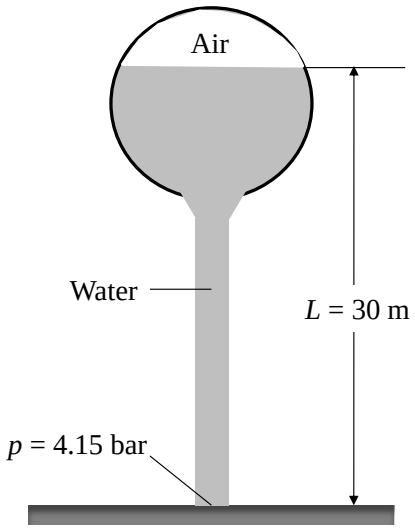
1.37 If the water pressure at the base of the water tower shown in Fig. P1.37 is 4.15 bar, determine the pressure of the air trapped above the water level, in bar. The density of the water is 10^3 kg/m^3. And g = 9.81 m/s^2.

KNOWN: Air is trapped above a column of water in a water tower.

FIND: the pressure of the air trapped above the water level.

SCHEMATIC AND GIVEN DATA:



ENGINEERING MODEL:
1. Water density is 10^3 kg/m^3.
2. Local gravitational acceleration is 9.81 m/s^2.

ANALYSIS: Ignoring the vertical variation in pressure of the air trapped above the water level,

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

pressure at the base

$$p_{air} = p - \rho g L$$

$$p_{air} = (4.15\,\text{bar}) - \left(10^3 \frac{\text{kg}}{\text{m}^3}\right)\left(9.81 \frac{\text{m}}{\text{s}^2}\right)(30\,\text{m})\left|\frac{1\,\text{N}}{1\,\frac{\text{kg}\cdot\text{m}}{\text{s}^2}}\right|\left|\frac{1\,\text{bar}}{10^5\,\frac{\text{N}}{\text{m}^2}}\right| = \underline{\mathbf{1.21\ bar}}$$