Summer 2012

Ve320 Introduction to Semiconductor Device

Homework #3, due next Friday (June 8,2012) **before class**

1. RFP, Problem 2.6

2. For Si at room temperature, calculate the following quantities (numerical answers required and don't forget to include units with your answer.):

a)The effective density of conduction band states(N_C)

b)The effective density of valence band states(N_V)

3.Consider a region of a Si at room temperature. For each of the following cases, calculate the equilibrium electron and hole concentrations (n and p):

a) Intrinsic material($N_A = N_D = 0$)

b) $N_D = 1*10^{13} cm^{-3}, N_A = 0$

c) $N_A = 1*10^{17} cm^{-3}, N_D = 0$

d) $N_A = 3*10^{17} cm^{-3}, N_D = 1*10^{17} cm^{-3}$

e) Calculate the location of the Fermi Level for $N_A = 1*10^{17} cm^{-3}, N_D = 0$. You can assume $E_V = 0$.

4、Compute the location of the intrinsic level for the two cases below. You should express your answer (in eV) with respect to i) E_V and ii) E_C (i.e. calculate (E_i-E_V) and (E_C-E_i)) .

a) Silicon at T=300K with $m_n^* = 1.182 m_0$ and $m_p^* = 0.81 m_0$

b) GaAs at T=300K with $m_n^* = 0.067 m_0$ and $m_p^* = 0.524 m_0$

5、RPF Problem 2.22