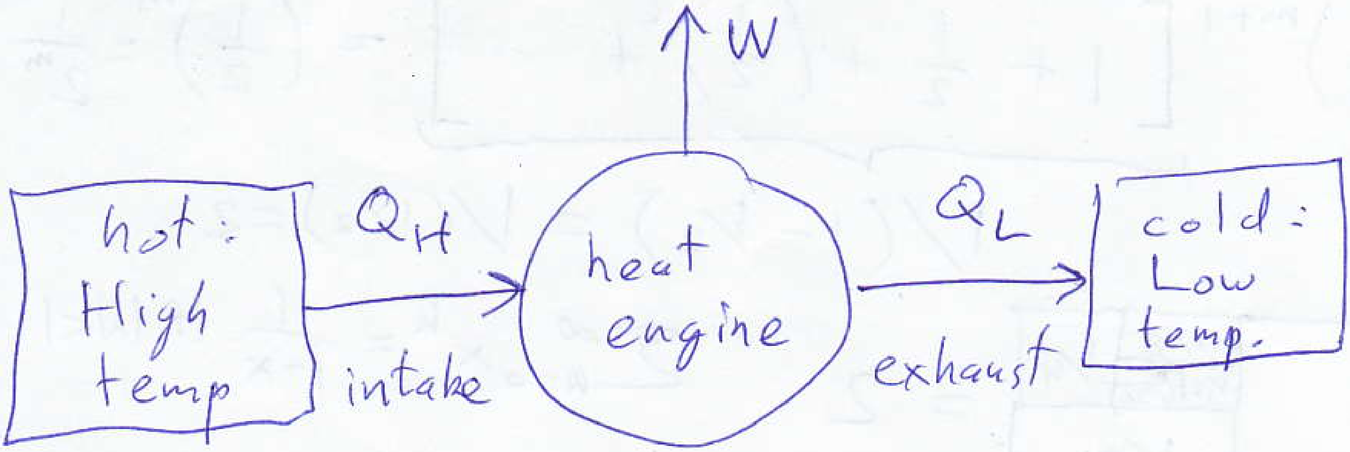
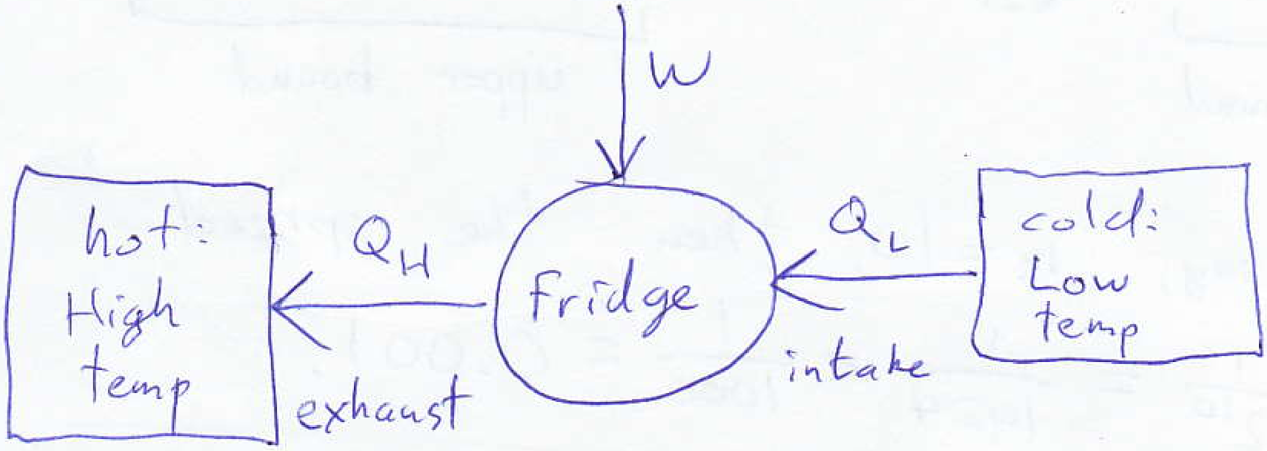


$$Q_H = W + Q_L$$



$$\frac{Q_{exhaust}}{Q_{intake}} \geq \frac{T_{exhaust}}{T_{intake}} \qquad \text{(2nd Law)}$$

equivalently: $$\frac{Q_{exhaust}}{T_{exhaust}} \geq \frac{Q_{intake}}{T_{intake}}$$

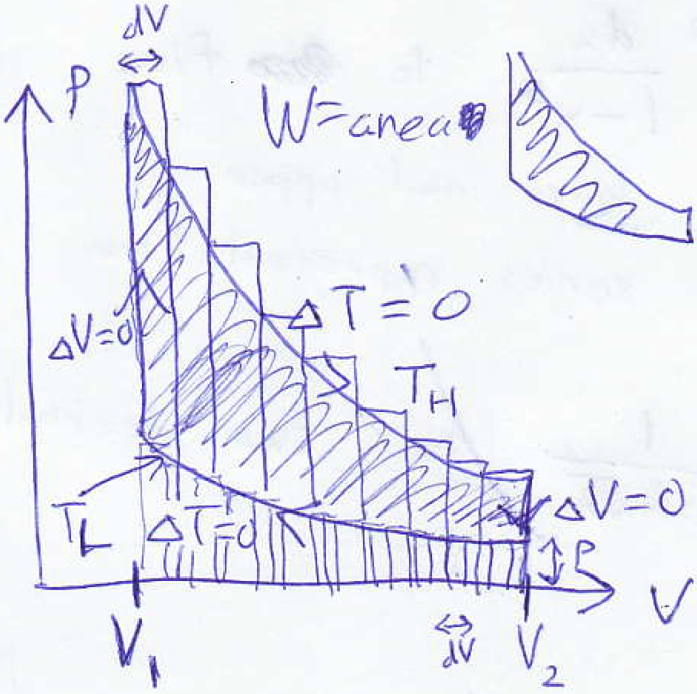
$$\underbrace{\Delta S_{universe}}_{\text{entropy}} = \frac{Q_{exhaust}}{T_{exhaust}} - \frac{Q_{intake}}{T_{intake}} \geq 0$$

heat engine: $\Delta S = \frac{Q_L}{T_L} - \frac{Q_H}{T_H} \geq 0$

refridgerator: $\Delta S = \frac{Q_H}{T_H} - \frac{Q_L}{T_L} \geq 0$

Carnot: $\Delta S = 0$; reversible

In practice, we can't reverse our heat engines or refridgerators.



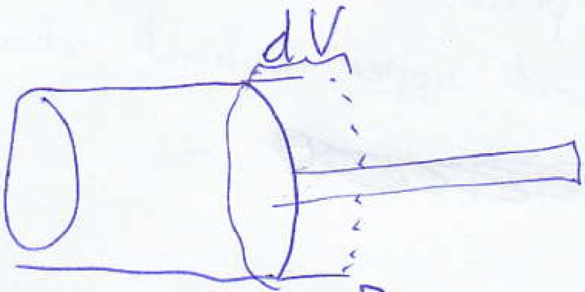
$$Pa = \frac{N}{m^2} = \frac{kg \cdot m/s^2}{m^2}$$

$$Pa \cdot m^3 = \frac{N}{m^2} \cdot m^3 = N \cdot m$$

$$N \cdot m = kg(m/s^2)m$$

$$N \cdot m = kg\, m^2/s^2 = J$$

$$dW = P\,dV$$



HW: Assuming an ideal monoatomic gas, find a formula for work W done per cycle by the Stirling engine above, using T_L, T_H, V_1, V_2.

Then get a formula for its efficiency.

Final: 8AM, May 12