

Assignment 3: Introduction to Solid State Physics

- 1) Determine the density of states of a two-dimensional continuous medium using periodic boundary conditions.
- 2) Using Maxwell-Boltzmann distribution, show that the average energy of a one-dimensional oscillator at thermal equilibrium is $\bar{\epsilon} = kT$.
- 3) Derive Equation (3.26)
- 4) Write down the specific heat obtained with Einstein's model. What are the results in the limits 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 temperature.
- 7) Derive Equation (3.59)
- 8) Derive Equation (3.61)
- 9) Compare the acoustic and optical branches at $q=0$.