

## Thermodynamics:

Thermodynamics deals with the energy change of a system containing many molecules. Laws of thermodynamics apply when a system moves from one equilibrium state to another equilibrium state.

## Terminologies:

*System:* A system refers to the part of the universe which we observe for a duration to study the changes that occur.

*Surroundings:* Everything except a system in the universe is considered as surroundings.

For example, if we add sugar to the water in a container, the water-sugar mixture in the container is our system, and everything except the system is our surroundings.

Systems can have either real or imaginary *physical boundaries*, which separate systems from their surroundings.

## Types of Systems:

*Open systems:* can exchange both energy and mass with the surroundings

*Closed systems:* can exchange only energy with the surroundings

*Isolated systems:* can exchange neither energy nor mass with the surroundings.

## State Variables:

State variables are thermodynamics parameters used to describe the state of a system. Pressure, Volume, Temperature are examples of state variables. These are bulk or macroscopic properties of the system. All of them can't be varied independently. Once we fix a minimum number of variables, others will also be dependent on those and the state can be completely defined. These variables don't depend on the path through which the state is being achieved.

On the other hand, the state of the surroundings can never be completely specified.

## Extensive and Intensive variables:

*Extensive Variables:* depend on the size of the system. The value obtained will be doubled if we double the size of the system. Example: volume, mass

*Intensive variables:* don't depend on the size of the system. Example: density, temperature, pressure

NB: systems can exchange energy with surroundings in two ways: *heat* and *work*