Example 2.6a	A germanium wafer is doped with a shallow donor density of $3n_i/2$. Calculate the electron and hole density.
Solution	The electron density is obtained from equation (2.6.34)

$$n_o = \frac{N_d^+ - N_a^-}{2} + \sqrt{(\frac{N_d^+ - N_a^-}{2})^2 + n_i^2}$$

$$= n_i(\frac{3}{4} + \sqrt{\frac{9}{16} + 1}) = 2n_i$$

and the hole density is obtained using the mass action law:

$$p_o = \frac{n_i^2}{n_o} = \frac{n_i}{2}$$

Example 2.6b	A silicon wafer is doped with a shallow acceptor doping of 10^{16} cm^{-3}. Calculate the electron and hole density.
Solution	Since the acceptor doping is much larger than the intrinsic density and much smaller than the effective density of states, the hole density equals:

$$p_o \cong N_a^+ = 10^{16} \text{ cm}^{-3}$$

The electron density is then obtained using the mass action law

$$n_o \cong \frac{n_i^2}{N_a^+} = \frac{10^{20}}{10^{16}} = 10^4 \text{ cm}^{-3}$$

The approach described in example 2.6a yields the same result.