

**Question 1**

For real gases the relation between  $p$ ,  $V$  and  $T$  are given by van der Waals equation:

$$P + \frac{an^2}{V - nb} = nRT$$

Where, 'a' and 'b' are van der Waals constants, 'nb' is approximately equal to the total volume of the molecules of a gas. 'a' is the measure of the magnitude of intermolecular attraction.

- (i) Arrange the following gases in the increasing order of 'b'. Give reason. O<sub>2</sub>, CO<sub>2</sub>, H<sub>2</sub>, He
- (ii) Arrange the following gases in the decreasing order of magnitude of 'a'. Give reason. CH<sub>4</sub>, O<sub>2</sub>, H<sub>2</sub>

**Solution:**

- (i) the increasing order of 'b' is as follows: He < H<sub>2</sub> < O<sub>2</sub> < CO<sub>2</sub> As the Vander Waals constants, 'b' is approximately equal to the total volume of the molecules of a gas.
- (ii) The decreasing order will be: CH<sub>4</sub> > O<sub>2</sub> > H<sub>2</sub> as the surface area of CH<sub>4</sub> is highest so, it has highest Vander Waal's force of attraction so, has the highest value of 'a', followed by O<sub>2</sub> and H<sub>2</sub>.