Date Planned : __ / __ / __	Daily Tutorial Sheet-1	Expected Duration : 90 Min
Actual Date of Attempt : __ / __ / __	JEE Main (Archive)	Exact Duration :_____

1. Equal weights of methane and oxygen are mixed in an empty container at $25°C$. The fraction of the total pressure exerted by oxygen is: **(1981)**

(A) $\frac{1}{3}$ **(B)** $\frac{1}{2}$ **(C)** $\frac{2}{3}$ **(D)** $\frac{1}{3}\times\frac{273}{298}$

2. The rate of diffusion of methane at a given temperature is twice that of a gas X. The molecular weight of X is: **(1990)**

(A) 64.0 **(B)** 32.0 **(C)** 4.0 **(D)** 8.0

3. Equal weights of ethane and hydrogen are mixed in an empty container at $25°C$. The fraction of the total pressure exerted by hydrogen is : **(1993)**

(A) 1: 2 **(B)** 1: 1 **(C)** 1: 16 **(D)** 15: 16

4. **(i)** One mole of nitrogen gas at 0.8 atm takes 38s to diffuse through a pin-hole, whereas one mole of an unknown compound of xenon with fluorine at 1.6 atm takes 57s to diffuse through the same hole. Calculate the molecular formula of the compound. **(1999)**

(ii) The pressure exerted by 12 g of an ideal gas at temperature $T°C$ in a vessel volume *V* litre is one atm. When the temperature is increased by $10°C$ at the same volume, the pressure increases by 10%. Calculate the temperature T and volume *V*.
(Molecular weight of the gas = 120)

5. For gaseous state, if most probable speed is denoted by C*, average speed by $\bar{C}$ and root square by C, then for a large number of molecules, the ratios of these speeds are: **(2013)**

(A) $C^* : \bar{C} : C = 1.225 : 1.128 : 1$ **(B)** $C^* : \bar{C} : C = 1.128 : 1.225 : 1$

(C) $C^* : \bar{C} : C = 1 : 1.128 : 1.225$ **(D)** $C^* : \bar{C} : C = 1 : 1.225 : 1.128$

6. If Z is a compressibility factor, van der Waal's equation at low pressure can be written as : **(2014)**

(A) $Z = 1 + \frac{RT}{pb}$ **(B)** $Z = 1 - \frac{a}{VRT}$

(C) $Z = 1 - \frac{pb}{RT}$ **(D)** $Z = 1 + \frac{pb}{RT}$

7. Which of the following is not an assumption of the kinetic theory of gases? **(2015)**

(A) A gas consists of many identical particles which are in continual motion

(B) Gas particles have negligible volume

(C) At high pressure, gas particles are difficult to compress

(D) Collisions of gas particles are perfectly elastic.

8. When does a gas deviate the most from its ideal behavior? **(2015)**

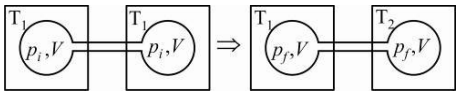
(A) At low pressure and low temperature

(B) At low pressure and high temperature

(C) At high pressure and low temperature

(D) At high pressure and high temperature

9. Two closed bulbs of equal volume (V) containing an ideal gas initially at pressure p_i and temperature T_1 are connected through a narrow tube of negligible volume as shown in the figure below. The temperature of one of the bulbs is then raised to T_2. The final pressure p_f is: **(2016)**



(A) $2p_i\left(\frac{T_1}{T_1+T_2}\right)$ **(B)** $\frac{2p_i(T_2)}{T_1+T_2}$ **(C)** $2p_i\left(\frac{T_1T_2}{T_1+T_2}\right)$ **(D)** $p_i\left(\frac{T_1T_2}{T_1+T_2}\right)$

10, Among the following, the incorrect statement is: **(2017)**

(A) at very large volume, real gases show ideal behavior

(B) at very low temperature, real gases show ideal behaviour

(C) at Boyle's temperature, real gases show ideal behaviour

(D) at low pressure, real gases show ideal behaviour

11. At 300 K, the density of a certain gaseous molecule at 2 bar is double to that of dinitrogen (N_2) at 4 bar. The molar mass of gaseous molecule is: **(2017)**

(A) $56\,g\,mol^{-1}$ **(B)** $112\,g\,mol^{-1}$ **(C)** $224\,g\,mol^{-1}$ **(D)** $28\,g\,mol^{-1}$

12. Assuming ideal gas behaviour, the ratio of density of ammonia to that of hydrogen chloride at same temperature and pressure is : (Atomic wt. of Cl = 35.5 u) **(2018)**

(A) 1.46 **(B)** 0.46 **(C)** 1.64 **(D)** 0.64

13. An open vessel at 27°C is heated until two fifth of the air(assumed as an ideal gas) in it has escaped from the vessel. Assuming that the volume of the vessel remains constant, the temperature at which the vessel has been heated is : **(2019)**

(A) 500°C **(B)** 750°C **(C)** 750 K **(D)** 500 K

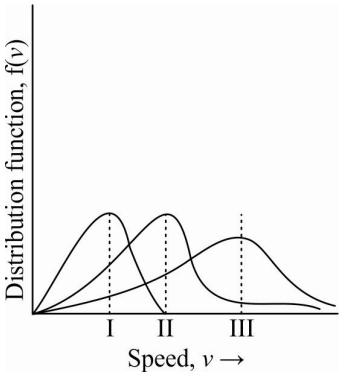
14. Consider the van der Waals constants, a and b, for the following gases. **(2019)**

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

Which gas is expected to have the highest critical temperature?

(A) Ar **(B)** Ne **(C)** Kr **(D)** Xe

15. Points I, II and III in the following plot respectively correspond to (V_{mp} : most probable velocity) **(2019)**



(A) V_{mp} of N_2(300K); V_{mp} of H_2 (300 K); V_{mp} of O_2 (400 K)

(B) V_{mp} of N_2(300K); V_{mp} of O_2 (400 K); V_{mp} of H_2 (300 K)

(C) V_{mp} of H_2(300K); V_{mp} of N_2 (300 K); V_{mp} of O_2 (400 K)

(D) V_{mp} of O_2(400K); V_{mp} of N_2 (300 K); V_{mp} of H_2 (300 K)

16. At a given temperature T, gases Ne, Ar, Xe and Kr are found to deviate from ideal gas behavior. Their equation of state is given as $P = \frac{RT}{V - b}$ 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?

(A) Xe **(B)** Ne **(C)** Kr **(D)** Ar