

PHYS 109: Suggested problems

CHAPTER 8

8.3. A container of volume $V = 400 \text{ cm}^3$ has a mass of 244.5500 g when evacuated. When the container is filled with air of pressure $p = 1 \text{ atm}$ at temperature $T = 20^\circ\text{C}$, the mass of the system increases to 245.0307 g. Assuming air behaves like an ideal gas, calculate from these data the average molar mass of air.

8.6. An ideal gas is initially at temperature 300 K, volume 1.5 m^3 , and pressure $2.0 \times 10^4 \text{ Pa}$. What will be its final temperature if it is compressed to a volume of 0.7 m^3 and the final pressure is $8.0 \times 10^4 \text{ Pa}$?

8.13. Nitrogen is commercially available as a compressed gas contained in metal cylinders. (a) If a cylinder of 120 L is filled with N_2 to a pressure of $1.45 \times 10^4 \text{ kPa}$ at 20°C , how many mol of nitrogen does the cylinder contain? (b) If we open the valve on the cylinder and allow N_2 to escape, how many litres of nitrogen at $p = 1 \text{ atm}$ and 20°C would leave the cylinder?

8.15. 2.0 mol of an ideal gas are sealed in a 10.0 L container at pressure $p = 5.0 \text{ atm}$. What is the internal energy U of the gas (that is, the total energy, not the internal energy, per mol)?

8.17. Calculate the pressure exerted by 25 g of nitrogen gas in a 1.0 L container at 298 K.