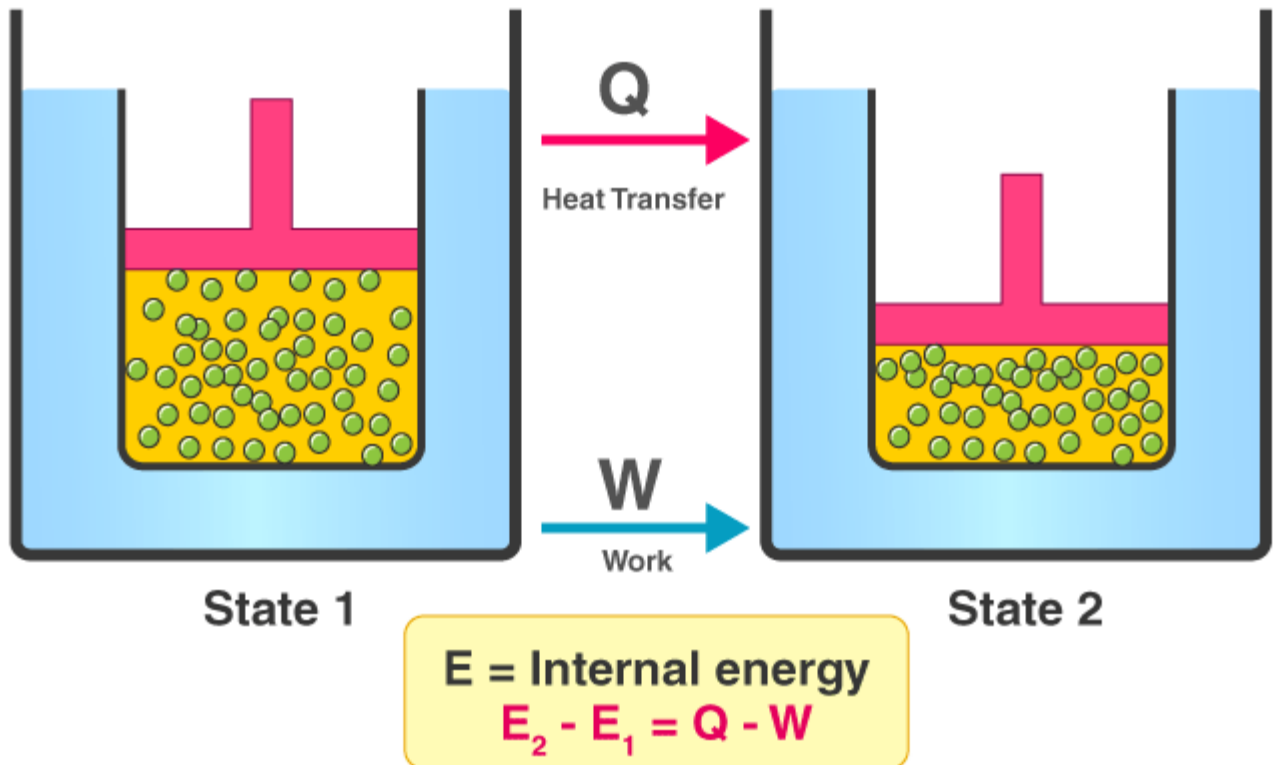


First Law of Thermodynamics

Before we get into the first law of thermodynamics we need to understand the relation between heat and work and the concept of internal energy. Just like mass, energy is always conserved i.e. it can neither be created nor destroyed but it can be transformed from one form to another. Internal energy is a thermodynamic property of the system that refers to the energy associated with the molecules of the system which includes kinetic energy and potential energy.

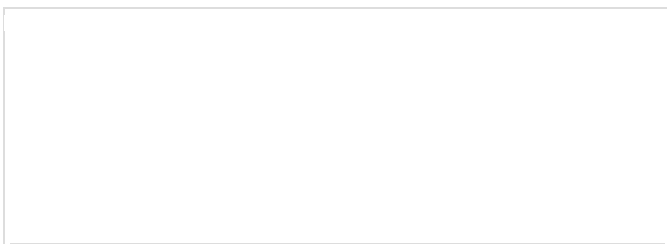
Whenever a system goes through any change due to interaction of heat, work and internal energy, it is followed by numerous energy transfer and conversions. However, during these transfers, there is no net change in the total energy. Similarly, if we look at the first law of thermodynamics it affirms that heat is a form of energy. What it means is that the thermodynamic processes are governed by the *principle of conservation of energy*.

What is the First Law of Thermodynamics?



A thermodynamic system in an equilibrium state possesses a state variable known as the internal energy (E). Between two systems the change in the internal energy is equal to the difference of the heat transfer into the system and the work done by the system.

The first law of thermodynamics states that the energy of the universe remains the same. Though it may be exchanged between the system and the surroundings, it can't be created or destroyed. The law basically relates to the changes in energy states due to work and heat transfer. It redefines the conservation of energy concept.



First Law of Thermodynamics

The First Law of Thermodynamics states that heat is a form of energy, and thermodynamic processes are therefore subject to the principle of conservation of energy. This means that heat energy cannot be created or destroyed. It can, however, be transferred from one location to another and converted to and from other forms of energy.

First Law of Thermodynamics Equation

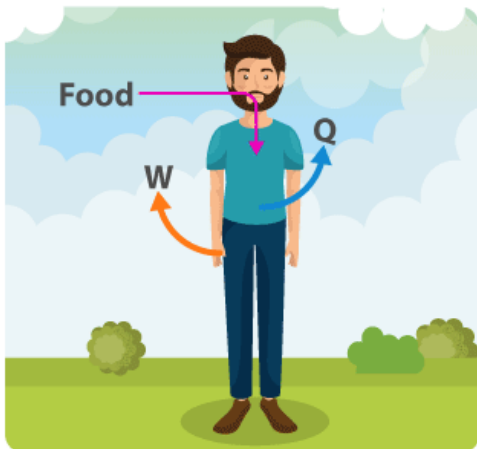
The equation for the first law of thermodynamics is given as;

$$\Delta U = q + W$$

Where,

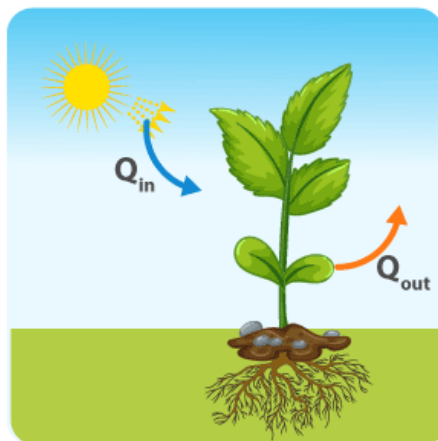
- ΔU = change in internal energy of the system.
- q = algebraic sum of heat transfer between system and surroundings.
- W = work interaction of the system with its surroundings.

$$\Delta U = -Q - W + \text{Food energy}$$



(a)

$$\Delta U = \text{Stored food energy}$$



(b)