Class ⇒ B.Sc. (Part I) subsidiary
Subject ⇒ Chemistry
Chapter ⇒ Gaseous state (Grp. A)
Topic ⇒ Real and Ideal gases, Deviation of Real gases from ideal behaviour.

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## Real gases

A real gas is one which obeys the gas laws fairly well under low pressure or high temperature.

All gases are real gases. They show more and more deviations from the gas laws as the pressure is increased or the temperature is decreased.

## Ideal gas

An ideal gas is one which obeys the gas laws or the gas equation ($PV = nRT$) at all pressure and temperature.

However no gas is ideal. Almost all gases show significant deviations from the ideal behaviour.

## Difference between Ideal gas and Real gases

(1) An ideal gas obeys the basic laws strictly under all conditions of temperature and pressure.

Real gases do not obeys the basic laws under all conditions of temperature and pressure.

(2) In an ideal gas the actual volume of molecules is negligible.

While in Real gases the actual volume of molecules is appreciable.

(3) In Ideal gas there are no attractive forces between molecules.

While in Real gases attractive forces between molecules exist.

(4) Molecular collisions in an ideal gas are perfectly elastic while it is not so in a real gas.

## Deviation of Real gases from ideal behaviour

According to Boyle's law,

$PV = \text{Constant}$ at Constant temp

This means that the Product PV should remain Constant at all pressures provided temperature is kept constant.

Thus a plot of PV vs P should be a horizontal straight line parallel to x-axis.

However, in actual practice, it is found that no gas gives a straight line plot. Two types of curves are generally obtained.

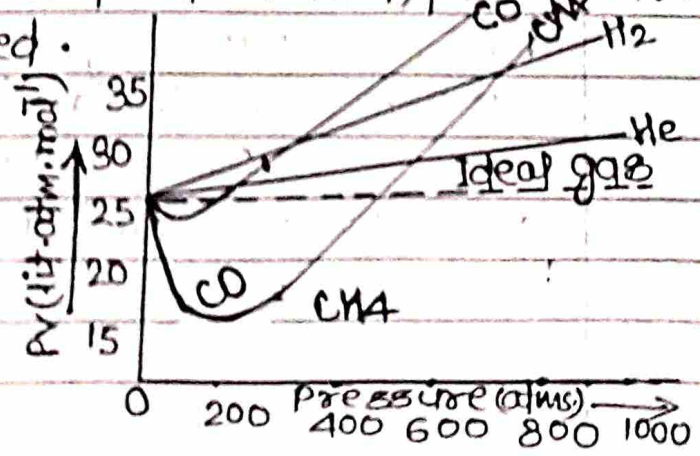


fig:- Plots of PV vs P for different gases at 0°C (273K)

(i) For gases like hydrogen and helium, the product PV continuously increases with increase of pressure. (from ~~plot~~ PV vs P)

(ii) For gases like CO and $CH_4$, the product PV first decreases with increase of pressure, reaches a minimum value and then begins to increase (from plot PV vs P).

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⟹ Deviation of real gases from ideal behaviour in terms of compressibility factor, denoted by Z.

$$Z = \frac{PV}{nRT}$$

For an Ideal gas, Z=1 at all temperature and pressure.

In case of real gases the compressibility factor Z varies from values less than 1 to values greater than 1 with changes of temperature and pressure.

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