PROBLEM 1.37

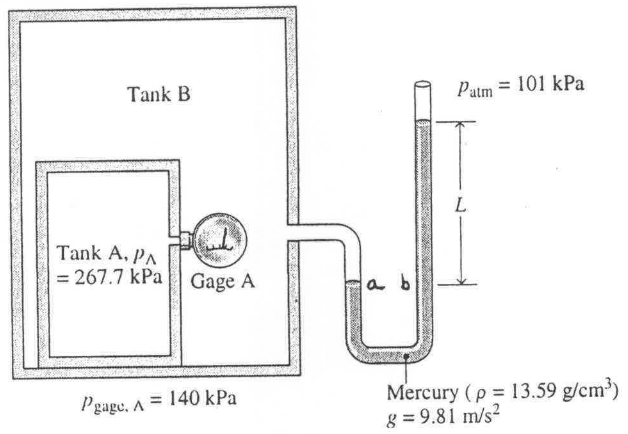


Fig. P1.37

Looking at gage A,

$$p_{gage,A} = p_A - p_B$$

$$\Rightarrow \quad p_B = p_A - p_{gage,A} = 267.7\,kPa - 140\,kPa = 127.7\,kPa \longleftarrow$$

The pressures at a and b are equal. At a, the pressure is p_B. At b, the pressure is

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

So, $\quad p_B = p_{atm} + \rho g L$

Solving,

$$L = \frac{p_B - p_{atm}}{\rho g} = \frac{(127.7\,kPa - 101\,kPa)\left|\frac{10^3\,N/m^2}{1\,kPa}\right|\left|\frac{1\,kg\cdot m/s^2}{1\,N}\right|}{\left(13.59\,\frac{g}{cm^3}\right)\left|\frac{1\,kg}{10^3\,g}\right|\left|\frac{10^2\,cm}{1\,m}\right|^3\left(9.81\,\frac{m}{s^2}\right)} = 0.2\ m$$

$$= (0.2\,m)\left|\frac{10^2\,cm}{1\,m}\right| = 20\,cm \longleftarrow$$

PROBLEM 1.38

See Fig. P1.38.

The pressure acting on the vehicle at a depth $L = 1000\,ft$ is

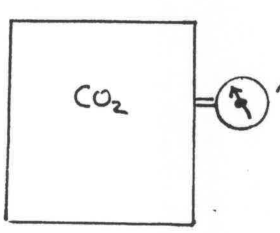
$$p = p_{atm} + \rho g L$$

$$= 1\,atm + \left(62.4\,\frac{lb}{ft^3}\right)\left(32.2\,\frac{ft}{s^2}\right)(1000\,ft)\left|\frac{1\,atm}{14.696\,lbf/in^2}\right|\left|\frac{1\,ft^2}{144\,in^2}\right|\left|\frac{1\,lbf}{32.2\,lb\cdot ft/s^2}\right|$$

rounded

$$= 1\,atm + 29.49\,atm = 30.49\,atm \longleftarrow$$

PROBLEM 1.39



$p_{atm} = 750\,mmHg$, $\rho_m = 13.59\,g/cm^3$, $g = 9.81\,m/s^2$

$p_{gage} = 10\,kPa$ (vacuum)

The atmospheric pressure, in kPa, can be found using the "for example" of Sec. 1.6.1. The calculation is the same as used there, giving $p_{atm} = 10^5\,N/m^2$.

Thus, $p_{atm} = 10^5\,\frac{N}{m^2}\left|\frac{1\,kPa}{10^3\,N/m^2}\right| = 100\,kPa$. Then, with Eq. 1.15

$$p_{CO_2} = 100\,kPa - 10\,kPa = 90\,kPa \longleftarrow$$