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Suggested problems: Chapter 20- HRW-Principles of Physics- ISV 10th Edition.

5. A Carnot engine whose high-temperature reservoir is at 483 K has an efficiency of 40.0%. By how much should the temperature of the low-temperature reservoir be changed to increase the efficiency to 50.0%?

    Answer: 48.0 K

14. An ice maker is kept cold by a reverse Carnot engine that removes 28.0 kJ as heat per cycle , with coefficient of performance 6.90, what are (a) the energy delivered as heat to the room and (b) the work done?

    Answer: (a) 24.5kJ ; (b) 3.54 kJ

29. A heat pump is used to heat a building. The external temperature is less than the internal temperature. The pump coefficient of performance is 3.30, and the heat pump delivers 7.54 MJ as heat to the building each hour. If the heat pump is is a Carnot engine working in reverse, at what rate must work be done to run it?

    Answer: 487 W

36. How much energy must be transferred as heat for a reversible isothermal expansion of an ideal gas at 180°C if the entropy of the gas increases by 46.0 J/K?

    Answer: 2.08×10^4 J = 20.8 kJ

39. In an experiment, 400 g of aluminum (with a specific heat of 900 J/kg · K) at 100°C is mixed with 50.0 g of water at 20.0°C, with the mixture thermally isolated. (a) What is the equilibrium temperature? What are the entropy changes of (b) the aluminum (c) the water, and (d) the aluminum–water system?

    Answer: (a) 70.6 °C (b) −29.6 J/K ; (c) +33.4 J/K ; (d)+ 3.8 J/K

43. A Carnot engine operates between 235°C and 115°C, absorbing 3.00×10^4 J per cycle at the higher temperature. (a) What is the efficiency of the engine? (b) How much work percycle is this engine capable of performing?

    Answer: (a) 23.6 % ; (b) 7.09×10^3 J

46. (a) What is the entropy change of a 15.0 g ice cube that melts completely in a bucket of water whose temperature is just above the freezing point of water? (b) What is the entropy change of a 5.00 g spoonful of water that evaporates completely on a hot plate whose temperature is slightly above the boiling point of water?

    Answer: (a) 18.3 J/K ; (b) 30.2 J/K