PROBLEM SET: PERIODIC PROPERTIES

1. Which member of each pair would you predict to be larger?
(a) As, Bi (b) As, Sn (c) Ga, As (d) As, Br (e) Cs, Rb (f) Mn, Zn (g) Ca, Ga (h) Sb, Se

2. Which member of each of the following pairs has the higher first ionization energy?
(a) S, Ar (b) Ar, Kr (c) Ba, Sr (d) Cs, Ba (e) Cl, I (f) Se, Cl (g) K, Mg (h) Cs, Rb

3. How do the first Ionization Energy and atomic radii of metals compare with those of non-metals?

4. Explain why the first Ionization Energy of **O** is lower than that of **N**.

5. Why is the second Ionization Energy of an element always greater than the first Ionization Energy?

6. Of all the elements of the third period (Na to Ar):
(a) Which has the largest atomic radius?
(b) Which has the highest first Ionization Energy?
(c) Which is the most reactive metal?
(d) Which is the most reactive non-metal?
(e) Which is the least reactive?
(f) How many are metals?
(g) Which are **s**-block and which are **p**-block elements?

7. Arrange the following ions in order of increasing size: F^-, Mg^{2+}, Cl^-, Be^{2+}, S^{2-}, Na^+.

8. Write notations for the ground-state electronic configurations of the following ions: Mg^{2+}, Cr^{2+}, Co^{2+}, Ag^+,I^-.

9. State the number of unpaired electrons in each of the ions listed in problem #8. Which are paramagnetic and which are diamagnetic?

10. For each of the following, give the formulas of two ions that are isoelectronic with the atom or ion listed.
(a) Kr (b) Zn (c) Zn^{2+} (d) O^{2-} (e) Ca^{2+}

11. Give examples of $\mathbf{s}^2$ ions, $\mathbf{s}^2\mathbf{p}^6$ ions, $\mathbf{d}^{10}$ ions, $\mathbf{d}^{10}\mathbf{s}^2$ ions.

12. Which member of the following pairs would you predict to be larger?
(a) Cs^+, Ba^{2+} (b) S, S^{2-} (c) S^{2-}, Cl (d) Cr^{2+}, Cr^{3+} (e) Cu^{2+}, Ag^+ (f) Br, Br^- (g) O^{2-}, F^- (h) Cs, Cs^+ (i) In^+, Sn^{2+}

13. Give formulas for the oxides, chlorides, phosphates, sulfates and dichromates of sodium, of magnesium, and of aluminum.