Practice Problem 1

$$V_{bi} = \frac{kT}{e} \ln\left(\frac{N_a N_d}{n_i}\right) = 0.713 \text{ V}$$

Practice Problem 2

$$\mathrm{E_{max}} = -\frac{eN_d x_n}{\epsilon_s} = -\frac{(1.6 \times 10^{-19})(10^{15})(0.8644 \times 10^{-4})}{(11.7)(8.85 \times 10^{-14})} = -1.34 \times 10^4 \text{ V/cm}$$

Practice Problem 3

$$V_{bi} = \frac{kT}{e} \ln\left(\frac{N_d}{n_i}\right)^2$$

$$\therefore\ N_d = n_i \exp\left(\frac{eV_{bi}}{2kT}\right)$$

$$N_d = 1.11 \times 10^{16}\ cm^{-3}$$

Practice Problem 4

$$N_a x_p = N_d x_n$$

$$\therefore\ x_p = 0.08644\ \mu m$$

$$W = x_n + x_p = 0.951\ \mu m$$