

State of a system When macroscopic properties of a ^③ system have definite values, the system is said to be in definite state.

State variables → The state of a system changes with change in any of the macroscopic properties, these properties are called state variables. eg P, V, T, n and composition

$$PV = RT \text{ for 1 mole ideal gas.}$$

$$R = \text{constant}$$

$PV \propto T$. → if two variables are known, third is already known

∴ Two variable like P & T are independent variables. and V is dependent variables (b/c depends on P & T).

Thermodynamic equilibrium.

i) Thermal ii) Mechanical iii) Chemical

i) Thermal equilibrium → No flow of heat from one portion to another portion of the system

↓
Possible only if Temperature remains same

ii) Mechanical → No mechanical work is done by one part of the system to another part of the system.
if ↓ Pressure (P) → remain same

iii) Chemical → if the composition of the various phases in the system remains same throughout.

Extensive & Intensive properties.

(4)

Extensive property of a system is that which depends upon the amount of the substance or substances present in the system.

e.g. Mass, volume, Energy etc.

An intensive property of a system is that which is independent of the amount of the substance present in the system.

e.g. Temperature, pressure, density, viscosity, refractive index, surface tension, & specific heat.

Thermodynamic processes. A system changes from one state to another is called process.

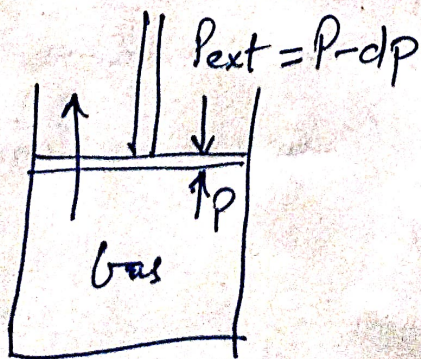
Isothermal process. $\rightarrow$ T remains constant

Adiabatic process $\rightarrow$ Q (heat) constant

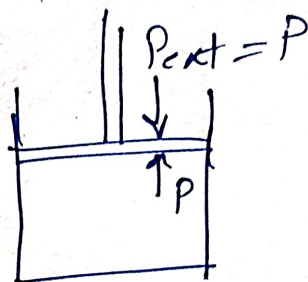
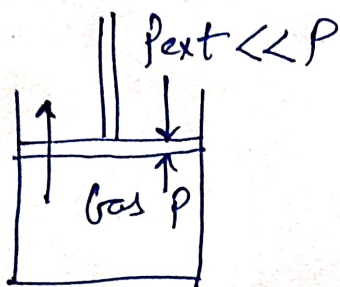
Isobaric process. $\rightarrow$ P constant

Reversible & Irreversible processes.

A process carried out infinitesimally slowly so that the driving force is only infinitesimally greater than opposing force. is called reversible process.



Irreversible process $\rightarrow$ which does not take place (5)
infinitesimally slowly



Work & Heat Whenever a system undergoes a change from one state to another, there is a change in energy. This change can appear in the form of heat, work, light etc.

$$W \propto H$$

$$W = JH$$

J is Joule mechanical equivalent of heat.

$$J = 4.184 \text{ Joules}$$