

## Homework 2

### ATOMIC STRUCTURE AND INTERATOMIC BONDING

1. Name the two atomic models cited, and note the differences between them.
2. Describe the important quantum-mechanical principle that relates to electron energies.
3. (a) Name the four electron quantum numbers.  
(b) For a specific electron, note what each of its quantum numbers determines.
4. Write a definition of the Pauli exclusion principle.
5. Write the equation that relates energy and force.
6. (a) Schematically plot attractive, repulsive, and net energies versus interatomic separation for two atoms or ions.  
(b) Now note on this plot the equilibrium separation and the bonding energy.
7. (a) Briefly describe ionic, covalent, metallic, hydrogen, and van der Waal's bonds.  
(b) Now note what materials exhibit each of these bonding types.

## THE STRUCTURE OF CRYSTALLINE SOLIDS

1. Give a definition of a crystalline solid.
2. Describe the difference between crystalline and noncrystalline materials.
3. Give a brief definition of a unit cell.
4. Schematically diagram face-centered cubic, body-centered cubic, and hexagonal close-packed unit cells.
5. Explain what is meant by coordination number and atomic packing factor.
6. Briefly define polymorphism (or allotropy).
7. Distinguish between crystal system and crystal structure.
8. Give definitions for *isotropy* and *anisotropy*.
9. Briefly describe the phenomenon of diffraction.