

ECSE-2210 Microelectronics Technology
Fall 2005
Class Activity – 1

1. Quick Quiz (see problem 1.1 in textbook)
 - a. Name one elemental semiconductor and one compound semiconductor.

 - b. What is the difference between a crystalline and polycrystalline material?

 - c. Give a word definition of the term “unit cell”.

 - d. How many atoms are in a unit cell of the simple cubic/bcc/fcc/diamond lattice ?

 - e. $1 \text{ \AA} = ? \text{ cm}$; $1 \text{ nm} = ? \text{ \AA}$.

 - f. In terms of lattice constant a , what is the distance between nearest-neighbor atoms in a simple cubic lattice?

 - g. How many nearest-neighbor atoms are there in the diamond and zincblende lattices?

- h. Classify materials based on their resistivity (hint: Three groups of materials) ? What is unique about semiconductors?
2. The lattice constant of Ge at room temperature is $a = 5.65 \text{ \AA}$. Determine the number of Ge atoms/cm³. Determine the mass density of Ge in g cm⁻³ (Use the fact that one mole of Ge weighs 72.6 g and contains 6.02×10^{23} atoms.)
3. In terms of the lattice constant a , what is the distance between nearest-neighbor atoms in:
a. a bcc lattice?
b. In an fcc lattice?
4. A crystalline lattice is characterized by the cubic unit cell pictured below. The cell has a single atom positioned at the center of the cube (Problem 1.11 in textbook).
a. What is the name of the lattice generated by the given unit cell ?
b. Determine the number of atoms per cm³ in the crystal if the lattice constant a is 0.5 nm.

