

Introduction:

Characteristics of Gases:

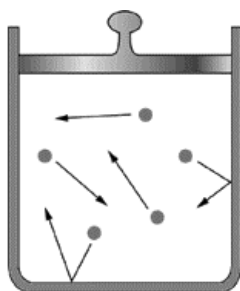
1. Gases or their mixtures are homogeneous in composition.
2. Gases have infinite expansibility and high compressibility.
3. Gases exert pressure.
4. Gases possess high diffusibility.
5. Gases do not have definite shape and volume like liquids.
6. Gaseous molecules move very rapidly in all directions in a random manner i.e., gases have highest kinetic energy.
7. Gaseous molecules collide with one another and with the walls of container with perfectly elastic collisions.
8. Gases can be liquified, if subjected to low temperatures (below critical) or high pressures.
9. Thermal energy of gases \gg molecular attraction.

Measurable Properties of Gases:

The five measurable properties of gases are:

1. Volume.
2. Pressure.
3. Temperature.
4. Amount of gases (Mass or moles of gases).
5. Velocity.

1. **Volume:** Gases occupy the entire space available to them, the volume occupied by the gas is taken as **volume of the container**.



- **Units:** litres(l) or milli litres (ml) or cubic centimetres(cc).

2. **Pressure:** Pressure of the gas is the force exerted by the gas per unit area of the walls of the container in all directions.

- **Units:** 1 atm = 760 mm of Hg = 760 torr = 76 cm of Hg

3. **Temperature:** The temperature of the gas is defined as the temperature at which the container is maintained.

- **Units:** Kelvin or Centigrade

$$K = ^\circ C + 273$$

4. **Mass:** Mass of the gas is generally measured in number of moles of the gas enclosed in the container.

$$\text{moles of gas } (n) = \frac{\text{Mass in grams}}{\text{Molar mass}} = \frac{m}{M}$$

Boyle's Law: For a fixed amount of gas at constant temperature, the gas volume is inversely proportional to the pressure of the gas.

$$P \propto \frac{1}{V} \text{ at constant temperature and mass}$$

$$P = \frac{K}{V} \text{ (where } k \text{ is constant)}$$

Or $P_1V_1 = P_2V_2 = K$ (for two or more gases)

Graphical representation of Boyle's law or isothermal process:

