

ANSWERS: Quiz: Week 2 Lecture 1
Thermoelectrics from Atoms to Systems
 Mark Lundstrom, nanoHUB-U Fall 2013

Answer the **five questions** below by choosing the **one, best answer**.

1) Which of the expressions below is the proper Landauer expression for the current?

a) $I = \frac{2q}{h} \int \mathcal{T}(E) M(E) (f_1 + f_2) dE$

b) $I = \frac{2q^2}{h} \int \mathcal{T}(E) M(E) (f_1 + f_2) dE$

c) $I = \frac{2q}{h} \int \mathcal{T}(E) M(E) (f_1 - f_2) dE$

d) $I = \frac{2q^2}{h} \int \mathcal{T}(E) M(E) (f_1 - f_2) dE$

e) $I = \frac{2q}{h} \int \mathcal{T}(E) M(E) (f_1 - f_2) dE$

2) Which of the expressions below is the proper expression for the transmission in terms of the mean-free-path for backscattering, l , and the device length, L ?

a) $\mathcal{T}(E) = \frac{L}{l(E) + L}$

b) $\mathcal{T}(E) = \frac{l(E)}{l(E) + L}$

c) $\mathcal{T}(E) = \frac{l(E)L}{l(E) + L}$

d) $\mathcal{T}(E) = \frac{L - l(E)}{l(E) + L}$

e) $\mathcal{T}(E) = \frac{l(E) - L}{l(E) + L}$

(continued on next page)

Quiz: Week 2 Lecture 1 (continued)

- 3) Which of the two thermoelectric coefficients are fundamentally related.
- a) S, S
 - b) S, ρ
 - c) S, k_e
 - d) S, ρ**
 - e) S, k_e
- 4) What are the units of the differential conductivity?
- a) Ohms.
 - b) One over Ohms (or Siemens).
 - c) Ohm-meter
 - d) Siemens/meter
 - e) Siemens/meter-Joule.**
- 5) What is the “Fermi window”?
- a) The range of energies for which f_1 and f_2 differ.
 - b) The range of energies for which $\partial f_0 / \partial E$ is significantly non-zero.
 - c) The range of energies that contribute to current flow.
 - d) All of the above.**
 - e) None of the above.

End of quiz. This quiz contains 5 questions.