1. Which of the following elements is a nonmetal?
   a. Si b. Cu c. Pb d. Mg e. C

2. Which of the following has the largest radius?
   a. Na+ b. Li+ c. Cl- d. Cl e. H

3. The electron configuration of S^2- is...
   a. 1s^2 2s^2 2p^6 3s^2 3p^6  b. 1s^2 2s^2 2p^6 3s^2 3p^6  c. 1s^2 2s^2 2p^6 3d^10  d. 1s^2 2s^2 2p^6  e. 1s^2 2s^2 2p^6 3s^2 3p^6 3d^10

4. Which of the following has the most negative electron affinity?

5. Which of the following has the lowest ionization energy?

6. Which of these atoms has the largest first ionization energy?
   a. Cs b. Na c. Si d. Ne e. F

7. Which of the following elements has the most nonmetallic character?
   a. F b. Ge c. Hg d. In e. S

8. What is the electron configuration of Fe^3+?

9. Which of the following elements is the least electronegative?

10. Which of the following has the largest size?

11. Which pair of elements reacts to form an ionic compound?
    a. calcium and copper  b. calcium and chlorine
    c. nitrogen and chlorine  d. argon and oxygen  e. fluorine and iodine

12. The smallest atom in the following list is:  a. B   b. C   c. N   d. P   e. As

13. Which of the following elements would be expected to lose electrons and form positive ions when it reacts?
    a. phosphorus  b. nitrogen  c. iron  d. iodine  e. fluorine

14. Which of the ions is unlikely to be formed?

15. Which of the species below has the smallest radius?

16. Which of the species below has the smallest radius?
17. The successive ionization energies of a certain element in units of kJ/mol are: $I_1 = 578$; $I_2 = 1820$; $I_3 = 2750$; $I_4 = 11,600$. [I$_1$ is the first ionization energy; I$_2$, the second, etc.] This element most likely is:
   a. Na  b. Mg  c. Al  d. Si  e. P

18. The electron affinity of F is the energy associated with which of the following reactions?
   a. F$_2$ (g) $\rightarrow$ 2F(g)  b. F (g) $\rightarrow$ F$^+$ (g) + e$^-$  c. F$^+$ (g) $\rightarrow$ F$_2$ + (g) + e$^-$
   d. F (g) + e$^-$ $\rightarrow$ F$^-$ (g)  e. F$_2$ (g) + e$^-$ $\rightarrow$ F$^-$ (g) + F (g)

19. Which of the following is an alkali metal?  a. H  b. Ca  c. Zn  d. Fe  e. Rb

20. Which of the following ions does not have the electronic configuration of argon, 18Ar?
   a. 17Cl$^-$  b. 19K$^+$  c. 20Ca$^{2+}$  d. 21Sc$^{3+}$  e. 9F$^-$

21. Which of the following is covalent?  a. Li$_2$S  b. MgO  c. Al$_2$O$_3$  d. Bi$_2$O$_3$  e. P$_2$O$_5$

22. The bond in N$_2$ is a:  a. double bond.  b. single bond.  c. triple bond.  d. lone pair.  e. none of these


24. The number of valence shell electrons in chlorine is:  a. 17  b. 2  c. 5  d. 7  e. 4

25. Which of the following IIIA family members should form the fluoride molecule with the highest lattice energy?  a. AlF$_3$  b. GaF$_3$  c. InF$_3$  d. TlF$_3$  e. none of these

26. The number of bonds in the best Lewis structure of CS$_2$ (similar to CO$_2$) is:  a. 1  b. 2  c. 3  d. 4  e. 5

27. The crystal lattice energy can be determined by means of a Born-Haber cycle, in which several reactions are combined according to Hess’ Law. In applying this procedure to the lattice energy of KBr, the following reactions are combined:

   $\begin{align*}
   (1) & \quad \text{K(s)} \rightarrow \text{K(g)} \\
   (2) & \quad 1/2\text{Br}_2(l) \rightarrow \text{Br(g)} \\
   (3) & \quad \text{K} \quad (g) \rightarrow \text{K} \quad (g) + e^- \\
   (4) & \quad \text{Br} \quad (g) + e^- \rightarrow \text{Br} \quad (g) \\
   (5) & \quad \text{K(s)} + 1/2\text{Br}_2(l) \rightarrow \text{KBr(s)}
   \end{align*}$

   For which of the above reactions is $\Delta H < 0$?  a. All 5 reactions  b. Reactions 2, 4 and 5  c. Reactions 4 and 5  d. Reactions 2 and 4  e. Only reaction 4

28. Which of the following will have the largest dipole moment?
   a. HF  b. HCl  c. HBr  d. HI  e. F$_2$