Ch. 8 Problem 1

This question asks you to calculate work. The useful equation here is:

\[ Q = m \times C \times \Delta T \]

Where “m” is the mass of water, “C” is water’s specific heat capacity, and “delta T” is the change in temperature.

We know that:

\[ m = 1 \text{ kg} \]

\[ \Delta T = 1 ^\circ C \text{ which is the same as 1K since this is a “change in temperature”} \]

And we can look up the specific heat capacity of water as about \( 4190 \frac{J}{kg \cdot K} \)

Plugging everything together we get:

\[ Q = 1 \text{ kg} \times 4190 \frac{J}{kg \cdot K} \times 1K = 4190 J \]
Ch. 8 Problem 7

This question asks you to calculate the heat put out by a refrigerator. The problem tells us that it removes 900 J of heat from the food, but we also need to find out how much work it took for the refrigerator to do this. The useful equation to use here is:

\[ Q_c = W \times \frac{T_c}{T_h - T_c} \]

Where \( Q_c \) is the heat removed from the cold object, \( W \) is the work consumed, and \( T_h \) and \( T_c \) are the hot and cold temperatures. So we get:

\[ 900 = W \times \frac{270}{300 - 270} \]

\[ W = 100 \text{ J} \]

Now, we add this work to the heat it removed to the food:

\[ Q_h = Q_c + W \]
\[ Q_h = 900 \text{ J} + 100 \text{ J} = 1000 \text{ J} \]

Ch. 8 Problem 13

This question asks us to calculate the percent of solar heat that an ideal system can transform into work. To do this we just divide the difference between the two temperatures by the larger of the two temperatures.

\[ \frac{6100 \text{ K} - 300 \text{ K}}{6100 \text{ K}} = \frac{5800}{6100} = .95 = 95\% \]