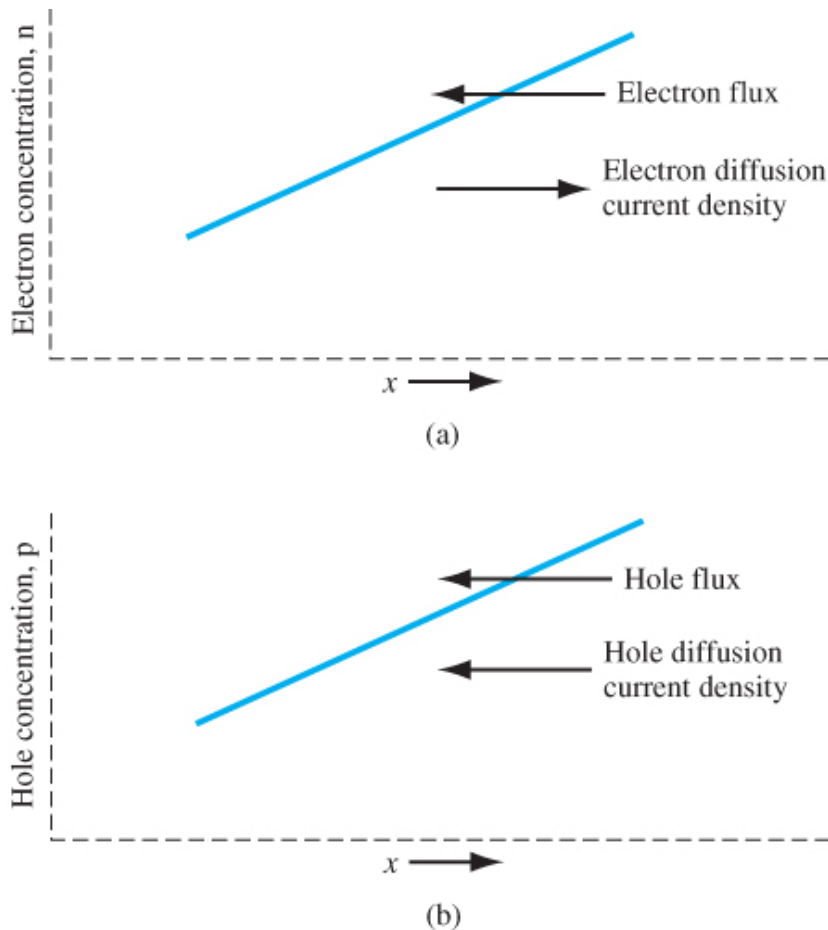Figure 5.11 | (a) Diffusion of electrons due to a density gradient. (b) Diffusion of holes due to a density gradient.

➢ Note that current density is defined as the flow of **positive** charges per unit area.

➢ Therefore, in part (a), the electron diffusion current density (left to right) goes in the *opposite* direction to the flux of electrons from higher to lower concentration n (right to left).

➢ Whereas, in part (b), the hole diffusion current density (right to left) goes in the *same* direction as the flux of holes from higher to lower concentration p (also right to left).

➢ This explains the sign difference between the 1D diffusion current density equations-

$$J_{nx|dif} = eD_n \frac{dn}{dx} \text{ (5.33)} \quad \text{and} \quad J_{px|dif} = -eD_p \frac{dp}{dx} \text{ (5.34)}.$$