(4) Grahm's Law of Diffusion :—

If M is the total mass of a gas, then the kinetic gas equation,

$PV = \frac{1}{3} mnc^2$, reduces to—

$$PV = \frac{1}{3} Mc^2$$

$$\text{or } c^2 = \frac{3PV}{M} = \frac{3P}{\frac{M}{V}} = \frac{3P}{D} \quad \left[\frac{M}{V} = \text{Density}\right]$$

$$\text{or } c^2 = \frac{3P}{D}$$

$$c = \sqrt{\frac{3P}{D}} \quad \text{—— (1)}$$

Where D is the density of the gas, We know that the rate of diffusion (r) of a gas varies with the mean velocity (C), ($\because r = \frac{s}{t}$)

from the above eqn (1)

$$c \propto \sqrt{\frac{1}{D}} \quad \text{where P is constant}$$

Thus the rate of diffusion of a gas is inversely proportional to the squre root of density of the gas at constant Pressure.

This is the Grahm's law of diffusion.

(5) Dalton's Law of Partial Pressure :—

Let n_1 molecules each of mass m_1 of a gas A are taken in a Container of volume V. Then the Pressure P_a for the gas is given by Kinetic gas Eqn.

$$P_a = \frac{m_1 n_1 c_1^2}{3V}$$

Similarly for gas B,

$$P_b = \frac{m_2 n_2 c_2^2}{3V}$$

If both the gases are present in the same Containers, then total Pressure,

$$P = \frac{m_1 n_1 c_1^2}{3V} + \frac{m_2 n_2 c_2^2}{3V}$$

$$= P_a + P_b$$

Similarly for n gases, the total Pressure,

$$P = P_a + P_b + P_c + \text{-----} P_n$$

This is Dalton's Law of Partial Pressure.

ideal gas and real gas

At very low Pressures and very high temperatures, the gases tend to obey the gas laws.

A gas which obeys the gas laws under all circumstances has been named as ideal or Perfect gas, while a gas do not obey the gas laws is known as a real gas.

The gas which obeys the equation of state $PV = nRT$ strictly is called ideal gas.

Gases which do not obey the equation of state $PV = nRT$ are called real gases.

All gases are real and no one is ideal in true sense.

Other differences may be mentioned below

1. Equation of State i.e $PV = nRT$
   ideal gases strictly obey
   Real gases do not obey

2. Compressibility factor Z. ($Z = \frac{PV}{RT}$)
   Compressibility factor $Z = 1$ for ideal gases
   " " $Z \neq 1$ for Real gases

3. Molar Volume -
   Molar Volume is 22.4 for ideal gases
   Molar volume is not exact 22.4 for real gases

4. Intermolecular attraction :-
   Inter molecular attraction do not exist in ideal gases
   Inter molecular attraction exist in Real gases

5. PV Vs P Curve :-
   In ideal gas PV Vs P Curve is Horizontal st. line.
   In Real gas PV Vs P Curve is not so.

6. PV Vs Z Curve :-
   In ideal gas PV Vs Z curve is Horizontal st. line.
   But In Real gas PV Vs Z curve is not so.