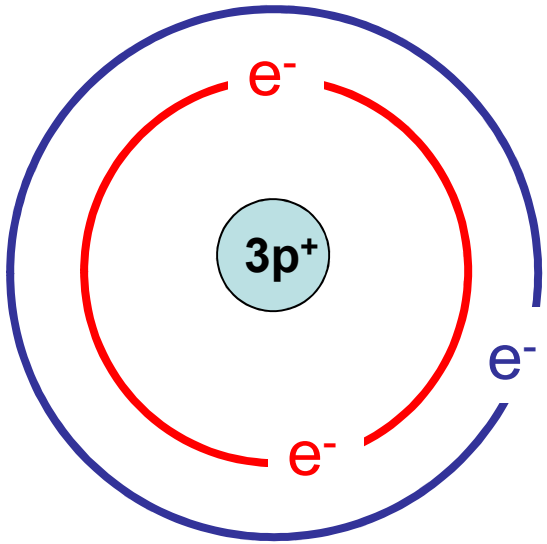
Factors that affect electron energies: Shielding provided by inner electrons

Neutral Lithium Atom

Full 1s orbital
& **½ full 2s orbital**

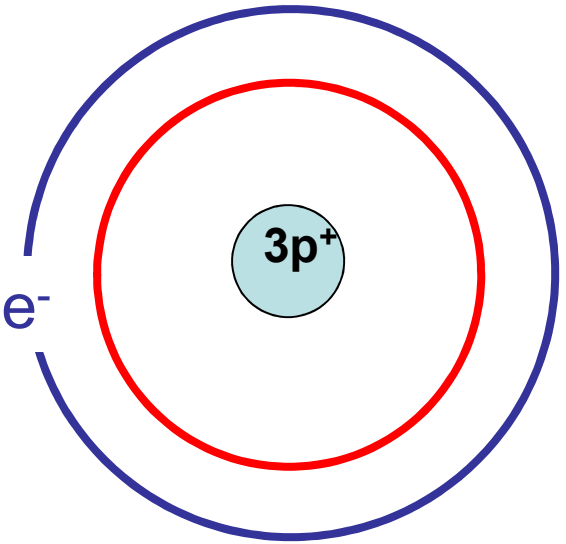


The presence of inner "core" electrons makes it easier to remove outer electrons from the atom.

Remove the electron and compare!

Li^{2+} Cation

Empty 1s



...all electrons attracted to nucleus

...1s electrons repel 2s electron

... 2s electron easier to remove

... 2s electron higher energy

... 2s electron experiences only the full attraction of the nucleus

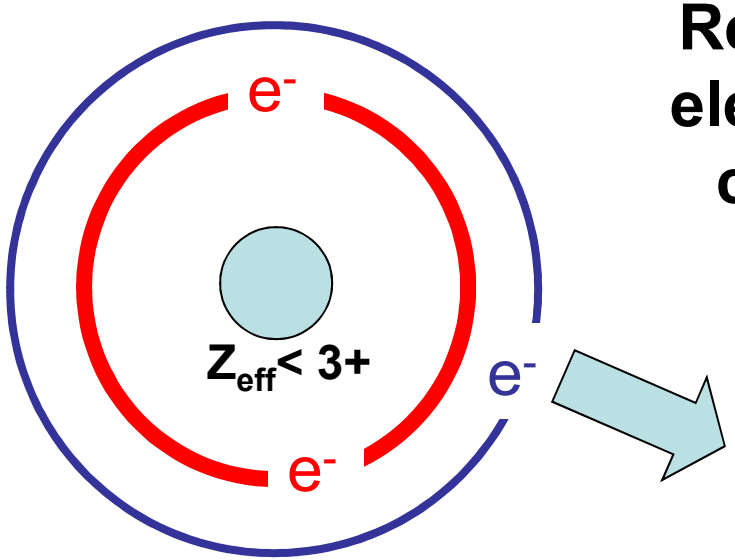
... 2s electron harder to remove

... 2s electron lower energy

Factors that affect electron energies: Shielding provided by inner electrons

Neutral Lithium Atom

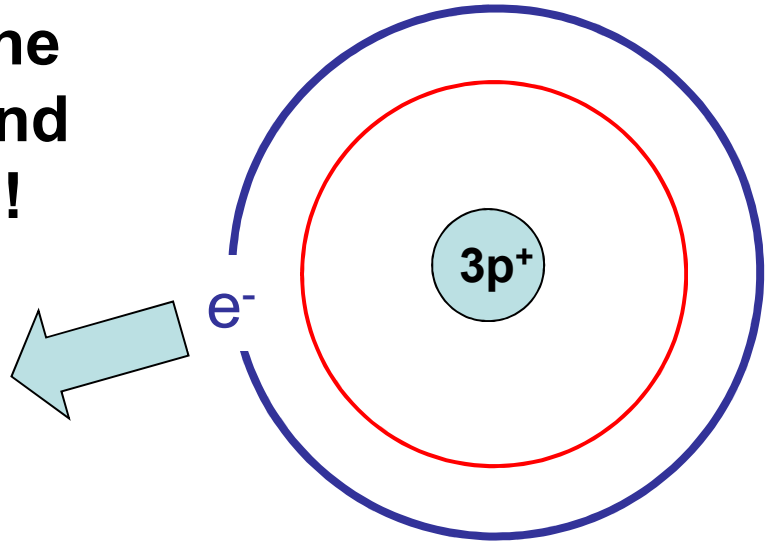
Full 1s orbital
& **½ full 2s orbital**



Remove the electron and compare!

Li^{2+} Cation

Empty 1s



... 1s e-'s shield the 2s e- from nucleus

... 2s electron "feels" less nuclear charge

... Less attractive force, easily removed

... 2s electron higher energy

... nothing shields 2s e- from nucleus

... 2s electron "feels" full 3+ nucleus

... Greater attractive force, difficult to remove

... 2s electron lower energy

Factors Affecting Electron Energies: 2s versus 2p

(High P.E.)

2p

2s

1s

(Low P.E.)

Why should 2p be higher in energy than 2s?

Question: Is it easier to remove a 2s electron or a 2p electron?
Answer: It is easier to remove the 2p electron.

Significant probability that electron is near the nucleus.

2 s electron gets closer to nucleus ⇒ stronger attraction!

$E_s < E_p < E_d < E_f$