1. An X-ray beam of unknown wavelength is diffracted from a NaCl surface. If the interplanar distance in the crystal is 286 pm, and the angle of maximum reflection is found to be 7.23°. What is the wavelength of the X-ray beam? (Assume n = 1.)

2. An x-ray beam with a wavelength of 348 pm is directed at an NaCl crystal and produces a first order (n = 1) maximum diffraction at 26.3°. Calculate the distance between layers of NaCl atoms in the crystal.

3. A body-centered cubic unit cell has an edge length of 588 pm. What is the radius of the atoms composing the unit cell?
   A. 588 pm
   B. 208 pm
   C. 294 pm
   D. 255 pm

4. How many atoms are in the unit cell in the face-centered cubic structure?
   A. 1
   B. 2
   C. 4
   D. 14

5. Vanadium crystallizes with the body-centered cubic unit cell. The radius of the vanadium atom is 134 pm. Calculate the density of vanadium in g/cm^3

6. Copper crystallizes with the face-centered cubic unit cell. The radius of the copper atom is 128 pm. Calculate the density of copper in g/ cm3.

7. Identify each solid as molecular, ionic, or atomic.
   A. $Br_2(s)$
   B. CO_2 (s)
   C. Cu(s)
   D. $CaBr_2$ (s)
   E. Ru(s)

8. Classify each of the following as a component of a silicate ceramic, an oxide ceramic, or a nonoxide ceramic.
   A. Mg_2SiO_4
   B. $MOSi_2$

9. Which solid would you expect to have the largest band gap?
   A. As(s)
   B. Sb(s)

10. A substance has a band gap of 0. 77 eV at 273 K. Is this substance best classified as an insulator, a semiconductor, or a metal?

11. Indicate if each solid forms an n-type or a p-type semiconductor.
   A. germanium doped with antimony
   B. silicon doped with gallium