ISSN NO: 2770-4491
Date of Publication:30-10-2022

Subject and Laws of Thermodynamics

Sobirova Mohiniso
A student of the Faculty of Pharmacy of Samarkand State Medical University.

Annotation: This article contains information about the definition of thermodynamics, laws of thermodynamics, thermodynamic system, and thermodynamic balances. Each law of thermodynamics is discussed separately.

Key words: Thermodynamics, energy conservation law, heat energy, atom, molecule, R. Mayer, R. Clausius, Thermodynamic potential

Thermodynamics (Greek: thermo-hot, dynamis - force) is the science of general properties of macroscopic systems in a state of thermodynamic equilibrium and transitions between these states. T. is built on the basis of fundamental laws and principles. The first main law of thermodynamics is the law of conservation of energy of the system, according to which, basically, the system can perform work at the expense of its internal energy or some external energy source. Yu. Described by R. Mayer. G. Helmholtz gave a more precise form (1874). The second main law of thermodynamics is as follows: thermal energy is not fully converted into work during the process of conversion, heat cannot transfer from a cold system to a hot system by itself. This law was described by R. Clausius (1850). According to this law, any machine cannot fully convert the transferred heat into work, a certain part of the heat remains in the refrigerator. The third main law of thermodynamics determines the absolute value of entropy; Also called Nernst's law of heat. According to this law, any temperature at which the entropy S of an arbitrary system tends to absolute zero reaches its last limiting value in thermodynamics, independent of pressure and density. In 1911, M. Planck expressed this law as follows: when the temperature tends to absolute zero, the entropy of the system also tends to zero. It is divided into Thermodynamics of irreversible processes, which studies irreversible processes with the help of laws.

A thermodynamic system is a physical system consisting of a large number of particles - atoms and molecules - interacting and exchanging energy. Optional heat machine. An example of a thermodynamic system. The state of the thermodynamic system is determined by macroscopic parameters such as volume, pressure, and temperature. Thermodynamic equilibrium is the state of the thermodynamic system; where all the parameters describing the system have definite values, and these values will remain unchanged for as long as the external environment does not change. Any irreversible processes such as heat conduction and diffusion stop in the system that has reached thermodynamic equilibrium. Depending on the interaction of the system with the external environment, its

It can be determined that the state of thermodynamic equilibrium has been reached by the limit values of various physical quantities in the observed conditions. Mac, in a system adiabatically isolated from the environment, entropy will have the greatest possible value; the free energy for the system at the thermostat takes the smallest value; Gibbs thermodynamic potential for a system in a thermostat under the influence of constant external pressure reaches its smallest value.

Reversible processes are physical processes that occur first in one direction and then in the opposite direction, and when the system returns to its initial state, there is no change in the external environment. All purely mechanical processes occurring under ideal conditions (without friction and inelastic shock) are reversible. A certain part of the energy is converted into heat energy in the conditions of absolute friction and absolutely elastic collisions. The process, which depends on the heat movement with infinite slowness, consists of a continuous series of successive equilibrium states and is reversible. In real conditions, any process occurs at a finite speed and decays due to energy dissipation. The theory of feedback processes is studied in statistical physics.

Irreversible processes are physical processes that spontaneously occur in a system in only one direction when the equilibrium is disturbed. Diffusion, heat conduction, expansion of a gas over a certain volume, and other phenomena are examples of irreversible processes. All irreversible processes consist of a continuous series of successive non-equilibrium states. If Irreversible processes have occurred in systems, it cannot be

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returned to its initial state without causing any change in the external environment. In general, all real processes occurring in nature consist of irreversible processes. Irreversible processes can occur in Berk systems, as a result of which the entropy of the system only increases.

Conclusion: This article provides information on the definition and laws of thermodynamics, the movement of atoms and molecules in a thermodynamic system under the influence of heat, and thermodynamic equilibrium. In addition, information is provided on reversible and irreversible processes.

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