Fundamentals of Nanotransistors

L4.2 Quiz

ANSWERS

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Lecture 4.2: Transmission

1) How is the mean-free-path, $\lambda(E) = u(E)\tau(E)$ related to the mean-free-path for backscattering, $l(E)$?

   a) $\lambda(E) = l(E)$ (They are different names for the same quantity.)

   b) $\lambda(E) < l(E)$.

   c) $\lambda(E) > l(E)$.

   d) $\lambda(E)$ is the mfp in a metal and $l(E)$ is the mfp in a semiconductor.

   e) $\lambda(E)$ is the mfp assuming Fermi-Dirac statistics, and $l(E)$ is the mfp assuming Maxwell-Boltzmann statistics.

2) In a region with a very strong accelerating electric field but that is many mfps long, what is the transmission?

   a) $\mathcal{T}(E) << 1$

   b) $\mathcal{T}(E) \gg 1$

   c) $\mathcal{T}(E) > 1$

   d) $\mathcal{T}(E) = 0.0$

   e) $\mathcal{T}(E) \gg 0.5$

3) In a structure that consists of a region of length, L_{low}, with no electric field followed by a region of length, L_{high}, with a very high accelerating electric field, approximately what is the overall transmission?

   a) $\mathcal{T}(E) \gg \dfrac{l(E)}{l(E)+L_{low}}$

   b) $\mathcal{T}(E) \gg \dfrac{l(E)}{l(E)+L_{high}}$

   c) $\mathcal{T}(E) \approx \left(\dfrac{\lambda(E)}{\lambda(E)+L_{low}}\right)+\left(\dfrac{\lambda(E)}{\lambda(E)+L_{high}}\right)$

   d) $\mathcal{T}(E) \approx \left(\dfrac{\lambda(E)}{\lambda(E)+L_{low}L_{high}/\left(L_{low}+L_{high}\right)}\right)$

   e) $\mathcal{T}(E) \gg \dfrac{l(E)}{l(E)+\left(L_{low}+L_{high}\right)}$