Sheet 5

1. Explain in terms of electron distributions:

a) the difference between metals and non-metals

b) the stability of the noble gases

c) the transition metals almost all show a 2+ oxidation state, and are

found only with atomic numbers greater than 20.

d) The short periods have 8 elements, and the long have 18 or 32.

e) Calcium and Zinc are not placed in the same group, even though both

show only a 2+ oxidation state, and both have 2 valence electrons.

2. Write electron configurations for the following atoms and ions. DO NOT

use a reference table. a) 22Ti b) 24Cr c) 50Sn d) 87Fr e)58Ce f) 35Br- g) 8O2- h) 40Zr2+

4. Why is Cr in the ground state 3d54s1 ?

5. Which of the following atoms is paramagnetic? 3Li, 4Be, 5B, 9F, 10Ne, 21Sc, 69Tm, 78Pt

6. Determine the electron configurations of the underlined ions and state

whether they are paramagnetic. a)ZrF4 b) Fe(NH3)3(CN)3 c)Ni(NO3)3

d)CrO2Cl2 e) Cr2O3

7. Explain how the relative sizes of the atoms of period 3 change with increasing atomic number. What factors are most important in determining the size of an atom?

8. What generally happens to the atomic radius as one goes down a group?

Across a period? Explain.

9. What happens to ionic radii as atoms lose one electron? Two electrons?

What happens to ionic radii as atoms gain one electron? Two electrons?

10. Explain in each case which is the smaller ion. a) Al3+ or Mg2+

b) S2- or Cl- c) K+ or Ca2+ d) Na+ or F- e) Fe2+ or Fe3+

11. Which of the pairs in the previous question are isoelectronic?

12. What factors influence the magnitude of the ionization energy? (aka ionization potential)

13. How does ionization energy change within a period? within a group?

Explain the general trends.

14. Why does He have a higher ionization potential than H?

15. Why is the ionization energy higher for Li than for Na ?

16. Why is the third ionization energy of Be much higher than its first or second?

17. Account for the fact that it requires more energy to remove a third electron from a carbon atom than from a nitrogen atom. Why is it easier to remove the first two electrons from the carbon than from the nitrogen?

18. Why is the ionization energy of P higher than that of S?

19. Why is the ionization energy of zinc higher than that of gallium?