

# Review: Second law of thermodynamics

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# Exercise

An engine absorbs 1.70 kJ from a hot reservoir at 277°C and expels 1.20 kJ to a cold reservoir at 27°C in each cycle.

(a) What is the engine's efficiency?

(b) How much work is done by the engine in each cycle?

(c) What is the power output of the engine if each cycle lasts 0.300 s?

# Exercise

An ideal gas is taken through a Carnot cycle. The isothermal expansion occurs at  $250^{\circ}\text{C}$ , and the isothermal compression takes place at  $50.0^{\circ}\text{C}$ . The gas takes in  $1.20 \times 10^3 \text{ J}$  of energy from the hot reservoir during the isothermal expansion. Find

- (a) the energy expelled to the cold reservoir in each cycle and
- (b) the net work done by the gas in each cycle.

# Exercise

Calculate the increase in entropy of the Universe when you add 20.0 g of 5.00°C cream to 200 g of 60.0°C coffee. Assume that the specific heats of cream and coffee are both 4.20 J/g °C.