1. Calculate the density of NH_3 at 30°C and 5 atm pressure. **(1978)**

2. 4.215 g of a metallic carbonate was heated in a hard glass tube, the CO_2 evolved was found to measure 1336 mL at 27°C and 700 mm of Hg pressure. What is the equivalent weight of the metal? ▶ **(1979)**

3. 3.7 g of a gas at 25°C occupied the same volume as 0.184g of hydrogen at 17°C and at the same pressure. What is the molecular weight of the gas? **(1979)**

4. A hydrocarbon contains 10.5 g of carbon per gram of hydrogen. 1 L of the vapour of the hydrocarbon at 127°C and 1 atm pressure weighs 2.8 g. Find the molecular formula of the hydrocarbon. **(1980)**

5. The pressure in a bulb dropped from 2000 to 1500 mm of mercury in 47 min when the contained oxygen leaked through a small hole. The bulb was then evacuated. A mixture of oxygen and another gas of molecular weight 79 in the molar ratio of 1: 1 at a total pressure of 4000 mm of mercury was introduced. Find the molar ratio of the two gases remaining in the bulb after a period of 74 min. ▶ **(1981)**

6. The ratio of root mean square velocity to average velocity of a gas molecule at a particular temperature is:
    (A) 1.085 :1 **(B)** 1:1.086 **(C)** 2 :1.086 **(D)** 1.086 : 2 **(1981)**

7. The temperature at which a real gas obeys the ideal gas laws over a wide range of pressure is: **(1981)**
    (A) critical temperature **(B)** Boyle temperature
    (C) Inversion temperature **(D)** reduced temperature

8. Calculate the average kinetic energy, in joule per molecule in 8.0 g of methane at 27°C. **(1982)**

9. Helium atom is two times heavier than a hydrogen molecule. At 298 K, the average kinetic energy of a helium atom is: **(1982)**
    (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)** half that of a hydrogen molecule

10. A gas in a closed container will exert much higher pressure due to gravity at the bottom than at the top. Is it true or false? **(1983)**

11. Give reasons for the following in one or two sentences. **(1983)**
    (i) Equal volumes of gases contain equal number of moles.
    (ii) A bottle of liquid ammonia should be cooled before opening the stopper.

12. When 2g of a gas A is introduced into an evacuated flask kept at 25°C, the pressure is found to be one atmosphere. If 3g of another gas B is then added to the same flask, the total pressure becomes 1.5 atm. Assuming ideal gas behavior, calculate the ratio of the molecular weights M_A : M_B. ▶ **(1983)**

13. Oxygen is present in one litre flask at a pressure of 7.6×10^{-10} mm Hg. Calculate the number of oxygen molecules in the flask at 0°C. **(1984)**

14. When an ideal gas undergoes unrestrained expansion, no cooling occurs because the molecules: **(1984)**
    (A) are above the inversion temperature **(B)** exert no attractive forces on each other ▶
    (C) do work equal to loss in kinetic energy **(D)** collide without loss of energy

15. Calculate the root mean square velocity of ozone kept in a closed vessel at 20°C and 82 cm mercury pressure. **(1985)**