Exercise 2.3.5-1

Show the equivalence of the two equations for the minority carrier density

The two equations for the minority carrier concentration (here the electrons at the p-side) at the edge of a junction were

$$n_e^p(U)\Big|_{\text{edge}}^{\text{SCR}} = n_e^n(U)\Big|_{\text{edge}}^{\text{SCR}} \cdot \exp -\frac{V^n + U}{kT}$$

$$n_e^p(U=0) = \frac{n_i^2}{n_h^p(U=0)}$$

The first equation came from simply relating one kind of carriers on both sides of the junction including non-equilibrium (i.e. voltage U not zero), the second one is simple the mass action law valid for equlibium (i.e. $U = 0$).

- Show that the two equations are equivalent.
- *Hint:* Express n_e^n in terms of n_h^p. Write down the equation for n_h^p and reshuffle the energies in the exponent so that n_e^n and n_i can be extracted.

Link to the solution