**CHE1031 Module 6 Quiz: Electronic structure & periodic properties**

*This is a take-home quiz. You may use any and all resources to answer the questions. However, be aware that this will not be the case for exams and quizzes are a chance to prepare for exams.*

* *Please show all work for full & partial credit.*

**6.1: Electromagnetic energy**

**1.** FM-95, an FM radio station, broadcasts at a frequency of 9.51 E7 s−1 (95.1 MHz). What is the wavelength of these radio waves in meters?

**2.** Light with a wavelength of 614.5 nm looks orange.
(a) What is the energy, in joules, per photon of this orange light?

(b)What is the energy in eV (1 eV = 1.602 E−19 J)?

**3.** RGB color television and computer displays use cathode ray tubes that produce colors by mixing red, green, and blue light. If we look at the screen with a magnifying glass, we can see individual dots turn on and off as the colors change. Using a spectrum of visible light, determine the approximate wavelength of each of these colors. What is the frequency and energy of a photon of each of these colors?

**6.2: The Bohr model**

**4.** Using the Bohr model, determine the lowest possible energy, in joules, for the electron in the Li+2 ion.

**5.** How far from the nucleus in angstroms (1 angstrom = 1 E–10 m) is the electron in a hydrogen atom if it has an energy of –8.72 E–20 J?

**6.3: Development of quantum theory**

**6.** Without using quantum numbers, describe the differences between the shells, subshells, and orbitals of an atom.

**7.** Identify the subshell in which electrons with the following quantum numbers are found:

(a) n = 3, l = 2

(b) n = 1, l = 0

(c) n = 4, l = 3

**8.** Which of the subshells described in the previous question contain degenerate orbitals? How many degenerate orbitals are in each?

**6.4: Electronic structure of atoms (electron configuration)**

**9.** Use an box-arrow diagram to describe the electron configuration of the valence shell of each of the following atoms:

(a) N

(b) Si

(c) Fe

**10.** Which ion with a +1 charge has the electron configuration 1s22s22p63s23p63d104s24p6? Which ion with a –2 charge has this configuration?

**6.5: Periodic variations in element properties**

**11.** Based on their positions in the periodic table, predict which has the largest atomic radius: Li, Rb, N, F, I.

**12.** Based on their positions in the periodic table, predict which has the largest first ionization energy: Mg, Ba, B, O, Te.

**13.** Which of the following atoms and ions is (are) isoelectronic with S+2: Cl+3, Ar, As+3, Si, Al+3?

**14.** Which main group atom would be expected to have the lowest second ionization energy?