Honors Chemistry Name

Periodic Trends Worksheet Date / /

Part I: Summary of Periodic Trends

Period

1. Define the phrase “periodic trend” in your own words.

|  |  |  |  |
| --- | --- | --- | --- |
| Property | Definition | Trend From Left to Right Across a Period | Trend Down a Group |
| Atomic radius |  |  |  |
| Ionic radius |  |  |  |
| First Ionization Energy |  |  |  |
| Electronegativity |  |  |  |
| Valence Electrons |  |  |  |
| Melting Point |  |  |  |
| Shielding |  |  |  |

Part II: Explaining Periodic Trends

1. How is ionization energy related to how easily an electron can be lost from an atom?
2. What happens to the amount of positive charge in the nucleus as you go **from left to right across a period?**
   1. How is the ionization energy trend related to an atom’s atomic radius?
   2. Why does the increasing atomic number within a period effect the first ionization energy?
3. What is different about the number of energy levels of electrons as you **go down a group**?
   1. How does the number of occupied energy levels effect the atomic radius?
   2. How does the number of occupied energy levels effect the first ionization energy?
4. What is the relationship between the group numbers for the s and p blocks and the number of valence electrons?
   1. How does this account for the ions that are formed for each group?
   2. In terms of protons, electrons, and occupied energy levels, how does the loss and/or gain of electrons effect the ionic radius? Provide examples of each, comparing the atom to its ion.
   3. What is the relationship between the number of valence electrons and an element’s electronegativity?
5. In general, what happens to the metallic character that elements have as you go from left to right across a period
6. In general, what happens to the metallic character that elements have as you go down a group?

Part III: Applying Periodic Trends

1. Which group on the periodic table has the largest atomic radii?
2. Which group on the periodic table has the largest first ionization energy?
3. Which elements on the periodic table has the largest and smallest atomic radius?
4. Which ions in period 2 have the largest and smallest ionic radius?
5. Which elements on the periodic table have the highest and lowest ionization energy?
6. Which element on the periodic table have the highest and lowest electronegativity?
7. Compare the element Fe and Cu by answering the next three questions.
   1. Which element has the smaller radius?
   2. Which element has the larger first ionization energy?
   3. Which element has the least metallic character?
8. What is the number of valence electrons for the next four elements.
   1. Ba c. Po
   2. Pb d. Rn
9. In each pair of elements, circle the one that has the larger atomic radius.
   1. Cs or Fr b. Sn or Pb c. Ag or Cd
10. In each pair of elements, circle the one that has the larger first ionization energy.
    1. Cs or Ba b. Sb or Bi c. Au or Hg d. O or N
11. In each pair of elements, circle the one that has the most metallic character.
    1. Ba or Ra b. Pb or Pt c. Po or Te
12. Place the following elements / ions in order of **increasing** radius.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| a. Na, K, Li |  |  | d. O, O-1, O-2 |  |
| b. Te, I, Xe |  |  | e. O+1, O, O-1 |  |
| c. Fe, P, O |  |  | f. Se-2, Ca+2, Br-1, K+1 |  |

1. In each pair of elements, circle the one that has the larger electronegativity.
   1. F or Cl b. Si or P c. Cu or Zn d. Mn or Fe
2. In each pair of elements, circle the one that has the larger second ionization energy.

b. Li or Be b. Be or B c. S or P

1. a) Explain how the atomic structure, including subatomic particles and occupied number of energy levels of relate to how easily valence electrons are removed from or added to an atom.

b) Since chemical reactivity of metals is based on losing electrons, explain how this accounts for the increased chemical reactivity of metals as you go down a group on the periodic table.

c) Since chemical reactivity of nonmetals is based on gaining electrons, explain how this accounts for the increased chemical reactivity of nonmetals as you go up a group on the periodic table.