Name:

Date:

Chapter 7

Periodicity Worksheet

*Effective Nuclear Charge:*

1. What is effective nuclear charge? How do orbitals have an effect on Zeff?
2. Describe the trend for effective nuclear charge, both across a period and down a group.
3. Which electron would have a great attraction to the nucleus, a 3s or 2s electron? Why?
4. Calculate Zeff on Sodium and Oxygen, easy way.
5. Using Slaters rule calculate Zeff on a *valence electron* Sodium and Oxygen.
6. Rank the following lowest to greatest in terms of Zeff on a *valence electron*.

a. H, Ca, K, Na

b. O, F, Cl, Ne

c. Zn, Al, Ag, Cu

*Coulomb’s Law:*

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* **F** is the force of attraction/repulsion in newtons (N)
* **q1** and **q2** are a measure of the charge on each particle. For example, the charge on the electron is -1, so q = -1 for the electron.
* **d** is the distance between the two charges measured in meters.
* **k** is a proportionality constant.

1. According to Coulomb’s Law, what happens to the force as the charges get farther apart?
2. According to Coulomb’s Law, what happens to the force as the charges get larger?
3. If q = -1 for an electron, what is q for a proton?
4. What is q for a neutron?
5. What is q for the nucleus of a carbon atom, as felt by the 1s electrons?
6. What is q for the nucleus of a phosphorous atom, as felt by the 2p electrons?
7. If the attractive force between in an electron and its nucleus is 10 N and in another atom it is 5 N, which will have a higher ionization energy?
8. If a nucleus has more protons, will the electrons feel a greater or lesser attractive force? Use Coulomb’s law to defend your answer.
9. If the nucleus and electrons are closer in one atom than another, will the electrons feel a greater or lesser attractive force. Use Coulomb’s law to defend your answer.

*Atomic and Ionic Radii:*

1. Describe the difference between atomic radius, bonding radius, and Van der Waals radius.
2. Describe the trend for atomic radii, both across a period and down a group.
3. What unit of measurement is used to measure atomic radii? Using table on 7.6 convert the radius of a hydrogen atom to meters.
4. How is ionic size effected for anions and cations? What is the difference?
5. How do Na and Na+1 compare in relative size? Explain the difference.
6. How do Cl and Cl-1 compare in relative size? Explain the difference.
7. Rank the following in terms of atomic size, smallest to largest.

a. Li, C, F

b. Li, Na, K

c. Ge, P, O

d. C, N, Si

e. Al, Cl, Br

1. Rank the following in terms of ionic size, smallest to largest.
2. Ca, Ca 2+, Na +
3. N3-, O2-, F-
4. N3-, N2-, N-