Week 8 Lecture 19 Quiz:
Thermoelectric Effects: (Electronic) heat flow

ECE 656: Electronic Conduction In Semiconductors

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Student's name: _____

Answer the **multiple choice questions** below by choosing the **one, best answer**. Then **ask a question** about the lecture.

1) What is the relation between the Peltier coefficient and the Seebeck coefficient called?
   a. The Wiedemann-Franz law
   b. The Lorenz relation
   c. Mathiessen's rule
   d. The Kelvin relation
   e. Dulong and Petit law

2) What are the coefficients, κ_0 and κ_e?
   a) κ_0 is the thermal conductivity due to phonons and κ_e is the same quantity due to electrons.
   b) κ_0 is the thermal conductivity due to electrons and κ_e is the same quantity due to phonons.
   c) κ_0 is the open-circuit thermal conductivity due to electrons and κ_e is the short-circuit thermal conductivity due to electrons.
   d) κ_0 is the short-circuit thermal conductivity due to electrons and κ_e is the open-circuit thermal conductivity due to electrons.
   e) κ_0 and κ_e two names for the same quantity, the thermal conductivity due to electrons.

3) When we write the current equation in this form: $J_{nx} = L_{11}\dfrac{d\left(F_n/q\right)}{dx} + L_{12}\dfrac{dT_L}{dx}$

   what is the coefficient L_{12} called?
   a) The Seebeck coefficient.
   b) The Soret coefficient.
   c) The Peltier coefficient.
   d) The electronic thermal conductivity, κ_0.
   e) The electronic thermal conductivity, κ_e.

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4) When we write the current equation in this form:

$$\frac{d\left(F_n/q\right)}{dx} = L_{11}J_{nx} + L_{12}\frac{dT_L}{dx}$$

what is the coefficient L_{12} called?

a) The Seebeck coefficient.
b) The Soret coefficient.
c) The Peltier coefficient.
d) The electronic thermal conductivity, κ_0.
e) The electronic thermal conductivity, κ_e.

5) The current in an n-type conductor flows at an energy, Δ_n, above the bottom of the conduction band. What determines the value of Δ_n?

a) The location of the Fermi level .
b) The shape of the bandstructure.
c) The energy depdendence of the mean-free-path.
d) All of the above.
e) None of the above.

6) What question do you have about this lecture?

Turn in to Prof. Lundstrom in class on Friday.