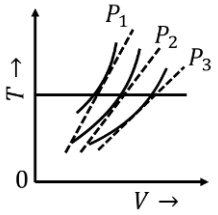
1. The following graph represents the T-V curves of an ideal gas (where T is the temperature and V the volume) at three pressures P_1, P_2 and P_3 compared with those of Charles's law represented as dotted lines. **(2024)**



Then the correct relation is

(a) $P_1 > P_3 > P_2$ (b) $P_2 > P_1 > P_3$

(c) $P_1 > P_2 > P_3$ (d) $P_3 > P_2 > P_1$

2. The volume occupied by the molecules contained in 4.5 kg water at STP, if the intermolecular forces vanish away is: **(2022)**

(a) $5.6 \times 10^3 m^3$ (b) $5.6 \times 10^{-3} m^3$

(c) $5.6\, m^3$ (d) $5.6 \times 10^6 m^3$

3. The temperature of a gas is –50 °C. To what temperature the gas should be heated so that the rms speed is increased by 3 times? **(2023)**

(a) 223 K (b) 669°C

(c) 3295°C (d) 3097 K

4. Match Column-I and Column-II and choose the correct match from the given choices. **(2021)**

	Column-I	Column-II
(a)	Root mean square speed of gas molecules	(P) $\frac{1}{3}nmv^2$
(b)	Pressure exerted by ideal gas	(Q) $\sqrt{\frac{3RT}{M}}$
(c)	Average kinetic energy of a molecules	(R) $\frac{5}{2}RT$
(d)	Total internal energy of 1 mole of a diatomic gas	(S) $\frac{3}{2}k_BT$

(a) (A) - (Q), (B) - (R), (C) - (S), (D) - (P)

(b) (A) - (Q), (B) - (P), (C) - (S), (D) - (R)

(c) (A) - (R), (B) - (Q), (C) - (P), (D) - (S)

(d) (A) - (R), (B) - (P), (C) - (S), (D) - (Q)

5. The average thermal energy for a mono-atomic gas is: (k_B is Boltzmann constant and T absolute temperature) **(2020)**

(a) $\frac{3}{2}k_BT$ (b) $\frac{5}{2}k_BT$

(c) $\frac{7}{2}k_BT$ (d) $\frac{1}{2}k_BT$

6. The mean free path for a gas, with molecular diameter d and number density n can be expressed as : **(2020)**

(a) $\frac{1}{\sqrt{2}n\pi d^2}$ (b) $\frac{1}{\sqrt{2}n^2\pi d^2}$

(c) $\frac{1}{\sqrt{2}n^2\pi^2 d^2}$ (d) $\frac{1}{\sqrt{2}n\pi d}$

7. A cylinder contains hydrogen gas at pressure of 249 kPa and temperature 27°C. Its density is: (R = 8.3 J mol^{-1}K^{-1}) **(2020)**

(a) $0.2 kg/m^3$ (b) $0.1 kg/m^3$

(c) $0.02 kg/m^3$ (d) $0.5 kg/m^3$

8. The mean free path l for a gas molecule depends upon diameter d of the molecule as **(2020 Covid Re-NEET)**

(a) $l \propto d$ (b) $l \propto d^2$

(c) $l \propto \frac{1}{d}$ (d) $l \propto \frac{1}{d^2}$

9. An ideal gas equation can be written as $P = \frac{\rho RT}{M_0}$ where ρ and M_0 are respectively, **(2020 Covid Re-NEET)**

(a) Number density, molar mass

(b) Mass density, molar mass

(c) Number density, mass of the gas

(d) Mass density, mass of the gas

10. Increase in temperature of a gas filled in a container would lead to: **(2019)**

(a) Increase in its mass

(b) Increase in its kinetic energy

(c) Decrease in its pressure

(d) Decrease in intermolecular distance

11. At what temperature will the rms speed of oxygen molecules become just sufficient for escaping from the Earth's atmosphere? (Given: Mass of oxygen molecule $(m) = 2.76 \times 10^{-26} kg$, Boltzmann's constant $k_B = 1.38 \times 10^{-23} JK^{-1}$) **(2018)**

(a) $5.016 \times 10^4 K$ (b) $8.360 \times 10^4 K$
(c) $2.508 \times 10^4 K$ (d) $1.254 \times 10^4 K$

12. A gas mixture consists of 2 moles of O_2 and 4 moles of Ar at temperature T. Neglecting all vibrational modes, the total internal energy of the system is: **(2017)**

(a) 15 RT (b) 9 RT
(c) 11 RT (d) 4 RT

13. When the temperature of a gas is raised from 30°C to 90°C, the percentage increase in the r.m.s. velocity of the molecules will be: **(2017-Gujrat)**

(a) 60% (b) 10%
(c) 15% (d) 30%

14. A given sample of an ideal gas occupies a volume V at a pressure P and absolute temperature T. The mass of each molecule of the gas is m. Which of the following gives the density of the gas? **(2016-II)**

(a) P/(kTV) (b) mkT
(c) P/(kT) (d) Pm/(kT)

15. One mole of an ideal monoatomic gas undergoes a process described by the equation PV^3 = constant. The heat capacity of the gas during this process is: **(2016-II)**

(a) 2R (b) R
(c) $\frac{3}{2}R$ (d) $\frac{5}{3}R$

16. On observing light from three different stars P, Q and R, it was found that intensity of violet color is maximum in the spectrum of P, the intensity of green color is maximum in the spectrum of R and the intensity of red color is maximum in the spectrum of Q. If T_P, T_Q and T_R are the respective absolute temperatures of P, Q and R then it can be concluded from the above observations that: **(2015)**

(a) $T_P > T_R > T_Q$ (b) $T_P < T_R < T_Q$
(c) $T_P < T_Q < T_R$ (d) $T_P > T_Q > T_R$

17. The ratio of the specific heats $\frac{C_p}{C_v} = \gamma$ in terms of degrees of freedom (n) is given by: **(2015)**

(a) $\left(1 + \frac{n}{3}\right)$ (b) $\left(1 + \frac{2}{n}\right)$
(c) $\left(1 + \frac{n}{2}\right)$ (d) $\left(1 + \frac{1}{n}\right)$

18. 4.0 g of a gas occupies 22.4 litres at NTP. The specific heat capacity of the gas at constant volume is $5.0 JK^{-1}mol^{-1}$. If the speed of sound in this gas at NTP is $952\ ms^{-1}$, then the heat capacity at constant pressure is **(2015 Re)**

(Take gas constant R = 8.3J/mol K):

(a) 8.5 J/K mol (b) 8.0 J/K mol
(c) 7.5 J/K mol (d) 7.0 J/K mol

19. Two vessels separately contain two ideal gases A and B at the same temperature, the pressure of A being twice that of B. Under such conditions, the density of A is found to be 1.5 times the density of B. The ratio of molecular weight of A and B is: **(2015 Re)**

(a) ½ (b) 2/3
(c) ¾ (d) 2

20. The mean free path of molecules of a gas, (radius r) is inversely proportional to: **(2014)**

(a) r^3 (b) r^2
(c) r (d) $\sqrt{r}$

21. The amount of heat energy required to raise the temperature of 1 g of Helium at NTP, from T_1K to T_2K is: **(2013)**

(a) $\frac{3}{4}N_A k_B \left(\frac{T_2}{T_1}\right)$ (b) $\frac{3}{8}N_A k_B (T_2 - T_1)$
(c) $\frac{3}{2}N_A k_B (T_2 - T_1)$ (d) $\frac{3}{4}N_A k_B (T_2 - T_1)$