CONCEPT OF CONTINUUM

The behaviour of the matter can be studied by the microscopic approach (Statistical thermodynamics) and macroscopic approach (classical thermodynamics).

Microscopic approach

A matter consists of large no of molecules. The properties of matter such as pressure, velocity, position and energy of a gas for each molecule will change frequently as a result of collisions. The behaviour of the gas is described by summing up the behaviour of each molecule. Such a study is called microscopic or statistical thermodynamics.

Random motion of molecules

A container consists of O_2. It consists of many number of molecules. These molecules has position, velocity, energy etc. The position and velocity of molecules are described by the coordinates x, y, z, with velocity u, v, and w. The molecules move and hit the container wall. The amount of force exerted by molecule is called pressure of that molecule. The pressure exerted by the molecule may not be one and same.

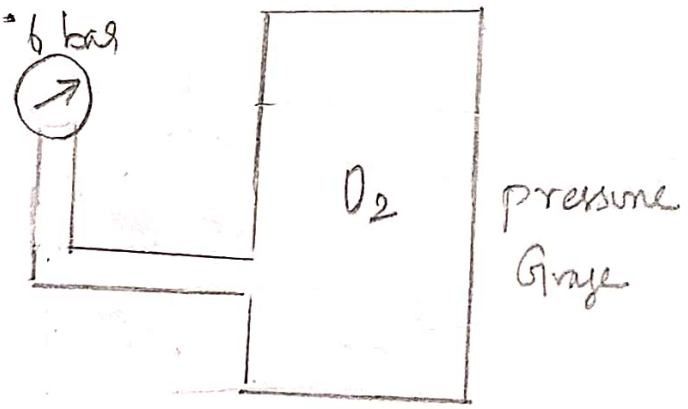
The study to predict the average behaviour of

numerous individual molecules and Correlate the properties of matter Considering Intermolecular forces. This kind of evaluation of a property of the System by going upto molecular level is known as microscopic approach.

The microscopic point of view deals with the Structures of the System and time behaviour. This involve lot of Statistics and hence also known as Statistical thermodynamics.

Macroscopic approach

A Simple pressure gauge is fitted to the Container can measure the pressure of the same gas at any instant.



In this method all the molecules will not come come and collide with diaphgram of the pressure guage However we assume that the other molecules are also behaving in the similar manner to describe the System. Thus measuring the properties of the System to knowing the overall behaviour approach is known as Macroscopic approach

Macroscopic approach	Microscopic approach
> Study of properties of matter by imparting overall behaviour approach	Study of properties at molecular level and observed based on individual characteristics of each molecule.
> Overall behaviour is used to study classical thermodynamics	Structure of matter is essential, Statistical thermodynamics.

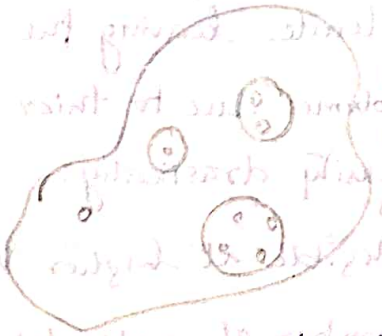
CONCEPT OF CONTIUM.

The Concept of Continuum is to treat all substances as being continuous without considering the action of individual molecules. A Continuum is a continuous homogenous medium. It is a classical thermodynamics.

Example.

> Air at atmospheric pressure and at sea level has a density of $1.2 kg/m^3$

> As we move up, the density of air decreases.



Non Continuum exists at very high altitudes or when volume $\to 0$.

> The mean free molecular path of molecules goes on increasing.

> At about 2km the mean molecular path of a molecule is 3 to 4m.

> Under such condition the fluid can't be treated as continuum.

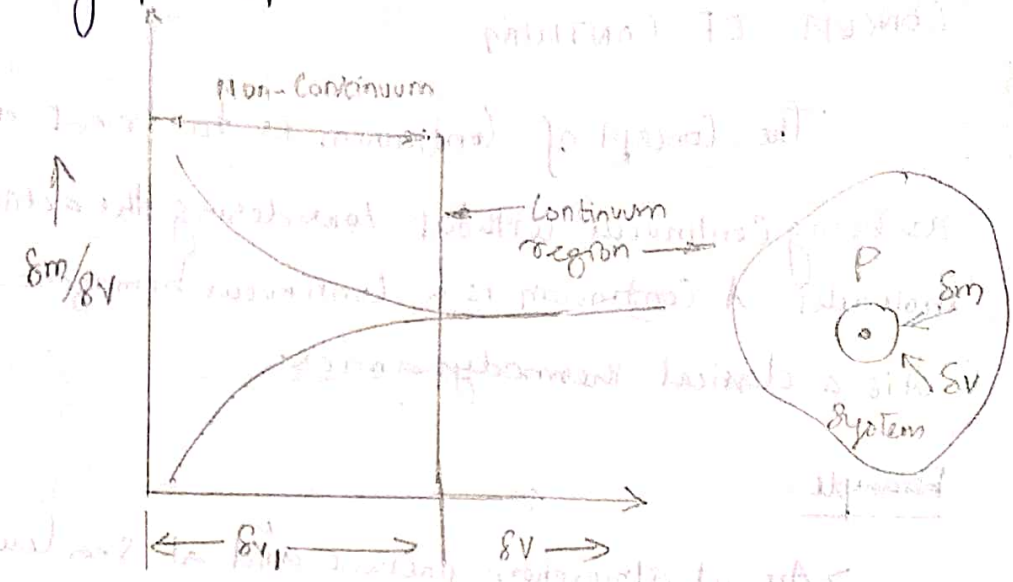
> Because density varies from one point to another point within the fluid.

Example: 2

> Let us Consider the mass δm with a volume δV at a particular point 'P'.

> The Density of the System is $\delta m/\delta V$

> The graph is plotted between $\delta m/\delta V$ and δV



> If δV becomes very small tending to zero, relatively few molecules are present.

> At this stage a molecule leaving the volume or another molecule entering the volume due to their random motion tends to change the density drastically.

> The same is negligible at higher volumes where there are large number of molecules.

> At the smallest volume of δV_1 is continuous, the density ρ of the system at any point is defined as

$$\rho = \lim_{\delta V - \delta V_1} \frac{\delta m}{\delta V}$$

> From this we come to know that Continuum holds good only upto ΔV.

> This idealisation is not useful for small volumes or at

Very high altitudes

→ Thus for very small volumes and at very high altitudes that is analysis of missiles, Space shuttles, Supersonic rockets and earth Satellites the microscopic point of view is to be applied.