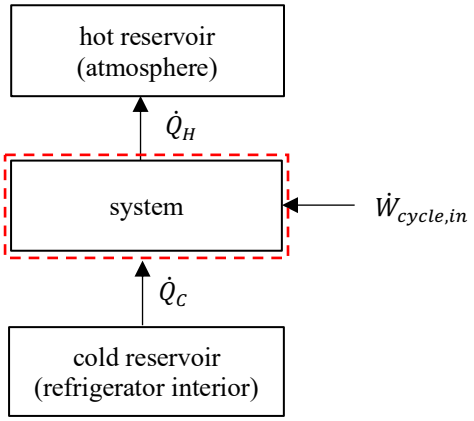
A refrigerator steadily receives a power input of 0.15 kW while rejecting energy by heat transfer to the surroundings at a rate of 0.6 kW.

a. Determine the rate at which energy is removed by heat transfer from the refrigerated space.
b. Determine the refrigerator's coefficient of performance.

SOLUTION:



Apply the 1st Law to the system to determine the rate at which heat is transferred from the refrigerator interior into the system,

$$\dot{W}_{cycle,in} = \dot{Q}_H - \dot{Q}_C, \quad (1)$$

$$\dot{Q}_C = \dot{Q}_H - \dot{W}_{cycle,in}. \quad (2)$$

Using the given data,

$\dot{Q}_H = 0.6$ kW,

$\dot{W}_{cycle,in} = 0.15$ kW,

⇨ $\underline{\dot{Q}_C = 0.45 \text{ kW}}$.

The coefficient of performance for a refrigeration cycle is,

$$COP_{ref} = \frac{\dot{Q}_C}{\dot{W}_{cycle,in}}. \quad (3)$$

Using the given data,

$\boxed{COP_{ref} = 3.0}$.