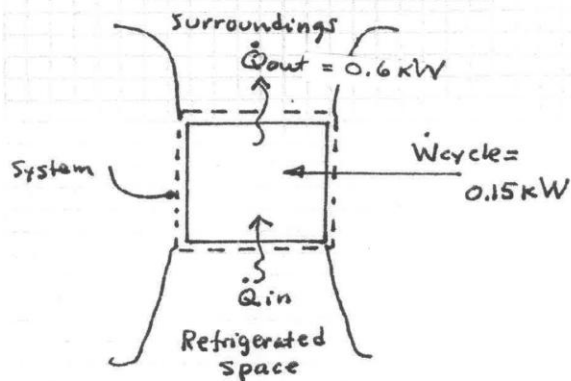


## PROBLEM 2.90

KNOWN: Steady-state operating data are provided for refrigerator.

FIND: Determine the rate energy is removed by heat transfer from the refrigerated space, in kW, and the coefficient of performance.

SCHEMATIC & GIVEN DATA:



ENGINEERING MODEL:

1. The system undergoes a refrigeration cycle.
2. Energy transfers are positive in the direction of the arrows on the schematic.
3. The cycle operates steadily.

ANALYSIS:

Applying Eq. 2.44 on a time rate basis:

$$\begin{aligned}\dot{W}_{\text{cycle}} &= \dot{Q}_{\text{out}} - \dot{Q}_{\text{in}} \\ \Rightarrow \dot{Q}_{\text{in}} &= \dot{Q}_{\text{out}} - \dot{W}_{\text{cycle}} \\ &= 0.6 \text{ kW} - 0.15 \text{ kW} \\ &= 0.45 \text{ kW}\end{aligned}$$

Then, with Eq. 2.45 on a time rate basis,

$$\begin{aligned}\beta &= \frac{\dot{Q}_{\text{in}}}{\dot{W}_{\text{cycle}}} \\ &= \frac{0.45 \text{ kW}}{0.15 \text{ kW}} \\ &= 3\end{aligned}$$

←  $\dot{Q}_{\text{in}}$

←  $\beta$