Team Vortex

MET 330

HW 1.2

1/25/24

6) Q: The value for the absolute pressure will always be greater than that for the gage pressure.

A: True. Absolute pressure includes the atmospheric pressure, where gauge pressure does not.

7) Q: As long as you stay on the surface of Earth, the atmospheric pressure will be 14.7 psia.

A: False. Atmospheric pressure changes according to altitude.

8) Q: The pressure in a certain tank is -53.6 Pa (abs)

A: False. Absolute pressure can not be a negative value

9) Q: The pressure in a certain tank is -4.65 psig.

A: True. Guage pressure can be negative because it is relative to the atmosphere.

10) Q: The pressure in a certain tank is -175 kPa (gage).

A: True. Guage pressure can be negative because it is relative to the atmosphere.

11) Q: 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?

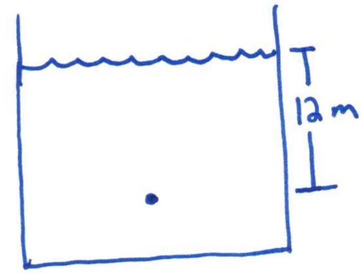
A: At an elevation of 4,000 ft the atmospheric pressure would be 12.7 psia. (Linear interpolation)

13) Q: Expressed as a gage pressure, what is the pressure at the surface of a glass of milk?

A: The gage pressure would be 0 psig because the surface of the milk would only be exposed to atmospheric pressure.

41) Q: For the tank of ethylene glycol described in Problem 3.40, compute the pressure at a depth of 12.0 m.

A:



$\rho_{EG} = 1.13 \times 1{,}000$

$\rho_{EG} = 1{,}130 \text{ kg/m}^3$

$P = \rho g h$

$P = (1{,}130 \text{ kg/m}^3)(9.81 \text{ m/s})(12.0 \text{ m})$

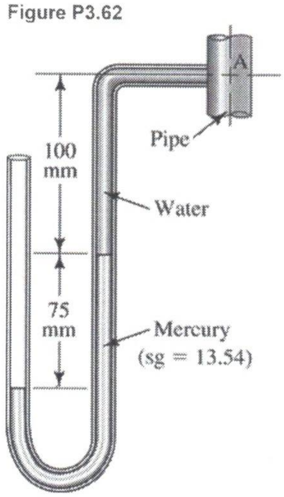
$P = 133{,}023.6 \text{ Pa}$

$\underline{P = 133 \text{ kPa}}$

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

A:

Figure P3.62



$\rho_{Hg} = 13.54 \times 1{,}000$

$= 13{,}540 \text{ kg/m}^3$

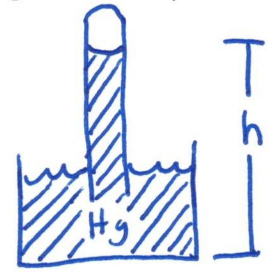
$P_A + \rho_{H_2O}\, g\, h_{H2O} + \rho_{Hg}\, g\, h_{Hg} = 0$

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

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

$\underline{P_A = -10.94 \text{ kPa}_{(gage)}}$

83) Q: What would be the reading of a barometer in inches of mercury corresponding to an atmospheric pressure of 14.2 psia?



A: $1 \text{ psia} = 2.036'' \text{ Hg}$

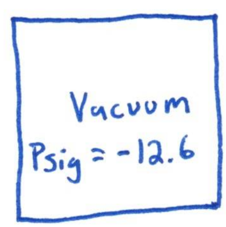
$$14.2 \text{ psia} \left(\frac{2.036'' \text{ Hg}}{1 \text{ psia}} \right) = 28.9'' \text{ of Hg}$$

$$\underline{h = 28.9'' \text{ Hg}}$$

90) Q: The pressure in a vacuum chamber is −12.6 psig. Express this pressure in inHg.

A:

$$-12.6 \text{ psig} + 14.7 \text{ psia} = 2.095 \text{ psia}$$

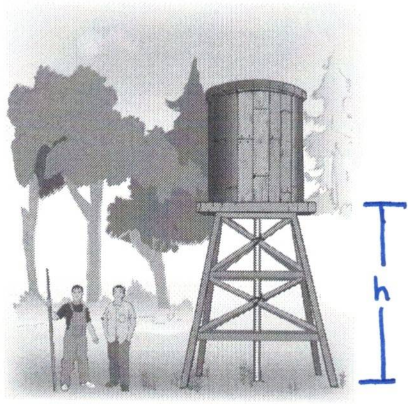


$$\frac{(2.095 \text{ psia})(30.2'')}{(14.7 \text{ psia})} = \underline{4.3'' \text{ Hg}}$$

94) Q: 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.

A:

Figure P3.94



$$P = \rho h g$$

$$h = \frac{P}{\rho g}$$

$$h = \frac{160 \text{ kPa}}{\rho_{H_2O}\,(9.81\ m/s)}$$

$$h = \frac{160 \times 10^3 \text{ Pa}}{(1{,}000)\,(9.81\ m/s)}$$

$$\underline{h = 16.3 \text{ m}}$$

1) Review the solved problems that were discussed in class and the ones under "Lectures". Write a paragraph or two on what you learned.

Across the classes this last week we learned about absolute pressure and gauge pressure, reading a manometer, reading a pressure gauge, and Bernoulli's equation. Also, we were introduced to the ideas and formula that explain the following concepts, hydrodynamics, streamlines, volumetric flow rate ($Q = v * A$), the 1st law of thermodynamics, conservation of mass ($V_{in} * A_{in} = V_{out} * A_{out}$), Newton's Law, and conservation of momentum. This week we were introduced to the concept of friction and viscous fluids. And, explaining the phenomena of how viscosity and friction interact with each other inside of a pipe. The problems featured this week included varrios pipes with differing fluids in which we had to calculate the pressure between two points. The primary point of these exercises was to demonstrate the fact that pressure is only relative to height and the fluid being pressed and you can "cut across" as horizontal changes do not affect pressure.