CH1201 : Quiz 2

Name : Priyanshu Mahato

Roll No. : pm21mb002

Q. Given :

$a = 1.4 \text{ atm } L^2 \text{ mol}^{-2}$

$b = 0.04 \text{ L mol}^{-1}$

Vol. of gas = 10 L

No. of moles (n) = 2 mol

T = 300 K

Using the Van der Waals Real Gas Eq^n :-

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

$$\Rightarrow \left(P + \frac{1.4 \times 4}{100}\right)(10 - 2 \times 0.04) = 2 \times 0.0821 \times 300$$

$$\Rightarrow \left(P + \frac{56}{1000}\right)(9.92) = 49.26$$

$$\Rightarrow \left(P + \frac{56}{1000}\right) = \frac{49.26}{9.92}$$

$$\Rightarrow P + 0.056 \simeq 4.966$$

$$\Rightarrow \boxed{P \simeq 4.91 \text{ atm}}$$

∴ Pressure of Real Gas ≃ 4.91 atm

According to the Ideal Gas Eq^{n} :-

$PV = nRT$

$\Rightarrow P_{ideal} = \frac{nRT}{V} = \frac{2 \times 0.0821 \times 300}{10}$

$\Rightarrow P_{ideal} = \frac{49.26}{10} = \boxed{4.926 \text{ atm}}$

Extent of deviation from Ideal Gas :-

$$\text{Percentage Deviation} = \frac{|P_{ideal} - P_{real}|}{\underbrace{4.926}_{(P_{ideal})}} \times 100\%$$

$$\Rightarrow \frac{|P_{ideal} - P_{real}|}{P_{ideal}} \times 100 = \frac{4.926 - 4.910}{4.926}$$

$$\Rightarrow \frac{0.016 \times 100}{4.926} = \frac{1.6}{4.926} \simeq 0.325$$

$\Rightarrow$ **Percentage Deviation from Ideal Behaviour = 0.325%**