

Date Planned : __ / __ / __	Daily Tutorial Sheet-3	Expected Duration : 90 Min
Actual Date of Attempt : __ / __ / __	Level-1	Exact Duration : _____

31. A sample of a gas at 100°C and 0.80 atm pressure has a density of 1.15 g L⁻¹. What is the molecular weight of the gas?
(A) 88.0 **(B)** 44.0 **(C)** 28.0 **(D)** 46.0
32. Which of the following expressions is correct ?
(A) $M = \left(\frac{\rho}{p}\right)RT$ **(B)** $M = \left(\frac{p}{\rho}\right)RT$ **(C)** $M = \left(\frac{1}{p}\right)RT$ **(D)** $M = (p)RT$
33. If a gas expands at a constant temperature : ▶
(A) The pressure decreases
(B) The kinetic energy of the molecules increases
(C) The kinetic energy of the molecules decreases
(D) The number of molecules of the gas increases
34. A helium atom is two times heavier than a hydrogen molecule. At 298 K, the average KE of a helium atom is :
(A) Two times that of a hydrogen molecule **(B)** Same as that of a hydrogen molecule
(C) Four times that of a hydrogen molecule **(D)** Six times that of a hydrogen molecule
35. Assuming ideal gas behavior, identify the option, which is incorrect as per assumption involved in KTG, speed distribution and biomolecular collision- ▶
(A) Average molar translational KE depends only upon absolute temperature
(B) Lighter gases will have more uniform speed distribution pattern as compared to heavier gases at same temperature
(C) All the molecules of heavier gas will move at a slower speed as compared to any molecule of a lighter gas
(D) Collision frequency is directly proportional to square root of absolute temperature in a closed rigid vessel.
36. At 27°C, the ratio of rms speed of ozone to that of oxygen is :
(A) $\sqrt{3/5}$ **(B)** $\sqrt{4/3}$ **(C)** $\sqrt{2/3}$ **(D)** $\sqrt{1/16}$
37. Which of the following combinations is correct ?
(A) $U_{rms} \propto \sqrt{T}$ and $U_{rms} \propto \sqrt{M}$ **(B)** $U_{rms} \propto \sqrt{T}$ and $U_{rms} \propto \frac{1}{\sqrt{M}}$
(C) $U_{rms} \propto \frac{1}{\sqrt{T}}$ and $U_{rms} \propto \frac{1}{\sqrt{M}}$ **(D)** $U_{rms} \propto \frac{1}{\sqrt{T}}$ and $U_{rms} \propto \sqrt{M}$
38. Which of the following expressions correctly represents the relationship between the average molar kinetic energies of CO and N₂ molecules at the same temperature?
(A) KE(CO) = KE(N₂)
(B) KE(CO) > KE(N₂)
(C) KE(CO) < KE (N₂)
(D) Cannot be predicted unless the volumes of the gases are given

39. According to Graham's law, at a given temperature the ratio of the rate of diffusion of gases A and B (r_A / r_B) is given by :
- (A) $(p_A / p_B)(M_A / M_B)^{1/2}$ (B) $(M_A / M_B)(p_A / p_B)^{1/2}$
 (C) $(p_A / p_B)(M_B / M_A)^{1/2}$ (D) $(M_A / M_B)(p_B / p_A)^{1/2}$
40. The density of air is $0.001293 \text{ g mL}^{-1}$ at STP. Its vapour density will be : ▶
- (A) 10.0 (B) 15.0 (C) 1.44 (D) 14.4
41. 3.2 g of oxygen gas is placed in a vessel of 10 litre at 1000 K so that 60% oxygen is dissociated to gaseous oxygen atoms. Assuming ideal gas nature, the final pressure at 1000 K is:
- (A) 0.821 atm (B) 1.31 atm (C) 0.33 atm (D) 0.49 atm
42. Which of the assumptions of the kinetic-molecular theory best explains the observation that a balloon collapses when exposed to liquid nitrogen (which is much colder than a cold winter day)?
- (A) Gas molecules move at random with no attractive forces between them
 (B) The velocity of gas molecules is proportional to their Kelvin temperature
 (C) The amount of space occupied by a gas is much greater than the space occupied by the actual gas molecules
 (D) Collisions with the walls of the container or with other molecules are elastic
43. Select the correct statement(s).
- I. The velocity at which distribution of molecules is maximum is called most probable velocity
 II. Most probable velocity of a gas is larger than root mean square velocity
- The correct option is:
- (A) I (B) II (C) I, II (D) None of these
44. Gaseous benzene reacts with hydrogen gas in presence of a nickel catalyst to form gaseous cyclohexane according to the reaction: ▶
- $$\text{C}_6\text{H}_6(\text{g}) + 3\text{H}_2(\text{g}) \longrightarrow \text{C}_6\text{H}_{12}(\text{g})$$
- A mixture of C_6H_6 and excess H_2 has a pressure of 60 mm of Hg in an unknown volume. After the gas has been passed over a nickel catalyst and all the benzene converted to cyclohexane, the pressure of the gas was 30 mm of Hg in the same volume and temperature. The fraction of C_6H_6 (by volume) present in the original mixture is :
- (A) $\frac{1}{3}$ (B) $\frac{1}{4}$ (C) $\frac{1}{5}$ (D) $\frac{1}{6}$
45. Root mean square velocity of a gas is $x \text{ ms}^{-1}$ at a pressure p atm and temperature T K. If pressure is made $2p$ under isothermal condition, root mean square speed becomes: ▶
- (A) $2x$ (B) $4x$ (C) $x/2$ (D) x