**Quiz 6**

# Directions: Answer each of the following questions. Be sure to use complete sentences where appropriate. For full credit be sure to show all of your work. Where appropriate answers should be boxed for clarity, written to the correct number of significant figures, and, include the proper units.

1. Where does the waste for this week’s experiment go (2 points)?

There is no waste generated for Atomic Spectra or Periodic Properties, which are both dry labs.

1. Explain each answer briefly (4 points).
   1. Place the following elements in order of increasing ionization energy: F, O, and S.

Increasing ionization energy: S < O < F. S is less than O because ionization energy increases down a group. F is greater than O because ionization energy generally increases across a period.

* 1. Which has the largest radius: O2-, F-, or F?

O2- has the largest radius. Negative ions are larger than their corresponding neutral atoms. F- is thus larger than F. O2- and F- are isoelectronic, but the O2- ion has only eight protons in its nucleus to attract the 10 electrons, whereas the F- ion has nine protons, making the O2- ion larger.

1. Which electrons experience a greater effective nuclear charge, the valence electrons in beryllium, or the valence electrons in nitrogen? Why (4 points)?

The valence electrons in nitrogen would experience a greater effective nuclear charge. Beryllium has 4 protons and nitrogen has 7 protons. Both atoms have 2 core electrons that predominately contribute to the shielding while the valence electrons will contribute a slight shielding effect. So, beryllium has an effective nuclear charge of slightly more than 2+ and nitrogen has an effective nuclear charge of slightly more than 5+.

1. Answer the following questions about iron (10 points).
   1. Write the complete electron configuration. 1s22s22p63s23p64s23d6
   2. Write the shortened electron configuration. [Ar]4s23d6
   3. Write the full orbital diagram.

3d ↑↓ ↑ ↑ ↑ ↑

4s ↑↓

3p ↑↓ ↑↓ ↑↓

3s ↑↓

2p ↑↓ ↑↓ ↑↓

2s ↑↓

1s ↑↓

* 1. Based on its electron configuration and orbital diagram, what is the most likely ion(s) for iron?

Fe2+ and Fe3+

Fe2+ occurs when the 4s electrons are lost.

Fe3+ occurs when the 4s and one 3d electron, making the d sublevel half filled, are lost.