

22. With $T_L = 290$ K, we find

$$\varepsilon = 1 - \frac{T_L}{T_H} \implies T_H = \frac{T_L}{1 - \varepsilon} = \frac{290 \text{ K}}{1 - 0.40}$$

which yields the (initial) temperature of the high-temperature reservoir: $T_H = 483$ K. If we replace $\varepsilon = 0.40$ in the above calculation with $\varepsilon = 0.50$, we obtain a (final) high temperature equal to $T'_H = 580$ K. The difference is

$$T'_H - T_H = 580 \text{ K} - 483 \text{ K} = 97 \text{ K} .$$