Many-Electron Atoms, Electron Configurations, Aufbau Principle

Review – Quantum Numbers

Give two potential sets of quantum numbers (n, l, m_l, and m_s) for an electron in a 6d orbital. (There are more than two options – just pick two.)

If an electron has the set of quantum numbers (4, 2, 1, -½ ), what orbital must it be located in?

What Happens When 2+ Electrons Get Together?

One-electron atoms (H)

1. Electrostatic ________________ between ______________ and ______________.

2. Orbital energy is determined only by ________________.

Atoms with 2+ electrons (everything else!)

Look at the Li atom – how many electrons are there?

What quantum numbers will the electrons have?

The basic picture of potential energy (Coulomb’s Law)
1. Electrostatic __________________ between ______________ and ______________.
   Coulomb’s law term:

2. Electrostatic __________________ between ______________ and ______________.
   Coulomb’s law term:

Shielding – Z vs. \( Z_{\text{eff}} \)
   a. Shielding by e- in the same E-level

   b. Shielding by e- in lower (inner) E-levels

Penetration – how close can you get to the ________________________________?

Sublevel energy order due to penetration:

**Relationship Between QM Orbitals and the Periodic Table**

Basic idea – *aufbau* principle (German for “______________ ______”)

Each period/group corresponds to filling a new set of __________________________.
Electron configurations

List ______________ in order of ________________.  

What’s the electron configuration for He? Co?

Exceptions:

Orbital diagrams

Represent ______________ using ______________ and ______________ using ________________.

Draw an orbital diagram for He.

Hund’s rule:

Draw an orbital diagram for Cr.
Electron configuration and reactivity

Group IA: _________ electrons in outer sublevels.

What type of ions are formed by Group IA elements?

Where are the electrons lost from/added to?

Group VIIA: _________ electrons in outer sublevels.

What type of ions are formed by Group IA elements?

Where are the electrons lost from/added to?

Group VIIIA: ________ electrons in outer sublevels?

Why are these nonreactive?

Classifying Electrons in Atoms

1. Inner electrons:

2. Outer electrons:

3. Valence electrons:

What about transition metals?