Interpretation of Periodic Trends Worksheet

Atomic Radii

1. What is meant by nuclear shielding? What effect does it have on trends in atomic radii?

2. Why do atomic radii decrease from left to right within a period in the periodic table?

3. Arrange each of the following sets of atoms in order of increasing atomic radii, explain your reasoning for the order your arranged them in:
   (a) the alkaline earth elements;
   (b) the noble gases;
   (c) the representative elements in the third period;
   (d) N, Ba, B, Sr, and Sb?

4. Arrange each of the following sets of atoms in order of increasing atomic volume, explain your reasoning for the order your arranged them in:
   (a) O, Mg, Al, Si;
   (b) O, S, Se, Te;
   (c) Ca, Sr, Ga, As

Ionization Energy

5. Define (a) first ionization energy and (b) second ionization energy? Why is the second ionization energy for a given element always greater than the first ionization energy?

6. What is the usual relationship between atomic radius and first ionization energy, other factors being equal? What is the usual relationship between effective nuclear charge and first ionization energy, other factors being equal?

7. Going across a period on the periodic table, what is the relationship between shielding and first ionization energy? Within a group on the periodic table, what is the relationship between shielding and first ionization energy?

8. Arrange the members of each of the following sets of elements in order of increasing first ionization energies, explain your reasoning for the order your arranged them in:
   (a) the alkali metals;
   (b) the halogens;
   (c) the elements in the second period;
   (d) Br, F, B, Ga, Cs, and H?

Electron Affinity

9. Arrange the following elements in order of increasing negative values of electron affinity: P, S, Cl, and Br?

10. Arrange the members of each of the following sets of elements in order of increasingly negative electron affinities, explain your reasoning for the order your arranged them in: (a) the Group IA metals; (b) the Group VIIA elements; (c) the elements in the second period; (d) Li, K, C, F, and Cl?

11. The addition of a second electron to form an ion with a 2- charge is always endothermic? Why is this so?

12. Write the equation for the change described by each of the following, and write the electron configuration for each atom or ion shown: (a) the electron affinity of oxygen; (b) the electron affinity of chlorine; (c) the electron affinity of magnesium?

Ionic Radii

13. Compare the sizes of cations and the neutral atoms from which they are formed by citing three specific examples? Compare the sizes of anions and the neutral atoms from which they are formed by citing three specific examples?

14. Arrange the members of each of the following sets of cations in order of increasing ionic radii, explain your reasoning for the order your arranged them in:
    (a) K^+, Ca^{2+}, Ga^{3+};
    (b) Ca^{2+}, Be^{2+}, Ba^{2+}, Mg^{2+};
    (c) Al^{3+}, Sr^{2+}, Rb^+, K^+;
    (d) K^+, Ca^{2+}, Rb^+?

15. Arrange the following sets of anions in order of increasing ionic radii, explain your reasoning for the order your arranged them in:
    (a) Cl^-, S^{2-}, P^{3-};
    (b) O^{2-}, S^{2-}, Se^{2-};
    (c) N^{3-}, S^{2-}, Br^-, P^{3-};
    (d) Cl^-, Br^-, I^-?

16. Explain the trend in size of either the atom or ion as one moves down a group?

Electronegativity *43?

17. What is electronegativity?

18. Arrange the members of each of the following sets of elements in order of increasing electronegativities, explain your reasoning for the order your arranged them in:
    (a) Pb, C, Sn, Ge;
    (b) S, Na, Mg, Cl;
    (c) P, N, Sb, Bi;
    (d) Se, Ba, F, Si, Sc?

19. Which of the following statements is better? Why?
    (a) Magnesium has a weak attraction for electrons in a chemical bond because it has a low electronegativity?
    (b) The electronegativity of magnesium is low because magnesium has a weak attraction for electrons in a chemical bond?