Z_{eff} for 4s electron
in Cu (29) atom.

- e conf
- group them
- name them $n, n-1, \dots$
- apply Slater's rules



no $n-3$ gp

Consider the extend
of shielding offered by inner e

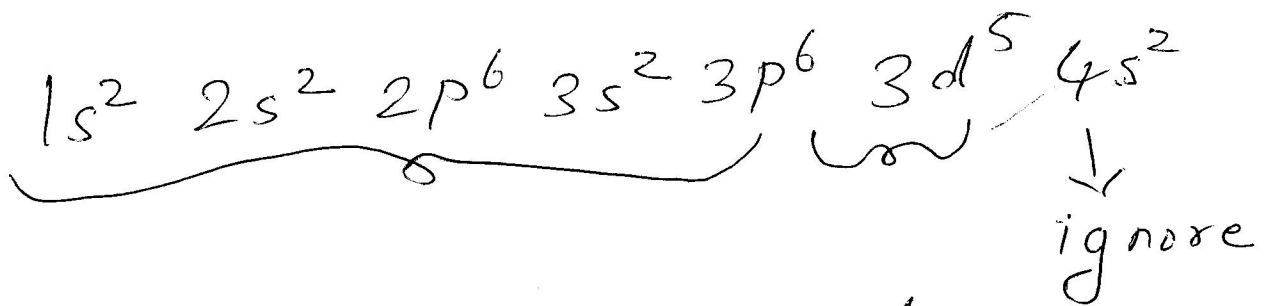
$$0 \times 0.35 + 18 \times 0.85 + 10 \times 1$$

$$= 25.3 \longrightarrow \text{shielding const, } S$$

$$Z_{\text{eff}} = 29 - 25.3 = 3.7$$

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Calculate the Z_{eff} for 3d e
in Mn ($Z = 25$)

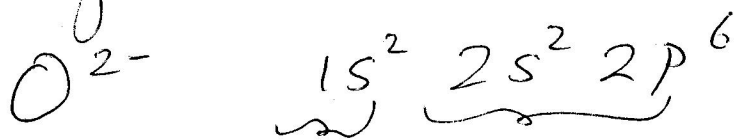


3d is given a separate gp
All other orbitals in one gp.

$$4 \times 0.35 + 1 \times 18 = 19.4 \rightarrow s$$

$$Z_{\text{eff}} = Z - s = 25 - 19.4 = \underline{\underline{5.6}}$$

Calculate Z_{eff} at the periphery
of O^{2-} ion



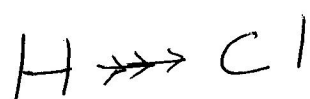
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Calculate 's' for all the e
in O^{2-} ion

$$0.35 \times 8 + 0.85 \times 2 = 4.5$$

$$8 - 4.5 = \underline{\underline{3.5}} \rightarrow Z_{\text{eff}}$$

Scales of electronegativity



1) Mulliken Scale

The electronegativity of an atom χ can be expressed as the half-sum of its I.E. & E.A.