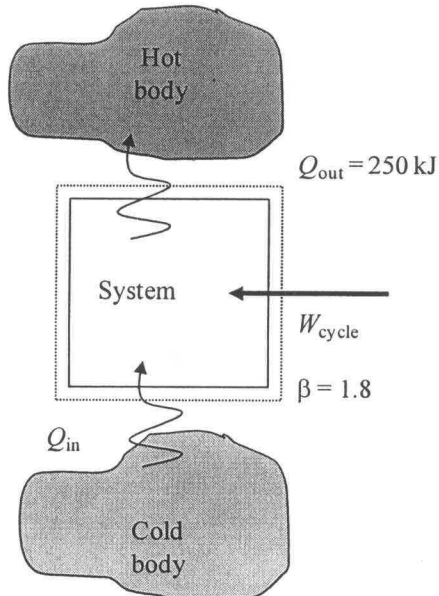


Problem 2.86:

A refrigeration cycle operating as shown in Fig. 2.17b has a coefficient of performance $\beta = 1.8$. For the cycle, $Q_{\text{out}} = 250 \text{ kJ}$. Determine Q_{in} and W_{cycle} , each in kJ.

Solution:Schematic and Given Data:Analysis:

Using the following, determine Q_{out} and W_{cycle} , each in kJ

$$\beta = \frac{Q_{\text{in}}}{W_{\text{cycle}}} \text{ and } W_{\text{cycle}} = Q_{\text{out}} - Q_{\text{in}}$$

$$\beta = \frac{Q_{\text{in}}}{Q_{\text{out}} - Q_{\text{in}}}$$

$$Q_{\text{in}} = \beta(Q_{\text{out}} - Q_{\text{in}}) = Q_{\text{out}} \left(\frac{\beta}{1 + \beta} \right) = 250 \text{ kJ} \left(\frac{1.8}{1 + 1.8} \right) = 161 \text{ kJ} \quad \longleftarrow$$

$$W_{\text{cycle}} = \frac{Q_{\text{in}}}{\beta} = \frac{161 \text{ kJ}}{1.8} = 89 \text{ kJ} \quad \longleftarrow$$