The kinetic theory of gases explains the three macroscopic properties of a gas in terms of the microscopic nature of atoms and molecules making up the gas. Usually, the physical properties of solids and liquids can be described by their size, shape, mass, volume etc. However, when we talk about gases, they have no definite shape, size while mass and volume are not directly measurable. The Kinetic theory of gases is useful and can be applied in this case.

With the help of the kinetic theory of gases, the physical properties of any gas can be defined generally in terms of three measurable macroscopic properties. The pressure, volume and temperature of the container where the gas is stored or present.

Kinetic theory of gases is a theoretical model that describes the molecular composition of the gas in terms of a large number of submicroscopic particles which include atoms and molecules. Further, the theory explains that gas pressure arises due to particles colliding with each other and the walls of the container. Kinetic theory of gases also defines properties such as temperature, volume, pressure s well as transport properties such as viscosity and thermal conductivity as well as mass diffusivity. It basically explains all the properties that are related to the microscopic phenomenon.

The significance of the theory is that it helps in developing a correlation between the macroscopic properties and the microscopic phenomenon. In simple terms, the kinetic theory of gases also helps us study the action of the molecules. Generally, the molecules of gases are always in motion and they tend to collide with each other and the walls of the containers. In addition, the model also helps in understanding the related phenomena such as the Brownian motion.

Kinetic theory of gases considers the atoms or molecules of a gas as constantly moving point masses, with huge inter-particle distance and may undergo perfectly [elastic collisions](https://byjus.com/physics/elastic-collision/). Implications of these assumptions are –

**i) Particles**

Gas is a collection of a large number of atoms or molecules.

**ii) Point Masses**

Atoms or molecules making up the gas are very small particles like a point(dot) on a paper with a small mass.

**iii) Negligible Volume Particles**

Particles are generally far apart such that their inter-particle distance is much larger than the particle size and there is large free unoccupied space in the container. Compared to the volume of the container, the volume of the particle is negligible (zero volume).

**iv) Nil Force of Interaction**

Particles are independent. They do not have any (attractive or repulsive) interactions among them.

**v) Particles in Motion**

The particles are always in constant motion. Because of the lack of interactions and the free space available, the particles randomly move in all directions but in a straight line.

**vi) Volume of Gas**

Because of motion, gas particles, occupy the total volume of the container whether it is small or big and hence the volume of the container to be treated as the volume of the gases.

**vi) Mean Free Path**

This is the average distance a particle travels to meet another particle.

**vii) Kinetic Energy of the Particle**

Since the particles are always in motion, they have average [kinetic energy](https://byjus.com/physics/kinetic-energy/) proportional to the temperature of the gas.

**viii) Constancy of Energy / Momentum**

Moving particles may collide with other particles or containers. But the collisions are perfectly elastic. Collisions do not change the energy or momentum of the particle.

**ix)** **Pressure of Gas**

The collision of the particles on the walls of the container exerts a force on the walls of the container. Force per unit area is the pressure. The pressure of the gas is thus proportional to the number of particles colliding (frequency of collisions) in unit time per unit area on the wall of the container.

The kinetic theory of gas postulates is useful in the understanding of the macroscopic properties from the microscopic properties.

* Gases consist of a large number of tiny particles (atoms and molecules). These particles are extremely small compared to the distance between the particles. The size of the individual particle is considered negligible and most of the volume occupied by the gas is empty space.
* These molecules are in constant random motion which results in colliding with each other and with the walls of the container. As the gas molecules collide with the walls of a container, the molecules impart some momentum to the walls. Basically, this results in the production of a force that can be measured. So, if we divide this force by the area it is defined to be the pressure.
* The collisions between the molecules and the walls are perfectly elastic. That means when the molecules collide they do not lose kinetic energy. Molecules never slow down and will stay at the same speed.
* The average kinetic energy of the gas particles changes with temperature. i.e., The higher the temperature, the higher the average kinetic energy of the gas.
* The molecules do not exert any force of attraction or repulsion on one another except during collisions.

### What is the main basis of the kinetic theory?

Kinetic theory explains the behaviour of gases based on the idea that gas consists of rapidly moving atoms or molecules.

### What are real gases?

The gases that show deviation from ideal gas features are defined as real gases.

### What is mean energy?

K.E of one mole of gas is known as mean energy or the internal energy of the gas and is denoted by U.

### What are the three main points of the kinetic model?

The simplest kinetic model is based on the assumptions that: (1) the gas is composed of a large number of identical molecules moving in random directions, separated by distances that are large compared with their size; (2) the molecules undergo perfectly elastic collisions (no energy loss) with each other and with the walls of the container, but otherwise do not interact; and (3) the transfer of kinetic energy between molecules is heat.

### What do you mean by Degree of Freedom (n)

Degree of freedom is defined as the number of possible independent ways in which the position and configuration of the system may change.

### What is the degree of freedom of the monoatomic gas molecule?

The degree of freedom of monoatomic gas molecule n = 3