SSP Exercise 6

To be handed in by 4pm, Thursday 8th March.

1. Calculate the probability of the occupancy of the lowest energy state in the conduction band if the Fermi level is 3kT below the conduction band edge.

   [5 marks]

2. Find the built-in potential for a p-n Si junction at room temperature if the bulk resistivity of Si is 1 Ω cm. Electron mobility in Si at RT is 1400 $cm^2V^{-1}s^{-1}$; $\mu_n/\mu_p = 3.1$; $n_i = 1.05 \times 10^{10}$ cm^{-3} (where μ_n and μ_p are majority carrier mobilities on n and p side, and n_i is intrinsic carrier concentration). **Hint** - please use the following relationships: $\sigma = en\mu_e$ on n-side and $\sigma = ep\mu_p$ on p-side since conductivity is dominated by the majority of carriers on each side.

   [15 marks]