Thermoelectricity: From Atoms to Systems

L4.4 Quiz

Answers

1) What is the maximum cooling for a thermoelectric cooler made of a homogeneous material with the figure of merit *Z,* and cold and hot side temperatures T_C and T_H, respectively?

   a. $\Delta T_{\max} = ZT_C^{\,2}$

   b. $\Delta T_{\max} = ZT_H^{\,2}$

   c. $\Delta T_{\max} = \frac{1}{2} ZT_C^{\,2}$

   d. $\Delta T_{\max} = \frac{1}{2} ZT_H^{\,2}$

   e. $\Delta T_{\max} = \frac{1}{2} Z\left(\frac{T_C + T_H}{2}\right)^2$

2) Which of the following states is true for maximum cooling with an inhomogeneous material?

   a. Maximum cooling can be enhanced when the local magnitude of the Seebeck coefficient is monotonically increasing as we approach the heat sink when the power factor is kept constant through the material.

   b. Maximizing the local *ZT* throughout the material will give the largest amount of cooling.

   c. The uniform efficiency criterion can achieve larger cooling than maximizing the local *ZT* throughout the material.

   d. a and b

   e. a and c

3) In the case of uniform current distribution on the contact area that is much smaller than the actual thermoelectric element size, which of the following statements is true?

   a. Potential is highest and cooling is largest at the center of the contact area.

   b. Potential is highest, and cooling is smallest at the center of the contact area.

   c. Potential is lowest, and cooling is largest at the center of the contact area.

   d. Potential is lowest, and cooling is smallest at the center of the contact area.

   e. Cooling is largest near the perimeter of the contact.