Exam 3 Study Guide

The exam will cover the material found in Chapter 6 and Chapter 7. Remember, the best way to prepare is to complete the OWL assignments and do the optional Chapter Review questions. The following list is provided to help guide your preparation, but may not include everything.

You will be provided with a periodic table with the exam. You may bring a calculator and one page of notes.

An important point when doing the calculations for this exam: MAKE SURE YOUR NUMBERS ARE IN THE CORRECT UNITS! For example, the equation relating frequency, wavelength and the speed of light has the wavelength units in meters, but wavelengths are often given in nm, so you would convert your wavelength to meters before doing the calculation. (1×10^9 nm = 1 m)

Be able to:

1. Determine the relative energy, wavelength, or frequency for a transition between n-levels and make comparisons between transitions.
2. Recognize the shapes of *s*, *p*, and *d* orbitals.
3. Determine the number and type of nodes for a given orbital.
4. Determine the orbital type based on the quantum numbers.
5. Tell which orbital is the highest in energy.
6. Identify a set of quantum numbers that is allowed/not allowed.
7. Give the order of orbital filling.
8. Express the electron configuration of **an atom or an ion** in spectroscopic (spdf) notation, orbital notation, or Noble Gas notation.
9. Determine the orbital that loses or gains an electron(s) when an ion is formed.
10. Use Periodic trends to:
    - Determine relative atom or ion size
    - Place atoms or ions in order of ionization energy
    - State the trends for ionization energy, size, orbital energy going either down a group or across a period

Calculations you should be comfortable doing:

1. Calculate the wavelength, frequency, or energy of a photon given the necessary information.
2. Calculate the wavelength of an object given its mass and velocity (or any variation of this).
3. Determine the energy of a photon.
4. Calculate the energy of an *n*-level in a one electron system.
5. Determine the wavelength of light emitted or absorbed when an electron transitions between energy levels.

Concepts to understand:

1. The relationship between the wavelength, frequency, and energy of a photon. (Shorter wavelengths=higher frequencies=higher energies)
2. Understand the source of bright-line spectra and be able to discern whether energy was absorbed or emitted given the n-levels of a transition.
3. Stability- systems that are high in energy are less stable than those that are lower in energy.
4. Know what a standing wave is and how this relates to electron behavior.
5. Know what the following principles/theories/terms state:
    - Pauli Exclusion Principle
    - Heisenberg Uncertainty Principles
    - Bohr's Model of the Hydrogen atom
    - Light as a particle and a wave
    - The photoelectric effect

Quantum numbers- know the allowed values for each and what their physical meaning is:

- Principal quantum number (n)
- Angular momentum quantum number (l)
- Magnetic quantum number (m_l)
- Spin quantum number (m_s)