## Laws of thermodynamics

The four laws of thermodynamics define fundamental physical quantities (temperature,energy, and entropy) that characterize thermodynamic systems. The laws describe how these quantities behave under various circumstances, and forbid certain phenomena (such as perpetual motion).

The four laws of thermodynamics are:

- Zeroth law of thermodynamics: If two systems are in thermal equilibrium with a third system, they must be in thermal equilibrium with each other. This law helps define the notion of temperature.
- First law of thermodynamics: Heat and work are forms of energy transfer. Energy is invariably conserved but the internal energy of a closed system changes as heat and work are transferred in or out of it. Equivalently, perpetual motion machines of the first kind are impossible.
- Second law of thermodynamics: The entropy of any isolated system not in thermal equilibrium almost always increases. Isolated systems spontaneously evolve towards thermal equilibrium—the state of maximum entropy of the system—in a process known as "thermalization". Equivalently, perpetual motion machines of the second kind are impossible.

 Third law of thermodynamics: The entropy of a system approaches a constant value as the temperature approaches zero. The entropy of a system at absolute zero is typically zero, and in all cases is determined only by the number of different ground states it has. Specifically, the entropy of a pure crystalline substance at absolute zero temperature is zero.