

Thermodynamic equilibrium

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What is thermodynamics?

Thermodynamics is the branch of science, which studies heat and its relation with energy and work. It concerns measures such as entropy, temperature, internal energy, and pressure and explains how they are related and by what laws they change with time. It is concerned with the large scale response of systems, which can be observed and measured.

Thermodynamics in medicine

Thermodynamic equilibrium in medicine is observed in the biochemistry of the body, having as principal focus the chemical equilibrium. In the medical approach, thermodynamics concerns itself with the study of internal biochemical dynamics, as ATP hydrolysis, protein solubility, DNA binding, membrane diffusion, enzyme kinetics etc. Also, thermodynamics can be seen for example in metabolic processes, which are chemical reactions and these often involve generation of heat. Living organisms, however, do not follow all the laws of thermodynamics. Organisms are open systems and exchange matter and energy with their surroundings. This means that living systems are not in equilibrium, but instead are scattered (WHAT DO YOU MEAN BY SCATTERED?) systems that maintain their state of high complexity.

Thermodynamic equilibrium

The state of a system in which properties have definite, unchanged values as long as external conditions are unchanged is called an equilibrium state. A thermodynamic system is said to be in a thermodynamic equilibrium if it is in a chemical equilibrium, mechanical equilibrium, radiative equilibrium, and thermal equilibrium; so when the relevant parameters cease to vary with time. A type of equilibrium, which is often not mentioned, is hydraulic equilibrium, which is crucial in living systems. For example, two adjacent cells taking in consideration their proximity often are extremely close to thermal equilibrium and hydraulic equilibrium. Hydraulic equilibrium is usually only achieved at a rapid approach due to the membrane permeability of cells and osmosis. In equilibrium there exists a state of balance. This balance in thermodynamics means there are no phase changes, or unbalanced potentials within the system.

Transition from non-equilibrium to equilibrium

A body's spontaneous behavior is to evolve towards its own internal state of thermodynamic equilibrium, if it is in a non-equilibrium state of diversity or chemical non-equilibrium, and is has no surroundings (isolated). It is not necessary that all aspects of internal thermodynamic equilibrium be reached simultaneously; some can be established before others.