

SSP Exercise 8

To be handed in by 4pm, Thursday 22nd March.

Consider a case of a germanium quantum dot and evaluate the energy gap between the highest occupied state and the lowest unoccupied state for a cubic particle of 5 nm in size. Use an infinite square potential well as an approximation for the confining potential. Use the following values of the effective masses $m_e^* = 0.12m_e$ and $m_h^* = 0.21m_e$. What would be the value of the wavelength of a photon emitted via recombination of the electron the lowest unoccupied state and hole at the highest occupied state? Compare the results for germanium quantum dot with those for a silicon quantum dot of the same size ($m_e^* = 0.26m_e$ and $m_h^* = 0.36m_e$).

[10 marks]