81. The weight of the air inside the balloon of volume V is $W = \rho_{\text{gas}} V g$, and the buoyant force exerted on it is given by $F_b = \rho_{\text{air}} V g$. Thus, we have $F_b = W + mg$, where m is the mass of the payload. we have $\rho_{\text{air}} V g = \rho_{\text{gas}} V g + mg$, which gives

$$V = \frac{m}{\rho_{\text{air}} - \rho_{\text{gas}}} = \frac{40\,\text{kg} + 15\,\text{kg}}{0.035\,\text{kg/m}^3 - 0.0051\,\text{kg/m}^3} = 1.8 \times 10^3\ \text{m}^3\ .$$