Date Planned : __ / __ / __	Daily Tutorial Sheet-3	Expected Duration : 90 Min
Actual Date of Attempt : __ / __ / __	JEE Advanced (Archive)	Exact Duration :_____

31. At constant volume, for a fixed number of moles of a gas the pressure of the gas increases with rise of temperature due to: **(1992)**

(A) increases in average molecular speed **(B)** increase rate of collisions amongst molecules

(C) increase in molecular attraction **(D)** decrease in mean free path

32. At room temperature, ammonia gas at 1 atm pressure and hydrogen chloride gas at p atm pressure are allowed to effuse through identical pin holes from opposite ends of a glass tube of one metre length and of uniform cross-section. Ammonium chloride is first formed at a distance of 60 cm from the end through which HCl gas is sent in. What is the value of p? **(1992)**

33. At room temperature, the following reaction proceeds nearly to completion. **(1992)**

$$2NO + O_2 \longrightarrow 2NO_2 \longrightarrow N_2O_4$$

The dimer, N_2O_4, solidifies at 262 K. A 250 mL flask and a 100 mL flask are separated by a stopcock. At 300 K, the nitric oxide in the larger flask exerts a pressure of 1.053 atm and the smaller one contains oxygen at 0.789 atm.

The gases are mixed by opening the stopcock and after the end of the reaction the flasks are cooled to 220 K. Neglecting the vapor pressure of the dimer, find out the pressure and composition of the gas remaining at 220 K. (Assume the gases to behave ideally).

34. At $27°C$, hydrogen is leaked through a tiny hole into a vessel for 20 min. Another unknown gas at the same temperature and pressure as that of hydrogen is leaked through same hole for 20 min. After the effusion of the gases the mixture exerts a pressure of 6 atm. The hydrogen content of the mixture is 0.7 mole. If the volume of the container is 3L. What is the molecular weight of the unknown gas? **(1992)**

35. A gas bulb of 1 L capacity contains 2.0×10^{21} molecules of nitrogen exerting a pressure of 7.57×10^3 Nm^{-2}. Calculate the root mean square (rms) speed and the temperature of the gas molecules. If the ratio of the most probable speed to root mean square speed is 0.82, calculate the most probable speed for these molecules at this temperature. **(1993)**

36. In the Van der Waals' equation, $\left(p + \frac{n^2a}{V^2}\right)(V - nb) = nRT$ the constant 'a' reflects the actual volume of the gas molecules. **(1993)**

37. A 4: 1 molar mixture of He and CH_4 is contained in a vessel at 20 bar pressure. Due to a hole in the vessel, the gas mixture leaks out. What is the composition of the mixture effusing out initially? **(1994)**

38. An LPG (liquefied petroleum gas) cylinder weighs 14.8 kg when empty. When full it weighs 29.0 kg and shows a pressure of 2.5 atm. In the course of use at $27°C$, the weight of the full cylinder reduces to 23.2 kg. Find out the volume of the gas in cubic metres used up at the normal usage conditions, and the final pressure inside the cylinder. Assume LPG to be *n*-butane with normal boiling point of $0°C$. **(1994)**

39. A mixture of ethane (C_2H_6) and ethene (C_2H_4) occupies 40 L at 1.00 atm and at 400 K. The mixture reacts completely with 130g of O_2 to produce CO_2 and H_2O. Assuming ideal gas behavior, calculate the mole fractions of C_2H_4 and C_2H_6 in the mixture. **(1995)**

40. The composition of the equilibrium mixture $(Cl_2 \rightleftharpoons 2Cl)$ which is attained at 1200°C, is determined by measuring the rate of effusion through a pin-hole. It is observed that at 1.80 mm Hg pressure, the mixture effuses 1.16 times as fast as krypton effuse under the same conditions. Calculate the fraction of chlorine molecules dissociated into atoms (atomic weight of Kr = 84 gm) **(1995)**

41. The ratio between the root mean square speed of H_2 at 50 K and that of O_2 at 800 K is: **(1996)**

(A) 4 **(B)** 2 **(C)** 1 **(D)** $\frac{1}{4}$

42. A mixture of ideal gases is cooled up to liquid helium temperature (4.22 K) to form an ideal solution. Is this statement true or false? Justify your answer in not more than two lines. **(1996)**

43. The compressibility factor for an ideal gas is : **(1997)**

(A) 1.5 **(B)** 1.0 **(C)** 2.0 **(D)** ∞

44. The absolute temperature of an ideal gas is ..... to/than the average kinetic energy of the gas molecules. **(1997)**

45. According to Graham's law, at a given temperature the ratio of the rates of diffusion $\frac{r_A}{r_B}$ of gases A and B is given by (where, p and M are pressure and molecular weights of gases A and B respectively). **(1998)**

(A) $\left(\frac{p_A}{p_B}\right)\left(\frac{M_A}{M_B}\right)^{\frac{1}{2}}$ **(B)** $\left(\frac{M_A}{M_B}\right)\left(\frac{p_A}{p_B}\right)^{\frac{1}{2}}$ **(C)** $\left(\frac{p_A}{p_B}\right)\left(\frac{M_B}{M_A}\right)^{\frac{1}{2}}$ **(D)** $\left(\frac{M_A}{M_B}\right)\left(\frac{p_B}{p_A}\right)^{\frac{1}{2}}$