INDIAN SCHOOL MUSCAT

DEPARTMENT OF PHYSICS

STUDY MATERIAL FOR NEET AND JEE EXAMS

KINETIC THEORY OF GASES

1.	The specific heat of a gas (a) Has only one value (b) Has two values C_P and C_V (c) Is proportional to the square root of its absolute temperature (d) Can have any value between 0 and infinity
2.	At a certain temperature, hydrogen molecules have r.m.s. velocity of 3 km/s. what is the r.m.s velocity of the oxygen molecules at the same temperature? (a) 0.25 km/s (b) 0.5 km/s (c) 0.75 km/s (d) 6 km/s
3.	A unit mass of solid converted to liquid at its melting point. Heat is required for this process is (a) Specific heat (b) Latent heat of vaporization (c) Latent heat of fusion (d) External latent heat
4.	At constant volume temperature is increased then (a) Collision on walls will be less (b) Collision frequency will be increases (c) Collision will be in straight line (d) Collision will not change
5.	A sample of an ideal gas occupies a volume V at a pressure P and absolute temperature T, the mass of each molecules is m. the expression for the density of gas is (k = Boltzmann constant) (a) mkT (b) $\frac{P}{kT}$ (c) $\frac{P}{kTV}$

	(d) $\frac{Pm}{kT}$
6.	Mean kinetic energy per gram molecule of a gas is given by (a) $\frac{3}{2}RT$ (b) kT (c) $\frac{1}{2}kT$ (d) $\frac{3}{2}kT$
7.	A gas is taken in a sealed container at 300 K. it is heated at constant volume to a temperature 600 K. the mean K.E. of its molecules is (a) Halved (b) Doubled (c) Tripled (d) Quadrupled
8.	C_P and C_V denote the molar specific heats of a gas at constant pressure and at constant volume respectively. If $\frac{C_P}{C_V} = \gamma$ and $C_P - C_V = R$, then C_V is equal to (a) $\frac{R}{\gamma - 1}$ (b) $\frac{\gamma - 1}{R}$ (c) $\frac{\gamma R}{\gamma - 1}$ (d) $\sqrt{\frac{R}{\gamma - 1}}$
9.	The specific heat of a gas in isothermal process is (a) Zero (b) Negative (c) Remains constant (d) Infinite
10.	Mean square velocity of five molecules of velocities 2 m/s, 3 m/s, 4 m/s, 5 m/s and 6 m/s is

	(a) 10 m^2/s^2 (b) 18 m^2/s^2 (c) 20 m^2/s^2 (d) 15 m^2/s^2
11.	Following gases are kept at the same temperature. Which gas possesses maximum r.m.s. speed? (a) Oxygen (b) Nitrogen (c) Hydrogen (d) Carbon dioxide
12.	Consider a gas with density ρ and C as the root mean square velocity of its molecules contained in a volume. If the system moves as a whole with velocity v, then the pressure exerted by the gas is (a) $\frac{1}{3}\rho C^2$ (b) $\frac{1}{3}\rho(C+v)^2$ (c) $\frac{1}{3}\rho(C-v)^2$ (d) $\frac{1}{3}\rho(C^2-v^2)$
13.	If E is the kinetic energy per mole of a gas, and T is the absolute temperature, then the universal gas constant is given by (a) $R=\frac{3T}{2E}$ (b) $R=\frac{2E}{3T}$ (c) $R=\frac{3E}{2T}$ (d) $R=\frac{2T}{3E}$

14.	5 gm of air is heated from 273°K to 275°K. the change in internal energy of air will be (C_v = 172 cal/kg °K and 4.2 J/cal) (a) 7.22 J (b) 5.22 J (c) 8.16 J (d) 3.5 J
16.	If the pressure of an ideal gas is decreased by 10% isothermally, then its volume will (a) Increase by 10% (b) Increase by 11.1% (c) Decrease by 10% (d) Decrease by 9%
17.	According to kinetic theory of gases, at absolute zero of temperature (a) Water freezes (b) Liquid helium freezes (c) Molecular motion stops (d) Liquid hydrogen freezes
18.	A room temperature the r.m.s. velocity of the molecules of a certain diatomic gas is found to be 1930 m/sec. the gas is (a) H_2 (b) F_2 (c) O_2 (d) Cl_2
19.	If two gases of molecular weights M_1 and M_2 are at same pressure and temperature, ratio of their r.m.s. speed will be (a) $M_2 : M_1$ (b) $M_1 : M_2$ (c) $\sqrt{M_1} : \sqrt{M_2}$ (d) $\sqrt{M_2} : \sqrt{M_1}$

20	The temperature of a gas is –68°C. to what temperature should it be heated, so that the r.m.s. velocity of the molecules be doubled? (a) 357°C (b) 457°C (c) 547°C (d) 820°C
21.	Translational kinetic energy of gas molecule, for one mole of the gas, is equal (a) $\frac{3}{2}RT$ (b) $\frac{2}{3}KT$ (c) $\frac{1}{2}RT$ (d) $\frac{2}{1}KT$
22.	If 3 kg of mass is converted into energy. Energy released is (a) 9×10^8 J (b) 9×10^{16} J (c) 27×10^8 J (d) 27×10^{16} J
23.	Three containers of the same volume contains three different gases. The masses of the molecules are m_1, m_2 and m_3 and number of molecules in their respective container are N_1, N_2 and N_3. the gas pressure in the container are P_1, P_2, and P_3 respectively. All the gasses are now mixed and put in one of these containers. The pressure P of the mixture is (a) $P < (P_1 + P_2 + P_3)$ (b) $P = \left(\frac{P_1 + P_2 + P_3}{3}\right)$ (c) $P = (P_1 + P_2 + P_3)$ (d) $P > (P_1 + P_2 + P_3)$
24.	K.E. per unit volume is given by (a) $E = \frac{3}{2}P$

	(b) $E = \frac{2}{3}P$ (c) $E = \frac{1}{2}mv^2$ (d) None of these
25.	The r.m.s. speed of the molecules of an enclosed gas is x. what will be the r.m.s. speed, if the pressure of the gas is doubled but the temperature is kept constant? (a) x (b) $\frac{x}{2}$ (c) 2x (d) $\sqrt{x}$
26.	Mass of gas is 300 gm and its specific heat at constant volume is 750J/kg K. if gas is heated through 75°C at constant pressure of 10^5 N/m^2, it expands by volume 0.08×10^6 cm^3. find C_P/C_V. (a) 1.4 (b) 1.374 (c) 1.474 (d) 1.5
27.	At what temperature, the rms speed of gas molecules I half the value at NTP? (a) 68.25 K (b) 273 K (c) 345 K (d) 0 K
28.	For hydrogen gas $C_P - C_V = a$, and for oxygen gas $C_P - C_V = b$, so that relation between a and b given by (a) a = 16 b (b) 16 a = b (c) a = b (d) a = 4 b
29.	The temperature at which the r.m.s. velocity of H_2 becomes escape velocity from the earth is,

	(a) 10059 °C (b) 10059 K (c) 10332 °C (d) 10332 K
30.	The root mean square speed of hydrogen molecules at 300 K is 1930 m/s. then the root mean square speed of oxygen molecules at 900 K will be (a) $1930\sqrt{3}$ m/s (b) 836 m/s (c) 643 m/s (d) $\frac{1930}{\sqrt{3}}$ m/s
31.	A molecule of mass m moving with a velocity v makes 5 elastic collisions with a wall of the container per second. The change in its momentum per second will be (a) mv (b) 5 mv (c) $\frac{mv}{10}$ (d) 10 mv
32.	What is the true for 3 moles of a gas? (a) $3 (C_P - C_V) = R$ (b) $\frac{(C_P - C_V)}{3} = R$ (c) $C_P - C_V = R$ (d) $C_P - 3C_V = R$
33.	PV/3 = RT, V represents volume of (a) Any amount of gas (b) 2 moles of gas (c) 3 moles of gas (d) 4 moles of gas
34.	Energy supplied to convert unit mass of substance from solid to liquid state at its melting point is called (a) Latent heat of fusion

	(b) Evaporation (c) Solidification (d) Latent heat of fission
35.	The average kinetic energy of the molecules of a gas at 27°C is 9×10^{-20} J. what is its average K.E. at 227°C? (a) 5×10^{-20} J (b) 10×10^{-20} J (c) 15×10^{-20} J (d) 20×10^{-20} J
36.	For a gas, the r.m.s. speed at 800K is (a) Half the value at 200 K (b) Double the value at 200 K (c) Same as at 200 K (d) Four times the value at 200 K
37.	The internal energy of one mole of an ideal gas depend upon (a) Volume of gas (b) Temperature of gas (c) Nature of gas (d) Density of gas
38.	Which of the statement is true (a) $R = (\gamma - 1) C_v$ (b) $R = (\gamma + 1) C_v$ (c) $C_v = R(\gamma + 1)$ (d) $C_P = \frac{R}{(\gamma - 1)}$
39.	If at same temperature and pressure, the densities for two diatomic gases are respectively d_1 and d_2, then the ratio of velocities of sound in these will be (a) $\sqrt{\frac{d_2}{d_1}}$ (b) $\sqrt{\frac{d_1}{d_2}}$ (c) $d_1 d_2$

	(d) $\sqrt{d_1 d_2}$
40.	The average kinetic energy of the molecules of a gas at 27°C is 9×10^{-20} J. what is its average K.E. at 227°C? (a) 5×10^{20} J (b) 10×10^{20} J (c) 15×10^{20} J (d) 20×10^{20} J
41.	For a gas, the r.m.s. speed at 800K is (a) Half the value at 200 K (b) Double the value at 200 K (c) Same as at 200 K (d) Four times the value at 200 K
42.	The r.m.s. speed of the molecules of a gas in a vessel is 200 m/s. if 25% of the gas leaks out of the vessel, at constant temperature, then the r.m.s. speed of the remaining molecules will be (a) 400 m/s (b) 150 m/s (c) 100 m/s (d) 200 m/s
43.	Real gases show mark able deviation from that of ideal gas behavior at (a) High temperature and low pressure (b) Low temperature and high pressure (c) High temperature and high pressure (d) Low temperature and low pressure
44.	Speed of 3 molecules of a gas are 3 m/s, 4 m/s and 5 m/s. R.m.s. speed of these molecule is, (a) 4.8 m/s (b) 4.08 m/s (c) 4.5 m/s

	(d) 4 m/s
45.	The difference between the principal specific heats of nitrogen is 300 J/kg-K and ratio of the two specific heats is 1.4 then (a) C_P = 1050 J/kg-K (b) C_P = 750 J/kg-K (c) C_P = 650 J/kg-K (d) C_P = 150 J/kg-K
46.	N molecules, each of mass m, of gas A and 2 N molecules, each of mass 2 m, of gas B are contained in the same vessel which maintained at a temperature T. the mean square of he velocity of molecules of B type is denoted by v^2 and the mean square of the X component of the velocity of A type is denoted by ω^2, then $\left(\frac{\omega^2}{v^2}\right)$ is (a) 2 (b) 1 (c) $\frac{1}{3}$ (d) $\frac{2}{3}$
47.	One mole of mono atomic gas (γ = 5/3) is mixed with one mole of diatomic gas (γ = 7/5) what will be the value of γ for the mixture? (a) 1.5 (b) 2.5 (c) 1.0 (d) 2
48.	In a gas, 5 molecules have speed 150 m/s, 170 m/s, 170 m/s, 180 m/s, 190 m/s. ratio of V_{rms} to V_{mean} is nearly (a) 1 (b) 3 (c) 0.5 (d) 0.04
49.	The mean free path of nitrogen molecules at 27°C is 3×10^{-7} m/s. if the average speed of nitrogen molecules at the same temperature is 600 m/s then the collision frequency will be

	(a) 10^9/sec (b) 1.5×10^9/sec (c) 2×10^9/sec (d) 3×10^9/sec
50.	K.E. per unit volume is given by (a) $E = \frac{3}{2}P$ (b) $E = \frac{2}{3}P$ (c) $E = \frac{1}{2}mv^2$ (d) None of these

ANSWER KEY

1.	Answer: (d)	11.	Answer: (c)	21.	Answer: (a)	31.	Answer: (d)	41.	Answer: (b)
2.	Answer: (c)	12.	Answer: (a)	22.	Answer: (d)	32.	Answer: (c)	42.	Answer: (d)
3.	Answer: (c)	13.	Answer: (b)	23.	Answer: (c)	33.	Answer: (c)	43.	Answer: (b)
4.	Answer: (b)	14.	Answer: (a)	24.	Answer: (a)	34.	Answer: (a)	44.	Answer: (b)
5.	Answer: (d)	15.	Answer: (c)	25.	Answer: (a)	35.	Answer: (c)	45.	Answer: (a)
6.	Answer: (a)	16.	Answer: (b)	26.	Answer: (d)	36.	Answer: (b)	46.	Answer: (d)
7.	Answer: (b)	17.	Answer: (c)	27.	Answer: (a)	37.	Answer: (b)	47.	Answer: (a)
8.	Answer: (a)	18.	Answer: (a)	28.	Answer: (c)	38.	Answer: (a)	48.	Answer: (a)
9.	Answer: (d)	19.	Answer: (d)	29.	Answer: (b)	39.	Answer: (a)	49.	Answer: (c)
10.	Answer: (b)	20.	Answer: (c)	30.	Answer: (b)	40.	Answer: (c)	50.	Answer: (a)