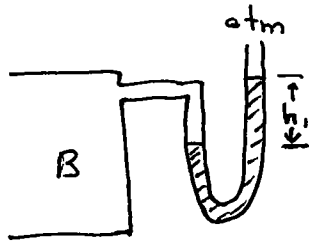


Problem 11-12

1st, consider the manometer connecting B and the atmosphere:



By inspection of the manometer levels, $P_B > P_{atm}$.

$$\Delta P = P_B - P_{atm} = \rho g h_1$$

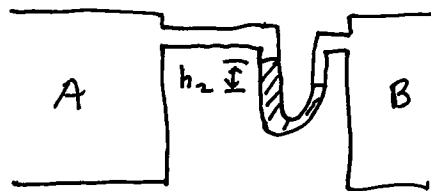
Easier to use gauge pressures:

$$\therefore \text{write (gauge) } P_B - 0 = \rho g h_1$$

↑
gauge press. corresponding
to $P_{abs} = P_{atm}$

$$\therefore \text{(gauge) } P_B = \rho g h_1 \quad [1]$$

Now consider the manometer connecting A and B:



By inspection of the manometer levels,

$$P_A < P_B$$

$$\therefore P_A = P_B - \rho g h_2$$

$$\begin{aligned} \therefore \text{from [1], } P_A &= \rho g h_1 - \rho g h_2 \\ &= \rho g (h_1 - h_2) \end{aligned}$$

$$\begin{aligned} \therefore P_A &= (1000 \text{ kg/m}^3)(9.80 \text{ m/s}^2)[(0.30 - 0.10) \text{ m}] \\ &= 2.0 \times 10^3 \text{ Pa} \quad (1.96 \times 10^3 \text{ Pa}) \end{aligned}$$

↖ This is the gauge pressure.

$$\begin{aligned} \text{Then, absolute } P_A &= P_{A, \text{GAUGE}} + 1 \text{ atm} \\ &= (2.0 \times 10^3 + 1.01 \times 10^5) \text{ Pa} \\ &= 1.03 \times 10^5 \text{ Pa} \end{aligned}$$