Deviation from ideality :→

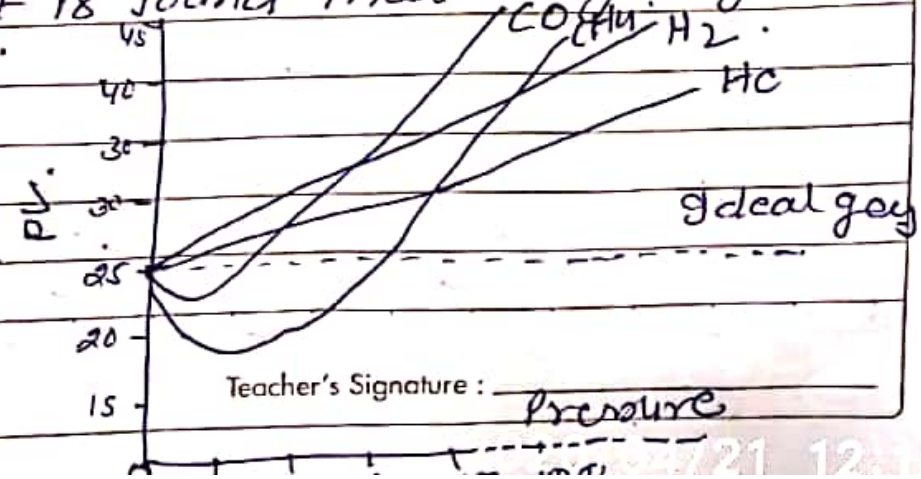
Deviations from the ideal gas behaviour are large at high pressure and low temperature. Under such conditions the total volume of the gas is small. A careful study shows that two postulates of kinetic theory of gases are faulty. These are

(i) There is no force of attraction or repulsion between the molecules of a gas.

(ii) Volume of the gas molecules is negligible in comparision to the total volume of the gas.

If assumption (i) is correct, then the gas will never liquify. But we know that gases are ~~liquify~~ liquified when they are cooled and compressed. Moreover, it is difficult to compress the liquid.

According to Boyle's law, PV = constant at constant temperature. 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.



Teacher's Signature :

Two types of curves are obtained.

(i) For gases like hydrogen and helium, the product PV continuously increases with increase of Pressure

(ii) For gases like CO and city, the product PV first decreases with increase of Pressure, reaches a minimum and then begins to increase.

The effect of temperature and Pressure on the behaviour of a gas may be studied in terms of quantity 'Z' called compressibility factor, which is defined as.

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

For an ideal gas $Z = 1$, at all temperature and Pressure. In case of real gases, the factor Z varries from values less than 1 to values greater than 1, which changes of temperature and Pressure

The Plots of compressibility factor Z vs. Pressure P at different constant temperature. that as the temperature the temperature increases, the minimum in the curves shifts upwards. Ultimately, a temperature is reached at which the value of Z remains close to 1 over an appreciable range of Pressure. For H_2 gas at 50°C, the value of Z remains close to 1 upto nearly 100 atmospheres. This temperature at which a real gas behaves like an ideal gas over an appreciable Pressure range is called Boyle's temperature or Byle Point because at this temperature Boyle's law is obeyed over a range of Pressure. Above the Boyle temperature a gas shows positive deviations only.