Ideal gas	Real gas
1. Behaviour of Ideal gas is much simpler	The behaviour of Real gas is much Complex
2. Ideal gas has no definite volume	Real gas has definite volume
3. Has no mass	Has mass
4. Ideal gas is elastic	Real gas is non-elastic
5. No energy involved during collision of particles in ideal gas	collision of particles in real gas has attracting energy
6. Has high Pressure	has low Pressure
7. Ideal gas follows the eqn $PV = nRT$	Real gas follows the equation $\left(P + a/V^2\right)(V - b) = nR$

$$\left(P+\frac{a}{V^2}\right)(V-b)=RT$$

$$\left(P+\frac{na}{V^2}\right)(V-nb)=nRT$$

Law of corresponding states (Reduced equation of state)

van der Waals equation is not applicable to all gases since the so called constants 'a' and 'b' have different values for different gases. A more general equation is derived from the knowledge of critical pressure (Pc), critical volume (Vc) and critical temperature (Tc)

Let $P/Pc = \pi$, $V/Vc = \phi$ and $T/Tc = \theta$

where π, ϕ and θ are called the "reduced pressure", reduced volume" and "reduced temperature" respectively. We know,

$$Vc = 3b$$

$$Pc = a/27b^2$$

$$Tc = 8a/27Rb$$

Substituting the values of Pc, Vc and Tc in van der Waals equation, we get

$$(\pi + 3/\phi^2)(3\phi - 1) = 8\theta$$

The above equation is called the "*reduced equation of state*". It invovles neither R nor the van der Waals constants "a" and "b". Hence, it is a general equation applicable to all gases. It follows from the equation that "*if two or more gases have the same reduced temperature and reduced pressure, they should occupy the same reduced volume*". This statement is known as the "*Law of corresponding states*"

Significances of the law

1. Since the reduced equation of state does not involve the constants "a" and "b", it is applicable to all gases.

2. All gases deviate from the ideal behaviour to the same extent when they are in the corresponding states.

3. The law has a good deal of importance in engineering calculations.

4. Measurement of parameters for the characterisation of a gas under reduced pressure and temperature gives reliable results.

5. Liquids are very nearly in corresponding states at their boiling points in absolute degrees. Therefore, the physical properties of liquids are determined at their boiling points and used to study their chemical constitution.