

**REAL GAS**

1. The volume of gas A is twice than that of gas B. The compressibility factor of gas A is thrice than that of gas B at same temperature. The pressures of the gases for equal number of moles are :

$$(1) 2P_A = 3P_B \quad (2) P_A = 3P_B$$

$$(3) P_A = 2P_B \quad (4) 3P_A = 2P_B$$

2. Consider the van der Waals constants,  $a$  and  $b$ , for the following gases.

Gas	Ar	Ne	Kr	Xe
$a/(\text{atm dm}^6 \text{ mol}^{-2})$	1.3	0.2	5.1	4.1
$b/(10^{-2} \text{ dm}^3 \text{ mol}^{-1})$	3.2	1.7	1.0	5.0

Which gas is expected to have the highest critical temperature?

- (1) Kr                                      (2) Ne  
(3) Ar                                      (4) Xe

3. At a given temperature  $T$ , gases Ne, Ar, Xe and Kr are found to deviate from ideal gas behaviour. Their equation of state is given as

$$p = \frac{RT}{V - b} \text{ at } T.$$

Here,  $b$  is the van der Waals constant. Which gas will exhibit steepest increase in the plot of  $Z$  (compression factor) vs  $p$ ?

- (1) Ne                                      (2) Ar  
(3) Xe                                      (4) Kr

4. Consider the following table :

Gas	$a/(\text{k Pa dm}^6 \text{ mol}^{-1})$	$b/(\text{dm}^3 \text{ mol}^{-1})$
A	642.32	0.05196
B	155.21	0.04136
C	431.91	0.05196
D	155.21	0.4382

$a$  and  $b$  are vander waals constant. The correct statement about the gases is :

- (1) Gas C will occupy lesser volume than gas A; gas B will be lesser compressible than gas D  
(2) Gas C will occupy more volume than gas A; gas B will be lesser compressible than gas D  
(3) Gas C will occupy more volume than gas A; gas B will be more compressible than gas D  
(4) Gas C will occupy lesser volume than gas A; gas B will be more compressible than gas D

## SOLUTION

1. **Ans. (1)**

$$V_A = 2V_B$$

$$Z_A = 3Z_B$$

$$\frac{P_A V_A}{n_A R T_A} = \frac{3 \cdot P_B \cdot V_B}{n_B \cdot R T_B}$$

$$2P_A = 3P_B$$

2. **Ans. (1)**

$$\text{Sol. } T_c = \frac{8a}{27Rb}$$

Greater value of  $\frac{a}{b} \Rightarrow$  higher is ' $T_c$ '

Gas	$\frac{a}{b}$	
Ar	$\frac{1.3}{3.2}$	= 0.406

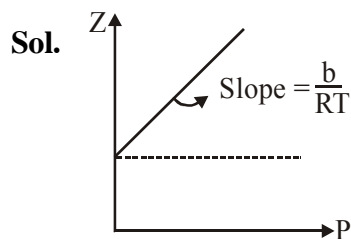
Ne	$\frac{0.2}{1.7}$	= 0.118
----	-------------------	---------

Kr	$\frac{5.1}{1}$	= 5.1
----	-----------------	-------

Xe	$\frac{4.1}{5}$	= 0.82
----	-----------------	--------

$\therefore T_c$  has order : Kr > Xe > Ar > Ne

$\therefore$  Ans. is (1)

3. **Ans. (3)**

As  $b \uparrow \Rightarrow$  slope  $\uparrow$

Hence, Xe, will have highest slope

4. **Ans. (3)**

- Sol.
- Gas A and C have same value of 'b' but different value of 'a' so gas having higher value of 'a' have more force of attraction so molecules will be more closer hence occupy less volume.
  - Gas B and D have same value of 'a' but different value of 'b' so gas having lesser value of 'b' will be more compressible. so option (3) is correct.