Stanford University
Dept. of Electrical Engineering

Device Physics Qualifying Exam

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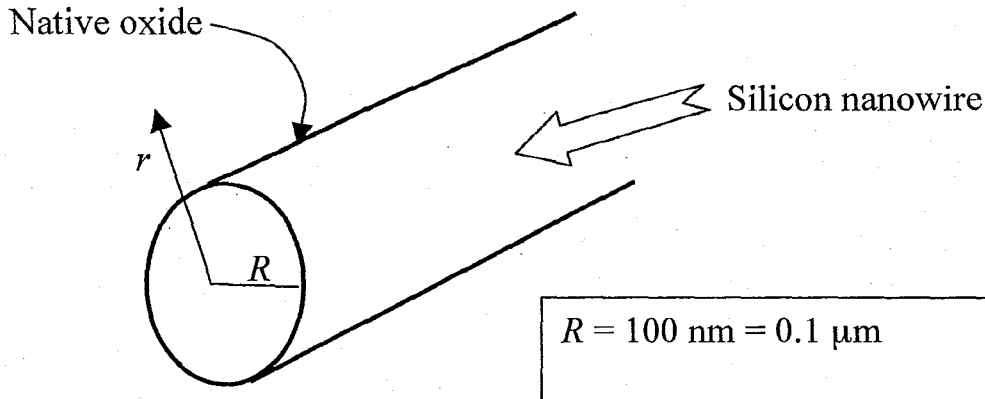

R = 100 nm = 0.1 μm

Acceptor concentration = $N_a = 10^{17}$ cm^{-3}

Native oxide thicknesss = t_{ox} = 5 nm

Density per unit area of positive charges in the native oxide = 10^{11} cm^{-2}

Oxide charge is *fixed and uniformly distributed* through the thickness

a) Sketch (on the white board) the band diagram in thermal equilibrium from $r = 0$ to $r = R + t_{ox}$. Make reasonable assumptions and then verify them.

b) If the doping is reduced to $N_a = 10^{16}$ cm^{-3}, how does the band diagram change?