Problem

For silicon at T=300K, given that the value of N_c =2.8x10^{19} cm^{-3} and N_v=1.04x10^{19} cm^{-3}, find:

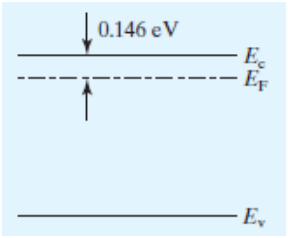
a) The electron concentration for an n-type doped semiconductor if E_F is located at 146 meV below E_C.
b) The hole concentration for a p-type doped semiconductor if E_F is located at 0.31eV above E_V.

Solution

a) Givens: N_c =2.8x10^{19} cm^{-3} , E_c - E_F= 0.146eV, k=8.6173324×10^{-5}eV.K^{-1} and T=300K

Substituting in the equation $n = N_c e^{\frac{-(E_C - E_F)}{KT}}$

∴n = 9.87x$10^{16}$$cm^{-3}$



b) Givens: N_v=1.04x10^{19} cm^{-3}, E_F – E_v= 0.31eV, k=8.6173324×10^{-5}eV.K^{-1} and T=300K

Substituting in the equation $p = N_v e^{\frac{-(E_F - E_v)}{KT}}$

∴p = 6.44x$10^{13}$$cm^{-3}$.