

- Thermodynamics -

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Thermodynamics is the science which deals with energies possessed by gases and vapours, their conversion in terms of heat and work and their relationship with properties of system.

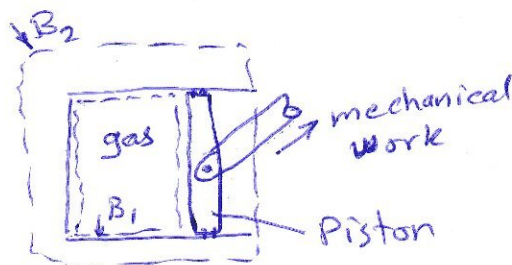
OR Thermodynamics is the science which deals with the relationship between heat, work and the properties of matters (gases and vapours).

It is concerned with the means necessary to convert heat energy from available sources such as chemical fuels or nuclear piles into mechanical work.

* Thermodynamic system:

It refers to any space or to any matter or group of matters within prescribed boundary which may be real or imaginary.

Surrounding is everything outside the boundaries of the system.



B₁: real boundary

B₂: imaginary boundary

* Types of thermodynamic systems:

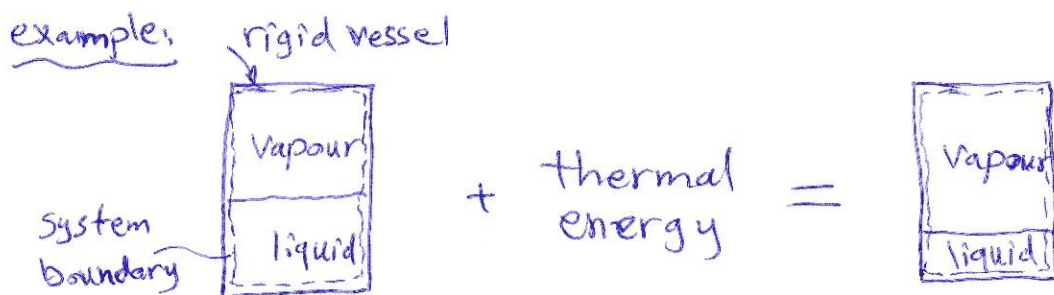
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Thermodynamic systems may be classified into three types:

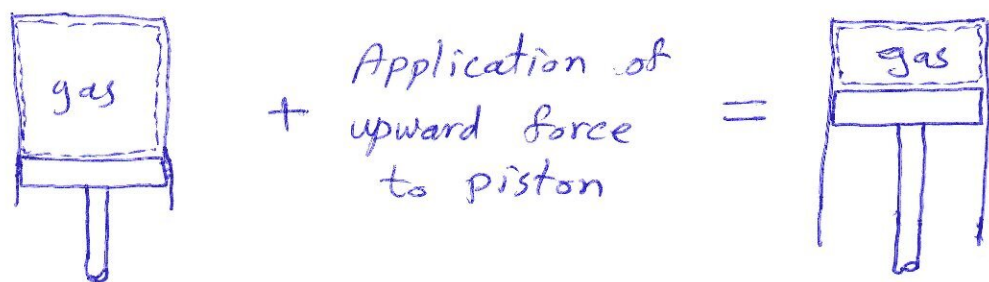
1. Closed system.
2. Open system.
3. Isolated system.

1. Closed system:

In a closed system, no mass crosses the system boundaries and transfer of energy may take place at the boundaries.



(closed system with constant volume)

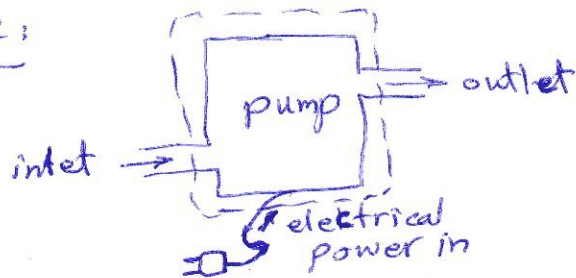


- closed system with non-constant volume -

2. Open system:

In an open system, mass does cross the system boundaries and transfer of energy may take place at the boundaries.

example:



open system

If the mass of substance entering per unit time is constant and equal to the mass leaving per unit time then the mass of the system remains constant, the system is termed a steady flow system.

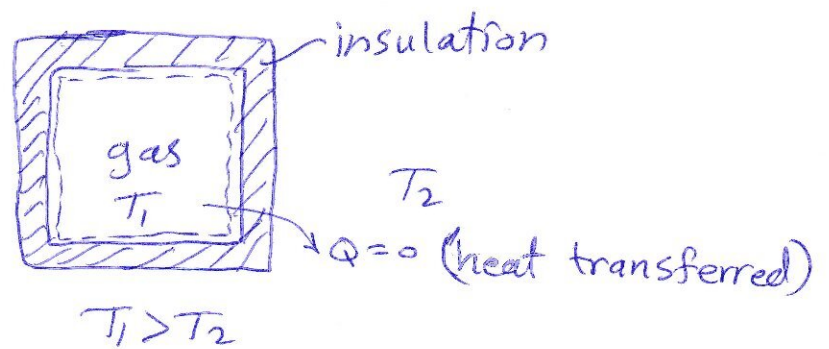
Steady flow: rate of mass transfer is constant
 unsteady flow: rate of mass transfer is not constant

* working fluid: is a matter contained within the boundaries of the system can be liquid, vapour or gas.

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3. Isolated system:

It is not influenced by the surroundings, and in this system neither the mass nor the energy crosses the boundary of the system.



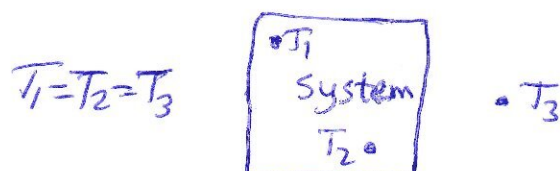
- Isolated system -

* Thermal equilibrium:

It means that there is no temperature gradient either within the system or between the system and its surroundings.

There are various types of equilibrium are:

1. Mechanical equilibrium. (no unbalancing forces)
2. Thermal equilibrium. (no temperature gradient)
3. Chemical equilibrium. (no reaction)



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* Properties of a system:

Property is any characteristic of a working fluid such as pressure, Volume, temperature, enthalpy, internal energy, entropy....

Specific properties are defined as properties per unit mass, for example, specific volume is volume of a substance per unit mass.

* State of a system:

It is defined by thermodynamic properties of the system at that state.

* Process:

A process is a path of a state points occurring when a system changes its state by external influence.

