CHAPTER: Kinetic theory

OBJECTIVE TYPE QUESTIONS:

Multiple Choice Questions (MCQs)

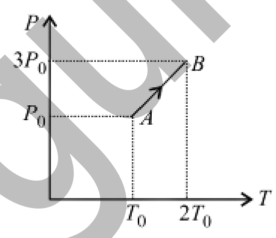
1 If C_P and C_V denoted the specific heats of unit mass of nitrogen at constant pressure and volume respectively, then

(a) $C_P - C_V = \frac{R}{28}$ (b) $C_P - C_V = \frac{R}{7}$ (c) $C_P - C_V = \frac{R}{14}$ (d) $C_P - C_V = R$

2 An ideal gas is compressed isothermally until its pressure is doubled and then allowed to expand adiabatically to regain its original volume ($\gamma = 1.4$ and $2^{-1.4} = 0.38$). The ratio of the final to initial pressure is

(a) $0.76:1$ (b) $1:1$ (c) $0.66:1$ (d) $0.86:1$

3 Pressure versus temperature graph of an ideal gas is as shown in figure. Density of the gas at point A is ρ_0. Density at point B will be



(a) $\frac{3}{4}\rho_0$

(b) $\frac{3}{2}\rho_0$

(c) $\frac{4}{3}\rho_0$

(d) $2\rho_0$

4 A vessel has 6 g of hydrogen at pressure P and temperature 500 K. A small hole is made in it so that hydrogen leaks out. How much hydrogen leaks out if the final pressure is $\frac{P}{2}$ and temperature falls to 300 K ?

(a) 2 g (b) 3 g (c) 4 g (d) 1 g

5 The pressure and density of a diatomic gas $\left(\gamma = \frac{7}{5}\right)$ changes adiabatically from (P, d) to (P', d'). If $\frac{d'}{d} = 32$ then $\frac{P'}{P}$ is

(a) $\frac{1}{128}$ (b) 32 (c) 128 (d) 256

6 The temperature of the gas contained in a closed vessel increases by 1°C when pressure of the gas is increased by 1%. The initial temperature of the gas is

(a) 100 K (b) 100°C (c) 200 K (d) 250°C

7 Two flasks R and S of volume V_1 and V_2 contain same gas at pressure P_1 and P_2 respectively at the same temperature. Pressure of the gas when the flasks R and S are connected by a tube of negligible volume is

(a) $\frac{P_1V_1+P_2V_2}{V_1+V_2}$ (b) $\frac{P_1V_1+P_2V_2}{2(V_1+V_2)}$ (c) $\frac{P_1V_2+P_2V_1}{V_1+V_2}$ (d) $\frac{(P_1+P_2)(V_1+V_2)}{(V_1+2V_2)}$

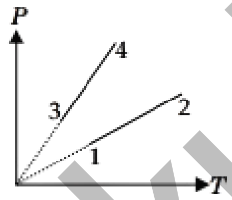
8 1 mole of H_2 gas is contained in a box of volume $V = 1.00\ m^3$ at $= 300$ K. The gas is heated to a temperature of $T = 3000$ K and the gas gets converted to a gas of hydrogen atoms. The final pressure would be (considering all gases to be ideal)

(a) same as the pressure initially. (b) 2 times the pressure initially.

(c) 10 times the pressure initially. (d) 20 times the pressure initially.

9 An inflated rubber balloon contains one mole of an ideal gas, has a pressure P, volume V and temperature T. If the temperature rises to 1.1 T, and the volume is increased to 1.05 V, the final pressure will be
(a) $1.1P$ (b) P (c) less than P (d) between P and 1.1

10 Pressure versus temperature graph of an ideal gas of equal number of moles of different volumes are plotted as shown in figure. Choose the correct alternative.
(a) $V_1 = V_2 = V_3 = V_4$
(b) $V_4 > V_3 > V_2 > V_1$
(c) $V_1 = V_2; V_3 = V_4$ and $V_2 > V_3$
(d) $V_1 = V_2, V_3 = V_4$ and $V_2 < V_3$



11 The temperature of an ideal gas is increased from 27°C to 127°C, then percentage increase in v_{rms} is
(a) 37% (b) 11% (c) 33% (d) 15.5%

12 An ideal gas at a pressure of 1 atmosphere and temperature of 27°C is compressed adiabatically until its pressure becomes 8 times the initial pressure. Then the final temperature is (Given $\gamma = \frac{3}{2}$)
(a) 627°C (b) 527°C (c) 427°C (d) 327°C

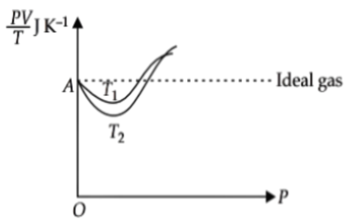
13 A cylinder contains 10 kg of gas at pressure of 10^7 N m^{-2}, the quantity of gas taken out of the cylinder, if final pressure is 2.5×10^6 N m^{-2} is
(a) 7.5 kg (b) 10.5 kg (c) 5.2 kg (d) 2.5 kg

14 A vessel is filled with a gas at a pressure of 76 cm of mercury of a certain temperature. The mass of the gas is increased by 50% by introducing more gas in the vessel at the same temperature. The resultant pressure of the gas is
(a) 76 cm of mercury (b) 108 cm of mercury
(c) 112 cm of mercury (d) 114 cm of mercury

15 A gas at absolute temperature 300 K has pressure 4×10^{-10} N/m^2. The number of molecules per cm^3 is of the order of (Boltzmann constant, $k_B = 1.38 \times 10^{-23}$ J/K)
(a) 100 (b) 10^5 (c) 10^8 (d) 10^{11}

16 Two containers of equal volume contain the same gas at pressures P_1 and P_2 and absolute temperatures T_1 and T_2 respectively. On joining the vessels, the gas reaches a common pressure P and a common temperature T. The ratio $\frac{P}{T}$ is
(a) $\frac{P_1}{T_1} + \frac{P_2}{T_2}$ (b) $\frac{1}{2}\left[\frac{P_1}{T_1} + \frac{P_2}{T_2}\right]$ (c) $\frac{P_1T_2+P_2T_1}{T_1+T_2}$ (d) $\frac{P_1T_2-P_2T_1}{T_1-T_2}$

17 Given is the graph between $\frac{PV}{T}$ and P for 1 g of oxygen gas at two different temperatures T_1 and T_2, as shown in figure. Given, density of oxygen $= 1.427$ kg m^{-3}. The value of PV/T at the point A and the relation between T_1 and T_2 are respectively
(a) 0.259 J K^{-1} and $T_1 < T_2$
(b) 8.314 J mol^{-1} K^{-1} and $T_1 > T_2$
(c) 0.259 J K^{-1} and $T_1 > T_2$
(d) 4.28 J K^{-1} and $T_1 < T_2$



18 A cubic vessel (with faces horizontal + vertical) contains an ideal gas at NTP. The vessel is being carried by a rocket which is moving at a speed of $500 \mathrm{~m} \mathrm{~s}^{-1}$ in vertical direction. The pressure of the gas inside the vessel as observed by us on the ground

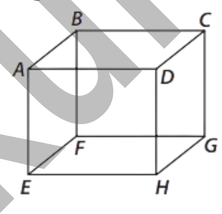
(a) remains the same because $500 \mathrm{~m} \mathrm{~s}^{-1}$ is very much smaller than v_{rms} of the gas.

(b) remains the same because motion of the vessel as a whole does not affect the relative motion of the gas Molecules and the walls.

(c) will increase by a factor equal to $[v_{\text{rms}}^2+(500)^2]/v_{\text{rms}}^2$, where v_{rms} was the original mean square velocity of the gas.

(d) will be different on the top wall and bottom wall of the vessel.

19 1 mole of an ideal gas is contained in a cubical volume V, $ABCDEFGH$ at 300 K as shown in figure. One face of the cube ($EFGH$) is made up of a material which totally absorbs any gas molecule incident on it. At any given time,



(a) the pressure on $EFGH$ would be zero.

(b) the pressure on all the faces will be equal.

(c) the pressure of $EFGH$ would be double the pressure on $ABCD$.

(d) the pressure on $EFGH$ would be half that on $ABCD$.

20 The average kinetic energy of the molecules of a low-density gas at 27°C is (Boltzmann constant $= 1.38 \times 10^{-23} \mathrm{~J~K}^{-1}$)

(a) 3.1×10^{-20} J (b) 3.5×10^{-21} J (c) 5.3×10^{-18} J (d) 6.21×10^{-21} J

21. At 27°C temperature, the kinetic energy of an ideal gas is E_1. If the temperature is increased to 327°C, then kinetic energy would be

(a) $\frac{E_1}{2}$ (b) $\frac{E_1}{\sqrt{2}}$ (c) $\sqrt{2}E_1$ (d) $2E_1$

22 At what temperature is the root mean square speed of an atom in an argon gas cylinder equal to the rms speed of a helium gas atom at −20°C ? (Atomic mass of Ar39u and He = 400u)

(a) 2.52×10^3 K (b) 2.52×10^2 K (c) 4.03×10^3 K (d) 4.03×10^2 K

23 One mole of an ideal monoatomic gas at temperature T_0 expands slowly according to the law $\frac{P}{V}=$ constant. If the final temperature is $2T_0$, heat supplied to the gas is

(a) $2RT_0$ (b) RT_0 (c) $\frac{3}{2}RT_0$ (d) $\frac{1}{2}RT_0$

24 The average kinetic energy of a gas molecule at 27°C is 6.21×10^{-21} J. Its average kinetic energy at 227°C will be

(a) 52.2×10^{-21} J (b) 5.22×10^{-21} J (c) 10.35×10^{-21} J (d) 11.35×10^{-21} J

25 The molecules of a given mass of a gas have root mean square speeds of $100 \mathrm{~m~s}^{-1}$ at 27°C and 1 atmospheric pressure. The root means square speeds of the molecules of the gas at 127°C and 2 atmospheric pressure is

(a) $\frac{200}{\sqrt{3}}$ (b) $\frac{100}{\sqrt{3}}$ (c) $\frac{400}{3}$ (d) $\frac{200}{3}$

26 A vessel has 6 g of oxygen at pressure P and temperature 400 K. A small hole is made in it so that oxygen leaks out. How much oxygen leaks out if the final pressure is $\frac{P}{2}$ and temperature 300 K ?

(a) 5 g (b) 4 g (c) 2 g (d) 3 g

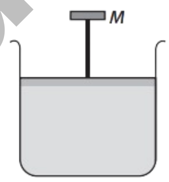
27 A gaseous mixture consists of 16 g of helium and 16 g of oxygen. The ratio C_P/C_V of the mixture is
(a) 1.4 (b) 1.54 (c) 1.59 (d) 1.62

28 The ratio $\frac{C_P}{C_V} = \gamma$ for a gas. Its molecular weight is M. Its specific heat capacity at constant pressure is
(a) $\frac{R}{\gamma-1}$ (b) $\frac{\gamma R}{\gamma-1}$ (c) $\frac{\gamma R}{M(\gamma-1)}$ (d) $\frac{\gamma RM}{(\gamma-1)}$

29 One mole of a monatomic gas is mixed with 3 moles of a diatomic gas. What is the molar specific heat of the mixture at constant volume?
(a) $\frac{5}{4}R$ (b) $\frac{9}{4}R$ (c) $\frac{3}{4}R$ (d) R

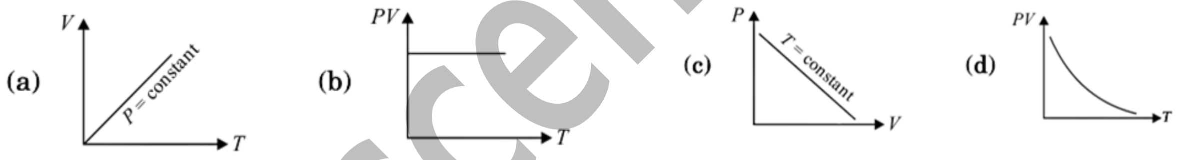
30 One kg of a diatomic gas is at a pressure of 8×10^4 N m^{-2}. The density of the gas is 4 kg m^{-3}. What is the energy of the gas due to its thermal motion?
(a) 3×10^4 J (b) 5×10^4 J (c) 6×10^4 J (d) 7×10^4 J

31 A cylinder containing an ideal gas is in vertical position and has a piston of mass M that is able to move up or down without friction. If the temperature is increased,
(a) both P and V of the gas will change.
(b) only P will increase according to Charle's law.
(c) V will change but not P.
(d) P will change but not V.



32 Volume versus temperature graphs for a given mass of an ideal gas are shown in figure at two different values of constant pressure. What can be inferred about relation between P_1 and P_2 ?
(a) $P_1 > P_2$ (b) $P_1 = P_2$ (c) $P_1 < P_2$ (d) data is insufficient

33 Which of the following graphs represent the behaviours of an ideal gas?



34 If one mole of a monatomic gas $\left(\gamma = \frac{5}{3}\right)$ is mixed with one mole of a diatomic gas $\left(\gamma = \frac{7}{5}\right)$, the value of γ for the mixture is
(a) 1.40 (b) 1.50 (c) 1.53 (d) 3.07

35 A gas mixture consists of 2.0 moles of oxygen and 4.0 moles of neon at temperature T. Neglecting all vibrational modes, calculate the total internal energy of the system. (Oxygen has two rotational modes.)
(a) $11RT$ (b) $13RT$ (c) $15RT$ (d) $19RT$

36 The heat capacity per mole of water is (R is universal gas constant)
(a) $9R$ (b) $\frac{9}{2}R$ (c) $6R$ (d) $5R$

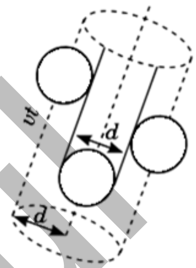
37 Two mole of oxygen is mixed with eight mole of helium. The effective specific heat of the mixture at constant volume is
(a) $1.3R$ (b) $1.4R$ (c) $1.7R$ (d) $1.9R$

Case Based MCQs

Case I : Read the passage given below and answer the following questions from 38 to 42.

Mean Free Path

The average distance travelled between successive collisions of molecules of a gas is called as mean free path (λ). Let in time interval t, the molecules moves a distance vt and collides with every molecule in the cylindrical volumes, $V = \pi d^2 vt$ and number of molecules in cylindrical volume be N.



∴ Number of molecules per unit volume be $n = \frac{N}{V} \Rightarrow N = n\pi d^2 vt$

The mean free path is the total distance divided by the number of collisions.

$$\lambda = \frac{vt}{n\pi d^2 vt} = \frac{1}{n\pi d^2}$$

By considering motion of all the molecules the exact expression is $\lambda = \frac{1}{\sqrt{2}n\pi d^2}$

38 A vessel contains 60,000 molecules of a gas. Due to a very fine hole in the wall, 10,000 molecules escape from the vessel. Then the mean free path of the molecules of the gas

(a) is increased (b) is decreased (c) is not changed (d) may increase or decrease

39 The path lengths travelled by a molecule A in 6 collisions are 3,7,1,2,4,3 units respectively. The mean free path of the molecule A is

(a) $\frac{13}{6}$ unit (b) $\frac{20}{6}$ unit (c) $\frac{87}{6}$ unit (d) $\frac{6}{20}$ unit

40 The mean free path of a gas varies with the density of gas according to the following relation

(a) $\lambda \propto \rho$ (b) $\lambda \propto \sqrt{\rho}$ (c) $\lambda \propto \frac{1}{\rho}$ (d) $\lambda \propto \rho^2$

41 Mean free path of a gas molecule is

(a) inversely proportional to number of molecules per unit volume

(b) inversely proportional to diameter of the molecule

(c) directly proportional to the square root of the absolute temperature

(d) directly proportional to the molecular mass

42 The volume of a gas and the number of molecules within that volume for three situations are (i) $2V_0$ and N_0 (ii) $3V_0$ and $3N_0$ (iii) $3V_0$ and $9N_0$. The situations are ranked according to the mean free path (greatest first) as

(a) (i), (ii), (iii) (b) (iii), (ii), (i) (c) (ii), (iii), (i) (d) (ii), (i), (iii)

Case II : Read the passage given below and answer the following questions from 43 to 46.

Law of Equipartition of Energy

In equilibrium the total energy is equally distributed in all possible energy modes, with each mode having an average energy equal to (1/2) kT. This is known as law of equipartition energy.

Each translational and rotational degree of freedom contributes (1/2) kT to the energy.

Each vibrational frequency contributes $2 \times (1/2)\ kT = kT$ energy since vibration has both kinetic and potential modes of energy.

43 According to equipartition law of energy each particle in a system of particles have thermal energy E equal to

(a) $E = k_B T$ (b) $E = \frac{1}{2}k_B T$ (c) $E = 3k_B T$ (d) $E = \frac{3}{2}k_B T$

44 The average energy per molecule of a triatomic gas at room temperature T is
(a) $3kT$ (b) $\frac{1}{2}kT$ (c) $\frac{3}{2}kT$ (d) $\frac{5}{2}kT$

45 The gases carbon-monoxide (CO) and nitrogen are kept at the same temperature. If their kinetic energies are E_1 and E_2 respectively, then
(a) $E_1 = E_2$ (b) $E_1 > E_2$ (c) $E_1 < E_2$ (d) E_1 and E_2 cannot be compared

46 Which one of the following molecules does not possess vibrational energy?
(a) Oxygen (b) Nitrogen (c) Argon (d) CO_2

Assertion & Reasoning Based MCQs

For question numbers 47-56, two statements are given-one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.
(a) Both A and R are true and R is the correct explanation of A
(b) Both A and R are true but R is NOT the correct explanation of A
(c) A is true but R is false
(d) A is false and R is also false

47 **Assertion (A)** : Mean free path of gas molecules varies inversely as density of the gas.
Reason (R) : Mean free path of gas molecules is defined as the average distance travelled by a molecule between two successive collisions.

48 **Assertion (A) :** The root mean square velocity of molecules of a gas having Maxwellian distribution of velocities is higher than their most probable velocity, at any temperature.
Reason (R): A very small number of molecules of a gas molecules which posses very large velocities.

49 **Assertion (A):** The number of degrees of freedom of a linear triatomic molecules is 7.
Reason (R): The number of degree of freedom depends on number of particle in the system.

50 **Assertion (A):** Air pressure in a car tyre increases during driving.
Reason (R) : Absolute zero-degree temperature is not zero energy temperature.

51 **Assertion (A) :** Absolute zero is not the temperature corresponding to zero energy.
Reason (R): The temperature at which no molecular motion ceases is called absolute zero temperature.

52 **Assertion (A):** The ratio of specific heat of a gas at constant pressure and specific heat at constant volume for a diatomic gas is more than that for a monatomic gas.
Reason (R): The molecules of a monatomic gas have more degree of freedom than those of a diatomic gas.

53 **Assertion (A):** Specific heat of a gas at constant pressure is greater than its specific heat at constant volume.
Reason (R): At constant pressure, some heat is spent in expansion of the gas.

54 **Assertion (A):** The total translational kinetic energy of all the molecules of a given mass of an ideal gas is 1.5 times the product of its pressure and its volume.
Reason (R): The molecules of a gas collide with each other and the velocities of the molecules change due to collision.

55. **Assertion (A):** Vibrational energy of diatomic molecule corresponding to each degree of freedom is $k_B T$.
Reason (R): For every molecule, vibrational degree of freedom is 2 .

56. **Assertion (A):** An undamped spring-mass system is simplest free vibration system.
Reason (R): It has three degrees of freedom.

Very Short Answer Type Questions (VSA)

57. The volume of a given mass of a gas at 27°C and 1 atm is 100 cm^3. What will be its volume at 327°C ?

58. A gas mixture consists of molecules of types A, B and C with masses $m_A > m_B > m_C$. Rank the three types of molecules in decreasing order of their rms speeds.

59. Plot pressure (P) versus volume (V) graphs for a fixed mass of a gas are drawn at two different temperatures.

60. On reducing the volume of a gas at constant temperature, the pressure of the gas increases. Explain it on the basis of kinetic theory.

61. What would be the effect on the rms velocity of gas molecules if the temperature of the gas is increased by a factor of 4?

62. Two gases are at temperatures of 300 K and 350 K respectively. What is the ratio of the average kinetic energies of their molecules?

63. Name the two factors on which the degree of freedom of gas depend.

64. Calculate the ratio of the mean free paths of the molecules of two gases having molecular diameters 1Å and 2Å. The gases may be considered under identical conditions of temperature, pressure and volume.

65. What is the order of mean free path (λ) of the gas molecules?

66. Find the energy per mole per degree of freedom of an ideal gas.

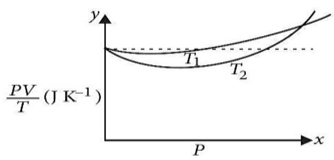
Short Answer Type Questions (SA-I)

67 For a rigid diatomic molecule, universal gas constant $R = nC_P$ where C_P is the molar specific heat at constant pressure and n is a number. Find the value of n.

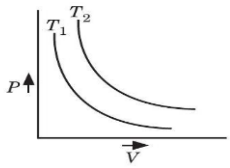
68 Calculate the internal energy of $1g$ of oxygen gas at STP.

69 A balloon has 5 g mole of helium at 7°C. Calculate,
(a) the number of atoms of helium in the balloon,
(b) the total internal energy of the system.

70 Figure shows plot of PV/T versus P for 1.00×10^{-3} kg of oxygen gas at two different temperatures.
(a) Which is true: $T_1 > T_2$ or $T_1 < T_2$?
(b) What is the value of PV/T where the curves meet on the y-axis?



71 Two vessels of the same volume are filled with the same gas at the same temperature. If the pressure of the gas in these vessels be in the ratio 1: 2 then, find
(i) the ratio of the rms speeds of the molecules.
(ii) the ratio of the number of molecules.



72. Isothermal curves for a given mass of gas are shown at two different temperatures T_1 and T_2. State whether $T_1 > T_2$ or $T_2 > T_1$. Justify your answer.

73. If C_P and C_V denote the specific heats of nitrogen per unit mass at constant pressure and constant volume respectively, then what is the value of $C_P - C_V$?

74. Calculate the number of degrees of freedom of molecules of hydrogen in 1 cm^3 of hydrogen gas at NTP.

75. A gas mixture consists of molecules of types A, B and C with masses $m_A > m_B > m_C$. Rank the three types of molecules in decreasing order of (a) average K.E., (b) rms speeds.

76. State the law of equipartition of energy.

Short Answer Type Questions (SA-II)

77. (a) Write the SI unit of R.
(b) Write the values of R in different units, where R is universal gas constant.

78. Calculate specific heat of water using law of equipartition of energy.
An insulated container containing monoatomic gas of molar mass m is moving with a velocity v_o. If the container is suddenly stopped, find the change in temperature.

79. From a certain apparatus, the diffusion rate of hydrogen has an average value of 28.7 $cm^3\ s^{-1}$. The diffusion of another gas under the same conditions is measured to have an average rate of 7.2 $cm^3\ s^{-1}$. Identify the gas.

80. Two monatomic ideal gases A and B occupying the same volume V, are at the same temperature T and pressure P. If they are mixed, the resultant mixture has volume V and temperature T. Calculate the pressure of the mixture.

81. Hydrogen is at temperature T and helium is at temperature $2T$. The internal energy of both gases is the same. What is the ratio of number of moles of hydrogen and helium gases?

82. (a) What do you understand by specific heat capacity of water (assume water behaves as a solid)?
(b) If one mole of ideal monatomic gas ($\gamma = 5/3$) is mixed with one mole of diatomic gas ($\gamma = 7/5$).
What is the value of γ for the mixtures? (here, γ represents the ratio of specific heat at constant pressure to that at constant volume)

83 Ten small planes are flying at a speed of 150 km h^{-1} in total darkness in an air space that is $20 \times 20 \times 1.5$ km^3 in volume. You are in one of the planes, flying at random within this space with no way of knowing where the other planes are. On the average about how long a time will elapse between near collision with your plane.
Assume for this rough computation that a safety region around the plane can be approximated by a sphere of radius 10 m.

84 (a) How much volume does one mole of a gas occupy at NTP?
(b) What are the essential characteristics of an ideal gas?
(c) What are the conditions under which real gases behave nearly as a perfect gas?

85. What do you understand by mean speed, root mean square speed and most probable speed of a gas. The velocities of ten particles in m/s are 0,2,3,4,4,4,5,5,6,9. Calculate
(i) average speed (ii) rms speed.

86. Explain why:(a) there is no atmosphere on moon.
(b) there is fall in temperature with altitude.

87. A flask contains argon and chlorine in the ratio of 2: 1 by mass. The temperature of the mixture is 27°C. Obtain the ratio of average kinetic energy per molecule and root mean square speed v_{rms} of the molecules of the two gases.
Given: atomic mass of argon = 39.9u and molecular mass of chlorine = 70.9u.

88. A closed vessel contains a mixture of two diatomic gases A and B. Molar mass of A is 16 times that of B and mass of gas A, contained in the vessel is 2 times that of B. Find the ratio of
(i) average kinetic energy per molecule of gas A is equal to that of gas B.
(ii) root mean square value of translational velocity of gas B to that of A.
(iii) pressure exerted by gas B to that exerted by gas A.

89. The velocities of ten particles of a sample of gas in ms^{-1} are 8, 1, 4, 4, 4, 4, 7, 7, 6, 5. Find the
(i) average speed (ii) rms speed (iii) most probable speed.

90. Estimate the average thermal energy of a helium atom at (i) room temperature (27°C), (ii) the temperature on the surface of the Sun (6000 K), (iii) the temperature of 10 million kelvin (the typical core temperature in case of a star).

91. A meter long narrow bore held horizontally (and closed at one end) contains a 76 cm long mercury thread, which traps a 15 cm column of air. What happens if the tube is held vertically with the open end at the bottom?

Long Answer Type Questions (LA)

92 Derive an expression for pressure of a gas in a container. Using it, relate K.E. with pressure.

93 Using the law of equipartition of energy, determine the values of C_P, C_V and γ for
(a) monatomic, (b) diatomic and (c) triatomic gases.

94 What is meant by mean free path of a gas molecule? Derive expression for it. On which factors does the mean free path depends?

95 Consider a rectangular block of wood moving with a velocity v_0 in a gas at temperature T and mass density ρ. Assume the velocity is along x-axis and the area of cross-section of the block perpendicular to v_0 is A. Show that the drag force on the block is $4\rho A v_0\sqrt{\frac{kT}{m}}$ where m is the mass of the gas molecule.

ANSWER:

Multiple Choice Questions (MCQs)

01. (a) 02. (a) 03. (b) 04. (d) 05. (c) 06. (a) 07. (a) 08. (d) 09. (d) 10. (c) 11. (d) 12. (d)

13. (a) 14. (d) 15. (b) 16. (b) 17. (c) 18. (b) 19. (d) 20. (d) 21. (d) 22. (a) 23. (a) 24. (c)

25. (a) 26. (c) 27. (d) 28. (c) 29. (b) 30. (b) 31. (c) 32. (a) 33. (a) 34. (b) 35. (a) 36. (a)

37. (c)

CASE BASED STUDY

38. (a) 39. (b) 40. (c) 41. (a) 42. (a) 43. (d) 44. (a) 45. (a) 46. (c)

ASSERTION & REASONS

47. (b) 48. (c) 49. (b) 50. (b) 51. (a) 52. (d) 53. (a) 54. (b) 55. (c) 56. (c)