Chapter

5

States of Matter : Gases and Liquids

1. Equal moles of hydrogen and oxygen gases are placed in a container with a pin-hole through which both can escape. What fraction of the oxygen escapes in the time required for one-half of the hydrogen to escape?
(a) 3/8 (b) 1/2 (c) 1/8 (d) 1/4
(NEET-I 2016)

2. A gas such as carbon monoxide would be most likely to obey the ideal gas law at
(a) low temperatures and high pressures
(b) high temperatures and high pressures
(c) low temperatures and low pressures
(d) high temperatures and low pressures.
(2015)

3. Maximum deviation from ideal gas is expected from
(a) $CH_{4(g)}$ (b) $NH_{3(g)}$ (c) $H_{2(g)}$ (d) $N_{2(g)}$
(NEET 2013)

4. What is the density of N_2 gas at 227°C and 5.00 atm. pressure? (R = 0.082 L atm K^{-1} mol^{-1})
(a) 1.40 g/mL (b) 2.81 g/mL
(c) 3.41 g/mL (d) 0.29 g/mL
(Karnataka NEET 2013)

5. 50 mL of each gas A and of gas B takes 150 and 200 seconds respectively for effusing through a pin hole under the similar conditions. If molecular mass of gas B is 36, the molecular mass of gas A will be
(a) 96 (b) 128 (c) 32 (d) 64
(2012)

6. A certain gas takes three times as long to effuse out as helium. Its molecular mass will be
(a) 27 u (b) 36 u (c) 64 u (d) 9 u
(Mains 2012)

7. For real gases van der Waals equation is written as $\left(p + \frac{an^2}{V^2}\right)(V - nb) = n\,RT$
where a and b are van der Waals constants Two sets of gases are
(I) O_2, CO_2, H_2 and He
(II) CH_4, O_2 and H_2
The gases given in set-I in increasing order of b and gases given in set-II in decreasing order of a, are arranged below. Select the correct order from the following
(a) (I) $He < H_2 < CO_2 < O_2$ (II) $CH_4 > H_2 > O_2$
(b) (I) $O_2 < He < H_2 < CO_2$ (II) $H_2 > O_2 > CH_4$
(c) (I) $H_2 < He < O_2 < CO_2$ (II) $CH_4 > O_2 > H_2$
(d) (I) $H_2 < O_2 < He < CO_2$ (II) $O_2 > CH_4 > H_2$
(Mains 2012)

8. Equal volumes of two monatomic gases, A and B at same temperature and pressure are mixed. The ratio of specific heats (C_P/C_V) of the mixture will be
(a) 0.83 (b) 1.50 (c) 3.3 (d) 1.67
(2012)

9. By what factor does the average velocity of a gaseous molecule increase when the temperature (in Kelvin) is doubled?
(a) 2.0 (b) 2.8 (c) 4.0 (d) 1.4
(2011)

10. Two gases A and B having the same volume diffuse through a porous partition in 20 and 10 seconds respectively. The molecular mass of A is 49 u. Molecular mas of B will be
(a) 50.00 u (b) 12.25 u
(c) 6.50 u (d) 25.00 u *(2011)*

11. A gaseous mixture was prepared by taking equal mole of CO and N_2. If the total pressure of the mixture was found 1 atmosphere, the partial pressure of the nitrogen (N_2) in the mixture is
(a) 0.5 atm (b) 0.8 atm
(c) 0.9 atm (d) 1 atm *(2011)*

12. A bubble of air is underwater at temperature 15°C and the pressure 1.5 bar. If the bubble rises to the surface where the temperature is 25°C and the pressure is 1.0 bar, what will happen to the volume of the bubble?

(a) Volume will become greater by a factor of 1.6.
(b) Volume will become greater by a factor of 1.1.
(c) Volume will become smaller by a factor of 0.70.
(d) Volume will become greater by a factor of 2.5. *(Mains 2011)*

13. The pressure exerted by 6.0 g of methane gas in a 0.03 m^3 vessel at 129°C is (Atomic masses: C = 12.01, H = 1.01 and $R = 8.314\ J\ K^{-1}\ mol^{-1}$)
(a) 215216 Pa (b) 13409 Pa
(c) 41648 Pa (d) 31684 Pa
(Mains 2010)

14. The energy absorbed by each molecule (A_2) of a substance is 4.4×10^{-19} J and bond energy per molecule is 4.0×10^{-19} J. The kinetic energy of the molecule per atom will be
(a) 2.2×10^{-19} J (b) 2.0×10^{-19} J
(c) 4.0×10^{-20} J (d) 2.0×10^{-20} J
(2009)

15. If a gas expands at constant temperature, it indicates that
(a) kinetic energy of molecules remains the same
(b) number of the molecules of gas increases
(c) kinetic energy of molecules decreases
(d) pressure of the gas increases. *(2008)*

16. Volume occupied by one molecule of water (density = 1 g cm^{-3}) is
(a) 3.0×10^{-23} cm^3 (b) 5.5×10^{-23} cm^3
(c) 9.0×10^{-23} cm^3 (d) 6.023×10^{-23} cm^3
(2008)

17. van der Waal's real gas, acts as an ideal gas, at which conditions?
(a) High temperature, low pressure
(b) Low temperature, high pressure
(c) High temperature, high pressure
(d) Low temperature, low pressure *(2002)*

18. Average molar kinetic energy of CO and N_2 at same temperature is
(a) $KE_1 = KE_2$
(b) $KE_1 > KE_2$
(c) $KE_1 < KE_2$
(d) can't say any thing. Both volumes are not given. *(2000)*

19. At 25°C and 730 mm pressure, 380 mL of dry oxygen was collected. If the temperature is constant, what volume will the oxygen occupy at 760 mm pressure?
(a) 569 mL (b) 365 mL
(c) 265 mL (d) 621 mL
(1999)

20. Which of the following statements is wrong for gases?
(a) Confined gas exerts uniform pressure on the walls of its container in all directions.
(b) Volume of the gas is equal to volume of container confining the gas.
(c) Gases do not have a definite shape and volume.
(d) Mass of a gas cannot be determined by weighing a container in which it is enclosed. *(1999)*

21. The average kinetic energy of an ideal gas, per molecule in S.I. units, at 25°C will be
(a) 6.17×10^{-20} J (b) 7.16×10^{-20} J
(c) 61.7×10^{-21} J (d) 6.17×10^{-21} J
(1996)

22. At what temperature, the rate of effusion of N_2 would be 1.625 times than the rate of SO_2 at 500°C?
(a) 373°C (b) 620°C
(c) 110°C (d) 173°C *(1996)*

23. Which of the following mixture of gases does not obey Dalton's Law of partial pressure?
(a) Cl_2 and SO_2 (b) CO_2 and He
(c) O_2 and CO_2 (d) N_2 and O_2
(1996)

24. An ideal gas, obeying kinetic theory of gases can not be liquefied, because
(a) it solidifies before becoming a liquid
(b) forces acting between its molecules are negligible
(c) its critical temperature is above 0°C
(d) its molecules are relatively small in size.
(1995)

25. 50 mL of hydrogen diffuses out through a small hole of a vessel, in 20 minutes. The time taken by 40 mL of oxygen to diffuse out is
(a) 32 minutes (b) 64 minutes
(c) 8 minutes (d) 12 minutes
(1994)

26. The temperature of a gas is raised from 27°C to 927°C. The root mean square speed of the gas
(a) remains same
(b) gets $\sqrt{\frac{927}{27}}$ times

(c) gets halved
(d) gets doubled. *(1994)*

27. At STP, 0.50 mol H_2 gas and 1.0 mol He gas
(a) have equal average kinetic energies
(b) have equal molecular speeds
(c) occupy equal volumes
(d) have equal effusion rates. *(1993)*

28. Under what conditions will a pure sample of an ideal gas not only exhibit a pressure of 1 atm but also a concentration of 1 mole litre^{-1}? (R = 0.082 litre atm mol^{-1} deg^{-1})
(a) At STP
(b) When V = 22.4 litres
(c) When T = 12 K
(d) Impossible under any conditions. *(1993)*

29. Internal energy and pressure of a gas per unit volume are related as
(a) $P = \frac{2}{3}E$ (b) $P = \frac{3}{2}E$
(c) $P = \frac{1}{2}E$ (d) $P = 2E$ *(1993)*

30. The ratio among most probable velocity, mean velocity and root mean square velocity is given by
(a) 1 : 2 : 3 (b) $1 : \sqrt{2} : \sqrt{3}$
(c) $\sqrt{2} : \sqrt{3} : \sqrt{8/\pi}$ (d) $\sqrt{2} : \sqrt{8/\pi} : \sqrt{3}$
(1993)

31. When is deviation more in the behaviour of a gas from the ideal gas equation $PV = nRT$?
(a) At high temperature and low pressure
(b) At low temperature and high pressure
(c) At high temperature and high pressure
(d) At low temperature and low pressure.
(1993)

32. A closed flask contains water in all its three states solid, liquid and vapour at 0°C. In this situation, the average kinetic energy of water molecules will be
(a) the greatest in all the three states
(b) the greatest in vapour state
(c) the greatest in the liquid state
(d) the greatest in the solid state. *(1992)*

33. Which is not true in case of an ideal gas?
(a) It cannot be converted into a liquid.
(b) There is no interaction between the molecules.
(c) All molecules of the gas move with same speed.
(d) At a given temperature, PV is proportional to the amount of the gas. *(1992)*

34. The correct value of the gas constant 'R' is close to
(a) 0.082 litre-atmosphere K
(b) 0.082 litre-atmosphere K^{-1} mol^{-1}
(c) 0.082 litre-atmosphere^{-1} K mol^{-1}
(d) 0.082 litre^{-1} atmosphere^{-1} K mol. *(1992)*

35. An ideal gas can't be liquefied because
(a) its critical temperature is always above 0°C
(b) its molecules are relatively smaller in size
(c) it solidifies before becoming a liquid
(d) forces operative between its molecules are negligible. *(1992)*

36. Select one correct statement. In the gas equation, $PV = nRT$
(a) n is the number of molecules of a gas
(b) V denotes volume of one mole of the gas
(c) n moles of the gas have a volume V
(d) P is the pressure of the gas when only one mole of gas is present. *(1992)*

37. A gas is said to behave like an ideal gas when the relation PV/T = constant. When do you expect a real gas to behave like an ideal gas?
(a) When the temperature is low.
(b) When both the temperature and pressure are low.
(c) When both the temperature and pressure are high.
(d) When the temperature is high and pressure is low. *(1991)*

38. In a closed flask of 5 litres, 1.0 g of H_2 is heated from 300 to 600 K. Which statement is not correct?
(a) Pressure of the gas increases
(b) The rate of collision increases
(c) The number of moles of gas increases
(d) The energy of gaseous molecules increases *(1991)*

39. At constant temperature, in a given mass of an ideal gas
(a) the ratio of pressure and volume always remains constant
(b) volume always remains constant
(c) pressure always remains constant
(d) the product of pressure and volume always remains constant. *(1991)*

40. The root mean square velocity at STP for the gases H_2, N_2, and HBr are in the order
(a) $H_2 < N_2 < O_2 < HBr$
(b) $HBr < O_2 < N_2 < H_2$
(c) $H_2 < N_2 = O_2 < HBr$
(d) $HBr < O_2 < H_2 < N_2$ *(1991)*

41. Root mean square velocity of a gas molecule is proportional to
(a) $m^{1/2}$ (b) m^0 (c) $m^{-1/2}$ (d) m (1990)

42. Absolute zero is defined as the temperature
(a) at which all molecular motion ceases
(b) at which liquid helium boils
(c) at which ether boils
(d) all of the above. *(1990)*

43. In van der Waals equation of state for a non-ideal gas, the term that accounts for intermolecular forces is
(a) $(V - b)$ (b) $(RT)^{-1}$
(c) $\left(P + \frac{a}{V^2}\right)$ (d) RT *(1990)*

44. If P, V, M, T and R are pressure, volume, molar mass, temperature and gas constant respectively, then for an ideal gas, the density is given by
(a) $\frac{RT}{PM}$ (b) $\frac{P}{RT}$ (c) $\frac{M}{V}$ (d) $\frac{PM}{RT}$ *(1989)*

45. Pressure remaining the same, the volume of a given mass of an ideal gas increases for every degree centrigrade rise in temperature by definite fraction of its volume at
(a) 0°C
(b) its critical temperature
(c) absolute zero
(d) its Boyle temperature. *(1989)*

46. Correct gas equation is
(a) $\frac{V_1T_2}{P_1} = \frac{V_2T_1}{P_2}$ (b) $\frac{P_1V_1}{P_2V_2} = \frac{T_1}{T_2}$
(c) $\frac{P_1T_2}{V_1} = \frac{P_2V_2}{T_2}$ (d) $\frac{V_1V_2}{T_1T_2} = P_1P_2$ *(1989)*

Answer Key

1.	(c)	**2.**	(d)	**3.**	(b)	**4.**	(c)	**5.**	(None)		**6.**	(b)	**7.**	(c)	**8.**	(d)	**9.**	(d)
10.	(b)	**11.**	(a)	**12.**	(a)	**13.**	(c)	**14.**	(d)	**15.** (a)	**16.**	(a)	**17.**	(a)	**18.**	(a)	**19.**	(b)
20.	(d)	**21.**	(d)	**22.**	(b)	**23.**	(a)	**24.**	(b)	**25.** (b)	**26.**	(d)	**27.**	(a)	**28.**	(c)	**29.**	(a)
30.	(d)	**31.**	(b)	**32.**	(b)	**33.**	(c)	**34.**	(b)	**35.** (d)	**36.**	(c)	**37.**	(d)	**38.**	(c)	**39.**	(d)
40.	(b)	**41.**	(c)	**42.**	(a)	**43.**	(c)	**44.**	(d)	**45.** (a)	**46.**	(b)						