Physics 4243/5243
Problem Set 6
Due Friday March 6th

Problem 1-3:
Simon 12.3, .4 and.5

Problem 4:
Simon 13.3

Problem 5:
X-ray Powder Diffraction

X-ray powder diffractions are done for three crystals. Each crystal is formed by one kind of atom. The atoms in the three crystals form a simple cubic (SC), a face centered cubic (FCC) and a body centered cubic (BCC) respectively. Let ϕ be the diffraction angle. Diffraction peaks are observed at the following angles for the three crystals:

Crystal A

Sin $\phi/2$= 0.127, 0.180, 0.255, 0.285, 0.312

Crystal B

Sin $\phi/2$= 0.150, 0.212, 0.260, 0.300, 0.335, 0.367

Crystal C

Sin $\phi/2$= 0.121, 0.140, 0.198, 0.232, 0.242, 0.280, 0.305

a) Identify the crystal structure of crystals A, B and C.
b) Sketch the first four diffraction peaks for the simple cubic crystal. Now assume that as we lower the temperature the SC crystal is changed into a tetragonal structure through a continuous phase transition. Describe and sketch how the above four peaks change as the crystal changes into the tetragonal structure.