DPP
DAILY PRACTICE PROBLEMS

CLASS : XIth **SUBJECT : PHYSICS**
Date : **DPP No. : 5**

Topic :- KINETIC THEORY

1. A mixture of 2 moles of helium gas (atomic mass = 4 amu), and 1 mole of argon gas (atomic mass = 40amu) is kept at 300K in a container. The ratio of the rms speeds $\left[\frac{V_{rms}(\text{helium})}{V_{rms}(\text{argon})}\right]$ is
   a) 0.32 b) 0.45 c) 2.24 d) 3.16

2. The value of the gas constant (R) calculated from the perfect gas equation is 8.32 $joules/g$ mole K, whereas its value calculated from the knowledge of C_P and C_V of the gas is 1.98 cal/g mole K. From this data, the value of J is
   a) 4.16 J/cal b) 4.18 J/cal c) 4.20 J/cal d) 4.22 J/cal

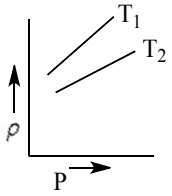
3. S.I. unit of universal gas constant is
   a) $cal/°C$ b) J/mol c) $J\ mol^{-1}K^{-1}$ d) J/kg

4. In Boyle's law what remains constant
   a) PV b) TV c) $\frac{V}{T}$ d) $\frac{P}{T}$

5. To what temperature should the hydrogen at 327°C be cooled at constant pressure, so that the root mean square velocity of its molecules becomes half of its previous value?
   a) -123°C b) 123°C c) -100°C d) 0°C

6. Two gases A and B having same pressure p, volume V and absolute temperature T are mixed. If the mixture has the volume and temperature as V and T respectively, then the pressure of the mixture is
   a) $2p$ b) p c) $\frac{p}{2}$ d) $4p$

7. The density (ρ) versus pressure (P) of a given mass of an ideal gas is shown at two temperatures T_1 and T_2



Then relation between T_1 and T_2 may be

a) $T_1 > T_2$ b) $T_2 > T_1$

c) $T_1 = T_2$ d) All the three are possible

8. The gas in vessel is subjected to a pressure of 20 atmosphere at a temperature 27°C. The pressure of the gas in a vessel after one half of the gas is released from the vessel and the temperature of the remainder is raised by 50°C is

a) 8.5 atm b) 10.8 atm c) 11.7 atm d) 17 atm

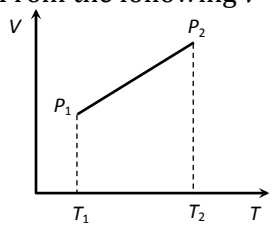
9. On any planet, the presence of atmosphere implies ($C_{rms} =$ root mean square velocity of molecules and $V_e =$ escape velocity)

a) $C_{rms} << V_e$ b) $C_{rms} > V_e$ c) $C_{rms} = V_e$ d) $C_{rms} = 0$

10. The degrees of freedom of a stationary rigid body about its axis will be

a) One b) Two c) Three d) Four

11. From the following V - T diagram we can conclude



a) $P_1 = P_2$ b) $P_1 > P_2$ c) $P_1 < P_2$ d) None of these

12. An electron tube was sealed off during manufacture at a pressure of $1.2 \times 10^{-7} mm$ of mercury at 27°C. Its volume is 100 cm^3. The number of molecules that remain in the tube is

a) 2×10^{16} b) 3×10^{15} c) 3.86×10^{11} d) 5×10^{11}

13. The average kinetic energy of hydrogen molecules at 300 K is E. At the same temperature, the average kinetic energy of oxygen molecules will be

a) $E/4$ b) $E/16$ c) E d) $4E$

14. The temperature of an ideal gas is increased from 27°C to 927°C. The root mean square speed of its molecules becomes

a) Twice b) Half c) Four times d) One-fourth

15. A given mass of a gas is allowed to expand freely until its volume becomes double. If C_b and C_a are the velocities of sound in this gas before and after expansion respectively, then C_a is equal to

a) $2C_b$ b) $\sqrt{2}C_b$ c) C_b d) $\frac{1}{\sqrt{2}}C_b$

16. For a gas at a temperature T the root-mean-square velocity v_{rms}, the most probable speed v_{mp}, and the average speed v_{av} obey the relationship

a) $v_{av} > v_{rms} > v_{mp}$ b) $v_{rms} > v_{av} > v_{mp}$ c) $v_{mp} > v_{av} > v_{rms}$ d) $v_{mp} > v_{rms} > v_{av}$

17. Two chambers containing m_1 and m_2 gram of a gas at pressures p_1 and p_2 respectively are put in communication with each other, temperature remaining constant. The common pressure reached will be

a) $\frac{p_1p_2(m_1+m_2)}{p_2m_1+p_1m_2}$ b) $\frac{p_1p_2m_1}{p_2m_1+p_1m_2}$ c) $\frac{m_1m_2(p_1+p_2)}{p_2m_1+p_1m_2}$ d) $\frac{m_1m_2p_2}{p_2m_1+p_1m_2}$

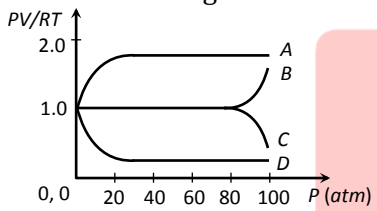
18. The root mean square speed of the molecules of a diatomic gas is v. When the temperature is doubled, the molecules dissociate into two atoms. The new root mean square speed of the atom is

a) $\sqrt{2}v$ b) v c) $2v$ d) $4v$

19. The ends of 2 different materials with their thermal conductivities, radii of cross section and length all in the ratio of 1 :2 maintained at temperature difference. If the rate of the flow of heat in the longer rod is 4 $cals^{-1}$, that in the shorter rod in $cals^{-1}$ will be

a) 1 b) 2 c) 8 d) 6

20. An experiment is carried on a fixed amount of gas at different temperatures and at high pressure such that it deviates from the ideal gas behavior. The variation of $\frac{PV}{RT}$ with P is shown in the diagram. The correct variation will correspond to



a) Curve A b) Curve B c) Curve C d) Curve D