

Consider an abrupt silicon p-n junction consisting of p-type region with acceptor concentration of  $2 \times 10^{16} \text{ cm}^{-3}$  and n-type region with donor concentration of  $2 \times 10^{17} \text{ cm}^{-3}$ . Assume temperature of 300K and an intrinsic carrier concentration in silicon of  $1 \times 10^{10} \text{ cm}^{-3}$ .

- a.** Calculate the equilibrium densities of both the electrons and holes in the n and p-type regions. (0.5 point)
- b.** Using the depletion approximation, calculate the maximum electric field in the junction and the built-in potential. Assume dielectric constant of silicon to be 11.7. (2 points)
- c.** Sketch the spatial distribution of the total charge density, electric field, and potential across the p-n junction. (1.5 points)