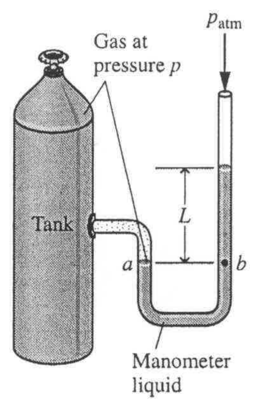
PROBLEM 1.32



(a) We have $p_a = p_{gas}$ and $p_a = p_b$. p_b is evaluated using Eq. 1.11. Collecting results,

$$\Rightarrow \quad p_{gas} = p_{atm} + \rho_w g L$$

where $\rho_w = 997\ kg/m^3$ and $g = 9.81\ m/s^2$.

Solving for L

$$L = \frac{(p_{gas} - p_{atm})}{\rho_w g} = \frac{(1.5-1)\,bar \left|\frac{10^5\,N/m^2}{1\,bar}\right|}{\left(997\,\frac{kg}{m^3}\right)\left(9.81\,\frac{m}{s^2}\right)\left|\frac{1\,N}{1\,kg\cdot m/s^2}\right|}$$

$$= 5.11\ m \quad \longleftarrow$$

(b) Following the approach of part (a) with $\rho_m = 13.59\ \frac{g}{cm^3}$, $p_{atm} = 750\ mm\ Hg = 10^5\ N/m^2$ (see "For Example" on p. 16)

$$L = \frac{p_{gas} - p_{atm}}{\rho_m g} = \frac{(1.3-1)\times 10^5\ N/m^2}{\left(13.59\,\frac{g}{cm^3}\right)\left|\frac{1\,kg}{10^3\,g}\right|\left|\frac{10^2\,cm}{1\,m}\right|^3\left(9.81\,\frac{m}{s^2}\right)\left|\frac{1\,N}{1\,kg\cdot m/s^2}\right|}$$

$$= 0.225\,m\left|\frac{100\,cm}{1\,m}\right| = 22.5\ cm \quad \longleftarrow$$

PROBLEM 1.33

Considering a manometer like that shown in Fig. 1.7 connected to the storage tank by a line filled with gas, we have $p_a = p_{gas}$ and $p_a = p_b$. p_b is evaluated using Eq. 1.11. Collecting results,

$$p_{gas} = p_{atm} + \rho g L$$

$$= 101\ kPa + \left(13.59\,\frac{g}{cm^3}\right)\left|\frac{1\,kg}{10^3\,g}\right|\left|\frac{10^2\,cm}{1\,m}\right|^3\left(9.81\,\frac{m}{s^2}\right)(1\,m)\left|\frac{1\,N}{1\,kg\cdot m/s^2}\right|\left|\frac{1\,kPa}{10^3\,N/m^2}\right|$$

$$= 101\ kPa + 133.3\ kPa$$

$$= 234.3\ kPa \quad \longleftarrow$$