CAE 208 / MMAE 320: Thermodynamics

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Problem solving session

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Unit Conversion

Question: We can usually represent heat transfer through building walls using the following equation:

$$Q = U \times A \times \Delta T$$

Where:

- U is the overall heat transfer coefficient expressed in $\frac{W}{m^2-K}$ (or $\frac{Btu}{ft^2-hr-°F}$).
- A is the area of the wall expressed in m^2 (ft^2).
- ΔT is the temperature difference across the wall K $(°F)$.

Unit Conversion

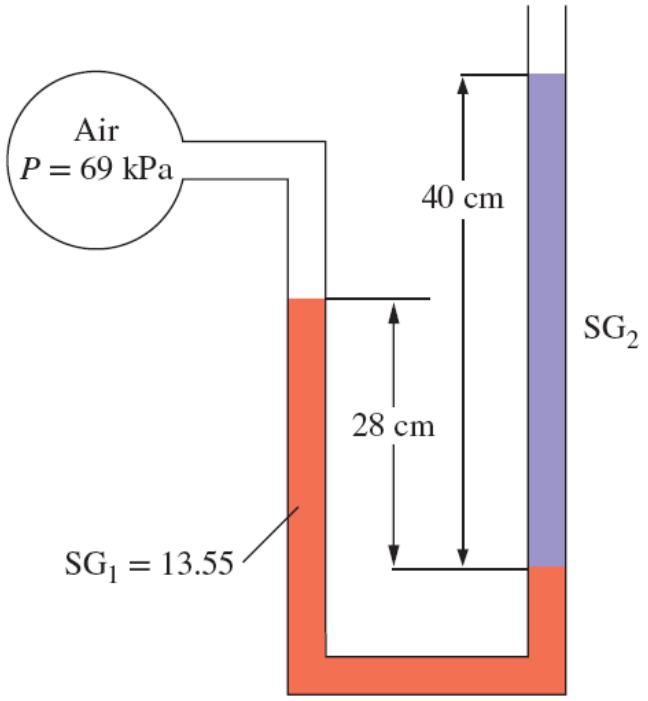
Solution:

Unit Conversion

Solution:

Manometer

Solution:



Manometer

Solution:

Pressure Calculation

Question: The barometer of a mountain hiker reads 750 mbars at the beginning of a hiking trip and 650 mbars at the end. Neglecting the effect of altitude on local gravitational acceleration, determine the vertical distance climbed. Assume an average air density of 1.20 kg/m^3.

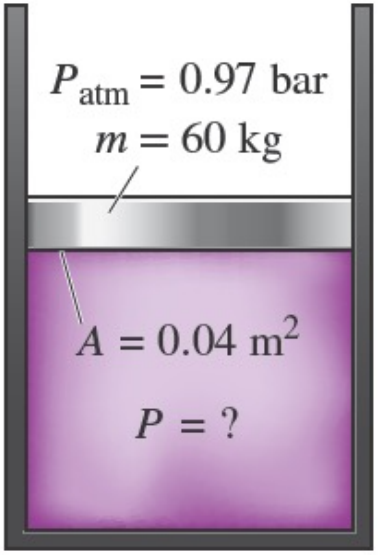
Pressure Calculation

Solution:

Pressure Measurement

Question: The piston of a vertical piston–cylinder device containing a gas has a mass of 60 kg and a cross-sectional area of 0.04 m^2, as shown below. The local atmospheric pressure is 0.97 bar, and the gravitational acceleration is 9.81 m/s^2.

a) Determine the pressure inside the cylinder.
b) If some heat is transferred to the gas and its volume is doubled, do you expect the pressure inside the cylinder to change?



Pressure Measurement

Solution:

Pressure Measurement

Solution: