Problem Set 3  
Due October 4, 2004

For the purposes of self-study, you should be able to do any of the Exercises on p. 140 of your text.

Problems from SA, Chapter 2, p. 64: 2.2, 2.3, 2.6, 2.8

Additional problems:

1. Which of each of the following pairs might be expected to be more ionic?
   a. CaCl$_2$ or MgCl$_2$  
   c. NaCl or CuCl (similar radii)
   b. NaCl or CaCl$_2$ (similar radii)  
   d. TiCl$_3$ or TiCl$_4$

2. The wurtzite ($hcp$ S$^{2-}$) structure of ZnS has open channels along the packing (stacking) direction, but the zinc blende ($ccp$ S$^{2-}$) structure does not. Explain.

3. Give a plausible explanation for why layer structures such as those of CdCl$_2$ and CdI$_2$ are usually not encountered for metal fluorides or compounds of the most active metals?

4. Calculate the ideal cation/anion radius ratio (by using plane geometry) for a triangular arrangement of anions in which the cation is in contact with the anions but does not push them apart.

5. Estimate the density of MgO (NaCl structure) and zinc blende (cubic ZnS) using radii to determine the cell dimensions and the number of formula units per unit cell.

6. Na[SbF$_6$] has the NaCl structure. The density is 4.37 g/cm$^3$. Calculate the radius of SbF$_6^-$ using the radius of Na$^+$, the density, the formula weight, and the number of formula units per unit cell.

7. Metals that are very malleable (can be beaten or rolled into sheets) and ductile (can be drawn into wire) have the $ccp$ structure. Why are these characteristics favored for $ccp$ rather than for $hcp$?

8. In the structure of MoS$_2$, the S atoms are arranged in layers that repeat themselves in the sequence ···AABB···. The holes between AB pairs of planes are vacant. The Mo atoms occupy holes with C.N. = 6. Show that each Mo atom is surrounded by a trigonal prism of S atoms.