Laws of Thermodynamics

0. Concept of Temperature - Equivalence Relation
1. Energy Conservation (can't win) PPM1
2. Entropy (can't break) PPM2
3. Absolute zero temperature

Definitions

Thermodynamics - phenomenological description of equilibrium properties of macroscopic systems. (treat system like a black box)
do not change with time (scale dependent)

Statistical Mechanics - probabilistic approach to equilibrium properties of a large number of degrees of freedom.

Heat - energy that flows spontaneously from hot to cold.

Adiabatic - (walls) do not allow heat to flow, insulating as opposite to diathermal.

- (processes) "slow" & "reversible" system always near equilibrium, "friction less"
Non-adiabatic example

Joule-Kelvin Expansion

Before

After

no equilibrium state

Zeroth Law

If two systems (A + B) are each separately in thermal equilibrium with a third system (C), then A + B are in thermal equilibrium with each other.

\[ T_A = T_C \quad \rightarrow \quad T_A = T_B \]

Weight_A = Weight_B