HW 1.1

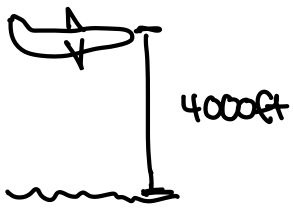
Group 2: Sanchez, Perkins, Ashley, Wells, Watts

3.6 The value for the absolute pressure will always be greater than that for the gage pressure.
3.7 As long as you stay on the surface of Earth, the atmospheric pressure will be 14.7 psia.
3.8 The pressure in a certain tank is $-53.6\ \mathrm{Pa(abs)}$.
3.9 The pressure in a certain tank is $-4.65\ \mathrm{psig}$.
3.10 The pressure in a certain tank is $-175\ \mathrm{kPa(gage)}$.

3.6) True
3.7) False
3.8) False
3.9) True
3.10) True

3.11 If you were to ride in an open-cockpit airplane to an elevation of 4000 ft above sea level, what would the atmospheric pressure be if it conforms to the standard atmosphere?

$\Delta P = \gamma h$
$= 1.4(4000\text{ft})$
$= 5600\text{psia}$



3.13 Expressed as a gage pressure, what is the pressure at the surface of a glass of milk?

$P_{gage} = 0\ \text{psig}$

3.41 For the tank of ethylene glycol described in **Problem 3.40**, compute the pressure at a depth of 12.0 m.

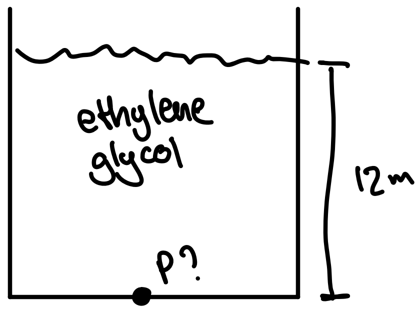
$\Delta P = \gamma h$

$= \rho g h$

$= (1113\ kg/m^3)(9.81\ m/s^2)(12\ m)$

$= 131{,}022.36\ kg/m \cdot s^2$

$= 131.022\ kPa$



3.62 Water is in the pipe shown in **Fig. P3.62**. Calculate the pressure at point A in kPa(gage).

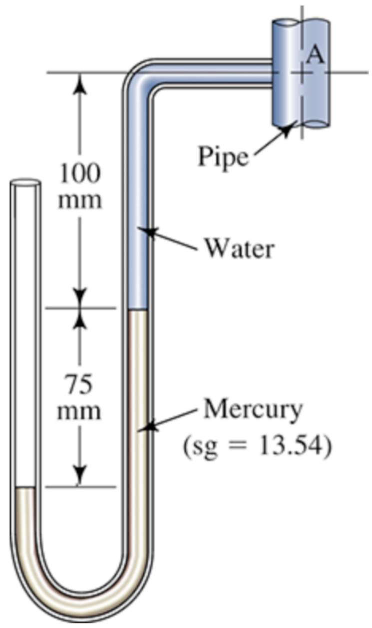
$\rho_{Hg} = (13.54)(1{,}000) = 13{,}540\ kg/m^3$

$P_A + \rho_{H_2O}\, g\, h_{H_2O} + \rho_{Hg}\, g\, h_{Hg} = 0$

$\rightarrow P_A + (1{,}000\ kg/m^3)(9.81\ m/s^2)(0.1\ m) + (13{,}540\ kg/m^3)(9.81\ m/s^2)(0.075\ m) = 0$

$\rightarrow P_A = -10{,}943.05\ Pa$

$= -10.94\ kPa\ (gage)$



3.83 What would be the reading of a barometer in inches of mercury corresponding to an atmospheric pressure of 14.2 psia?

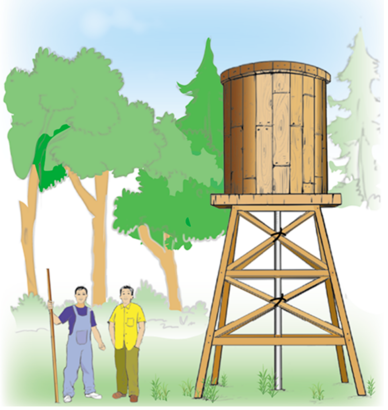
$(14.2\ psia)(2.036) = 28.91\ inHg$

3.90 The pressure in a vacuum chamber is -12.6 psig. Express this pressure in inHg.

$P_{abs} = 14.7\ psi - 12.6\ psi = 2.1\ psi$

$\rightarrow 2.1\ psi = 4.28\ inHg$

3.94 The elevated tank similar to the one shown in **Fig. P3.94** is part of a water delivery system to be built for a small village. Find the required elevation of the tank if a minimum gage pressure of 160 kPa is required at the outlet when the water is static (no flow). Note that the level calculated will establish the height for the bottom of the tank when it is nearly empty. When the level of water is higher, the outlet pressure will also be higher.



$P = 160\ kPa$

$160\ kPa = \gamma_w h$

$\rightarrow 160 \frac{kN}{m^2} = 9.807 \frac{kN}{m^3} h$

$\rightarrow 16.315 \frac{kN m^3}{kN m^2} = h$

$h = 16.315\ m$