

Homework 1.2

Robert Morris, Gavin Cotton, Naftaly Gichunga, Trey Ward

6.

3.6 True

7.

3.7) T or F ; As long as you stay at the earth's surface atmospheric pressure will be 14.7 PSI
True

8.

3.8: The pressure in a certain tank is -55.8 Pa (abs) .
- False - Absolute pressure cannot be negative.

9.

3.9: The pressure in a certain tank is -55.8 Pa (abs) .
- False - Absolute pressure cannot be negative.

10.

3.10) False ; atmospheric pressure on surface is $\sim 101 \text{ kPa}$.
Gauge pressure above atmospheric is positive.

11.

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

$$\Delta p = \gamma_{\text{air}} \cdot h \quad \begin{array}{l} h = 4000 \text{ ft} \\ p_1 = 1 \text{ atm} = 14.7 \text{ PSI} \\ \gamma_{\text{air}} = 0.0764 \text{ lb/ft}^3 \end{array}$$

$$p_2 = p_1 - \Delta p$$

$$\Rightarrow \Delta p = 0.0764 \frac{\text{lb}}{\text{ft}^3} \cdot 4000 \frac{\text{ft}}{1} = 305.6 \frac{\text{lb}}{\text{ft}^2}$$

$$\Rightarrow 305.6 \frac{\text{lb}}{\text{ft}^2} = 2.12 \frac{\text{lb}}{\text{in}^2} = 2.12 \text{ PSI}$$

$$\Rightarrow p_2 = p_1 - p_2 = 14.7 \text{ PSI} - 2.12 \text{ PSI}$$

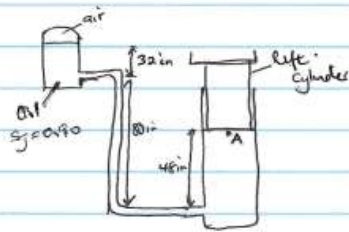
$$p_2 = 12.57 \text{ PSI}$$

13.

3.13) ϕ Pa (gage). Exposed to atmosphere

41.

Problem 3.41



What must the air pressure be if the pressure at point A

has to be at least 180 psig

$$P_{air} + \gamma_{oil}(32 \text{ in}) + \gamma_{oil}(8 \text{ in}) - \gamma_{oil}(48 \text{ in}) = 180 \text{ psig}$$

$$P_{air} = 180 \text{ psig} - (64 \text{ in})\gamma_{oil}$$

$$S = \frac{\gamma_{oil}}{\gamma_{water @ 4^\circ C}} \quad \gamma_{oil} = 0.9 \times 62.4 \frac{\text{lb}}{\text{ft}^3} \times \frac{\text{ft}^3}{(12 \text{ in})^3}$$

$$= 0.0325 \text{ lb/in}^3$$

$$P_{air} = 180 \text{ psi} - (64 \text{ in} \times 0.0325 \text{ lb/in}^2)$$

$$= 180 \text{ psig} - 2.08 \text{ psia}$$

$$\boxed{P_{air} = 177.92 \text{ psig}}$$

62.

3.62

Pressure at point A

$$\gamma_m = (13.54)(9.81 \text{ kN/m}^3) = 132.83 \text{ kN/m}^3$$

$$0 - (132.83)(0.075) - (9.81)(0.1)$$

$$P_A = -10.94 \text{ kN/m}^2 = -10.94 \text{ kPa (gauge)}$$

83.

3.83) A barometer indicates Atmospheric Pressure to be 30.65 in of Mercury. Find pressure in psia

$$\gamma_m = 848.7 \frac{\text{lb}}{\text{ft}^3} \quad h = 30.65 \text{ in}$$

$$\Rightarrow \gamma_m = 848.7 / 12^3 = 0.4911 \frac{\text{lb}}{\text{in}^3}$$

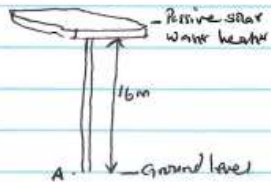
$$\Rightarrow P_{atm} = 0.4911 \frac{\text{lb}}{\text{in}^3} \cdot 30.65 \text{ in} = \boxed{15.05 \text{ PSI}}$$

90.

3.70 pressure is -68.2 kPa $\therefore H_2 = -68.2 \left(\frac{1}{101.125} \right) = -511.542 \text{ mm H}_2\text{O}$

94.

Problem 3.94



Gauge pressure at point A in kPa

$$P_A(\text{gauge}) = \gamma_w h$$

$$\gamma_w = 9.81 \text{ kN/m}^3$$

$$h = 16 \text{ m}$$

$$P_A = 9.81 \text{ kN/m}^3 \times 16 \text{ m}$$

$$P_A = 156.96 \text{ kN/m}^2$$

$$P_A = 156.96 \text{ kPa (gauge)}$$