

# Study of Gas Laws

- **Gaseous state**
- - No fixed shape, volume, and boundary
  - Highly compressible
  - Gases exert pressure
  - High particle motion

## Boyle's Law

- Relation between pressure ( $p$ ) and volume ( $V$ )
- Statement – At constant temperature, the pressure of a fixed amount (number of moles,  $n$ ) of a gas is inversely proportional to its volume.

## Charles' Law

- Relation between temperature ( $T$ ) and volume ( $V$ )
- Statement – At constant pressure, the volume of a fixed amount of a gas is directly proportional to its absolute temperature.

## Standard Temperature and Pressure(STP)

The standard values are  $0^{\circ}\text{C}$  or  $273\text{K}$  for temperature and  $1\text{ atm}$  or  $760\text{ mm of Hg}$  for pressure and are commonly known as **S.T.P.**

### Mass:

S.I. Unit is kg.

### Volume:

S.I. Unit is  $\text{m}^3$ .

### Density:

S.I. Unit is  $\text{kg m}^{-3}$ .

### Temperature:

Three scales are

- °C (degree Celsius)
- °F (degree Fahrenheit)
- K (kelvin)

S.I. Unit is K

- Relation between °F and °C

$$^{\circ}\text{F} = \frac{9}{5}(^{\circ}\text{C}) + 32$$

- Relation between K and °C

$$\text{K} = ^{\circ}\text{C} + 273.15$$

### **Ideal Gas**

- The gas which strictly follows Boyle's law, Charles' law and Avogadro law

### **Ideal Gas Equation**

- Equation obtained by the combination of Boyle's law, Charles' law and Avogadro law

$$\Rightarrow pV = nRT \dots\dots(i)$$

R = Proportionality constant, known as Universal Gas Constant

Equation (i) is called ideal gas equation.