Law's of Thermodynamics

Zeroth Law

Two systems that are in thermal equilibrium with a third system are in thermal equilibrium with each other.

First Law

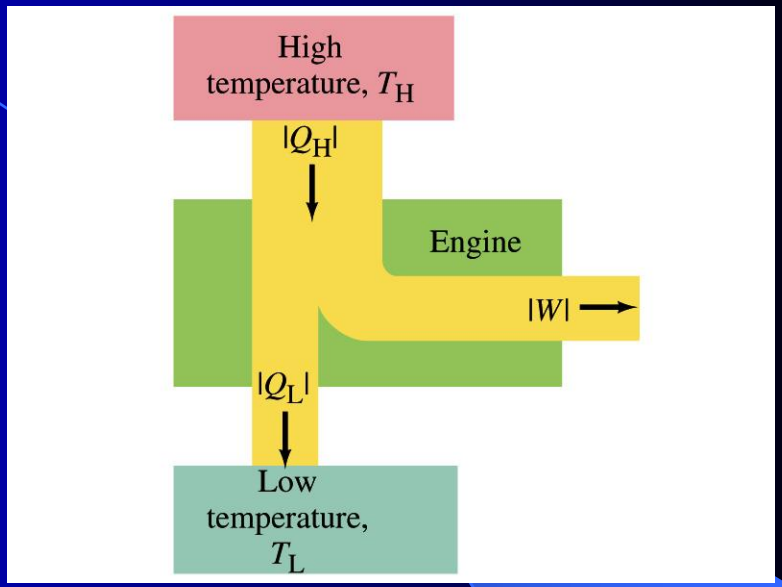
When heat Q is added to a system and work W is done by the system, the internal energy U changes by $\Delta U=Q-W$. The change in internal energy is path independent.

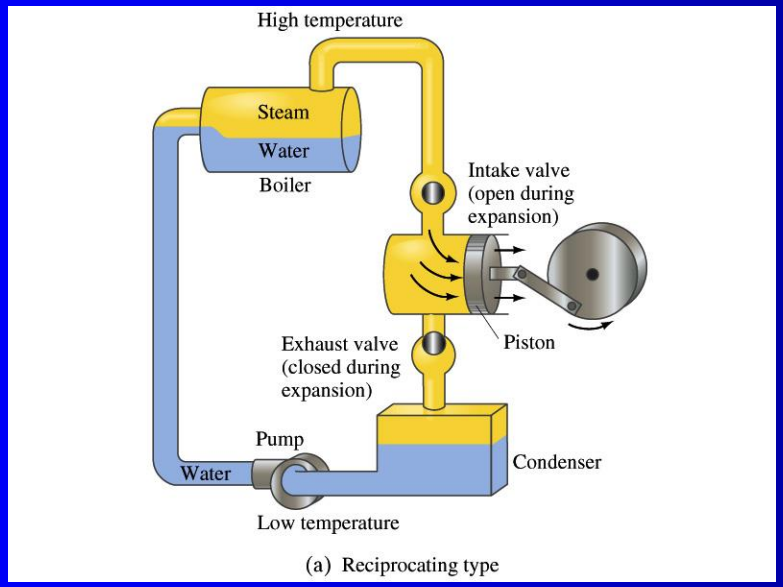
Second Law

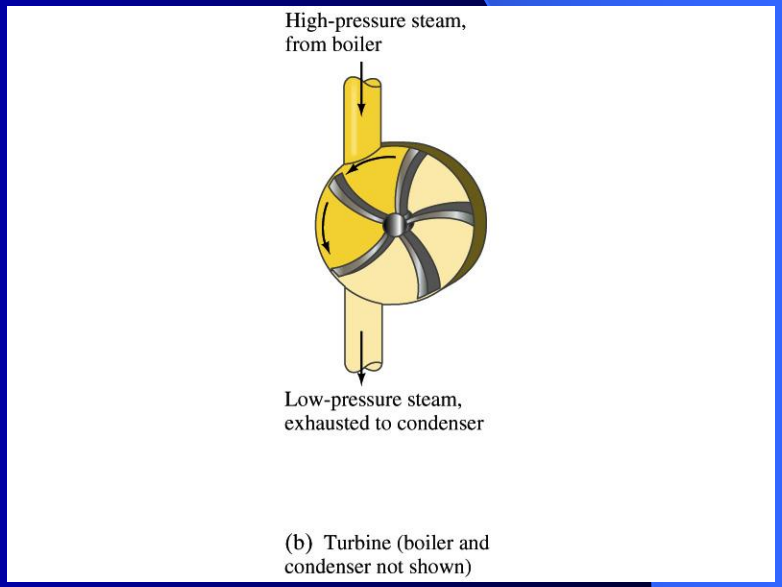
a) One cannot convert heat to work at 100% efficiency
b) One cannot transfer heat from a cooler to a hotter object
c) The entropy of an isolated system never decreases

A Heat Engine

Thermal efficiency:
$E=W/Q_H$

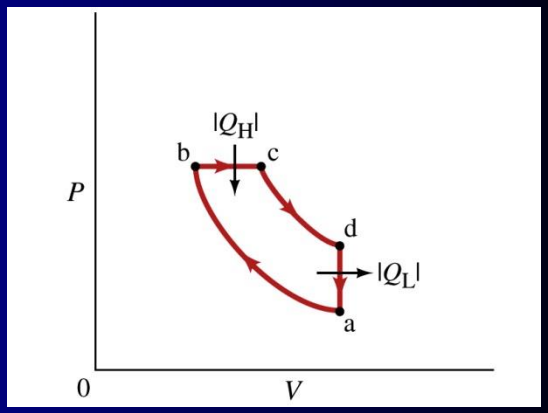


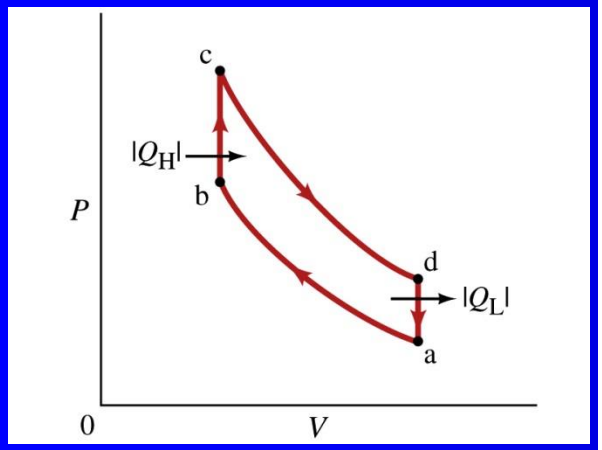


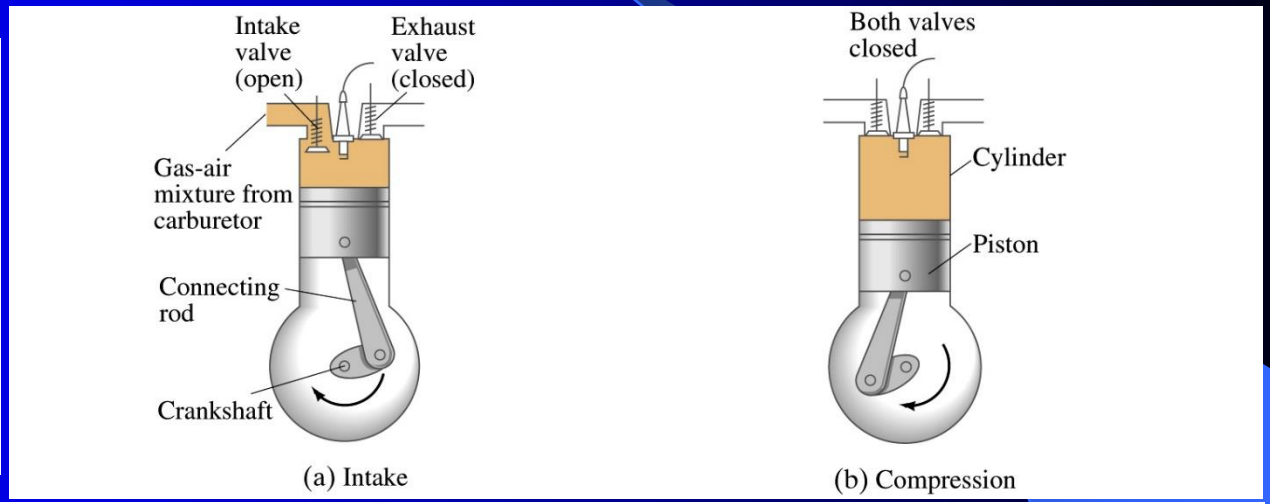


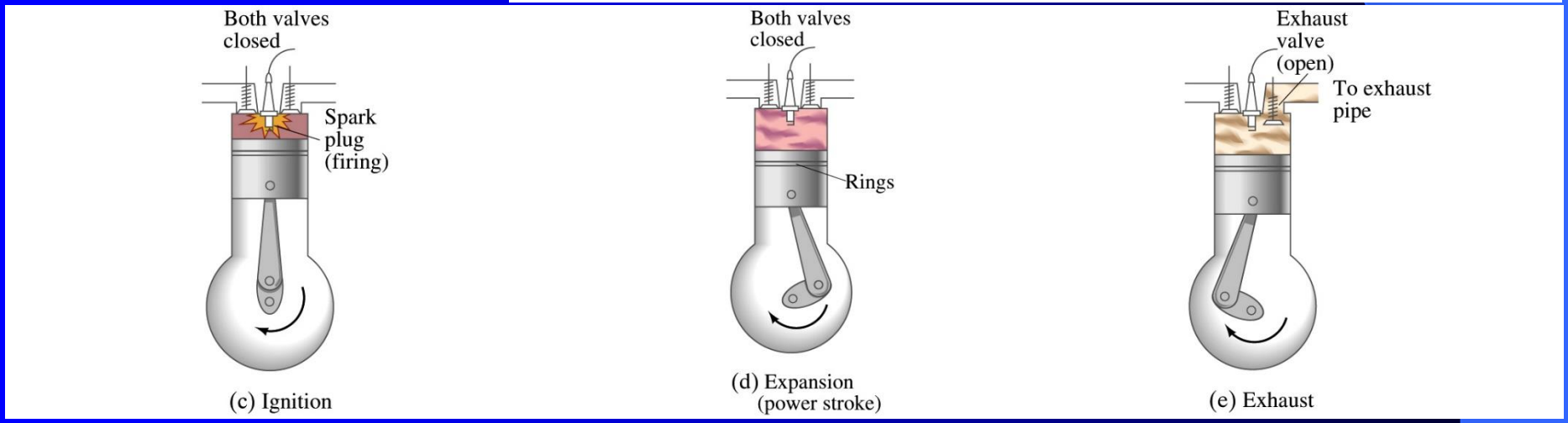
Internal Combustion Engine

Otto Cycle, there also is Diesel Cycle



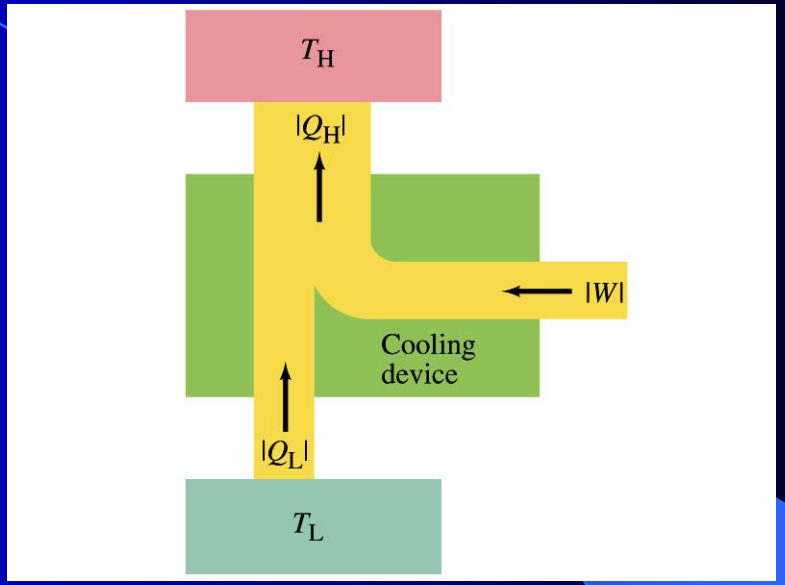


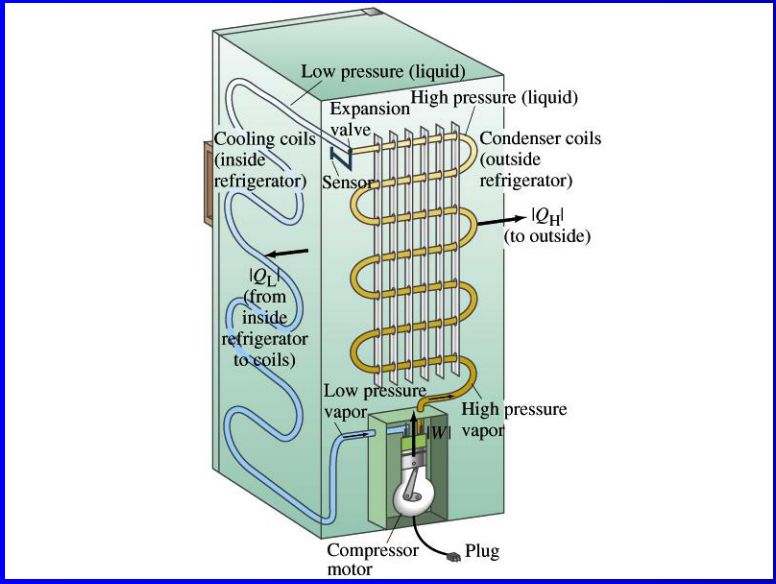


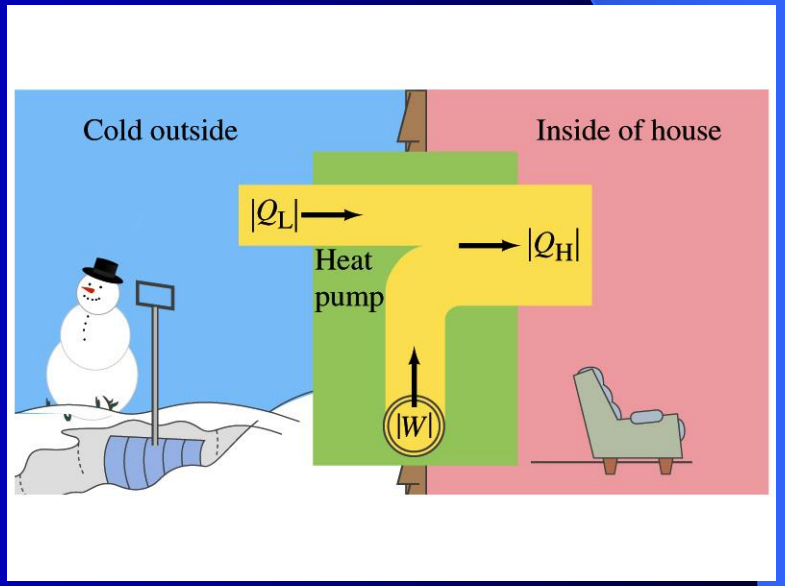


Refrigeration

Performance Coefficient:
$K=Q_H/W$







Entropy

Entropy S is a quantitative measure of disorder

$\Delta S = S_1 - S_2 = Q/T$