Tutorial questions – Lecture 1

1. The electron configuration of Si is often written as [Ne] $3s^2$ p^2. Explain what this means and how this relates to the tetrahedral coordination typically found in the diamond structure.
2. Use the plot of energy vs. atomic distance for a multi-atom system to explain thermal expansion of a material.
3. Explain with the above what happens to the band-gap if a thin layer of a semiconductor with large lattice constant is sandwiched between two thicker semiconductor layers of smaller lattice constant.
4. Calculate the atomic number density of silicon in units of atoms/nm^3 for a lattice constant of a=0.5431nm.
5. Calculate the atomic areal density of the silicon (001) surface in atoms/nm^2.