Week 1 Lecture 3 Quiz:
Sums in k-space and integrals in energy space

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) Which of the following is true about the density of states in *k*-space?
   a) It depends on the dimensionality of the semiconductor.
   b) States are spaced uniformly in k-space.
   c) It is independent of the semiconductor's bandstructure.
   d) All of the above.
   e) None of the above.

2) Which of the following is true about the density of states in energy space?
   a) It depends on the dimensionality of the semiconductor.
   b) States are spaced uniformly in energy space.
   c) It is independent of the semiconductor's bandstructure.
   d) All of the above.
   e) None of the above.

3) What is the quantity, $\dfrac{\sum_{k_x>0,k_y,k_z} v_x f_0(E_k)}{\sum_{k_x>0,k_y,k_z} f_0(E_k)}$?
   a) Zero.
   b) The average, thermal equilibrium electron velocity
   c) The average, thermal equilibrium velocity of electrons with a +x-directed velocity
   d) The rms thermal velocity
   e) The Richardson thermal velocity

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4) What is the difference between a "script F" Fermi-Dirac integral, $\mathcal{F}_j(\eta_F)$ and a "roman F" Fermi-Dirac integral, $F_j(\eta_F)$?

a) There is no difference – they are the same quantity.
b) $\mathcal{F}_j(\eta_F) = dF_j/d\eta_F$
c) $F_j(\eta_F) = d\mathcal{F}_j/d\eta_F$
d) $F_j(\eta_F) = \Gamma(j+1)\mathcal{F}_j(\eta_F)$
e) $F_j(\eta_F) = \mathcal{F}_j(\eta_F)$ for $\eta_F << 0$

5) Which of the following is true when $\eta_F >> 0$?

a) $\mathcal{F}_j(\eta_F) \rightarrow \exp(\eta_F)$
b) $\mathcal{F}_j(\eta_F) > \exp(\eta_F)$
c) $\mathcal{F}_j(\eta_F) < \exp(\eta_F)$
d) $\mathcal{F}_j(\eta_F) \rightarrow \exp(\eta_F^j)$
e) $\mathcal{F}_j(\eta_F) \rightarrow 1$.

6) What question do you have about this lecture?

Turn in to Prof. Lundstrom in class on Friday.