Question: A container of volume 50 cc contains air (mean molecular weight = 28.8 g) and open to atmosphere where the pressure is 100 kPa. The container is kept in a bath containing melting ice (0 °C). (a) Find the mass of the air in the container when thermal equilibrium is reached. (b) The container is now placed in another bath containing boiling water (100 °C). Find the mass of air in the container. (c) The container is now closed and placed in the melting-ice bath. Find the pressure of the air when thermal equilibrium is reached.

Solution: The volume of the container is $V = 50 \times 10^{-6}$ m^3, the atmospheric pressure pressure is $p = 10^5$ Pa, and molecular weight of air is $M = 28.8$ g. In case (a), temperature is $T = 273$ K and in case (b) temperature is $T = 373$ K. Apply the ideal gas equation, $pV = nRT = \frac{m}{M}RT$ to get $m = 0.0635$ g in case (a) and $m = 0.0464$ g in case (b). In case (c), mass is $m = 0.0464$ g and temperature is $T = 273$ K. Apply the ideal gas equation to get $p = \frac{mRT}{MV} = 73$ kPa. The answer given for (a) is 0.058 g whereas it should be 0.063 g.