Thermoelectricity: From Atoms to Systems

L5.5 Quiz

Answers

1) What is the Curzon-Ahlborn limit of efficiency for a thermodynamic system at maximum output power?

   a. $\sqrt{\frac{T_{\text{cold}}}{T_{\text{hot}}}}$

   b. $\frac{T_{\text{cold}}}{T_{\text{hot}}}$

   c. $1-\frac{T_{\text{cold}}}{T_{\text{hot}}}$

   d. $1-\sqrt{\frac{T_{\text{cold}}}{T_{\text{hot}}}}$

   e. $1-\left(\frac{T_{\text{cold}}}{T_{\text{hot}}}\right)^{1/3}$

2) What is the potential benefit of a very sharp carrier energy distribution approaching to a delta function for thermoelectrics?

   a. Electronic thermal conductivity can be minimized
   b. Seebeck coefficient can be significantly enhanced with sharply selective energy transport of carriers.
   c. Efficiency can be very high with an appropriate spatial variation of the chemical potential to realize a reversible process with the entropy production rate approaching zero.
   d. None of the above
   e. All of the above

3) What are the reasons thermal conductivity could be reduced in superlattices?

   a. Due to phonon mini-band formation
   b. Due to increased phonon interface scattering
   c. Due to reduced electronic contribution to thermal conductivity (Lorentz number)
   d. a and b
   e. b and c
   f. All of the above