

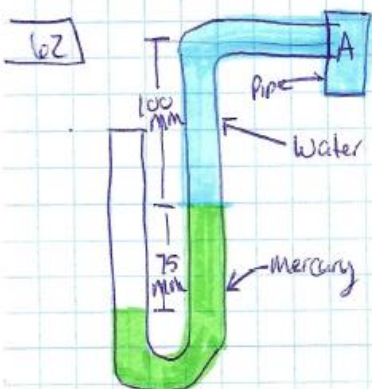
- 6] The value of absolute pressure will always be greater than that for the gauge pressure **T or F?** pg 40

True, the absolute pressure is the gauge pressure added to the atmospheric pressure. Absolute pressure will always be greater.

$$P_{abs} = P_{gauge} + P_{atm}$$

- 10] Gauge pressure in a tank is -150 kPa (gauge) **T or F?** pg 45 + 496

False, standard atmospheric pressure near the surface of the earth is 101 kPa . A gauge pressure above atmospheric pressure is positive, the value given was negative.



Calculate pressure at point A in kPa (gauge)
pg 40 + 49

$$P_{atm} = P_A + \gamma_{H_2O} h_{H_2O} + \gamma_{Hg} h_{Hg}$$

$$P_A - P_{atm} = -(\gamma_{H_2O} h_{H_2O} + \gamma_{Hg} h_{Hg})$$

$$(P_A)_{gauge} = -(\gamma_{H_2O} h_{H_2O} + \gamma_{Hg} h_{Hg})$$

$$= -(\gamma_{H_2O} h_{H_2O} + \gamma_{H_2O} S_{Hg} h_{Hg})$$

$$= -(9.81 \frac{\text{kJ}}{\text{m}^3})(1 \text{ m}) + (9.81 \frac{\text{kJ}}{\text{m}^3})(13.54)(0.075 \text{ m})$$

pg 488 + 490

$$0^\circ \text{C } H_2O = \gamma = 9.81 \text{ kN/m}^3$$

$$\text{Mercury} = S_{Hg} = 13.54$$

$$100 \text{ mm} = 1 \text{ m}$$

$$75 \text{ mm} = 0.075 \text{ m}$$

② $P_{A \text{ gauge}} = -10.94 \text{ kPa}$

3.7) As long as you stay on the surface of the earth, atmospheric pressure will be 14.7 psia.

False: atmospheric pressure changes depending on your location. Due to changes in Elevation and temperature

atm near Earth's surface ranged from 13.8 psia $\rightarrow$ 15.3 psia

Sea level = 14.7 psia

3.11) If you were to ride in a open-cockpit airplane at an elevation of 4,000 ft above sea level, what would the atmospheric pressure be if it conforms to the standard atmosphere?

Appendix E $\rightarrow$ Standard conditions at sea level $\rightarrow$ $P = 14.696$ Psia
 $\gamma = .0764$ lb/ft³

$$P = \gamma h \rightarrow .0764 \frac{\text{lb}}{\text{ft}^3} \left(\frac{1 \text{ ft}^3}{12^3 \text{ in}^3} \right) 4000 \text{ ft} \left(\frac{12 \text{ in}}{1 \text{ ft}} \right) \rightarrow P = 2.12 \text{ lb/in}^2$$

2.12 psia

$$\Delta P = 14.7 - 2.12 \rightarrow \Delta P = 12.58 \text{ psia} @ 4,000 \text{ ft}$$

(according to table E.3 @ 5,000 ft $P = 12.227$ psi so 12.58 psi makes sense for 4,000 ft)

3.83) A barometer indicates the atmospheric pressure to be 30.65 in of mercury. Calculate the atm in psia?

$$P_{\text{atm}} = \gamma_{\text{hg}}$$

$$\gamma_{\text{hg}} = 133.3 \text{ kN/m}^3$$

$$\gamma_{\text{hg}} = 848.7 \text{ lb/ft}^3$$

$$P_{\text{atm}} = 848.7 \frac{\text{lb}}{\text{ft}^3} \left(\frac{1 \text{ ft}^3}{12^3 \text{ in}^3} \right) 30.65 \text{ in}$$

$$\rightarrow 15.05 \text{ lb/in}^2 \rightarrow 15.05 \text{ psia}$$

3.8) The pressure in a certain tank is -55.8 Pa (abs) .

True or False

It is false because $-55.8 \text{ Pa} = -0.0558 \text{ kPa}$ or -0.008 psi therefore absolute pressure would be negative which is not possible. Absolute pressure will always be positive (Pg. 39)

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HW 2.2

Group 2

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

$P_{\text{gage}} = 0$ This is because $P_{\text{abs}} = P_{\text{atm}}$ at the surface of a liquid therefore $P_{\text{abs}} = P_{\text{gage}} + P_{\text{atm}}$

3.90) The pressure in a vacuum chamber is -68.2 kPa . Express the pressure in mmHg

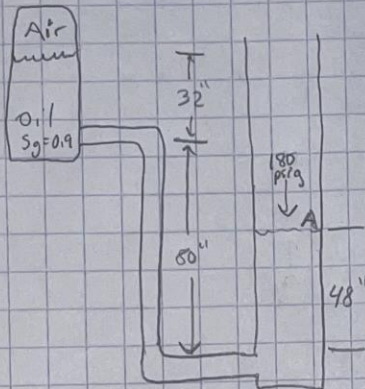
$$1 \text{ kPa} = 7.50062 \text{ mmHg}$$

$$\Rightarrow -68.2 \text{ kPa} = \boxed{-511.542 \text{ mmHg}}$$

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9/15/2021
Chapter 3 Homework

3.9) true - -55.8 Pa is about 0.00 psi

3.41)

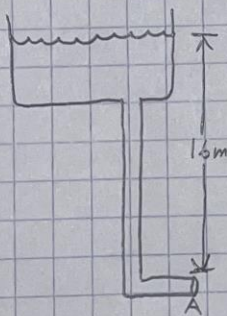


$$P_{Air} = P_A + 0.9(48") - 0.9(80") - 0.9(32")$$

$$P_{Air} = 180 \text{ psig} + 43.2 - 72 - 28.8$$

$$P_{Air} = 122.4 \text{ psig}$$

3.94)



$$P_A = 9.81 \text{ kPa/m}$$

$$P_A = 156.97 \text{ kPa}$$

$$P_A = 157 \text{ kPa minimum pressure}$$