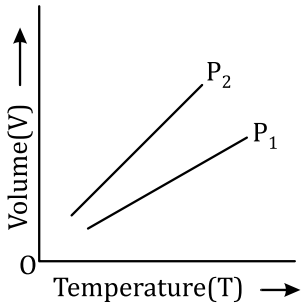
DPP 04

Q.1 For a perfect gas, two pressures P_1 and P_2 are shown in figure. The graph shows



(A) $P_1 > P_2$ (B) $P_1 < P_2$

(C) $P_1 = P_2$ (d) Insufficient data to draw any conclusion

Q.2 The relation between root mean square speed (v_{rms}) and most probable speed (v_p) for the molar mass M of oxygen gas molecule at the temperature of 300 K will be

(A) $v_{rms} = \sqrt{\frac{2}{3}} v_p$ (B) $v_{rms} = \sqrt{\frac{3}{2}} v_p$

(C) $v_{rms} = v_p$ (D) $v_{rms} = \sqrt{\frac{1}{3}} v_p$

Q.3 Sound travels in a mixture of two moles of helium and n moles of hydrogen. If rms speed of gas molecules in the mixture is $\sqrt{2}$ times the speed of sound, then the value of n will be

(A) 1 (B) 2 (C) 3 (D) 4

Q.4 The root mean square speed of smoke particles of mass 5×10^{-17} kg in their Brownian motion in air at NTP is approximately. [Given $k = 1.38 \times 10^{-23}$ J K^{-1}]

(A) 60 mm s^{-1} (B) 12 mm s^{-1}

(C) 15 mm s^{-1} (D) 36 mm s^{-1}

Q.5 Same gas is filled in two vessels of the same volume at the same temperature. If the ratio of the number of molecules is 1: 4, then

(a) The r.m.s. velocity of gas molecules in two vessels will be the same.

(b) The ratio of pressure in these vessels will be 1: 4.

(c) The ratio of pressure will be 1: 1.

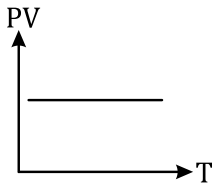
(d) The r.m.s velocity of gas molecules in two vessels will be in the ratio of 1: 4.

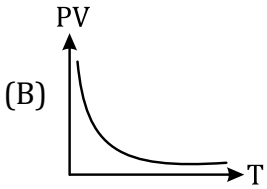
Choose the correct answer from the options given below:

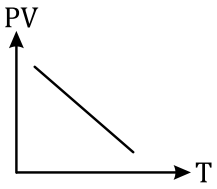
(A) a and c only (B) b and d only

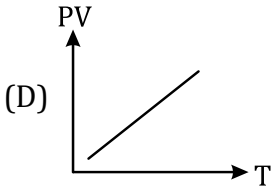
(C) a and b only (D) c and d only

Q.6 Which of the following graphs represent the behavior of an ideal gas? Symbols have their usual meaning.

(A) 

(B) 

(C) 

(D) 

Q.7 Consider a mixture of gas molecule of types A, B and C having masses $m_A < m_B < m_C$. The ratio of their root mean square speeds at normal temperature and pressure is

(A) $v_A = v_B \neq v_C$ (B) $\frac{1}{v_A} < \frac{1}{v_B} < \frac{1}{v_C}$

(C) $v_A = v_B = v_C = 0$ (D) $\frac{1}{v_A} > \frac{1}{v_B} > \frac{1}{v_C}$

Q.8 For an adiabatic expansion of an ideal gas, the fractional change in its pressure is equal to (where γ is the ratio of specific heats)

(A) $-\gamma\frac{V}{dV}$ (B) $-\frac{1}{\gamma}\frac{dV}{V}$ (C) $-\gamma\frac{dV}{V}$ (D) $\frac{dV}{V}$

Q.9 The volume V of an enclosure contains a mixture of three gases, 16 g of oxygen, 28 g of nitrogen and 44 g of carbon dioxide at absolute temperature T. Consider R as universal gas constant. The pressure of the mixture of gases is

(A) $\frac{4RT}{V}$ (B) $\frac{3RT}{V}$ (C) $\frac{88RT}{V}$ (D) $\frac{5}{2}\frac{RT}{V}$

Q.10 A mixture of hydrogen and oxygen has volume 500 cm^3, temperature 300 K, pressure 400 kPa and mass 0.76 g. The ratio of masses of oxygen to hydrogen will be

(A) 16: 3 (B) 3: 8 (C) 8: 3 (D) 3: 16

Q.11 The internal energy (U), pressure (P) and volume (V) of an ideal gas are related as $U = 3PV + 4$. The gas is

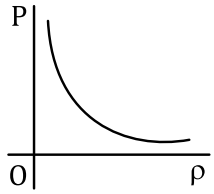
(A) monoatomic only

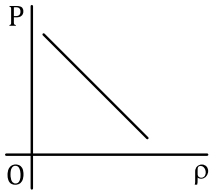
(B) diatomic only

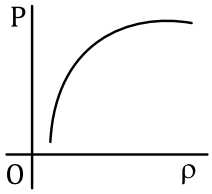
(C) polyatomic only

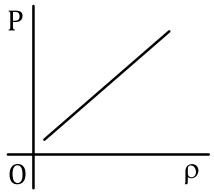
(D) either monoatomic or diatomic

Q.12 Which of the following shows the correct relationship between the pressure ' P ' and density ρ of an ideal gas at constant temperature?

(A) 

(B) 

(C) 

(D) 

Q.13 A mixture of 2 moles of helium gas (atomic mass = 4 u), and 1 mole of argon gas (atomic mass = 40 u) is kept at 300 K in a container. The ratio of their rms speeds $\left[\frac{v_{rms}\ (\text{helium})}{v_{rms}\ (\text{argon})}\right]$ is close to

(A) 2.24 (B) 0.32 (C) 0.45 (D) 3.16

Q.14 Three perfect gases at absolute temperatures T_1, T_2 and T_3 are mixed. The masses of molecules are m_1, m_2 and m_3 and the number of molecules are n_1, n_2 and n_3 respectively. Assuming no loss of energy, the final temperature of the mixture is

(A) $\frac{(T_1+T_2+T_3)}{3}$ (B) $\frac{n_1T_1+n_2T_2+n_3T_3}{n_1+n_2+n_3}$

(C) $\frac{n_1T_1^2+n_2T_2^2+n_3T_3^2}{n_1T_1+n_2T_2+n_3T_3}$ (D) $\frac{n_1^2T_1^2+n_2^2T_2^2+n_3^2T_3^2}{n_1T_1+n_2T_2+n_3T_3}$

Q.15 Two non-reactive monoatomic ideal gases have their atomic masses in the ratio 2: 3. The ratio of their partial pressures, when enclosed in a vessel kept at a constant temperature, is 4: 3. The ratio of their densities is

(A) 1: 4 (B) 1: 2 (C) 6: 9 (D) 8: 9

ANSWER KEY

1. (A)
2. (B)
3. (B)
4. (C)
5. (C)
6. (D)
7. (B)
8. (C)
9. (D)
10. (A)
11. (C)
12. (D)
13. (D)
14. (B)
15. (D)