

Thermoelectricity: From Atoms to Systems

L4.1 Quiz

Answers

- 1) What is the definition of *exergy* of a thermodynamic system?
 - a. The quantity to measure thermodynamic disorder of the system
 - b. The total energy stored in the system at the highest temperature during a thermodynamic cycle
 - c. The minimum work required to make the cycle reversible
 - d. The maximum useful work achievable during a thermodynamic cycle in the system
 - e. None of the above

- 2) How large is the average figure of merit ZT of a thermoelectric system required to have a power generation efficiency comparable to that of the coal/Rankine cycle with working fluid temperature at ~ 850 K? (refer to the slide 6 of Lecture 4.1.)
 - a. $ZT = 0.5$
 - b. $ZT = 1$
 - c. $ZT = 2$
 - d. $ZT = 4$
 - e. $ZT = 20$

- 3) What could be the benefit of using a thermoelectric system for power generation even though its efficiency is lower than those of conventional power generation systems?
 - a. Additional power output as a topping cycle (upstream of the mechanical generator between the heat source and the working fluid)
 - b. Lower cost per Watt
 - c. Additional power output by waste heat recovery (downstream of the mechanical generator)
 - d. a and c
 - e. b and c
 - f. All of the above

- 4) How large is the average figure of merit ZT of a thermoelectric cooling system required to have a coefficient of performance comparable to that of a conventional household refrigerator with temperature difference of ~ 20 °C? (refer to the slide 10 of Lecture 4.1.)
 - a. $ZT = 0.5$
 - b. $ZT = 1$
 - c. $ZT = 2$
 - d. $ZT = 4$
 - e. $ZT = 20$

- 5) What could be the benefit of using a thermoelectric cooler even though its coefficient of performance is lower than those of conventional mechanical refrigerators?
- a. Compact size
 - b. Localized hotspot cooling in a micro chip
 - c. High cooling power density
 - d. Fast response time
 - e. All of the above