

Indian School Muscat
Chemistry IIT - JEE
States of matter

1. Maximum deviation from ideal gas is expected from
 - A. $\text{H}_2(\text{g})$
 - B. $\text{N}_2(\text{g})$
 - C. $\text{CH}_4(\text{g})$
 - D. $\text{NH}_3(\text{g})$
2. If a gas expands at constant temperature, it indicates that:
 - A. $\text{H}_2(\text{g})$
 - B. $\text{N}_2(\text{g})$
 - C. $\text{CH}_4(\text{g})$
 - D. $\text{NH}_3(\text{g})$
3. In a flask of 'V' litres, 0.2 moles of O_2 , 0.4 moles of N_2 , 0.1 moles of NH_3 and 0.3 moles of He gases are present at 27°C . If total pressure exerted by these non-reacting gases is 1 atm, the partial pressure exerted by N_2 gas is
 - A. 0.4 atm
 - B. 0.3 atm
 - C. 0.2 atm
 - D. 0.1 atm
4. In order to increase the volume of a gas by 10%, the pressure of the gas should be
 - A. increased by 10%
 - B. increased by 1%
 - C. decreased by 10%
 - D. decreased by 1%
5. In which one of the following, does the given amount of chlorine exert the least pressure in a vessel of capacity 1 dm^3 at 273K ?
 - A. 0.071 g
 - B. 0.0355 g
 - C. 0.02 mole
 - D. 6.023×10^{21} molecules
6. One mole of oxygen at 273 k and one mole of sulphur dioxide at 546 k are taken in two separate containers, then,
 - A. kinetic energy of $\text{O}_2 >$ kinetic energy of SO_2 .
 - B. kinetic energy of $\text{O}_2 <$ kinetic energy of SO_2 .
 - C. kinetic energy of both are equal.
 - D. None of these

7. If 10^{-4} dm^3 of water is introduced into a 1.0 dm^3 flask at 300 K, how many moles of water are in the vapour phase when equilibrium is established?
(Given : Vapour pressure of H_2O at 300 K is 3170 Pa;
 $R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$)
- A. $1.27 \times 10^{-3} \text{ mol}$
B. $5.56 \times 10^{-3} \text{ mol}$
C. $1.53 \times 10^{-2} \text{ mol}$
D. $4.46 \times 10^{-2} \text{ mol}$
8. In the equation of state of an ideal gas $PV = nRT$, the value of the universal gas constant would depend only on
- A. the nature of the gas
B. the pressure of the gas
C. the units of the measurement
D. None of the above
9. In two vessels of 1 L each at the same temperature 1 g of H_2 and 1 g of CH_4 are taken, for these
- A. V_{rms} values will be same
B. kinetic energy per/mol will be same
C. total kinetic energy will same
D. pressure will be same
10. Which one of the following statements is NOT true about the effect of an increase in temperature on the distribution of molecular speeds in a gas?
- A. The most probable speed increases
B. The fraction of the molecules with the most probable speed increases
C. The distribution becomes broader
D. The area under the distribution curve remains the same as under the lower temperature
11. Hydrogen diffuses six times faster than gas A. The molar mass of gas A is:
- A. 24
B. 36
C. 72
D. 96
12. 'n' mole of an ideal gas at temperature T (in Kelvin) occupy "V" litres of volume, exerting a pressure of 'P' atmospheres. What is its concentration (in mole.lit)? (R = gas constant)
- A. P/RT
B. PT/R
C. RT/P
D. R/PT
13. 10g each of CH_4 and O_2 are kept in cylinders of same volume under same

- temperatures, give the pressure ratio of two gases.
- A. 2 : 1
 - B. 1 : 4
 - C. 2 : 3
 - D. 3 : 4
14. 138 grams of ethyl alcohol is mixed with 72 grams of water. The ratio of mole fraction of alcohol to water is
- A. 3 : 4
 - B. 1 : 2
 - C. 1 : 4
 - D. 1 : 1
15. 4 gms of an ideal gas occupies 5.6035 liters of volume at 546K and 2atm pressure. What is its molecular weight?
- A. 4
 - B. 16
 - C. 32
 - D. 64
16. 7.5 grams of a gas occupy 5.6 litres of volume at STP. The gas is (Atomic weights of C, N and O are 12, 14 and respectively)
- A. NO
 - B. N₂O
 - C. CO
 - D. CO₂
17. A and B are ideal. The molecular weights of A and B are in the ratio of 1:4. The pressure of a gas mixture containing equal weights of A and B is P atm. What is the partial pressure (in atm) of B in the mixture?
- A. $P/2.5$
 - B. $P/2$
 - C. $P/5$
 - D. $3P/4$
18. A certain mass of a gas occupies a volume of 2 litres at STP. To what temperature the gas must be heated to double its volume, keeping the pressure constant?
- A. 100 k
 - B. 273 k
 - C. 273°C
 - D. 546°C
19. A gas deviates from ideal behaviour at a high pressure because its molecules
- A. attract one another
 - B. show the Tyndall effect

- C. have kinetic energy
D. are bound by covalent bonds
20. 'a' and 'b' are van der Waals' constants for gases. Chlorine is more easily liquefied than ethane because
- A. a for $\text{Cl}_2 > a$ for C_2H_6 but b for $\text{Cl}_2 < b$ for C_2H_6
B. a for $\text{Cl}_2 < a$ for C_2H_6 but b for $\text{Cl}_2 > b$ for C_2H_6
C. a and b for $\text{Cl}_2 > a$ and b for C_2H_6
D. a and b for $\text{Cl}_2 < a$ and b for C_2H_6
21. A gas will approach ideal behaviour at
- A. high temperature, low pressure
B. low temperature, high pressure
C. low temperature, low pressure
D. high temperature, high pressure
22. According to the kinetic theory of gases, in an ideal gas, between two successive collisions a gas molecule travels
- A. in a wavy path
B. in a straight line path
C. with an accelerated velocity
D. in a circular path
23. At 100K r.m.s velocity of a gas is 104 cm/sec hence at what temperature r.m.s velocity becomes 3×10^4 cm/sec
- A. 900°C
B. 327°C
C. 627°C
D. 127°C
24. At 400 K, the root mean square (rms) speed of a gas X (molecular weight = 40) is equal to the most probable speed of gas Y at 60 K. The molecular weight of the gas Y is
- A. 4
B. 6
C. 8
D. 10
25. At 400K temperature and 0.0821 Pressure the density of Carbon dioxide is (gm/lit)
- A. 0.01
B. 0.11
C. 2.5
D. 4.4
26. By what ratio the average velocity of the molecule in gas change when the temperature is raised from 50 to 200°C ?

- A. 1.21/1
B. 1.46/1
C. 1.14/1
D. 4/1
27. Dalton's law of partial pressures is applicable to which one of the following systems?
A. $\text{CO} + \text{H}_2$
B. $\text{H}_2 + \text{Cl}_2$
C. $\text{NO} + \text{O}_2$
D. $\text{NH}_3 + \text{HCl}$
28. Equal masses of ethane and hydrogen are mixed in any empty container at 25°C . The fraction of total pressure exerted by hydrogen is
A. 1 : 2
B. 1 : 1
C. 1 : 16
D. 15 : 16
29. For one mole of an ideal gas, increasing the temperature from 10°C to 20°C _____.
A. increases the rms velocity by $\sqrt{2}$ times.
B. increases the average kinetic energy by two times.
C. increases both the average kinetic energy and rms velocity, but not significantly.
D. increases the rms velocity by two times.
30. At 27°C a closed vessel contains equal weight of He, CH_4 and SO_2 exerts a pressure of 210 mm. and partial pressures of He, CH_4 and SO_2 are P_1 , P_2 and P_3 . Which one of the following is correct?
A. $P_3 > P_2 > P_1$
B. $P_1 > P_2 > P_3$
C. $P_1 > P_3 > P_2$
D. $P_2 > P_3 > P_1$
31. The most probable velocity of a gas molecule at 298 K is m/s 300 m/s. Its RMS. Velocity in m. s^{-1} is
A. 420
B. 245
C. 402
D. 367
32. The RMS velocity of an ideal gas at 300K is $12240 \text{ cm. sec}^{-1}$. What is its most probable velocity (in cm. sec^{-1}) at the same temperature?
A. 10000
B. 11280
C. 1000

- D. 12240
33. The total pressure of a mixture of 6.4 grams of oxygen and 5.6 grams of nitrogen present in a 2 litre vessel is 1200 mm. What is the partial pressure (in mm) of nitrogen?
- A. 1200
B. 600
C. 900
D. 200
34. Temperature below which, the gas does not obey ideal gas laws is called
- A. Boyle's temperature
B. inversion temperature
C. reduced temperature
D. critical temperature
35. The density of an ideal gas is 0.03 g.cm^{-3} . Its pressure is $10^6 \text{ g.cm}^{-1}.\text{sec}^{-2}$. What is its RMS velocity (in cm sec^{-1})
- A. 10^3
B. 3×10^4
C. 10^8
D. 10^4
33. The density of O_2 is 16 at NTP. At what temperature its density will be 14? Consider that the pressure remain the constant, at
- A. 50°C
B. 39°C
C. 57°C
D. 43°C
37. The kinetic energy of 4 moles of nitrogen gas at 127°C is _____ cal. ($R = 2 \text{ cal.mole}^{-1}.\text{K}^{-1}$)
- A. 4400
B. 3200
C. 4800
D. 1524
38. The maximum number of molecules is present in:
- A. 5L of N_2 gas at STP
B. 0.5 g of H_2 gas
C. 10g of O_2 gas
D. 15 L of H_2 gas at STP
39. The molecular velocity of any gas is
- A. Directly proportional to square root of temperature
B. Inversely proportional to the square root of temperature
C. Inversely proportional to absolute temperature

- D. Directly proportional to square of temperature
40. The most probable velocity (in cm/s) of hydrogen molecule at 27°C , will be
- A. 19.3×10^4
 - B. 17.8×10^4
 - C. 24.93×10^9
 - D. 17.8×10^8
41. What is the ratio of kinetic energies of 3g of hydrogen and 4 gms of oxygen at T(K)?
- A. 12 : 1
 - B. 6 : 1
 - C. 1 : 6
 - D. 24 : 1
42. What is the temperature at which the kinetic energy of 0.3 moles of Helium is equal to the kinetic energy of 0.4 moles of Argon at 400 K?
- A. 400 K
 - B. 873 K
 - C. 533 K
 - D. 300 K
43. What is the value of gas constant? R.in $\text{Jmol}^{-1} \text{K}^{-1}$
- A. 82.1
 - B. 8.314×10^2
 - C. 8.314
 - D. 0.0821
44. What volume of oxygen gas (O_2) measured at 0°C and 1 atm, is needed to burn completely 1 litre of propane gas (C_3H_8) measured under the same conditions?
- A. 10 L
 - B. 7 L
 - C. 6 L
 - D. 5 L
45. The volume of 10 moles of an ideal gas is 1 litre at and 1 atm Pressure. What is the volume (in lit) of 20 moles of same gas at same temperature and pressure?
- A. 1
 - B. 2
 - C. 4
 - D. 8
46. To an evacuated vessel with movable piston under external pressure of 1 atm., 0.1 mol of He and 1.0 mol of an unknown compound (vapour pressure

- 0.68 atm. at 0°C) are introduced. Considering the ideal gas behaviour, the total volume (in litre) of the gases at 0°C is close to
- A. 7
 - B. 9
 - C. 13
 - D. 15
47. What are the conditions under which the relation between volume (V) and number of moles (n) gas plotted? (P = pressure; T= temperature)
- A. Constant P and T
 - B. Constant T and V
 - C. Constant P and V
 - D. Constant n and V
48. What is the dominant intermolecular force or bond that must be overcome in converting liquid CH_3OH to a gas?
- A. London dispersion force
 - B. Hydrogen bonding
 - C. Dipole-dipole interaction
 - D. Covalent bonds
49. When r, P and M represent rate of diffusion, pressure and molecular mass, respectively, then the ratio of the rates of diffusion (r_A/r_B) of two gases A and B, is given as
- A. $(P_A/P_B) (M_A/M_B)^{1/2}$
 - B. $(P_A/P_B)^{1/2} (M_A/M_B)$
 - C. $(P_A/P_B) (M_B/M_A)^{1/2}$
 - D. $(P_A/P_B)^{1/2} (M_B/M_A)$
50. Which of the given sets of temperature and pressure will cause a gas to exhibit the greatest deviation from ideal gas behaviour?
- A. 100°C and 4 atm
 - B. 100°C and 2 atm
 - C. -100°C and 4 atm
 - D. 0°C and 2 atm