Consider a 1D semiconductor nanowire with square cross-sections. Its width at $y$- and $z$-direction is $W$, its length along $x$-direction is very long.

(a) If only the lowest subband is occupied and assuming transmission probability of unity, how much is the conductance $\frac{dI}{dV}$?

(b) The effective mass for electrons in this nanowire is $m^*$. Calculate the energy spacing between the bottom of 1st and 2nd subbands.

(c) There is a single impurity inside the wire acting as a potential barrier. The potential can be expressed in the form of a delta function: $V(x) = V_0 \delta(x-x_0)$, where $x_0$ is the location of the impurity. Solve the 1D Schrödinger equation to calculate the transmission probability $T$ of electrons across the barrier.

(d) If two barriers are inside the nanowire, forming a double-barrier structure and it is observed to have its first resonant tunneling peak occurring at bias voltage of $V_1$. Estimate the distance $d$ between the two barriers.