

Problem 1

For a uniformly doped sample of Si under the following conditions:

1. $T = 300 \text{ K}$, doped with $10^{15}/\text{cm}^3$ Phosphorus atoms
2. $T = 300 \text{ K}$, doped with $10^{16}/\text{cm}^3$ Boron atoms

Determine

- a. the position of E_i
- b. compute $E_F - E_i$
- c. energy band diagram

Problem 2

A Si Step junction maintained at room temperature under equilibrium conditions has a p-side doping of $N_A = 2 \times 10^{15}/\text{cm}^3$ and an n-side doping of $N_D = 10^{15}/\text{cm}^3$. Compute

- a. V_{bi}
- b. x_p , x_n , and W
- c. the electric field at $x = 0$.
- d. the voltage at $x = 0$.
- e. Make sketches that are roughly to scale of the charge density, electric field, and electrostatic potential as a function of position.

Problem 3

Repeat problem 2 with $N_A = 10^{17}/\text{cm}^3$.