Answer on Question #54642-Engineering-Chemical Engineering

A balloon is slowly compressed at an atmospheric pressure of 649 torr and temperature of 169 °R. The temperature inside the balloon remains at the atmospheric temperature, while the volume changes from 0.0256 bbl (US) to V2 ft3, and gage pressure inside the balloon increases from 226 kgf/m2 to 0.672 lbf/in2.

Solution

For the ideal gases:

$$pV = \nu RT.$$

The temperature inside the balloon remains constant, so

$$p_1V_1 = p_2V_2.$$

Thus,

$$V_2 = \frac{p_1V_1}{p_2} = \frac{226 \cdot 0.00142233433 \frac{\text{lbf}}{\text{in}^2}}{0.672 \frac{\text{lbf}}{\text{in}^2}} 0.0256 \cdot 4.2109375\ ft^3 = 0.0516\ ft^3.$$

Answer: $\mathbf{0.0516\ ft^3}$.