Kelvin and Absolute Temperature scale

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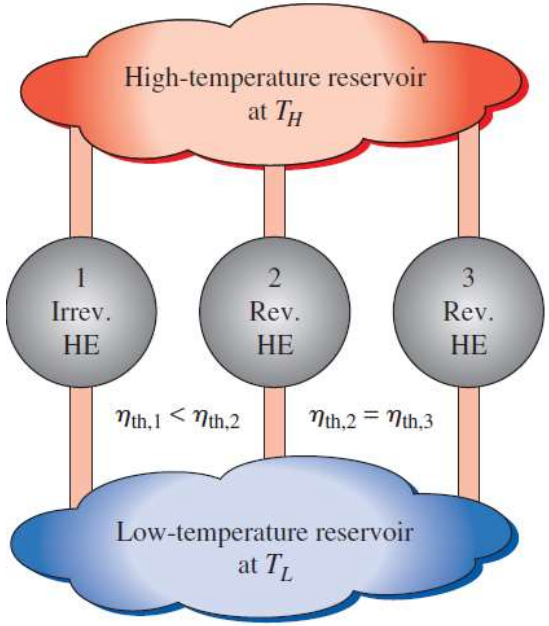
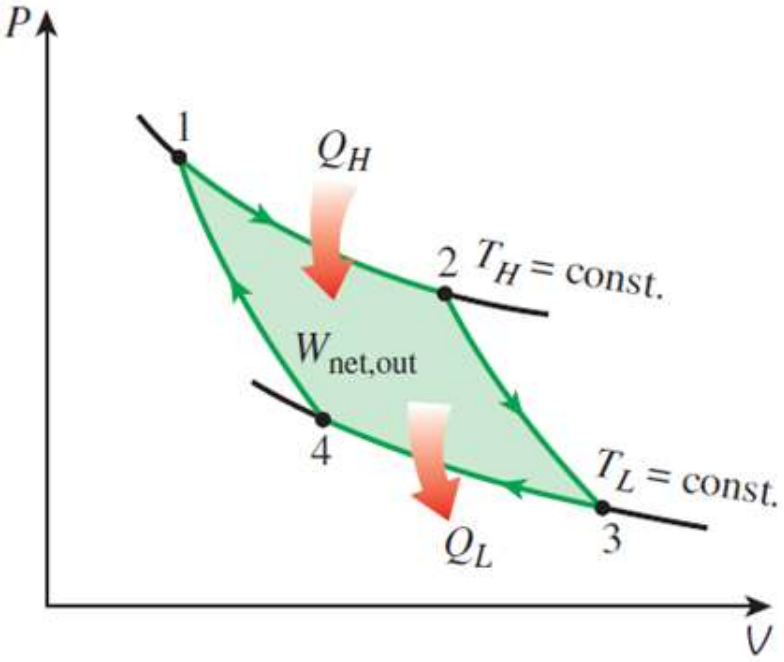
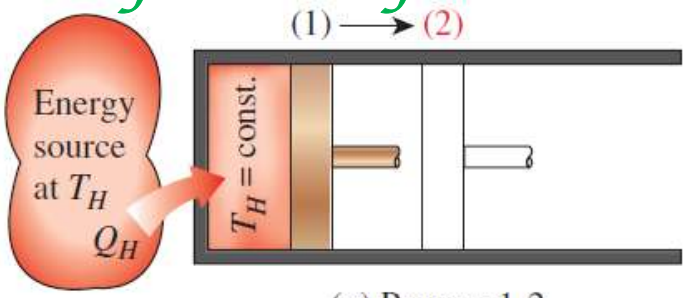
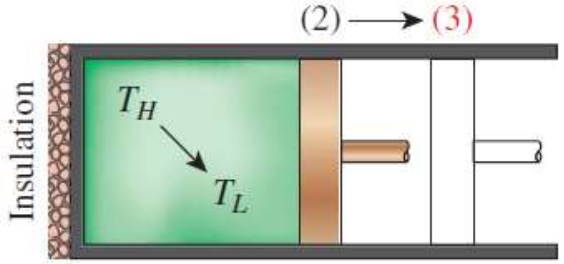
Previous Lecture: Carnot principles & Cycle

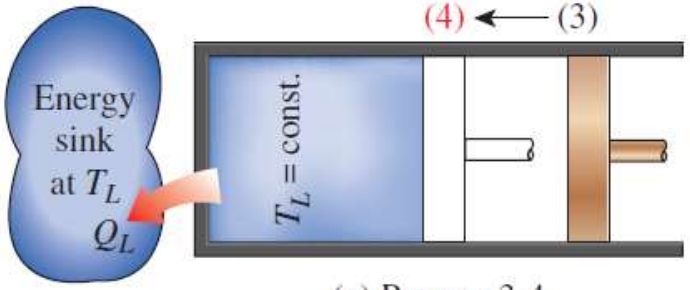




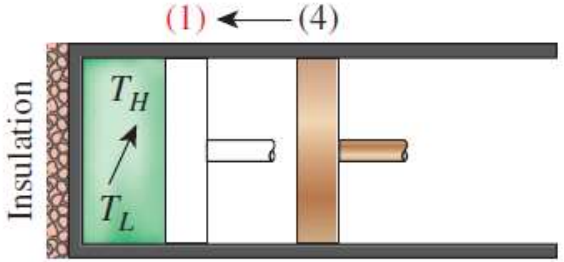


(*a*) Process 1-2





(*c*) Process 3-4



(*d*) Process 4-1

Implication of Carnot's second principle

$$\eta_{th,rev} = g(T_H, T_L) \qquad \eta_{th} = 1 - Q_L/Q_H$$

$$\frac{Q_H}{Q_L} = f(T_H, T_L)$$

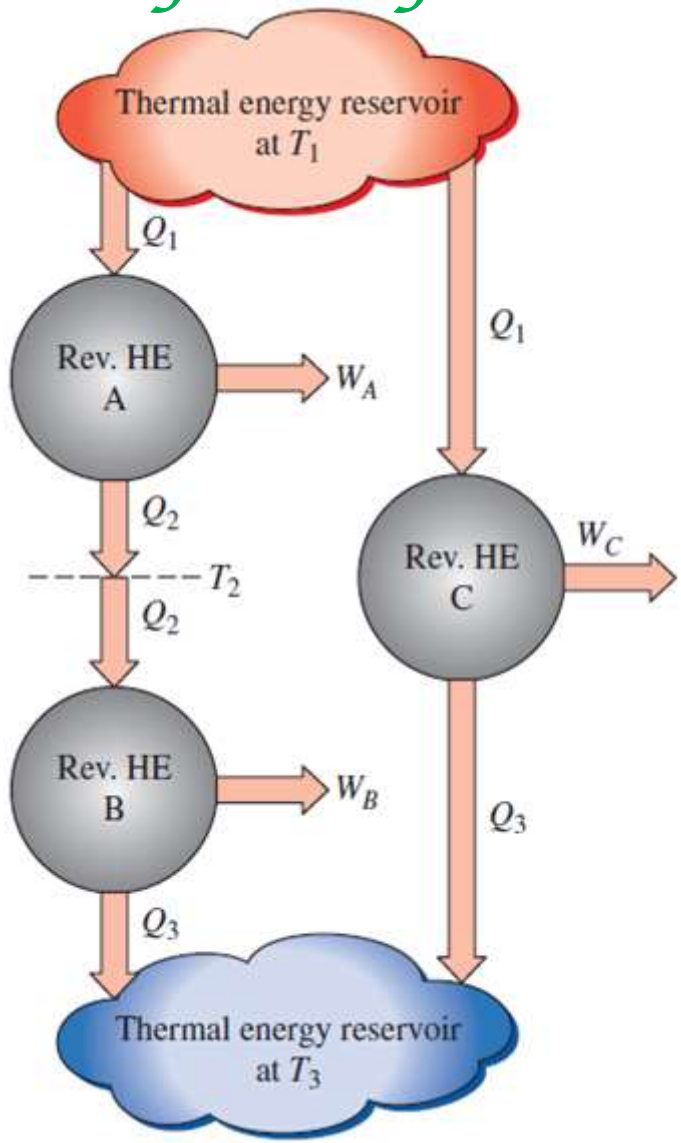
$$\frac{Q_1}{Q_2} = f(T_1, T_2), \quad \frac{Q_2}{Q_3} = f(T_2, T_3), \quad \text{and} \quad \frac{Q_1}{Q_3} = f(T_1, T_3)$$

$$\frac{Q_1}{Q_3} = \frac{Q_1}{Q_2}\frac{Q_2}{Q_3}$$

$$f(T_1, T_3) = f(T_1, T_2) \cdot f(T_2, T_3)$$

$$f(T_1, T_2) = \frac{\phi(T_1)}{\phi(T_2)} \qquad f(T_2, T_3) = \frac{\phi(T_2)}{\phi(T_3)}$$

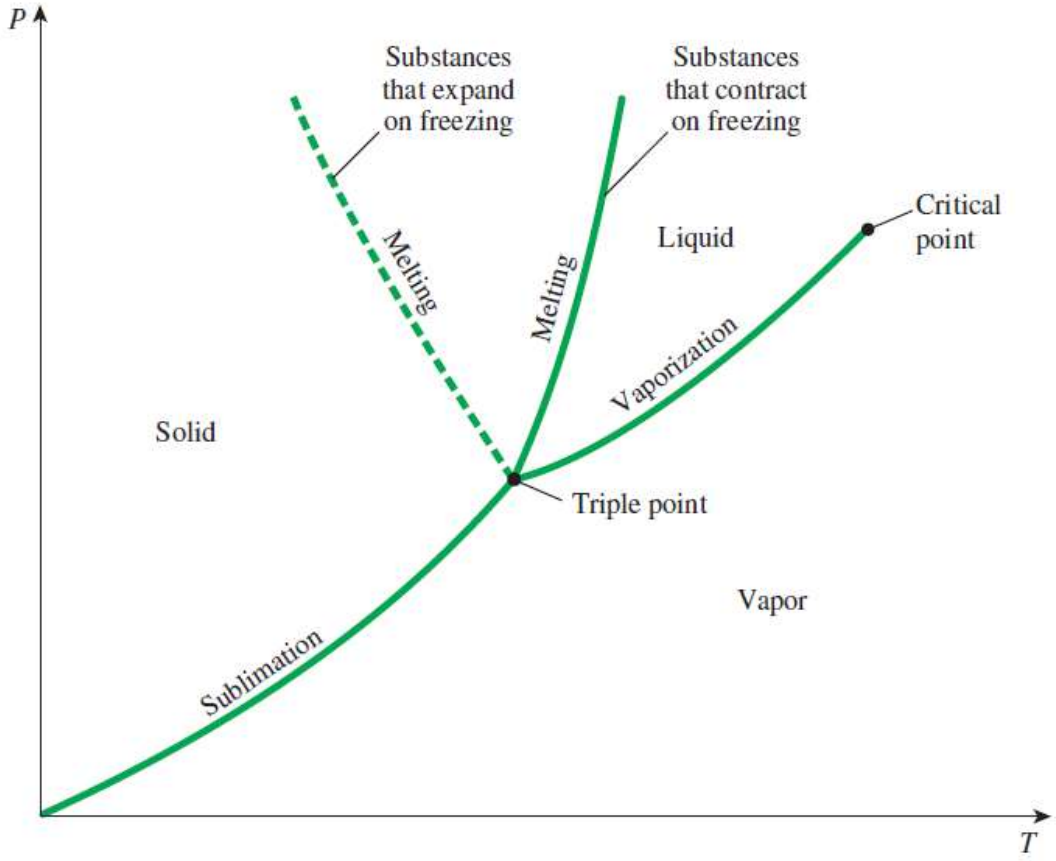
$$\frac{Q_1}{Q_3} = f(T_1, T_3) = \frac{\phi(T_1)}{\phi(T_3)}$$

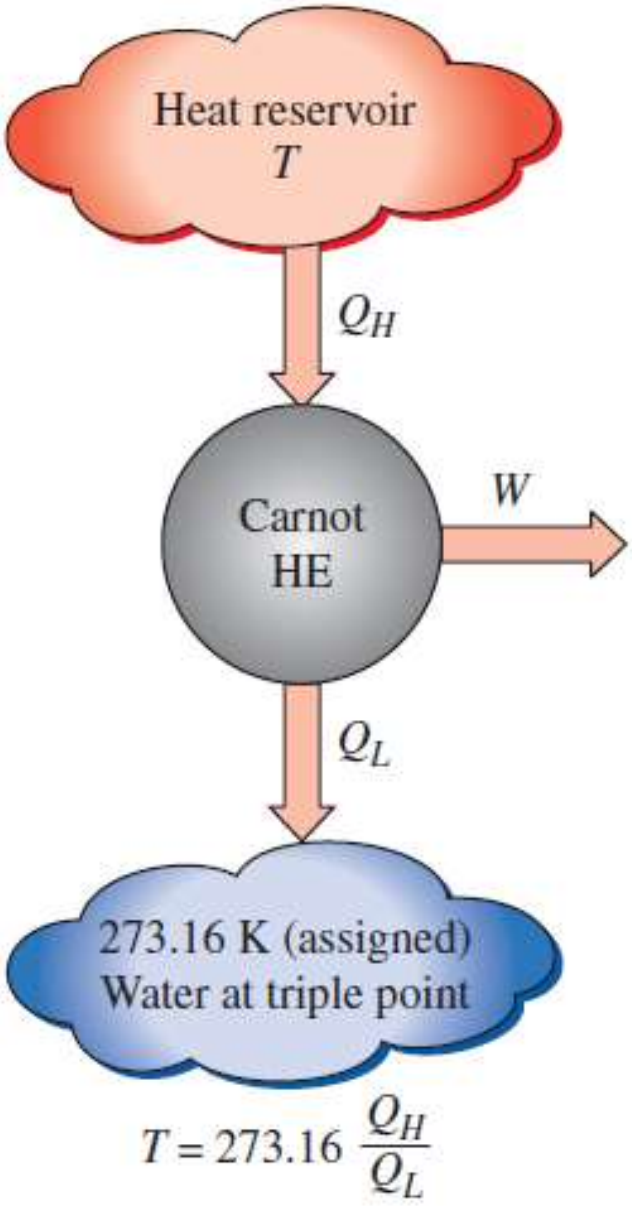


$$\left(\frac{Q_H}{Q_L}\right)_{rev} = \frac{T_H}{T_L}$$

Kelvin Scale & Absolute Temperatures

$$\left(\frac{Q_H}{Q_L}\right)_{\text{rev}} = \frac{T_H}{T_L}$$





$$T = 273.16\,\frac{Q_H}{Q_L}$$

$$T(^\circ\text{C}) = T(\text{K}) - 273.15$$

What's next?

- Carnot heat engine