Dalton's Law:

Suppose a mixture of two ideal gases, A and B, is contained in a volume V at a temperature T. Then, since each gas is ideal, we can write

$$P_A = n_A \frac{RT}{V}, \quad P_B = n_B \frac{RT}{V}$$

That is, in the mixture each gas exerts a pressure that is the same as it would exert if it were present alone, and this pressure is proportional to the number of moles of the gas present. The quantities P_A and P_B are called the partial pressures of A and B respectively. According to Dalton's law of partial pressures, the total pressure, P_t, exerted on the walls of the vessel is the sum of the partial pressures of the two gases:

$$P_t = P_A + P_B = (n_A + n_B)\left(\frac{RT}{V}\right).$$

The expression can be generalised so as to apply to a mixture of any number of gases. The result is

$$P_t = \sum_i P_i = \frac{RT}{V}, \sum_i n_i \qquad ...(1)$$

where ' i ' is an index that identifies each component in the mixture and the symbol Σ_i stands for the operation of adding all the indexed quantities together. Another useful expression of the law of partial pressures is obtained by writing

$$P_A = n_A \frac{RT}{V}, \quad P_t = \frac{RT}{V}\sum_i n_i, \quad \frac{P_A}{P_t} = \frac{n_A}{\sum_i n_i}, \qquad P_A = P_t\left(\frac{n_A}{\sum_i n_i}\right). \qquad ....(2)$$

The quantity $\frac{n_A}{\sum_i n_i}$, is called the mole fraction of component A, and equation (2) says that the partial pressure of any component , such as component A, is the total pressure of the mixture multiplied by $\frac{n_A}{\sum_i n_i}$, the fraction of the total moles which are component A.

1. A closed container of volume 30 litre contains a mixture of nitrogen and oxygen gases, at a temperature of 27°C and pressure of 4 atm. The total mass of the mixture is 148 gm. The moles of individual gases in the container are (Take R = 0.08 litre atm/moleK)

(A) n_{N_2} = 2 moles, n_{O_2} = 3 mole (B) n_{N_2} = 3 mole, n_{O_2} = 2 mole
(C) n_{N_2} = 4 mole, n_{O_2} = 1 mole (D) n_{N_2} = 2.5 mole, n_{O_2} = 2.5 mole

2. If the whole mixture (of above problem) is transferred to a 5 litre vessel at same temperature, then choose the correct one :

(A) Total pressure in the container remains same.
(B) mole fraction of gases will change by 1/2 unit.
(C) Partial pressure of each gases will be 6 times.
(D) Total pressure in the container becomes half of the initial pressure.

3. If the original mixture (as in Q.No. 1) is allowed to react at this temperature to form NO gas, then the total pressure in the container after the reaction is :

(A) 2 atm (B) 8 atm (C) 4 atm (D) None of these

ANSWER KEY

1. (B) **2.** (C) **3.** (C)

Graham's Law:

"Under similar conditions of temperature and pressure (partial pressure) the rate of diffusion of different gases is inversely proportional to square root of the density of different gases."

- rate of diffusion $r \propto \frac{1}{\sqrt{d}}$ d = density of gas

  $\frac{r_1}{r_2} = \frac{\sqrt{d_2}}{\sqrt{d_1}} = \frac{\sqrt{M_2}}{\sqrt{M_1}} = \sqrt{\frac{V.D_2}{V.D_1}}$ V.D is vapour density

  r = volume flow rate = $\frac{dV_{out}}{dt}$

  r = moles flow rate = $\frac{dn_{out}}{dt}$

  r = distance travelled by gaseous molecules per unit time = $\frac{dx}{dt}$

- The general form of the grahams law of diffusion can be stated as follows, when one or all of the parameters are varied.

  $$\text{rate} \propto \frac{P}{\sqrt{TM}} A$$

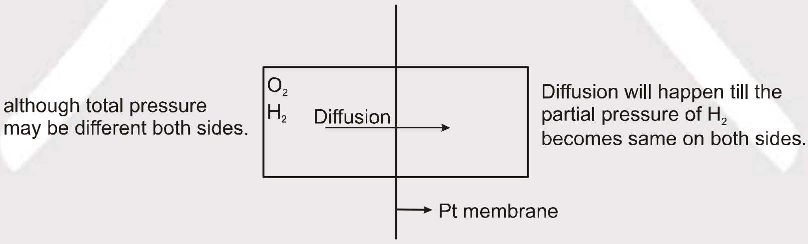
  P – Pressure, A – area of hole, T – Temp. , M – mol. wt.

- If partial pressure of gases are not equal.
  Then rate of diffusion is found to be proportional to partial pressure & inversely proportional to square root of molecular mass.

  $$r \propto P$$
  $$r \propto \frac{1}{\sqrt{M}}$$
  $$\frac{r_1}{r_2} = \frac{P_1}{P_2}\sqrt{\frac{M_2}{M_1}}$$

Selective diffusion:

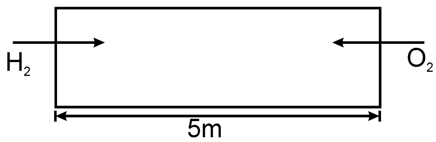
If one or more than one components of a mixture are allowed to diffuse and others are not allowed then it is selective diffusion of those components.



☞ **Platinum allows only H_2 gas to pass through**

Effusion: (forced diffusion) a gas is made to diffuse through a hole by the application of external pressure.

Example-1 In a tube of length 5 m having 2 identical holes at the opposite ends. H_2 & O_2 are made to effuse into the tube from opposite ends under identical conditions. Find the point where gases will meet for the first time.



Solution: $\frac{r_1}{r_2} = \frac{dx}{dt} \times \frac{dt}{dx} = \sqrt{\frac{M_2}{M_1}}$

$\frac{dx_1}{dx_2} = \sqrt{\frac{32}{2}}$

$\frac{dx_1}{dx_2} = 4 \quad \Rightarrow \quad \frac{\text{distance travelled by } H_2}{\text{distance travelled by } O_2} = 4$

$\frac{x}{(5-x)} = 4$

$x = (5 - x)\,4; \quad x = 20 - 4x\,; \quad 5x = 20\,; \quad x = 4$ from H_2 side

Example-2 Assume that you have a sample of hydrogen gas containing H_2, HD and D_2 that you want to separate into pure components (H = ^1H and D = ^2H). What are the relative rates of diffusion of the three molecules according to Graham's law?

Solution: Since D_2 is the heaviest of the three molecules, it will diffuse most slowly, and let we call its relative rate 1.00. We can then compare HD and H_2 with D_2.

Comparing HD with D_2, we have

$$\frac{\text{Rate of HD diffusion}}{\text{Rate of } D_2 \text{ diffusion}} = \sqrt{\frac{\text{Molecular mass of } D_2}{\text{Molecular mass of HD}}} = \sqrt{\frac{4.0\,\text{amu}}{3.0\,\text{amu}}} = 1.15$$

Comparing H_2 with D_2 we have

$$\frac{\text{Rate of } H_2 \text{ diffusion}}{\text{Rate of } D_2 \text{ diffusion}} = \sqrt{\frac{\text{Mass of } D_2}{\text{Mass of } H_2}} = \sqrt{\frac{4.0\,\text{amu}}{2.0\,\text{amu}}} = 1.41$$

Thus, the relative rates of diffusion are $H_2(1.41) > HD\ (1.15) > D_2(1.00)$.

Kinetic Theory of Gases:

Postulates / assumptions of KTG:

- A gas consists of tiny spherical particles called molecules of the gas which are identical in shape & size (mass)
- The volume occupied by the molecules is negligible in comparision to the total volume of the gas. For an ideal gas, volume of the ideal gas molecule $\simeq$ 0.
- Gaseous molecules are always in random motion and collide with other gaseous molecules & with the walls of the container.
- Pressure of the gas is due to these molecular collisions among themselves and with walls of the container
- These collisions are elastic in nature
- Molecular attraction forces are negligible. Infact, for an ideal gas attractive or repulsive forces are equal to zero.
- Newton's laws of motion are applicable on the motion of the gaseous molecules.
- Effect of gravity is negligible on molecular motion.
- The average K.E. of gaseous molecules is proportional to the absolute temperature of the gas.

$$\frac{1}{2} M (\overline{u^2}) \propto T \qquad \text{(bar is for average)}$$

Kinetic equation of gaseous state (expression for pressure of gas).

Different type of molecular speeds :

1. Root mean square speed :

$U_{rms} = \sqrt{\overline{U^2}} = \sqrt{\frac{3kT}{m}} = \sqrt{\frac{3RT}{mN_A}}$ Where m-mass of one molecule

- Dependent on nature of gas i.e mass of the gas

$U_{rms} = \sqrt{\frac{3RT}{M}}$ M = molar mass

2. **Average speed :**

$U_{av} = U_1 + U_2 + U_3 + \text{..........} U_N$

$U_{av} = \sqrt{\frac{8RT}{\pi M}} = \sqrt{\frac{8KT}{\pi m}}$ K is Boltzmman constant

3 **Most probable speed :** The speed possessed by maximum number of molecules at the given temperature

$U_{MPS} = \sqrt{\frac{2RT}{M}} = \sqrt{\frac{2KT}{m}}$

Velocity can be decribed by maximum number of molecule.

Molecular speed

Most probable speed: $\sqrt{\frac{2KT}{m}} = \sqrt{\frac{2RT}{M}}$

Average speed: $\sqrt{\frac{8RT}{\pi M}} = \sqrt{\frac{8KT}{m}}$

Root mean square: $\sqrt{\frac{3RT}{M}} = \sqrt{\frac{3KT}{m}}$

$$V_{mps} : V_{av} : V_{rms} = \sqrt{2} : \sqrt{\frac{8}{\pi}} : \sqrt{3}$$

1. Temperature at which r.m.s. speed of O_2 is equal to that of neon at 300 K is :
(A) 280 K (B) 480 K (C) 680 K (D) 180 K

2. The R.M.S. speed of the molecules of a gas of density 4 kg m^{-3} and pressure 1.2×10^5 N m^{-2} is :
(A) 120 $m\,s^{-1}$ (B) 300 $m\,s^{-1}$ (C) 600 $m\,s^{-1}$ (D) 900 $m\,s^{-1}$

3. The mass of molecule A is twice that of molecule B. The root mean square velocity of molecule A is twice that of molecule B. If two containers of equal volume have same number of molecules, the ratio of pressure P_A/P_B will be :
(A) 8 : 1 (B) 1 : 8 (C) 4 : 1 (D) 1 : 4

4. The kinetic energy of N molecules of O_2 is x joule at – 123ºC. Another sample of O_2 at 27ºC has a kinetic energy of 2 x. The latter sample contains _______ molecules of O_2.
(A) N (B) N/2 (C) 2 N (D) 3 N

5. The average kinetic energy (in joules of) molecules in 8.0 g of methane at 27º C is :
(A) 6.21×10^{-20} J/molecule (B) 6.21×10^{-21} J/molecule
(C) 6.21×10^{-22} J/molecule (D) 3.1×10^{-22} J/molecule

6. According to kinetic theory of gases, for a diatomic molecule :
(A) The pressure exerted by the gas is proportional to the mean velocity of the molecule.
(B) The pressure exerted by the gas is proportional to the r.m.s. velocity of the molecule.
(C) The r.m.s. velocity of the molecule is inversely proportional to the temperature.
(D) The mean translational K.E. of the molecule is proportional to the absolute temperature.

7. The temperature of an ideal gas is increased from 120 K to 480 K. If at 120 K the root-mean-square velocity of the gas molecules is v, at 480 K it becomes :
(A) 4v (B) 2v (C) v/2 (D) v/4

8. The ratio between the r.m.s. velocity of H_2 at 50 K and that of O_2 at 800 K is:
(A) 4 (B) 2 (C) 1 (D) 1/4

9. Which of the following expression correctly represents the relationship between the average kinetic energy of CO and N_2 molecules at the same temperature.
(A) $\bar{E}$ (CO) > $\bar{E}$ (N_2) (B) $\bar{E}$ (CO) < $\bar{E}$ (N_2) (C) $\bar{E}$ (CO) = $\bar{E}$ (N_2)
(D) Cannot be predicted unless volumes of the gases are given

10. Helium atom is two times heavier than a hydrogen molecule. At 298 K, the average kinetic energy of a helium atom is

(A) two times that of a hydrogen molecules (B) same as that of a hydrogen molecules
(C) four times that of a hydrogen molecules (D) half that of a hydrogen molecules

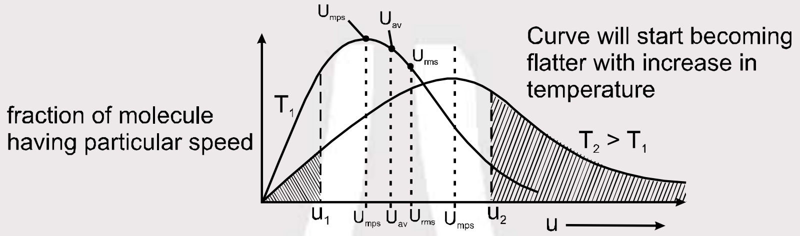
ANSWER KEY

1.	(B)	**2.**	(B)	**3.**	(A)	**4.**	(A)	**5.**	(B)	**6.**	(D)	**7.**	(B)
8.	(C)	**9.**	(C)	**10.**	(B)								

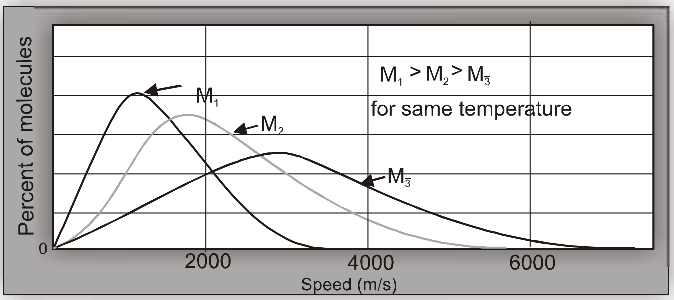
Maxwell's distributions of molecular speeds :

Postulates/Assumptions of speed distributions

- **It is based upon theory of probability.**
- **It gives the statistical averages of the speed of the whole collection of gas molecules.**
- Speed of gaseous molecules of may vary from 0 to ∞. The maxwell distribution of speed can be plotted against fraction of molecules as follows.



- The area under the curve will denote fraction of molecules having speeds between zero and infinity
- Total area under the curve will be constant and will be unity at all temperatures.
- Area under the curve between zero and u_1 will give fraction of molecules racing speed between 0 to u_1. This fraction is more at T_1 and is less at T_2.
- The peak corresponds to most probable speed.
- At higher temperature, fraction of molecules having speed less than a particular value decreases.
- For Gases with different molar masses will have following graph at a given temperature.



Exercise-1

PART - I : SUBJECTIVE QUESTIONS

1. A mixture of gases at 760 torr contains 55.0% nitrogen, 25.0% oxygen and 20.0% carbon dioxide by mole. What is the partial pressure of each gas in torr ?

2. What will be pressure exerted by a mixture of 3.2g of methane of 4.4g of carbon dioxide contained in a $9dm^3$ flask at 27°C ?

3. A container holds 22.4 litre of a gas at 1 atmospheric pressure and at 0ºC. The gas consists of a mixture of argon, oxygen and sulphur dioxide in which :
(a) Partial pressure of SO_2 = (Partial pressure O_2) + (Partial pressure of Ar)
(b) Partial pressure of O_2 = 2 × partial pressure of Ar
Calculate the density of the gas mixture under these conditions.

4. The rates of diffusion of two gases A and B are in the ratio 1 : 4. If the ratio of their masses present in the mixture is 2 : 3. The ratio of their mole fraction is : ($9^{1/3} = 2.08$)

5. For 10 minute each, at 0ºC, from two identical holes nitrogen and an unknown gas are leaked into a common vessel of 4 litre capacity. The resulting pressure is 2.8 atm and the mixture contains 0.4 mole of nitrogen. What is the molar mass of unknown gas? (Use R = 0.082 L-atm/mol-K)

6. The pressure in a vessel that contained pure oxygen dropped from 2000 torr to 1500 torr in 40 min as the oxygen leaked through a small hole into a vacuum. When the same vessel was filled with another gas, the pressure dropped from 2000 torr to 1500 torr in 80 min. What is the molecular weight of the second gas ?

7. A gaseous mixture contains oxygen and another unknown gas in the molar ratio of 4 : 1 diffuses through a porous plug in 245 seconds. Under similar conditions same volume of oxygen takes 220 sec to diffuse. Find the molecular mass of the unknown gas.

PART - II : SINGLE CHOICE OBJECTIVE QUESTIONS

1. Equal weights of ethane & hydrogen are mixed in an empty container at 25º C, the fraction of the total pressure exerted by hydrogen is:
(A) 1: 2 (B) 1: 1 (C) 1: 16 (D) 15: 16

2. A mixture of hydrogen and oxygen at one bar pressure contains 20% by weight of hydrogen. Partial pressure of hydrogen will be
(A) 0.2 bar (B) 0.4 bar (C) 0.6 bar (D) 0.8 bar

3. A compound exists in the gaseous phase both as monomer (A) and dimer (A_2). The atomic mass of A is 48 and molecular mass of A_2 is 96. In an experiment 96 g of the compound was confined in a vessel of volume 33.6 litre and heated to 273ºC. The pressure developed if the compound exists as dimer to the extent of 50 % by weight under these conditions will be :
(A) 1 atm (B) 2 atm (C) 1.5 atm (D) 4 atm

4. The total pressure of a mixture of oxygen and hydrogen is 1.0 atm. The mixture is ignited and the water is removed. The remaining gas is pure hydrogen and exerts a pressure of 0.40 atm when measured at the same values of T and V as the original mixture. What was the composition of the original mixture in mole percent?
(A) $x_{O_2} = 0.2$; $x_{H_2} = 0.8$ (B) $x_{O_2} = 0.4$; $x_{H_2} = 0.6$
(C) $x_{O_2} = 0.6$; $x_{H_2} = 0.4$ (D) $x_{O_2} = 0.8$; $x_{H_2} = 0.2$

5. The rates of diffusion of SO_3, CO_2, PCl_3 and SO_2 are in the following order -
(A) $PCl_3 > SO_3 > SO_2 > CO_2$ (B) $CO_2 > SO_2 > PCl_3 > SO_3$
(C) $SO_2 > SO_3 > PCl_3 > CO_2$ (D) $CO_2 > SO_2 > SO_3 > PCl_3$

6. 20 ℓ of SO_2 diffuses through a porous partition in 60 seconds. Volume of O_2 diffuse under similar conditions in 30 seconds will be :
(A) 12.14 ℓ (B) 14.14 ℓ (C) 18.14 ℓ (D) 28.14 ℓ

7. See the figure-1 :

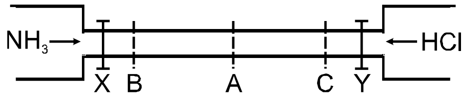


Fig.-1

The valves of X and Y are opened simultaneously. The white fumes of NH_4Cl will first form at:
(A) A (B) B (C) C (D) A,B and C simultaneously

8. X ml of H_2 gas effuses through a hole in a container in 5 sec. The time taken for the effusion of the same volume of the gas specified below under identical conditions is :

(A) 10 sec. He (B) 20 sec. O_2 (C) 25 sec. CO_2 (D) 55 sec. CO_2

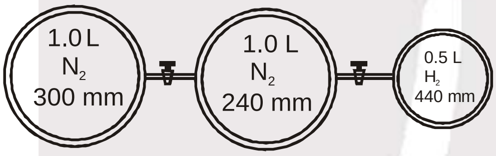
9. Three identical footballs are respectively filled with nitrogen , hydrogen and helium at same pressure. If the leaking of the gas occurs with time from the filling hole, then the ratio of the rate of leaking of gases $(r_{N_2} : r_{H_2} : r_{He})$ from three footballs under identical conditions (in equal time interval) is :

(A) $\left(1:\sqrt{14}:\sqrt{7}\right)$ (B) $\left(\sqrt{14}:\sqrt{7}:1\right)$ (C) $\left(\sqrt{7}:1:\sqrt{14}\right)$ (D) $\left(1:\sqrt{7}:\sqrt{14}\right)$

Exercise-2

PART - I : SINGLE OR DOUBLE INTEGER TYPE

1. Consider the arrangment of bulbs shown below.



If the pressure of the system when all the stopcocks are opened is x (in atm) then find 100 x ?
(760 mm = 1 atm)

2. At 20ºC, two balloons of equal volume and porosity are filled to a pressure of 2 atm, one with 14 kg N_2 and other with 1 kg of H_2. The N_2 balloon leaks to a pressure of 1/2 atm in 1 hr. How long will it take for H_2 balloon to reach a pressure of 1/2 atm ?

PART - II : ONE OR MORE THAN ONE OPTION CORRECT TYPE

1. In a closed rigid container, 3 mol of gas A and 1 mol of gas B are mixed at constant temperature. If 1mol of another gas C at same temperature is introduced and all gases are considered to be non reacting, then

(A) Partial pressure of gases A and B remain unaffected due to introduction of gas C.

(B) Ratio of total pressure before and after mixing of gas 'C' is $\frac{3}{5}$.

(C) If the total pressure of gas mixture before introducing gas 'C' is 20atm, then the total gas pressure after mixing 'C' will be 25 atm.

(D) If data of option'C' are used, then partial pressure of gas 'C' will be 5 atm.

2. Which of the following statements are correct?

(A) Helium diffuses at a rate 8.65 times as much as CO does.

(B) Helium escapes at a rate 2.65 times as fast as CO does.

(C) Helium escapes at a rate 4 times as fast as CO_2 does.

(D) Helium escapes at a rate 4 times as fast as SO_2 does.

3.– The rate of diffusion of 2 gases ‘A’ and ‘B’ are in the ratio 16: 3. If the ratio of their masses present in the mixture is 2 : 3. Then

(A) The ratio of their molar masses is 16 : 1

(B) The ratio of their molar masses is 1 : 4

(C) The ratio of their moles present inside the container is 1 : 24

(D) The ratio of their moles present inside the container is 8 : 3

Exercise-3

PART - I : JEE (ADVANCED) / IIT-JEE PROBLEMS (PREVIOUS YEARS)

*** Marked Questions may have more than one correct option.**

1. The average velocity of gas molecules is 400 m/sec calculate its r.m.s. velocity at the same temperature. **[JEE-2003(M), 2/60]**

2. For one mole of gas the average kinetic energy is given as E. The U_{rms} of gas is : **[JEE-2004(S), 3/84]**

(A) $\sqrt{\frac{2E}{M}}$ (B) $\sqrt{\frac{3E}{M}}$ (C) $\sqrt{\frac{2E}{3M}}$ (D) $\sqrt{\frac{3E}{2M}}$

3. Ratio of rates of diffusion of He and CH_4 (under identical conditions). **[JEE-2005(S), 3/84]**

(A) $\frac{1}{2}$ (B) 3 (C) $\frac{1}{3}$ (D) 2

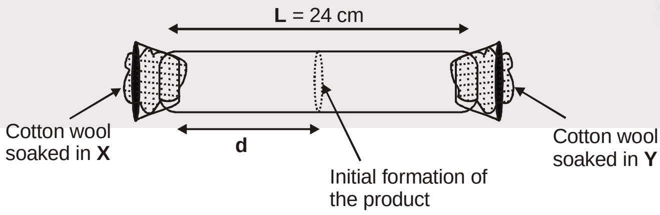
4. At 400 K, the root mean square (rms) speed of a gas **X** (molecular weight = 40) is equal to the most probable speed of gas **Y** at 60 K. The molecular weight of the gas **Y** is. **[JEE-2009, 4/160]**

5.* According to kinetic theory gases **[JEE-2011, 4/180]**

(A) collisions are always elastic
(B) heavier molecules transfer more momentum to the waal of the container
(C) only a small number of molecules have very high velocity
(D) between collisions, the molecules move in straight lines with constant velocities.

Paragraph for questions 6 and 7

X and **Y** are two volatile liquids with molar weights of 10 g mol^{-1} and 40 g mol^{-1} respectively. Two cotton plugs, one soaked in **X** and the other soaked in **Y**, are simultaneously placed at the ends of a tube of length **L** = 24 cm, as shown in the figure. The tube is filled with an inert gas at 1 atmosphere pressure and a temperature of 300 K. Vapours of **X** and **Y** react to form a product which is first observed at a distance **d** cm from the plug soaked in **X**. Take **X** and **Y** to have equal molecular diameters and assume ideal behaviour for the inert gas and the two vapours.



6. The value of **d** in cm (shown in the figure), as estimated from Graham's law, is : **[JEE(Advanced)-2014, 3/120]**

(A) 8 (B) 12 (C) 16 (D) 20

7. The experimental value of **d** is found to be smaller than the estimate obtained using Graham's law. This is due to **[JEE(Advanced)-2014, 3/120]**

(A) larger mean free path for **X** as compared to that of **Y**.
(B) larger mean free path for **Y** as compared to that of **X**.
(C) increased collision frequency of **Y** with the inert gas as compared to that of **X** with the inert gas.
(D) increased collision frequency of **X** with the inert gas as compared to that of **Y** with the inert gas.

PART - II : JEE (MAIN) / AIEEE PROBLEMS (PREVIOUS YEARS)

1. According to kinetic theory of gases in an ideal gas between two successive collisions a gas molecule travels: **[AIEEE 2003, 3/225]**

(1) In a straight line path (2) With an accelerated velocity

(3) In a circular path (4) In a wavy path

2. As the temperature is raised from 20ºC to 40ºC, the average kinetic energy of neon atoms changes by a factor : **[AIEEE 2004, 3/225]**

(1) 2 (2) $\sqrt{\frac{313}{293}}$ (3) $\frac{313}{293}$ (4) $\frac{1}{2}$

3. Which one of the following statements is not true about the effect of an increase in temperature on the distribution of molecular speeds in a gas ? **[AIEEE 2005, 3/225]**

(1) The area under the distribution curve remains the same as under the lower temperature

(2) The distribution becomes broader

(3) The fraction of the molecules with the most probable speed increases

(4) The most probable speed increases

4. Equal masses of methane and oxygen are mixed in an empty container at 25°C. The fraction of the total pressure exerted by oxygen is **[AIEEE 2007, 3/120]**

(1) 1/3 (2) 1/2 (3) 2/3 (4) $\frac{1}{3} \times \frac{273}{298}$

5. When r, P and M represent rate of diffusion, pressure and molecular mass, respectively, then the ratio of the rates of diffusion (r_A/r_B) of two gases A and B, is given as: **[AIEEE 2011, 4/120]**

(1) $(P_A/P_B)\,(M_B/M_A)^{1/2}$ (2) $(P_A/P_B)^{1/2}\,(M_B/M_A)$

(3) $(P_A/P_B)\,(M_A/M_B)^{1/2}$ (4) $(P_A/P_B)^{1/2}\,(M_A/M_B)$

6. The molecular velocity of any gas is: **[AIEEE 2011, 4/120]**

(1) inversely proportional to absolute temperature.

(2) directly proportional to square of temperature.

(3) directly proportional to square root of temperature.

(4) inversely proportional to the square root of temperature.

7. For gaseous state, if most probable speed is denoted by C*, average speed by $\bar{C}$ and mean square speed by C, then for a large number of molecules the ratios of these speeds are : **[JEE(Main) 2013, 4/120]**

(1) $C^* : \bar{C} : C = 1.225 : 1.128 : 1$ (2) $C^* : \bar{C} : C = 1.128 : 1.225 : 1$

(3) $C^* : \bar{C} : C = 1 : 1.128 : 1.225$ (4) $C^* : \bar{C} : C = 1 : 1.225 : 1.128$

Answers

EXERCISE - 1

PART - I

1. = 418 torr, = 190 torr, = .152 torr, total pressure = 760.

2. 8.32×10^4 Pa. **3.** 2.201 g/L **4.** 0.347 **5.** 448 g mol^{-1}

6. M = 128 g/mol **7.** 133

PART - II

1. (D) **2.** (D) **3.** (B) **4.** (A) **5.** (D)

6. (B) **7.** (C) **8.** (B) **9.** (A)

EXERCISE - 2

PART - I

1. 40 atm **2.** 16 Minutes

PART - II

1. (A,C,D) **2.** (B,D) **3.** (B,D)

EXERCISE - 3

PART - I

1. 434 m/s **2.** (A) **3.** (D) **4.** $M_Y = 4$. **5.*** (ACD)

6. (C) **7.** (D)

PART - II

1. (1) **2.** (3) **3.** (3) **4.** (1) **5.** (1)

6. (3) **7.** (3)