Thermodynamics

Extensive thermodynamics variable :-> Extensive variable depends on the Size or mass of the system.

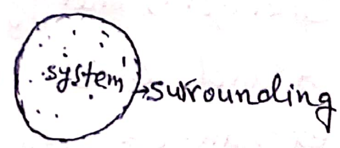
Example: Volume, total mass, entropy, internal energy, heat capacity etc.

Intensive thermodynamic variable :-> Intensive variable do not depends on the size or mass of the system.

Example: Temperature, Pressure, Specific heat capacity, density etc.

System :-> The region within the arbitrary boundary and on which attention is focused is called system.

Surrounding :-> The area outside the system.



system + surrounding = Universe

Close system :-> No exchange of matter between the system and its surroundings is called close system.

open system :-> Exchange of matter between the system and its surroundings is called open system.

Equilibrium state :-> A state of the system in which the coordinate X, Y have definite values and remain constant.

Let us consider a system of constant mass and uniform composition remain constant pressure and volume are independent variables.

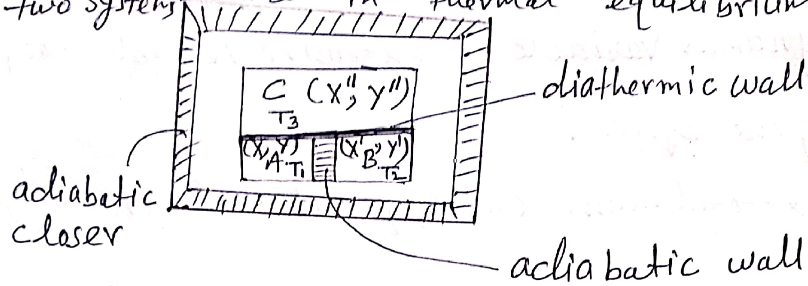
In general [X, Y] remain constant.

(i) In thermal equilibrium temperature remain constant

(ii) In mechanical equilibrium pressure is uniform throughout the system.

(iii) In chemical equilibrium chemical composition of the system remain constant.

Zeroth Law of thermodynamics :- Zeroth law states that if two thermodynamic systems are both in thermal equilibrium with a third system then the two systems are in thermal equilibrium with each other.



let us consider (X, Y), (X', Y') and (X'', Y'') are the parameters of the system A, B and C respectively.

A, B and C are separated by diathermic wall.

The system C is separated from system A and B by a diathermic wall.

Therefore, energy can be exchanged between system A and C, both A and C are in thermal equilibrium. Similarly energy can be exchanged between the system B and C, so both B and C are also in thermal equilibrium.

According to the zeroth law if system A is in thermal equilibrium with system C, then

Temperature of system A (T_1) = Temperature of system C (T_3) —(1)

Similarly, if system B is in thermal equilibrium with system C, then

Temperature of system B (T_2) = Temperature of system C (T_3) —(2)

Now from above relation, we have

Temperature of system A (T_1) = Temperature of system B (T_2)

i.e $T_1 = T_3$, and $T_2 = T_3$ then $T_1 = T_2$.