PHY 481/581 - Homework Set 4

Northern Arizona University   Due: 11/05/2018

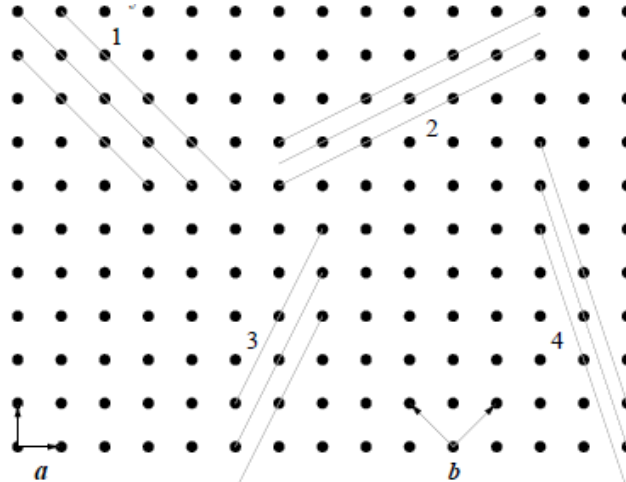**Problem 1.** Determine the Miller indices of the four sets of planes in Fig.1 for **both** coordinate systems a and b.

Figure 1: Lattice planes for the square lattice. Coordinate systems a and b are defined at the bottom.

Problem 2. Determine which planes in an FCC structure have the highest density of atoms and evaluate this density for Cu, where the inter-atomic spacing is $a = 3.61 \times 10^{-10}$m.

Problem 3. Reciprocal lattice:

(a) Calculate the primitive translation vectors of the reciprocal lattice for a simple cubic (SC) lattice with the cube edge a and determine the Bravais lattice of the reciprocal lattice.

(b) Do the same thing for a BCC lattice with the cube edge a.

(c) Do the same thing for an FCC lattice with the cube edge a.

Problem 4. From an X-ray diffraction experiment on NaCl, diamond, and CsCl crystal types, determine which sample is which from the following results:

Bragg angle	Sample 1	Sample 2	Sample 3
θ_1	10.8°	13.7°	22.0°
θ_2	15.3°	15.9°	37.7°
θ_3	18.9°	22.8°	45.8°
θ_4	22.0°	27.0°	59.8°
θ_5	24.7°	28.3°	70.4°