Problem 1. (25 points)

A. (15 Points) Consider a mystery crystal at T = 300 K in which $N_D = 4 \times 10^{13}$ cm^{-3} and $N_A = 7 \times 10^{13}$ cm^{-3}. Assume $n_i = 1.5 \times 10^{13}$ cm^{-3} and complete dopant ionization. Calculate the electron AND hole concentration.

B. (10 Points) Assume this mystery crystal has a band gap of 0.6 eV. Calculate the position of the Fermi level with respect to the intrinsic Fermi level (Ei) and draw the band diagram showing the Fermi level position quantitatively and to scale. $k_BT = 0.0259$ eV at 300 K.