DPP – 2 (KTG)

Video Solution on Website:- https://physicsaholics.com/home/courseDetails/58

Video Solution on YouTube:- https://youtu.be/OFgk-LWI6UI

Written Solutionon Website:- https://physicsaholics.com/note/notesDetalis/82

Q 1. The change in momentum of a molecule moving with momentum p colliding stationary wall of the container can not be
(a) p/2 (b) 2p
(c) 3p (d) p

Q 2. A gas is kept in a closed container, a small hole is made in container and due to hole gas is leaking out (Temperature of sample is constant).

	Column I		Column II
(A)	Pressure of gas	(P)	Increases
(B)	Frequency of collisions of a molecule with wall of container	(q)	Decreases
(C)	Momentum transferred to wall by a molecule per collision	(r)	Remain constant
(D)	Energy of gas sample	(s)	Zero

Q 3. N molecules each of mass (m) of gas (A) and 2N molecules, each of mass (2m) of gas (B) are contained in the same vessel which maintained at a temperature (T). The mean square of the 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 (w^2) then w^2 / v^2 is -
(a) 2 (b) 1
(c) 1/3 (d) 2/3

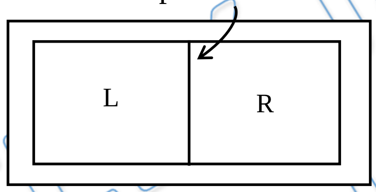
Q 4. Cooking gas container are kept in a lorry moving with uniform speed. The temperature of the gas molecules inside will –
(a) Increase
(b) Decrease
(c) Remain same
(d) Decrease for some, while increase for others

Q 5. The mass of hydrogen molecule is 3.32×10^{-27} kg. If 10^{23} hydrogen molecules strike per second at 2 cm^2 area of a rigid wall at an angle of 45^0 from the normal and rebound back with a speed of 1000 m/s, then the pressure exerted on the wall is
(a) 2.34×10^3 Pascal
(b) 0.23×10^3 Pascal
(c) 0.23×10^3 Pascal
(d) 23.4×10^3 Pascal

Q 6. When a gas is forced in a smaller volume without change in temperature, its pressure increases because its molecules –
(a) Strike the unit area of the container walls more often.
(b) Strike the unit area of the container walls at higher speed.
(c) Strike the unit area of the container wall with greater momentum.
(d) Have more energy.

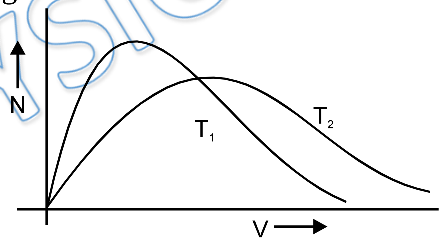
Q 7. A sample of a gas is kept in a closed container and temperature is increased. Which of the following is true?
(a) Pressure is increased because momentum transferred per collision to wall is increased
(b) Pressure is decreased
(c) Pressure is increased because frequency of collision is decreased
(d) Both (1) & (3) are correct

Q 8. A vessel is partitioned in two equal halves by a fixed diathermic separator. Two different ideal gases are filled in left (L) and right (R) halves. The rms speed of the molecules in L part is equal to the mean speed of molecules in the R part. Then the ratio of the mass of a molecules in L part to that of a molecules in R part is



(a) $\frac{3}{2}$ (b) $\frac{\pi}{4}$
(c) $\frac{2}{3}$ (d) $\frac{3\pi}{8}$

Q 9. Maxwell's velocity distribution curve is given for the same quantity two different temperatures. For the given curves.



(a) $T_1 > T_2$ (b) $T_1 < T_2$
(c) T_1 £ T_2 (d) $T_1 = T_2$

Q 10. The ratio of r.m.s. speed to the r.ms. angular speed of a diatomic gas at certain temperature is: (assume m = mass of one molecule, M = molecular mass, I = moment of inertia of the molecules)

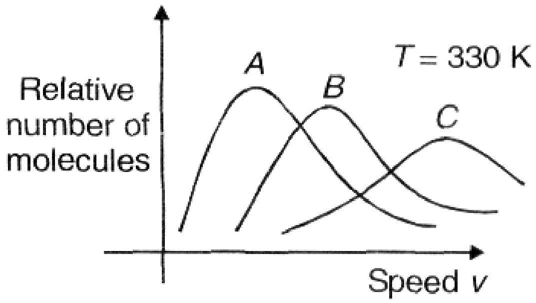
(a) $\sqrt{\frac{3}{2}}$ (b) $\sqrt{\frac{3I}{2M}}$ (c) $\sqrt{\frac{3I}{2m}}$ (d) 1

Q 11. The average velocity of molecules of a gas of molecular weight M at temperature T is:

(a) 0 (b) $\sqrt{\frac{3RT}{M}}$ (c) $\sqrt{\frac{8RT}{\pi M}}$ (d) $\sqrt{\frac{2RT}{M}}$

Q 12. The velocities of three molecules are 3v, 4v and 12v respectively. Their rms speed will be
(a) 3.1v
(b) 17 v
(c) 7.5 v
(d) Cannot say temperature is not provide

Q 13. Maxwell distribution function is shown in figure from different gases, which of the following is correct matching?



(a) A → Ne, B → O_2, C →He
(b) A → Ne, B → He, C → O_2
(c) A → O_2, B → He, C → Ne
(d) A → O_2, B→ Ne, C → He

Q 14. The root mean square (rms) speed of hydrogen molecules at a certain temperature is 300 m/s. If temperature is doubled and hydrogen gas dissociates into atomic hydrogen the r.m.s. speed will become :
(a) 424.26 m/s (b) 300 m/s
(c) 600 m/s (d) 150 m/s.

Q 15. Let v, v_{rms} and v_p respectively denote the mean speed, root mean square speed and most probable speed of the molecules of an ideal monoatomic gas at absolute temperature T. Mass of a gas molecule is m. Then :
(a) no molecule can have a speed greater than $\sqrt{2}v_{rms}$
(b) no molecule can have speed less than $v_p/\sqrt{2}$
(c) $v_p < v < v_{rms}$
(d) the average kinetic energy of a molecule is $\frac{3}{4}mv_p^2$.

Q 16. On increasing temperature area under maxwells speed distribution curve of a gas sample
(a) increases (b) decreases
(c) Remains same (d) none of these

Q 17. Three closed vessels A, B and C are at the same temperature and contain gases which obey the Maxwellian distribution of velocities. Vessel A contain only O_2, B only N_2 and C a mixture of equal quantities of O_2 and N_2. If the average speed of O_2 molecules in vessel A is v_1, that of the N_2 molecules in vessel B is v_2, the average speed of the O_2 molecules in vessel C is –

(a) $(v_1 + v_2)/2$ (b) v_1

(c) $(v_1v_2)^{1/2}$ (d) $\sqrt{(3kT/M)}$

Answer Key

Q.1 c	**Q.2 A(q), B(r), C(r), D(q)**	**Q.3 d**	**Q.4 c**	**Q.5 a**
Q.6 a	**Q.7 a**	**Q.8 d**	**Q.9 b**	**Q.10 c**
Q.11 a	**Q.12 a**	**Q.13 d**	**Q.14 c**	**Q.15 c,d**
Q.16 c	**Q.17 b**			