

Monday Oct 8: finish ch 5, start ch 6 sections 6.1-6.4

Tuesday Oct 9: Expt 7, no problem club with Ali

Wednesday Oct. 10: Section 6.5-6.8

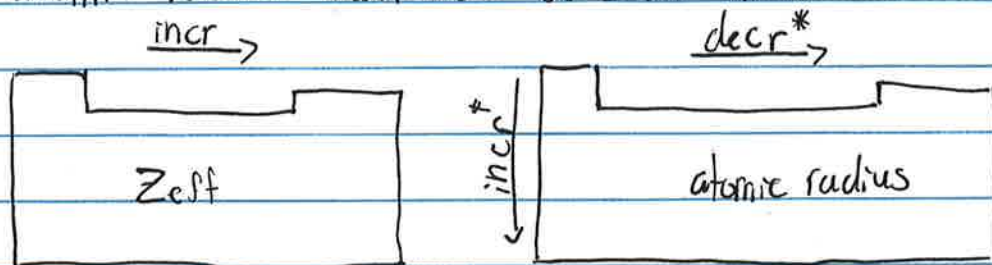
Friday Oct. 12: class does not meet

### Effective nuclear charge, $Z_{\text{eff}}$

nuclear charge = # of protons =  $Z$

H	1p + 1e	$Z = 1$	$Z_{\text{eff}} = 1$	
He	2p + 2e	$Z = 2$	$Z_{\text{eff}} = 1.7$	← has more shielding - the electrons block the others so they "feel"
Li		$Z = 3$	$Z_{\text{eff}} = 1.3$	$r = 152 \text{ pm}$ less of the protons than the actual number of protons
Be		$Z = 4$	$Z_{\text{eff}} = 1.95$	$r = 112 \text{ pm}$
B		$Z = 5$	$Z_{\text{eff}} = 2.60$	$r = 83 \text{ pm}$
C		$Z = 6$	$Z_{\text{eff}} = 3.25$	$r = 77 \text{ pm}$
N		$Z = 7$	$Z_{\text{eff}} = 3.90$	$r = 75 \text{ pm}$
O		$Z = 8$	$Z_{\text{eff}} = 4.55$	$r = 73 \text{ pm}$
F		$Z = 9$	$Z_{\text{eff}} = 5.20$	$r = 72 \text{ pm}$
Ne		$Z = 10$	$Z_{\text{eff}} = 5.85$	

• atomic radius decreases as  $Z_{\text{eff}}$  increases



\* because larger orbitals are being filled  
\* because of  $Z_{\text{eff}}$

predicted: Cr [Ar] 4s<sup>2</sup> 3d<sup>4</sup>

actual: Cr [Ar] 4s<sup>1</sup> 3d<sup>5</sup> ← each orbital has only 1 electron

predicted: Cu [Ar] 4s<sup>2</sup> 3d<sup>9</sup>

actual: Cu [Ar] 4s<sup>1</sup> 3d<sup>10</sup> ← d-shell wins over s-shell

## Ions

Na 1s<sup>2</sup> 2s<sup>2</sup> 2p<sup>6</sup> 3s<sup>1</sup> ) electron was removed

Na<sup>+</sup> 1s<sup>2</sup> 2s<sup>2</sup> 2p<sup>6</sup> 3s<sup>0</sup> (Cations are smaller)

isoelectronic  
(same # of electrons)

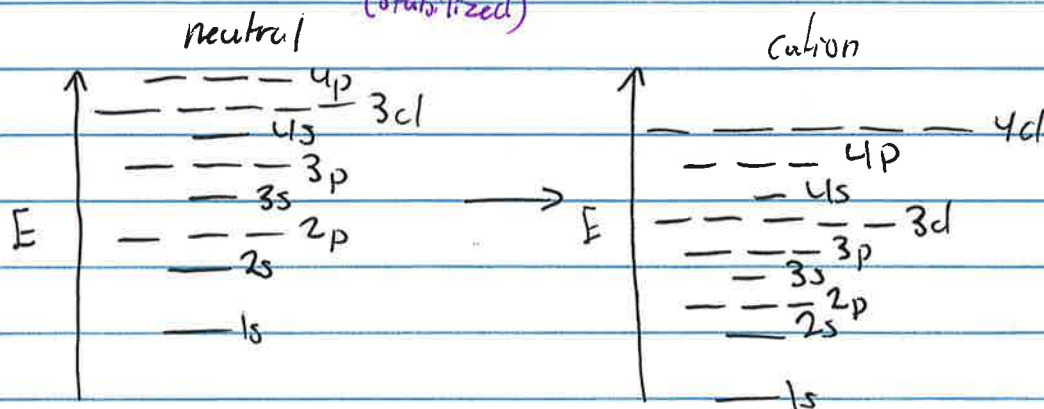
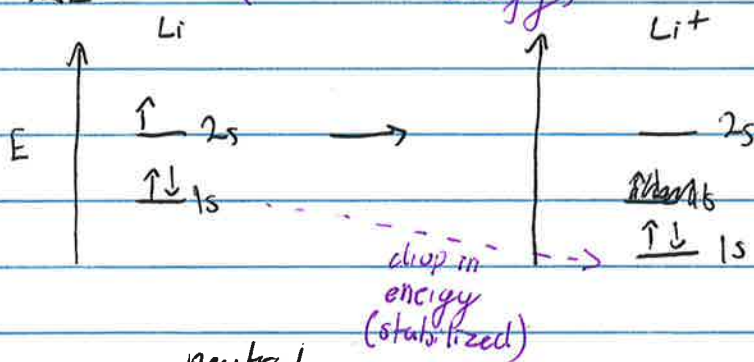
F 1s<sup>2</sup> 2s<sup>2</sup> 2p<sup>5</sup> ) electron was added

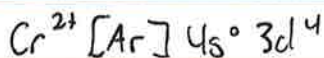
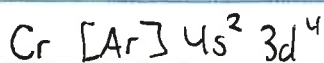
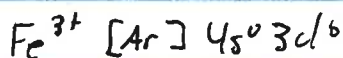
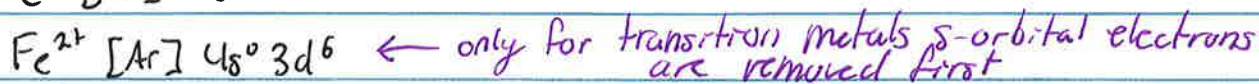
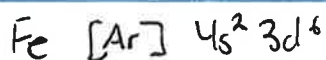
F<sup>-</sup> 1s<sup>2</sup> 2s<sup>2</sup> 2p<sup>6</sup> (anions are bigger)

## Ionization energy

energy it takes to remove an electron

ΔE > 0 (it takes energy)





incr due to Z<sub>eff</sub>

