DPP
DAILY PRACTICE PROBLEMS

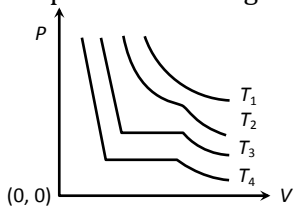
CLASS : XIth **SUBJECT : PHYSICS**
Date : **DPP No. : 4**

Topic :- KINETIC THEORY

1. A monoatomic gas molecule has
   a) Three degrees of freedom b) Four degrees of freedom
   c) Five degrees of freedom d) Six degrees of freedom

2. Considering the gases to be ideal, the value of $\gamma = \frac{C_P}{C_V}$ for a gaseous mixture consisting of 3 moles of carbon dioxide and 2 moles of oxygen will be ($\gamma_{O_2} = 1.4, \gamma_{CO_2} = 1.3$)
   a) 1.37 b) 1.34 c) 1.55 d) 1.63

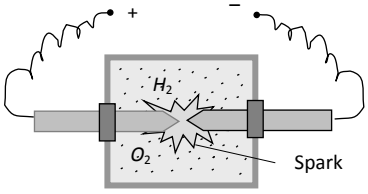
3. The change in volume V with respect to an increase in pressure P has been shown in the figure for a non-ideal gas at four different temperatures T_1,T_2,T_3 and T_4. The critical temperature of the gas is



   a) T_1 b) T_2 c) T_3 d) T_4

4. At a given temperature the ratio of $r.m.s.$ velocities of hydrogen molecule and helium atom will be
   a) $\sqrt{2}:1$ b) $1:\sqrt{2}$ c) 1 :2 d) 2 :1

5. A vessel contains 14 g (7 moles) of hydrogen and 96 g (9 moles) of oxygen at STP. Chemical reaction is induced by passing electric spark in the vessel till one of the gases is consumed. The temperature is brought back to it's starting value 273 K. The pressure in the vessel is



   a) 0.1 atm b) 0.2 atm c) 0.3 atm d) 0.4 atm

6. When the temperature of a gas is raised from 27°C to 90°C, the percentage increase in the $r.m.s.$ velocity of the molecules will be
   a) 10% b) 15% c) 20% d) 17.5%

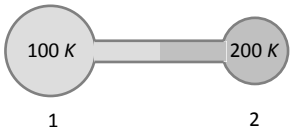
7. One litre of oxygen at a pressure of 1 atm and two litres of nitrogen at a pressure of 0.5 atm, are introduced into a vessel of volume 1 L. If there is no change in temperature, the final pressure of the mixture of gas (in atm) is

a) 1.5 b) 2.5 c) 2 d) 4

8. The power radiated by a black body is P, and it radiates maximum energy around the wavelength λ_0. If the temperature of black body is now changed so that it radiates maximum energy around a wavelength $\lambda_0/4$, the power radiated by it will increase by a factor of

a) $\frac{4}{3}$ b) $\frac{16}{9}$ c) $\frac{64}{27}$ d) $\frac{256}{81}$

9. Figure shows two flasks connected to each other. The volume of the flask 1 is twice that of flask 2. The system is filled with an ideal gas at temperature 100 K and 200 K respectively. If the mass of the gas in 1 be m then what is the mass of the gas in flask 2



a) m b) $m/2$ c) $m/4$ d) $m/8$

10. Under constant temperature, graph between P and $1/V$ is

a) Parabola b) Hyperbola c) Straight line d) Circle

11. A gas mixture consists of molecules of type 1,2 and 3, with molar masses $m_1 > m_2 > m_3$. V_{rms} and $\overline{K}$ are the $r.m.s.$ speed and average kinetic energy of the gases. Which of the following is tru

a) $(V_{rms})_1 < (V_{rms})_2 < (V_{rms})_3$ and $(\overline{K})_1 = (\overline{K})_2 = (\overline{K}_3)$

b) $(V_{rms})_1 = (V_{rms})_2 \leq (V_{rms})_3$ and $(\overline{K})_1 = (\overline{K})_2 > (\overline{K})_3$

c) $(V_{rms})_1 > (V_{rms})_2 < (V_{rms})_3$ and $(\overline{K})_1 < (\overline{K})_2 > (\overline{K}_3)$

d) $(V_{rms})_1 > (V_{rms})_2 > (V_{rms})_3$ and $(\overline{K})_1 < (\overline{K})_2 < (\overline{K})_3$

12. The ratio of mean kinetic energy of hydrogen and nitrogen at temperature 300 K and 450 K respectively is

a) 3 :2 b) 2 :3 c) 2 :21 d) 4 :9

13. Equation of gas in terms of pressure (P), absolute temperature (T) and density (d) is

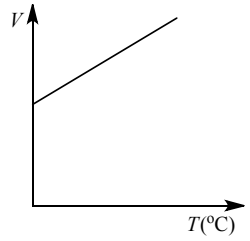
a) $\frac{P_1}{T_1 d_1} = \frac{P_2}{T_2 d_2}$ b) $\frac{P_1 T_1}{d_1} = \frac{P_2 T_2}{d_2}$ c) $\frac{P_1 d_2}{T_1} = \frac{P_2 d_1}{T_1}$ d) $\frac{P_1 d_1}{T_1} = \frac{P_2 d_2}{T_2}$

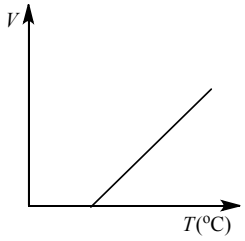
14. On 0°C pressure measured by barometer is 760 mm. What will be pressure at 100°C

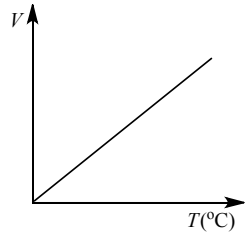
a) 760 mm b) 730 mm c) 780 mm d) None of these

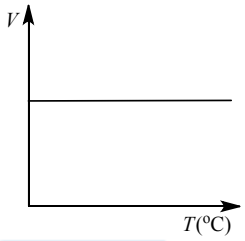
15. The $r.m.s.$ speed of the molecules of a gas in a vessel is 400 ms^{-1}. If half of the gas leaks out, at constant temperature, the $r.m.s.$ speed of the remaining molecules will be
a) 800 ms^{-1} b) $400\sqrt{2}$ ms^{-1} c) 400 ms^{-1} d) 200 ms^{-1}

16. Volume-temperature graph at atmospheric pressure for a monoatomic gas (V in m^3, T in °C) is

a) 

b) 

c) 

d) 

17. The temperature of argon, kept in a vessel, is raised by 1°C at a constant volume. The total heat supplied to the gas is a combination of translation and rotational energies. Their respective shares are
a) 60% and 40% b) 40% and 60% c) 50% and 50% d) 100% and 0%

18. The molar heat capacity at constant volume of oxygen gas at STP is nearly $\frac{5R}{2}$ and it approaches $\frac{7R}{2}$ as the temperature is increased. This happens because at higher temperature
a) Oxygen becomes triatomic b) Oxygen does not behaves as an ideal gas
c) Oxygen molecules rotate more vigorously d) Oxygen molecules start vibrating

19. Three containers of the same volume contain three different gases. The masses of the molecules are m_1,m_2 and m_3 and the number of molecules in their respective containers are N_1,N_2 and N_3. The gas pressure in the containers are P_1,P_2 and P_3 respectively. All the gases are now mixed and put in one of the containers. The pressure P of mixture will be
a) $P < (P_1 + P_2 + P_3)$ b) $P = \frac{P_1 + P_2 + P_3}{3}$ c) $P = P_1 + P_2 + P_3$ d) $P > (P_1 + P_2 + P_3)$

20. If temperature of gas increases from 27°C to 927°C the $K.E.$ will be
a) Double b) Half c) One fourth d) Four times