Assignment 3: Introduction to Solid State Physics

1) Question 2

2) Problem 4

3) Derive Equation (3.26)

4) Write down the specifc heat obtained with Einstein's model. What are the results in the extremes of high and low temperatures. Where does it diverge from experimental results and what is missing in the model?

5) Start from Equation (3.31) and derive Equation (3.37).

6) Use equation (3.37) to derive equation (3.38). Study the limits of high and low temperatue.

7) Derive Equation (3.59)

5) Derive Equation (3.61)

6) Which of the following reflections would be missing in a bcc lattice: (100), (110), (111), (2000), (210), (220), (211)? How about a fcc lattice?

7) A unit cell has the dimensions $a = 4\mathring{A}$, $b = 6\mathring{A}$, $c = 8\mathring{A}$, $\alpha = \beta = 90^o$, $\gamma = 120^o$. Determine:
   a) a*, b*, and c* for the reciprocal cell.
   b) The volume of the real and reciprocal unit cells.
   c) The spacing between the (210) planes.
   d) The Bragg angle θ for the reflection from the above planes.