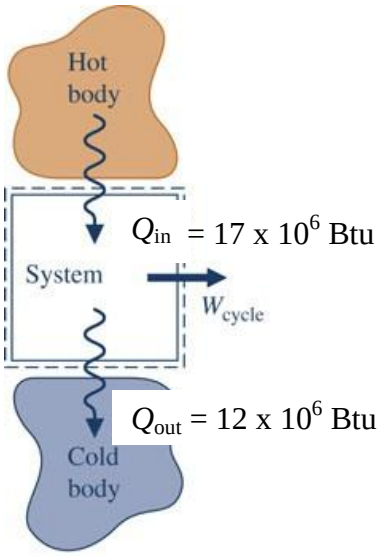
Problem 2.83

For a power cycle operating as in fig. 2.17a, $Q_{in}$ = 17 x $10^6$ Btu and $Q_{out}$ = 12 x $10^6$ Btu. Determine $W_{cycle}$, in Btu, and $\eta$.




$$W_{cycle} = Q_{cycle} = Q_{in} - Q_{out}$$

$$= (17 \times 10^6) - (12 \times 10^6) = 5 \times 10^6 \text{ Btu}$$ ←

$$\eta = \frac{W_{cycle}}{Q_{in}} = \frac{5 \times 10^6 \text{Btu}}{17 \times 10^6 \text{Btu}} = 0.294 \ (29.4\%)$$ ←

Alternatively

$$\eta = 1 - \frac{Q_{out}}{Q_{in}} = 1 - \frac{12 \times 10^6}{17 \times 10^6} = 0.294$$