1.42

1.42 The helium-filled blimp shown in Fig. P1.42 is used at various athletic events. Determine the number of pounds of helium within it if its volume is 68,000 ft^3 and the temperature and pressure are 80 °F and 14.2 psia, respectively.

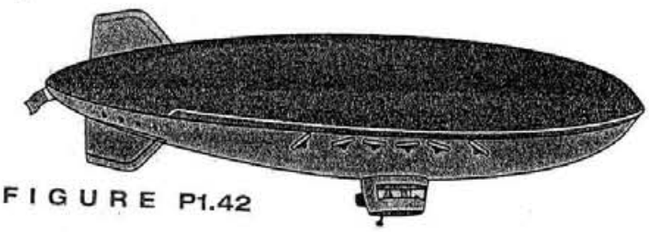

FIGURE P1.42

$W = \gamma V$ where $V = 68{,}000\,ft^3$ and $\gamma = \rho g = (p/RT)g$

Thus,

$$\gamma = \left[14.2 \frac{lb}{in^2}\left(144 \frac{in^2}{ft^2}\right) \Big/ \left((1.242 \times 10^4 \frac{ft \cdot lb}{slug \cdot {}^\circ R})(80+460)^\circ R\right)\right](32.2 \frac{ft}{s^2})$$

$$= 9.82 \times 10^{-3} \frac{slug}{ft^2 \cdot s^2}\left(1\,lb/(slug\,ft/s^2)\right) = 9.82 \times 10^{-3} \frac{lb}{ft^3}$$

Hence,

$$W = 9.82 \times 10^{-3} \frac{lb}{ft^3}(68{,}000\,ft^3) = \underline{\underline{668\,lb}}$$