

Home work #5

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case1

$$\phi_s = 0.3[\text{ev}], T_{\text{si}} = 5[\mu\text{m}], N^- = 10^{15}[\text{cm}^{-3}]$$

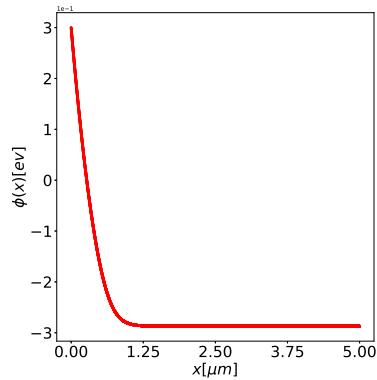


Figure 1: The energy ϕ in the semiconductor versus x

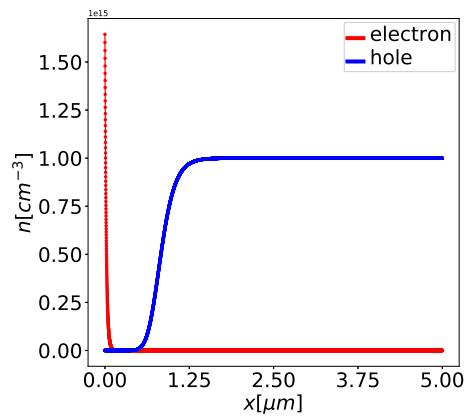


Figure 2: number density for the electron and hole concentration

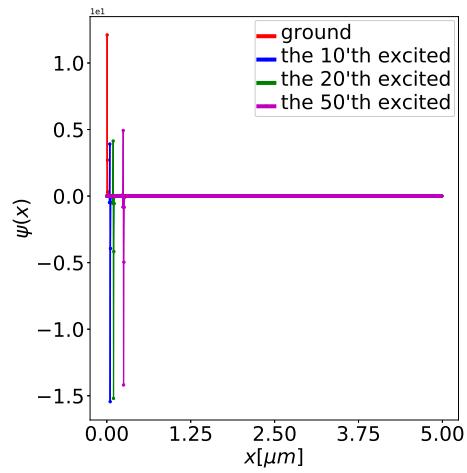


Figure 3: The wave function for the electron in the semiconductor

case2

$$\phi_s = 0.3[\text{ev}], T_{\text{si}} = 5[\mu\text{m}], N^- = 10^{15}[\text{cm}^{-3}]$$

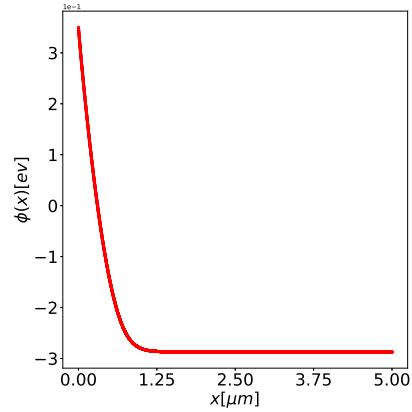


Figure 4: The energy ϕ in the semiconductor versus x

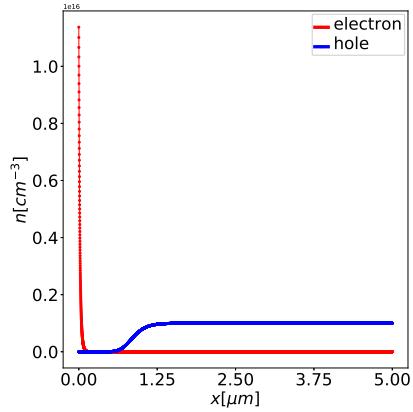


Figure 5: number density for the electron and hole concentration

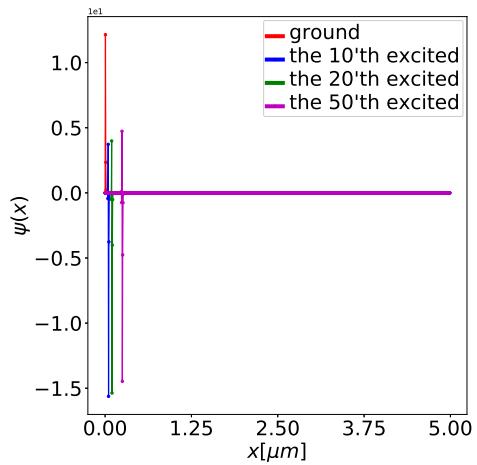


Figure 6: The wave function for the electron in the semiconductor

Case3.

$$\text{Analytic results: } \vec{E}_s = \sqrt{\frac{2K_bTN_a^-}{\epsilon_{\text{silicon}}}} \left\{ \left(e^{-\frac{q_0\phi_s}{K_bT}} + \frac{q_0\phi_s}{K_bT} - 1 \right) + \left(\frac{n_i}{N_a^-} \right)^2 \left(e^{\frac{q_0\phi_s}{K_bT}} - \frac{q_0\phi_s}{K_bT} - 1 \right) \right\}^{\frac{1}{2}}$$

$$\text{Numerical results: } -\nabla\phi|_x \simeq -\frac{\phi_2 - \phi_1}{x_2 - x_1}, \text{ where } \phi_1 = \phi_s.$$

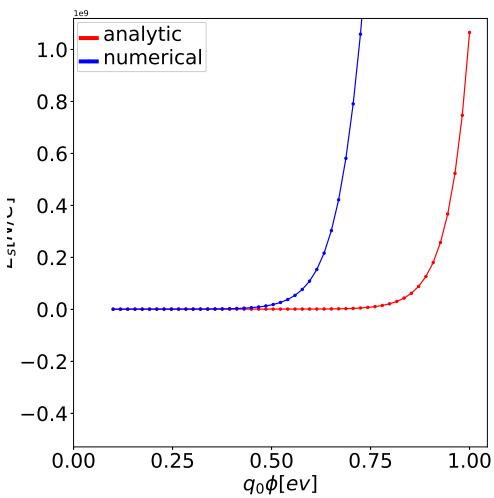
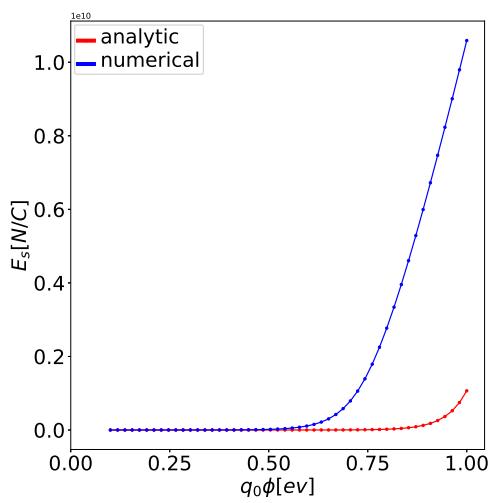


Figure 7: Comparison between the analytic solution and numerical results