Periodic Trends Worksheet

Pg: 58: #1 - 6

1. Describe what, in theory, happens to the radius of an atom as it
   (a) gains an electron;
   (b) loses an electron.

2. Explain, with diagrams of specific examples, the difference between the ionic radius and the atomic radius of an atom.

3. (a) Describe the periodic trend in ionization energy.
   (b) Provide a theoretical explanation for this trend.
   (c) Give empirical evidence in support of your explanation in (b).

4. Which element in the periodic table would you expect to be
   (a) the most reactive metal? Give your reasons.
   (b) the most reactive nonmetal? Give your reasons.

5. Sketch a graph showing the first, second, and third ionization energies of a Group 2 element.

6. The observations of reactivity shown in **Table 4** were made by placing alkali metals in water and samples of sodium in each of the halogens.
   (a) How does the reactivity of the halogens change as you move up the group?
   (b) Do the observations support the prediction that, as you look down a group of representative metals, the reactivity increases?
   (c) (c) Explain the observed trends in reactivity for these groups of representative elements in terms of number of valence electrons, nuclear charge, shielding, and distance of valence electrons from the nucleus.
   (d) (d) Which pair of elements from the table of observations would you expect to react together most readily?

Pg 59: 3 – 6

3. (a) S, Al, K, Mg, and Sr are all representative elements. Use your understanding of trends in the periodic table to predict their order of increasing ionization energy, atomic radius, electron affinity, and electronegativity.
   (b) Explain each prediction in terms of electronic structure.

4. Would you expect the first ionization energies for two isotopes of the same element to be the same or different? Justify your answer.

5. (a) Use the periodic table to predict the most common charges on ions of sodium, magnesium, and aluminum. Provide a theoretical explanation of your answer.
   (c) What would be the trend in ionic radius among these ions? Support your answer with a theoretical argument.

6. The second ionization energy of an unknown element X is about twice as much as its first ionization energy. However, its third ionization energy is many times greater than its second ionization energy.
   (a) How many valence electrons would you expect to be present in an atom of the element?
   (b) What group would you expect it to belong to?
   (c) Based on its location in the periodic table, what other physical and chemical properties would you expect the element to possess?
   (d) Explain the differences in ionization energies.

Pg 62: # 13 - 18

13. From a representative element's position in the periodic table, how would you determine each of the following?
    (a) number of protons
    (b) number of electrons
    (c) number of valence electrons
    (d) number of occupied energy level

14. List the number of protons, electrons, and valence electrons in each of the following atoms:
    (a) magnesium
    (b) aluminum
    (c) iodine

15. Write the chemical name and symbol corresponding to each of the following theoretical descriptions:
    (a) 11 protons and 10 electrons
    (b) 18 electrons and a net charge of 3–
    (c) 16 protons and 18 electrons

17. Determine the number of protons, electrons, and neutrons present in an atom of each of the following isotopes:
    (a) calcium-42
    (b) strontium-90
    (c) cesium-137
    (d) iron-59
    (e) sodium-24

18. Iodine-123, in the compound sodium iodide, is a common radioisotope for medical use.
    (a) How does the mass number of this isotope compare with the atomic mass stated for iodine in the periodic table? How can this difference be explained?
    (b) What does this difference suggest about the abundance of iodine-123 in an average sample of iodine atoms?